

THE FLOWERING PLANTS
OF THE
SUDAN

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BY

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VOLUME III
(COMPOSITAE—GRAMINEAE)

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PREFACE

THIS is the third and last volume of this flora and comprises the families *Compositae* to *Gramineae*. The arrangement of the families, genera and species is on similar lines to that of the two previous volumes.

In the preparation of this volume, assistance has been given by specialists in particular families, notably Mr. P. Taylor (*Lentibulariaceae*), Mr. E. Nelmes (*Cyperaceae*), Mr. C. E. Hubbard (*Gramineae*) and Mr. V. S. Summerhayes (*Orchidaceae*), to whom my best thanks are due.

Mr. J. E. Dandy of the British Museum (Natural History) has again corrected the proofs and prepared the index involving himself not only in nomenclatural corrections but in genuine botanical research; to him I offer my grateful thanks for all the work that he has put into this laborious task.

Mr. E. Milne-Redhead of the Herbarium, Royal Botanic Gardens, Kew, has continued his co-operation in the identification of Sudan plants and to him I offer my best thanks.

Use has again been made of illustrations from the works mentioned in Volume I of this flora and also from *East African Pasture Plants*¹ and once again I record my indebtedness to the authors and publishers for permission to make use of these illustrations. Many of the illustrations are original and have been prepared by Mrs. W. Andrew from fresh material in the Sudan.

I have also to record my thanks to my wife by whom much of the typing of this volume has been done, and in whose capable hands fell many of the tedious but necessary jobs associated with a publication such as this.

Equatoria includes the province of Bahr-el-Ghazal.

The preparation of the three volumes of this flora has occupied a period of some fifteen years though it is only during the latter half of this period that the work has progressed at any speed. During that time much new material has been found, studied and incorporated in this flora; that there are omissions in it is a *sine qua non*, but it is hoped that this flora will form a sure foundation upon which a more detailed flora may one day be written.

F. W. ANDREWS.

Maidstone, 1955.

¹*East African Pasture Plants*, 2 Parts: Crown Agents for the Colonies, London.

SEQUENCE OF FAMILIES CONTAINED IN VOLUME III

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DESCRIPTIVE SYSTEMATIC LIST

ANGIOSPERMAE

DICOTYLEDONES

119. COMPOSITAE

Herbs or shrubs or rarely trees or climbers, sometimes with milky juice. Leaves without stipules, alternate or opposite, simple or variously divided. Flowers small and crowded into heads (capitula) surrounded by an involucre of one or more rows of free or variously connate bracts, rarely the heads compound with the partial heads containing 1-few flowers. Receptacle concave, convex or globose, rarely elongated, with or without bracts (paleae) between the flowers, sometimes honey-combed. Flowers hermaphrodite or unisexual, the outer ones (ray-flowers) usually ligulate (i.e. strap-shaped), the inner ones (disk-flowers) usually tubular and actinomorphic. Calyx usually much modified, absent or reduced to bristles (pappus) or rarely dry and chaffy. Corolla gamopetalous, in the ray-flowers ligulate or thread-like, in the disk-flowers 4-5-lobed or rarely ligulate or bilabiate. Stamens 5 or rarely 4, epipetalous, usually included in the corolla-tube; filaments free; anthers united or rarely free. Ovary inferior, 1-locular, 1-ovuled; style of the hermaphrodite flowers branched or unbranched, often clothed with hairs; ovule erect. Fruit (achene) sessile.

The following plants of this family are cultivated in the Sudan: *Helianthus annuus* L., Sunflower; *Lactuca sativa* L., Lettuce; *Carthamus tinctorius* L., Safflower; *Cosmos sulphureus* Cav., Yellow Cosmos; *Zinnia elegans* Jacq., Youth-and-Old-Age.

KEY TO GROUPS.

- A. Flowers not all ligulate (strap-shaped); no milky juice (or very rarely):
 - B. Flowers of two kinds in each head, the outer female or neuter, ligulate or thread-like, the inner tubular and hermaphrodite, or the flower-heads unisexual:
 - C. Flower-heads bisexual:
 - D. Receptacle with paleae subtending the flowers; leaves usually opposite; pappus (when present) usually calyx-like or of stiff bristles GROUP 1.
 - DD. Receptacle without paleae; leaves alternate or rarely opposite:
 - E. Style of the hermaphrodite flowers usually undivided; achenes conspicuously 3-winged GROUP 2.

- EE. Style of the hermaphrodite flowers divided into 2 arms :
- F. Style-arms of the hermaphrodite flowers truncate and usually penicillate or papillose at the apex :
- (a) Pappus present :
- (b) Involucral bracts in one main row, sometimes with smaller ones at the base, not coloured
GROUP 3.
- (bb) Involucral bracts in many rows :
- (c) Involucral bracts not coloured; low often spreading herbs GROUP 4.
- (cc) Involucral bracts coloured; erect herbs or under-shrubs GROUP 6.
- (aa) Pappus absent; low often spreading herbs with solitary flower-heads GROUP 4.
- FF. Style-arms not truncate; involucral bracts in several rows :
- (d) Style-arms of the hermaphrodite flowers with a lanceolate or deltoid papillose tip; anther-base not tailed :
- (e) Involucral bracts in several rows GROUP 5.
- (ee) Involucral bracts in one main row, sometimes with an outer row of smaller ones GROUP 3.
- (dd) Style-arms of the hermaphrodite flowers club-shaped or obtuse :
- (f) Anther-base tailed; styles of both types of flower divided GROUP 6.
- (ff) Anther-base sagittate or mucronate; style of the sterile flowers undivided; herbs with prickly leaves; involucral bracts spinescent
GROUP 7.
- CC. Flower-heads unisexual GROUP 8.
- BB. Flowers all of one kind, all tubular and hermaphrodite :
- G. Style undivided GROUP 6.
- GG. Style divided into 2 arms :
- H. Style-arms without a ring of hairs below the base :
- I. Style-arms very slender and tapering, minutely hairy all over; flowers usually white or purple; leaves alternate or very rarely opposite :
- (g) Involucral bracts in more than one row, sometimes foliaceous GROUP 9.
- (gg) Involucral bracts in a single row GROUP 3.
- II. Style-arms truncate, obtuse or club-shaped at the apex, usually glabrous :
- J. Leaves alternate :
- (h) Anther-base rounded, not tailed :
- (i) Style-arms slender GROUP 10.
- (ii) Style-arms fairly thick, truncate GROUP 3.
- (hh) Anther-base sagittate, usually long-tailed :

- (j) Style-arms club-shaped, without an apical appendage GROUP 6.
- (jj) Style-arms terminating in a short glandular appendage GROUP 11.
- JJ. Leaves opposite:
 - (k) Flowers yellow GROUP 12.
 - (kk) Flowers white, pink or lilac GROUP 10.
- HH. Style-arms with a ring of hairs below the base, short, narrow, rather obtuse; involueral bracts in several rows, usually terminating in a spine and often pectinately toothed; flowers usually mauve, blue or rose GROUP 13.
- AA. Flowers all ligulate and hermaphrodite, usually yellow; juice milky GROUP 14.

GROUP 1.

- A. Paleae of the receptacle flat or nearly so, not folded round the achenes:
 - B. Involueral bracts all free, the outer ones herbaceous, the inner merging into the paleae of the receptacle:
 - C. Pappus present:
 - (a) Flower-heads medium-sized, solitary on long peduncles; ray-flowers yellow TRIDAX. 74.
 - (aa) Flower-heads small, several on short peduncles at the ends of branchlets, also axillary; ray-flowers white GALINSOGA. 36.
 - CC. Pappus absent; corolla-tube pubescent, especially at the base; outer bracts foliaceous GUIZOTIA. 41.
 - BB. Inner involueral bracts connate at the base, the outer ones fewer and smaller:
 - (b) Achenes with a pappus of 2-5 awn-like bristles:
 - (c) Mature achenes with 2 lateral wings; bristles without reflexed barbs COREOPSIS. 19.
 - (cc) Mature achenes not winged; bristles with or without reflexed barbs BIDENS. 8.
 - (bb) Achenes without a pappus:
 - (d) Style-branches tapered into long thin puberulous appendages; low herbs CHRYSANTHELLUM. 15.
 - (dd) Style-branches truncate or with a short acute or subulate appendage; erect branched herbs:
 - (e) Mature achenes with or without 2 lateral wings, glabrous COREOPSIS. 19.
 - (ee) Mature achenes not winged, usually hairy BIDENS. 8.
 - AA. Paleae of the receptacle concave or folded around the achenes:
 - D. Inner involueral bracts not embracing the achenes:
 - E. Leaves usually alternate:
 - (f) Flower-heads terminal or leaf-opposed; pappus absent SCLEROCARPUS. 66.

- (ff) Flower-heads in lax terminal corymbs; pappus of scales with or without bristles ANISOPAPPUS. 4.
- EE. Leaves usually opposite:
- F. Pappus forming a small cup or annulus with or without short bristles:
- G. Ray-flowers fertile:
- (g) Ligulate flowers very small; pappus-bristles 2 or 3, persistent BLAINVILLEA. 9.
- (gg) Ligulate flowers conspicuous, yellow; pappus-bristles soon falling off WEDELIA. 78.
- GG. Ray-flowers not fertile, conspicuous ASPILIA. 5.
- FF. Pappus composed of separate bristles or reduced to teeth, not united into a cup or annulus, or absent:
- H. Achenes thick or angular, not compressed:
- I. Ray-flowers yellow; paleae of the receptacle numerous:
- (h) Flower-heads overtopped by the leaves GEIGERIA. 37.
- (hh) Flower-heads not overtopped by the leaves MELANTHERA. 55.
- II. Ray-flowers white; paleae of the receptacle few and narrow; flower-heads small ECLIPTA. 26.
- HH. Achenes of the disk-flowers compressed:
- (i) Achenes winged VERBESINA. 75.
- (ii) Achenes not winged SPILANTHES. 71.
- DD. Inner involucre bracts embracing the fertile ray-achenes; flower-heads whitish, axillary, sessile; marsh plants ENYDRA. 29.

GROUP 2.

- Only Sudan genus OSTEOSPERMUM. 59.

GROUP 3.

- A. Style-arms ending in long subulate or ovate or lanceolate tips; flower-heads discoid (ray-flowers absent):
- (a) Style-arms long-subulate; stems leafy GYNURA. 43.
- (aa) Style-arms ovate or lanceolate, papillose; stems not leafy above KLEINIA. 50.
- AA. Style-arms more or less truncate with or without papillose appendages:
- B. Style-arms with papillose appendages at the apex CRASSOCEPHALUM. 21.
- BB. Style-arms without papillose appendages:
- C. Ray-flowers absent; involucre without a calyx-like outer row; flower-heads discoid EMILIA. 28.
- CC. Ray-flowers present:
- D. Involucre with a calyx-like outer row, the latter sometimes small:
- (b) Achenes 5-10-ribbed or 5-angled, not dorsally compressed SENECCIO. 68.

- (bb) Achenes not 5-10-ribbed, at least those of the ray-flowers dorsally compressed CINERARIA. 16.
 DD. Involucre without a calyx-like outer row ... SENECEO. 68.

GROUP 4.

- Only Sudan genus COTULA. 20.

GROUP 5.

- A. Pappus well-developed, composed of bristles:
 B. Ray-flowers present though sometimes very small:
 (a) Shrubs or climbers:
 (b) Ray-flowers white MICROGLOSSA. 56.
 (bb) Ray-flowers yellow PSIADIA. 63.
 (aa) Herbs; ray-flowers blue or white FELICIA. 34.
 BB. Ray-flowers absent; herbs CONYZA. 18.
 AA. Pappus absent or very rudimentary or of a few bristles falling early:
 C. Pappus of a few minutely hooked bristles falling early MICROTRICHIA. 57.
 CC. Pappus not as above:
 D. Pappus of minute subpaleaceous teeth GRANGEA. 40.
 DD. Pappus an annulus or absent:
 (c) Flower-heads yellow CERUANA. 14.
 (cc) Flower-heads white, violet or purple DICHROCEPHALA. 23.

GROUP 6.

- A. Flower-heads separate, not crowded into compound heads:
 B. Female flowers ligulate:
 (a) Flowers yellow:
 (b) Involucre hemispherical; receptacle punctate PULICARIA. 64.
 (bb) Involucre turbinate-campanulate; receptacle not punctate LEYSERA. 54.
 (aa) Flowers pink or mauve ATHRIXIA. 6.
 BB. Female flowers thread-like or tubular or all flowers tubular and hermaphrodite:
 C. Style unbranched EPALTES. 30.
 CC. Style branched:
 D. Style-arms of the hermaphrodite flowers thread-like or rounded at the apex, not truncate:
 E. Shrubs or undershrubs:
 (c) Plants prickly; pappus in many rows IPHIONA. 49.
 (cc) Plants not prickly; pappus in 1 row PLUCHEA. 62.
 EE. Herbs:
 (d) Anther-base tailed:
 (e) Outer flowers thread-like; pappus of numerous bristles BLUMEA. 10.

- (ee) Outer flowers tubular:
- (f) Pappus in 1 row:
- (g) Achenes 4-6-ribbed INULA. 48.
- (gg) Achenes not ribbed VICOA. 77.
- (ff) Pappus in 2 rows PEGOLETTIA. 60.
- (dd) Anther-base not tailed LAGGERA. 52.
- DD. Style-arms of the hermaphrodite flowers truncate:
- F. Ray-flowers less numerous than the disk-flowers
HELICHRYSUM. 44.
- FF. Ray-flowers more numerous than the disk-flowers:
- (h) Anther-base obtuse or minutely tailed
PHAGNALON. 61.
- (hh) Anther-base finely tailed GNAPHALIUM. 39.
- AA. Flower-heads crowded into compound heads on a common re-
ceptacle SPHAERANTHUS. 70.

GROUP 7.

- Only Sudan genus BERKHEYA. 7.

GROUP 8.

- A. Leaves strongly scented, much divided AMBROSIA. 3.
- AA. Leaves not scented, palmately lobed XANTHIUM. 79.

GROUP 9.

- A. Pappus present and composed of bristles:
- B. Pappus usually persistent for some time:
- (a) Flower-heads separate, not collected into bracteate heads ...
VERNONIA. 76.
- (aa) Flower-heads collected into globose bracteate compound
heads ELEPHANTOPUS. 27.
- BB. Pappus falling early; bristles of the pappus bearded; leaves
opposite, decussate ERLANGEA. 31.
- AA. Pappus absent or not composed of bristles:
- C. Flower-heads sessile and clustered in the leaf-axils
STRUCHIUM. 72.
- CC. Flower-heads more or less corymbose:
- (b) Achenes broadly truncate at the apex ETHULIA. 32.
- (bb) Achenes rounded at the apex GUTENBERGIA. 42.

GROUP 10.

- A. Bristles of the pappus numerous; anthers with a produced con-
nective at the apex:
- (a) Erect herbs; leaves usually alternate EUPATORIUM. 33.
- (aa) Climbers; leaves opposite MIKANIA. 58.
- AA. Bristles (or paleae) of the pappus 4-5; leaves opposite (or the
upper ones alternate):
- B. Apex of the anther truncate or minutely apiculate; pappus-
bristles gland-tipped ADENOSTEMMA. 1.
- BB. Apex of the anther with an ovate produced connective; pappus-
bristles not gland-tipped AGERATUM. 2.

GROUP 11.

- A. Branched herbs or shrubs; involucrel bracts rigid, usually pungent-pointed:
 B. Pappus in 2 or more rows DICOMA. 24.
 BB. Pappus in 1 row HOCHSTETTERIA. 46.
 AA. Stemless scapigerous herbs GERBERA. 38.

GROUP 12.

- A. Leaves entire; achenes not ribbed ... HYPERICOPHYLLUM. 47.
 AA. Leaves serrulate; achenes 8-10-ribbed FLAVERIA. 35.

GROUP 13.

- A. Flower-heads 1-flowered, crowded into globose heads
 ECHINOPS. 25.
 AA. Flower-heads many-flowered, separate:
 B. Bristles of the pappus connate into a ring at the base; achenes with a nearly central horizontal callus at the base; plants prickly:
 (a) Bristles of the pappus consisting of straight stiff hairs
 CARDUUS. 11.
 (aa) Bristles of the pappus plumose CIRSIUM. 17.
 BB. Bristles or paleae of the pappus not connate at the base, or absent; achenes with an oblique or lateral callus at the base:
 (b) Involucre naked at the base, not prickly
 CENTAUREA. 13.
 (bb) Involucre girt at the base with floral leaves, prickly
 CARTHAMUS. 12.

GROUP 14.

- A. Pappus a denticulate annulus at the apex of the achene
 SCOLYMUS. 67.
 AA. Pappus composed of bristles:
 B. Pappus of not more than 12 slender bristles TOLPIS. 73.
 BB. Pappus of numerous bristles:
 C. Achenes more or less beaked:
 (a) Achenes subterete or obscurely angular, not compressed ...
 CREPIS. 22.
 (aa) Achenes (at least the outer ones) more or less compressed:
 (b) Achenes all similar LACTUCA. 51.
 (bb) Achenes dissimilar, the outer ones compressed, the inner ones columnar HETERACHAENA. 45.
 CC. Achenes not beaked:
 D. Outer involucrel bracts with conspicuous scarious margins; achenes oblong, with 4-5 thick transversely rugose ribs REICHARDIA. 65.
 DD. Outer involucrel bracts herbaceous or achenes narrow:
 (c) Achenes 10-many-ribbed or -striate SONCHUS. 69.
 (cc) Achenes 4-5-ribbed or -winged LAUNAEA. 53.

1. **ADENOSTEMMA** J. R. & G. Forst.**Adenostemma mauritianum** DC.

Erect usually branched herb 2-4 ft. high; stems rather rough. Leaves long-petiolate, rather shortly serrate-dentate, ovate or ovate-rhomboid, cuneate or subentire towards the base, $3\frac{1}{2}$ -6 in. long, $1\frac{1}{4}$ - $2\frac{3}{4}$ in. broad, glabrous or nearly so beneath, prominently 3-nerved from above the base. Flower-heads white, numerous, about $\frac{1}{2}$ in. long, in loose dichotomous terminal panicles. Achenes smooth.

Equatoria: Imatong Mountains, Itobol Forest.

A. perrottetii DC.

Erect branched herb 2-4 ft. high. Leaves ovate, crenate or coarsely serrate, abruptly narrowed at the base into the long petiole, 2- $4\frac{1}{2}$ in. long, $1\frac{1}{4}$ - $2\frac{1}{2}$ in. broad, subscabrid on the nerves beneath. Flower-heads white or lilac, small, numerous. Achenes densely warted.

Equatoria.

A. caffrum DC.

A. viscosum (non J. R. & G. Forst.) Broun & Massey.

Erect or ascending herb 1-3 ft. high; stems striate, angular, glabrous or glandular-puberulous. Leaves petiolate, almost entire to serrate, lanceolate to ovate, acute to almost acuminate at the apex, cuneate at the base into the petiole, up to 6 in. long, 2 in. broad, scabrous to almost glabrous. Flower-heads white, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, on slender unequal peduncles in lax trichotomous corymbs. Achenes glandular-muricate.

Darfur: Jebel Marra. Equatoria.

2. **AGERATUM** L.**Ageratum conyzoides** L.

Erect branched annual herb 1-3 ft. high; stems pubescent. Leaves crenate, ovate or ovate-rhomboid, obtuse or subacute at the apex, broadly cuneate to almost truncate at the base, $1\frac{1}{2}$ - $2\frac{3}{4}$ in. long, 1- $1\frac{1}{2}$ in. broad, setose-pubescent on the nerves beneath. Flower-heads bluish-purple or whitish, small, abundant in terminal corymbs. Achenes black when dry, angular, glabrous or nearly so.

Central and Southern Sudan.

3. **AMBROSIA** L.**Ambrosia maritima** L.

Erect branched aromatic herb or undershrub 1-3 ft. high; stems striate, pilose with whitish hairs. Leaves petiolate, deeply bipinnately divided, up to $4\frac{1}{2}$ in. long, softly and sometimes densely white-pubescent. Flower-heads greenish-yellow, uni-

sexual, $\frac{1}{8}$ - $\frac{1}{6}$ in. in diameter, the male heads (with 15-20 flowers) at the top, the female heads (with 1 apetalous flower) below, arranged in a pyramidal or corymbose panicle. Achenes obovoid, enclosed in a 4-6-horned involucre, smooth, without a pappus.

Northern and Central Sudan.

4. **ANISOPAPPUS** Hook. & Arn.

Anisopappus africanus (Hook. f.) Oliv. & Hiern.

Erect herb 2-4 ft. high; stems striate, shortly pubescent. Leaves narrowly triangular-lanceolate, truncate or subcordate at the base, $1\frac{1}{4}$ - $1\frac{3}{4}$ in. long, $\frac{5}{8}$ - $1\frac{1}{4}$ in. broad, slightly scabrous above, puberulous beneath. Flower-heads yellow, $\frac{2}{3}$ - $\frac{3}{4}$ in. in diameter, few, more or less terminal. Achenes prominently ribbed, thinly pubescent; pappus a single row of narrowly oblong jagged scales.

Equatoria.

5. **ASPILIA** Thou.

Aspilia multiflora Oliv. & Hiern.

Slender branched subscabrous herb. Leaves denticulate, ovate or lanceolate, obtusely acuminate at the apex, suddenly narrowed near the base, $\frac{2}{3}$ - $1\frac{2}{3}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, strigillose. Flower-heads yellow, campanulate, $\frac{1}{4}$ in. long, pedunculate in lax leafy panicles; outer involucre bracts linear-oblong, shorter than the disk-flowers. Achenes silky-villous, indistinctly spotted, $\frac{1}{8}$ in. long; pappus cupular with 2 bristles about $\frac{1}{16}$ in. long.

Blue Nile Province.

A. schimperii (Schultz Bip.) Oliv. & Hiern.

Erect annual herb 1-3 ft. high; stems and branches strigillose. Leaves denticulate, ovate-lanceolate or lanceolate, acuminate at the apex, cuneate at the base, 1-5 in. long, $\frac{1}{4}$ -2 in. broad, strigillose. Flower-heads yellow, campanulate in flower, hemispherical in fruit, $\frac{1}{4}$ - $\frac{1}{3}$ in. long, pedunculate in lax open leafy cymes; outer involucre bracts linear-oblong, equalling or exceeding the flowers, strigose. Achenes silky-villous, $\frac{1}{2}$ in. long, spotted; pappus cupular with 2 long bristles $\frac{1}{8}$ in. long.

Kassala: Gallabat. Nuba Mountains.

A. latifolia Oliv. & Hiern.

Scrambling usually hispid herb. Leaves shortly petiolate, serrulate, ovate, acute at the apex, up to 5 in. long, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, shortly pubescent-scabrous. Flower-heads yellow, hemispherical, $\frac{1}{2}$ -1 in. long, solitary at the ends or in the forks of branches; peduncle up to 8 in. long; outer involucre bracts lanceolate, about equalling the ray-flowers. Achenes strigose; pappus cupular with rudimentary or very short bristles.

Equatoria.

A. kotschyii (Schultz Bip.) Oliv.

Erect roughly hispid herb 1-4 ft. high. Leaves sessile, linear-lanceolate, gradually acute at the apex, 2-7½ in. long, up to 1½ in. broad, pilose on both surfaces with stiff hairs. Flower-heads usually deep-red-purple or occasionally white, hemispherical, ½-¾ in. long, solitary or a few near together, often overtopped by the uppermost involucreal leaves; peduncles up to 1 in. long. Achenes turbinate-oblong, silky-villous, ½ in. long, not spotted; pappus cupular with 2 bristles rudimentary or up to ½ in. long.
Central and Southern Sudan.

6. **ATHRIXIA** Ker-Gawl.**Athrixia rosmarinifolia** (Schultz Bip.) Oliv. & Hiern.

Undershrub 2 or more ft. high; branches whitish-tomentose or puberulous at the ends, puberulous or thinly lanate below, finally nearly glabrous. Leaves sessile, linear to linear-lanceolate, acute or apiculate at the apex, ½-3¼ in. long, nearly or quite glabrous and shining above, white-tomentose beneath. Flower-heads magenta-pink, ½ in. long, shortly pedunculate, solitary or 1-3 close together, terminal or subterminal. Achenes thinly and shortly pubescent when young, at length almost glabrous, with a ring of erect hairs at the base, 6-8-ribbed; pappus in two rows, the outer very short.

Equatoria: Imatong Mountains, 8000-10,000 ft.

7. **BERKHEYA** Ehrh.**Berkheya spekeana** Oliv.

Erect leafy thistle-like herb 1-2 ft. high; stems ribbed, pubescent. Leaves sessile, often spine-tipped-dentate, linear to linear-lanceolate, acutely spinescent at the apex, auriculate at the base, about 3¼ in. long, green and minutely scabrous above, white-woolly-tomentose beneath. Flower-heads yellow, up to 3 in. in diameter, about 3 to each shoot, pedunculate; involucreal bracts margined with long spines, longer than the disk-flowers. Achenes somewhat hairy; pappus-paleae oblanceolate, serrulate.

Equatoria.

8. **BIDENS** L.

- A. Annual herbs; achene-bristles armed with reflexed barbs:
 B. Flower-heads with ray-flowers about ½ in. long ... *B. schimperi*.
 BB. Flower-heads discoid or with ray-flowers up to ¼ in. long:
 C. Involucre-bracts usually dilated towards the apex:
 (a) Disk-flowers 6-12; leaves usually simple *B. engleri*.
 (aa) Disk-flowers numerous; leaves usually 3-5-partite
B. pilosa.
 CC. Involucre-bracts usually narrow or linear towards the apex,
 not dilated:

B. biternata (Lour.) Merr. & Sherff.

Annual erect herb up to 6 ft. high; stems tetragonal, glabrous or pilose. Leaves petiolate, pinnate or 3-9-partite, serrate, ciliate on the margin, sparsely pilose on both surfaces; upper leaves oblong-ovate or lanceolate, acuminate at the apex, cuneate at the base, up to $2\frac{1}{4}$ in. long. Flower-heads 20-30-flowered; peduncles $\frac{1}{2}$ -3 in. long. Achenes linear, up to $\frac{3}{4}$ in. long; bristles 3-5, with reflexed barbs.

Widespread.

B. bipinnata L.

Setulose-pubescent or pilose annual herb. Leaves 2-3-pinnatisect or 2-pinnate; segments or leaflets coarsely toothed, narrowly ovate, acute at the apex, about $1\frac{1}{4}$ in. long. Flower-heads pale-yellow; outer involucre bracts ciliate or pubescent. Achenes linear; bristles 3-4, with reflexed barbs.

Northern and Central Sudan.

B. vatkei Sherff.

Coreopsis chrysantha Vatke, non L.

Erect pallid perennial herb 2-4 ft. high. Leaves 3-5-partite; segments entire near both ends, serrate in other parts, ovate or lanceolate, acutely narrowed at both ends, $\frac{3}{4}$ - $3\frac{1}{2}$ in. long, $\frac{1}{2}$ -1 in. broad, scabrid above, shortly hispid-pubescent beneath. Flower-heads on hispid peduncles $1\frac{1}{2}$ -4 in. long, in lax open corymbose cymes. Achenes oblong, $\frac{1}{2}$ in. long; bristles 2, without reflexed barbs.

Northern Sudan: Nubia.

B. chaetodonta Sherff.

Coreopsis abyssinica Schultz Bip. ex Walp.

Erect perennial herb about 3 ft. high, glabrous below, usually scabrid-pubescent above. Leaves sessile or petiolate, pinnatisect; segments usually oblong-linear or linear-lanceolate, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. long, more or less toothed, the teeth sometimes setaceous. Flower-heads about $\frac{1}{2}$ in. in diameter on peduncles $\frac{1}{2}$ - $4\frac{1}{2}$ in. long, in lax corymbose cymes. Achenes compressed, about $\frac{1}{4}$ in. long; bristles 2, without reflexed barbs.

Fung District.

B. mossii Sherff.

Coreopsis tripartita M. B. Moss.

Erect graceful herb 1-2 ft. high; stem glabrous or minutely puberulous. Leaves shortly broad-petiolate, about $\frac{7}{8}$ in. long, tripartite; segments linear-oblong, the margins turned in but not ciliate. Flower-heads solitary, terminal; peduncle up to $2\frac{1}{4}$ in. long; ray-flowers 9-12, yellow, linear-oblong.

Equatoria: Imatong Mountains, summit of Mount Kineti, 10,400 ft.

B. imatongensis Sherff.

Perennial robust herb up to 8 ft. high; branches sparsely or towards the top densely hispid. Leaves opposite, shortly wing-petioled, more or less 5-partite; lower lateral segments lanceolate-ovate, coarsely and sharply dentate, up to $3\frac{1}{2}$ in. long, 2 in. broad. Flower-heads about 4 to an inflorescence, about 2 in. in diameter; peduncles densely spreading-hispid, $\frac{1}{2}$ - $2\frac{1}{4}$ in. long; ray-flowers yellow, about 12. Achenes blackish-brown, erectly hairy at the apex and margins; bristles 2, without reflexed barbs.

Equatoria: *Imatong Mountains*, 6350-6500 ft.

B. schweinfurthii Sherff.

Corcopsis linearifolia Oliv. & Hiern, non DC.

Erect nearly glabrous perennial herb 4-5 ft. high; stems purplish, woody at the base, simple or branched above, glabrous. Leaves not distinctly petiolate, elongate-linear, scabrous-ciliate on the margin, 2-6 in. long. Flower-heads few, up to 2 in. broad; peduncles up to 5 in. long; ray-flowers 8-16, often 3-toothed at the apex, about $1\frac{1}{2}$ in. long. Achenes hairy, with or without 2 short smooth bristles.

Equatoria.

9. **BLAINVILLEA** Cass.**Blainvillea rhomboidea** Cass.

Erect branched scabrous herb 1- $3\frac{1}{2}$ ft. high; stems striate. Leaves ashy-green, crenate-serrate, lanceolate, tapering towards the apex, narrowed to the 3-nerved base, up to 3 in. long, 1 in. broad. Flower-heads $\frac{1}{4}$ - $\frac{3}{8}$ in. long, 1-2 together in paniced leafy cymes. Achenes blackish, the outer ones 3-cornered, more or less glabrous and tubercled, terminated by 3 bearded bristles.

Northern and Central Sudan.

B. priureana DC.

Erect branched scabrid or roughly pubescent herb 1-2 ft. high. Leaves distinctly serrulate, lanceolate, acute at the apex, 2-6 in. long, up to 1 in. broad, scabrid-setulose on both surfaces. Flower-heads yellow, $\frac{2}{3}$ in. in diameter, on slender peduncles in paniced leafy cymes. Achenes doubly convex, villous, terminated by 2 smooth glabrous bristles.

Central Sudan.

10. **BLUMEA** DC.**Blumea aurita** (L.f.) DC.

Strong-scented pale-hairy herb 1-3 or more ft. high. Leaves oblong to narrowly oblong-obovate, auriculate and often interruptedly decurrent at the base, the lower leaves about $2\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, the upper ones much smaller, sessile and pinnately lobed or coarsely toothed, more or less pilose beneath. Flower-

heads yellowish or pale-mauve, $\frac{1}{3}$ - $\frac{1}{2}$ in. in diameter, pedunculate, in wide corymbose or diffuse terminal panicles. Achenes thinly pilose; pappus white.

Central and Southern Sudan.

B. lacera (Burm.f.) DC.

B. bifoliata (non DC.) Broun & Massey.

Strong-scented pale-hairy herb 1-3 or more ft. high. Leaves irregularly and coarsely dentate, narrowly obovate, gradually narrowed to the base, $1\frac{1}{2}$ - $2\frac{3}{4}$ in. long, $\frac{3}{4}$ - $1\frac{1}{4}$ in. broad, softly tomentose beneath. Flower-heads purple, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter, very numerous and forming oblong spike-like inflorescences. Achenes glabrous; pappus white.

Central and Southern Sudan.

B. bovei (DC²) Vatke.

B. abyssinica Schultz Bip. ex A. Rich.

Herb up to 18 in. high; stems like the leaves glabrous or sparingly pilose. Leaves linear or the lower ones oblanceolate, acute at the apex, rounded at the sessile clasping base or the lower ones attenuate at the base, remotely denticulate or subentire at the margin, up to $2\frac{1}{2}$ in. long and $\frac{2}{3}$ in. broad. Flower-heads $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, on slender unequal peduncles up to 2 in. long.

Red Sea District.

B. gariepina DC.

Much-branched densely silky-villous undershrub. Leaves linear, decurrent at the base, about $\frac{1}{2}$ in. long. Flower-heads pedunculate, $\frac{1}{2}$ in. long, subpaniculate.

Darfur: Jebel Meidob.

11. **CARDUUS** L.

Carduus theodori R. E. Fr.

Stemless prickly herb. Leaves rosulate, pinnately lobed, prickly on the margin, lanceolate or oblanceolate, 4-12 in. long, $1\frac{1}{4}$ - $3\frac{1}{4}$ in. broad, glabrous except on the nerves beneath. Flower-heads purple, $1\frac{1}{2}$ -2 in. in diameter, sessile in the centre of the leaf-rosette. Achenes with a pappus 1- $1\frac{1}{4}$ in. long.

Equatoria: Imatong Mountains, summit of Mount Kineti, 10,400 ft.

C. kikuyorum R. E. Fr.

Erect rigid prickly herb up to 9 ft. high; stems angular and very sulcate. Leaves scabrous, pinnatipinnate, narrowly oblanceolate, 12-16 or more in. long, up to 4 in. broad, more or less pubescent above, at first crisp-hirsute beneath, later scabrous; lobes incised-dentate, terminating in prickles. Flower-heads white to pale-reddish-violet, sessile, 2-5 at the ends of the stems and branches.

Equatoria: Imatong Mountains, Kippia scrub, 8000 ft.

12. **CARTHAMUS** L.**Carthamus persicus** Desf. ex Willd.*C. leucocaulos* Sm.

Erect glaucous nearly glabrous prickly herb 1-1½ ft. high; stems white, smooth. Leaves pinnatifid, often deeply, the upper ones sessile, the lower ones narrowed into a short petiole, 1-4 in. long; lobes entire, ending in a sharp prickle. Flower-heads ½-¾ in. in diameter, terminal.

*Red Sea District.*13. **CENTAUREA** L.**Centaurea calcitrapa** L.

Star-thistle.

Pale branched nearly glabrous scabrous erect herb 1-2 ft. high. Leaves pinnatifid or pinnatisect, sometimes undivided, denticulate, sessile or shortly petiolate, 1-4 in. long. Flower-heads usually purple, ¼-¾ in. long, solitary, lateral or terminating leafy branches; involucre bracts usually terminating in yellowish prickles about ¾-1¼ in. long with smaller lateral ones. Achenes pale, shining, without a pappus.

*Kordofan.***C. senegalensis** DC.

Fig. 1.

C. papposa Schultz Bip. ex Broun & Massey.

Stiffly branched scabrous-pubescent prostrate or erect herb 1-2 ft. high. Leaves sessile, denticulate, elliptic or ovate or lanceolate, obtuse to acute and apiculate at the apex, semi-amplexicaul at the base, ½-2 in. long, more or less tomentose above and beneath. Flower-heads purplish or bluish-white, ½-¾ in. long, solitary, terminating leafy branches; involucre bracts terminating in yellowish prickles about 1 in. long with smaller lateral ones. Achenes pale, ¼ in. long; pappus copious, tawny or nearly white.

*Darfur. Kordofan.***C. praecox** Oliv. & Hiern.*C. rhizocephala* Oliv. & Hiern¹, non Trautv.

Erect stiff herb 1-2 ft. high but sometimes much shorter. Leaves sessile, oblanceolate, serrulate, acute at the apex, cuneate at the base, 1-3 in. long, up to ½ in. broad, scabrous. Flower-heads borne close to the ground, about 1 in. long, ¾ in. broad, 3-9 together; involucre bracts terminating in an appendix bearing 3-5 short spines; outer flowers white, inner pale-purplish. Achenes glabrous; pappus about ½ in. long.

*Equatoria.*¹Excluding the leaves, which may not belong to *Centaurea*.



Fig. 1—*CENTAUREA SENEGALENSIS* DC.

A, habit showing rosette of basal leaves and tap root. B, longitudinal section of flower-head. C, involucral bracts. D, longitudinal section of flower. E, achene.

C. imatongensis Philipson.

Grey-tomentose perennial herb up to about 8 ft. high; stems simple. Leaves alternate, petiolate, denticulate, ovate, up to 4½ in. long, 3¼ in. broad, tomentose on both surfaces when young, finally glabrous above, with the nerves prominent beneath. Flower-heads creamy-white, 2-2½ in. long and broad, terminal, solitary. Pappus-bristles numerous, bearded, about 1 in. long.

Equatoria: Imatong Mountains.

C. crupinoides Desf.

Herb up to 18 in. high; stems slender, villous or becoming glabrous. Lower leaves nearly sessile, pinnatipartite, the lobes linear or oblong, usually toothed; upper leaves sessile, pinnatipartite. Flower-heads with blue ray-flowers and golden disk-flowers; involucrel bracts with a blackish tip.

Red Sea Hills.

14. **CERUANA** Forsk.**Ceruana pratensis** Forsk.

Erect branched half-woody hairy herb. Leaves coarsely crenate in the upper part, obovate-ob lanceolate, narrowly auriculate at the base, 1½-2 in. long, about 2 in. broad, thinly pilose on both surfaces. Flower-heads dull-yellow, campanulate, about ¼ in. long, usually shortly pedunculate, terminal and leaf-opposed, surrounded at the base by 2 or more leafy bracts equalling or overtopping the heads. Achenes glabrous; pappus minute.

Northern and Central Sudan.

15. **CHRYSANTHELLUM** Rich.**Chrysanthellum americanum** (L.) Vatke.

Fig. 2.

C. procumbens Pers.

Glabrous branching herb, procumbent and often with a rosette of leaves or suberect. Leaves much divided, up to 1½ in. long; segments oblong-lanceolate, glabrous. Flower-heads golden-yellow, ½ in. in diameter, pedunculate, numerous, cymose.

Central and Southern Sudan.

16. **CINERARIA** L.**Cineraria grandiflora** Vatke.

Erect or semi-procumbent herb or undershrub up to 4 ft. high; stems glabrous or floccose. Leaves petiolate, irregularly serrate-dentate, broadly ovate, auriculate at the base, up to 2½ in. long, 2 in. broad, floccose or glabrous beneath; petiole as long as the lamina. Flower-heads yellow, in lax corymbs. Achenes compressed.

Equatoria: Imatong Mountains, 8000-10,000 ft.

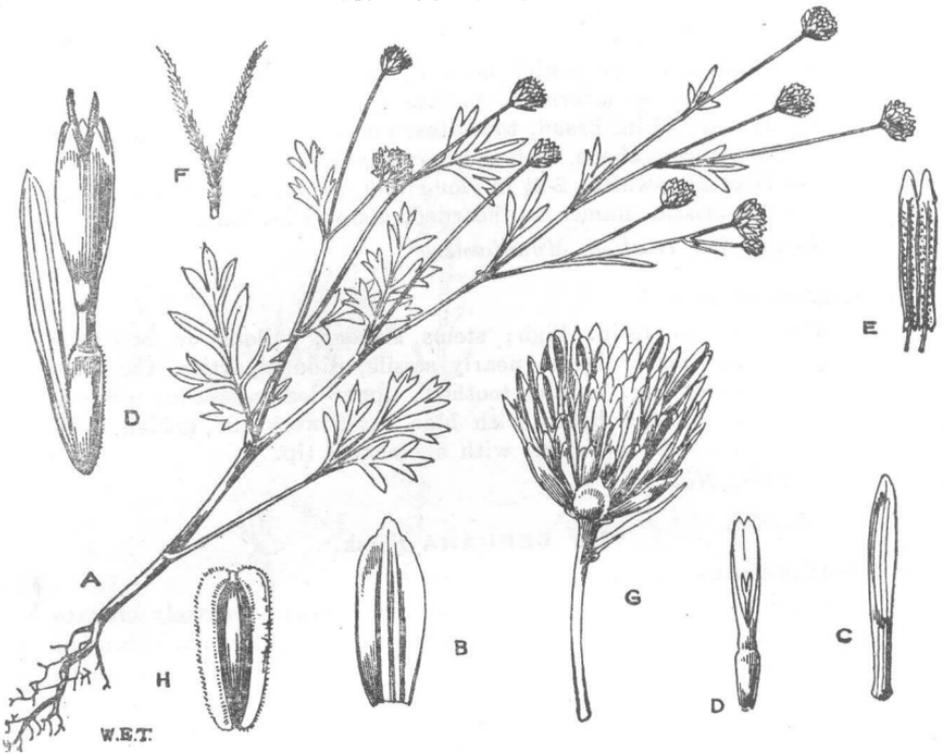


Fig. 2—*CHRYSANTHELLUM AMERICANUM* (L.) Vatke.

A, whole plant. B, involucre bract. C, palea. D, disk-flower and palea. E, anthers. F, style-arms. G, fruiting head. H, achene.

17. *CIRSIUM* Mill.

Cirsium sp.

Erect shrub about 3 ft. high; stems prickly. Leaves sessile, pinnatifid, lanceolate, acute at the apex, decurrent at the base, up to 5 in. long, prickly along the margin, thinly villous above, densely white-villous beneath. Flower-heads mauve, about $1\frac{1}{2}$ in. in diameter.

Equatoria: Imatong Mountains, summit of Mount Kineti, 10,400 ft.

18. *CONYZA* Less.

Conyza hochstetteri Schultz Bip. ex A. Rich.

Branched erect shortly hirsute herb $\frac{1}{2}$ -2 ft. high. Leaves sessile, dentate or subentire, oblong-lanceolate or narrowly elliptic, clasping or auriculate-cordate or narrowed into the winged clasping petiole at the base, 1-2 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. wide, hirsute. Flower-heads widely campanulate, $\frac{1}{2}$ in. in diameter, shortly pedunculate in dense terminal cymes about 1 in. in diameter. Achenes shortly and appressedly pilose; pappus nearly white.

Fung District.

C. abyssinica Schultz Bip. ex A. Rich.

Branched herb 2 ft. high. Leaves sessile, coarsely and distantly toothed, narrow-oblongate or the upper ones linear, apiculate at the apex, auriculate-cordate at the base, 1-2½ in. long, ½-1 in. broad, scabrous. Flower-heads ¼-½ in. in diameter, on short slender puberulous peduncles in subcorymbose terminal panicles 4-6 in. wide. Achenes thinly pilose; pappus bearded, tawny.

Darfur: *Jebel Marra*, 7500-9000 ft.

C. aegyptiaca (L.) Ait.

Erect branched hirsute or pilose herb 1½-3 ft. high. Leaves sessile, pinnatifid or subentire, coarsely toothed, linear-oblong or oblong-spathulate, amplexicaul or auriculate at the base, 1-4 in. long, ⅓-1 in. wide, pilose or hirsute on both surfaces. Flower-heads pale-yellow, ¼-½ in. in diameter, crowded at the ends of branches, the peduncles elongating. Achenes thinly pubescent; pappus tawny or nearly white.

Widespread.

C. stricta Willd.

Erect branched herb, woody below, 1-2 ft. high. Leaves sessile, pinnatifid or dentate, linear-spathulate, clasping at the base, ½-1 in. long, hispid-pubescent. Flower-heads cream to yellow, many-flowered, about ¼ in. in diameter, on short slender peduncles in dense corymbose cymes. Achenes somewhat pubescent; pappus tawny.

Red Sea Hills: *Erkowit*. *Darfur*: *Jebel Marra*.

19. COREOPSIS L.

Coreopsis borianiana Schultz Bip.

C. guineensis Oliv. & Hiern.

Nearly glabrous erect branched annual herb 2-8 ft. high. Leaves deeply tripartite into linear or linear-lanceolate dentate segments, up to 6 in. long, minutely scabrous on the margin. Flower-heads yellow, usually over 2 in. in diameter, on peduncles 2-7 in. long in lax open cymes or solitary and terminating the branches. Achenes about ¼ in. long, winged, ciliate on the wings.

Central Sudan.

C. schimperii O. Hoffm.

Perennial glabrous herb about 2-3½ ft. high. Leaves petiolate, opposite, 2-3-pinnatifid, about 2 in. long; segments linear. Flower-heads yellow, about ¾ in. in diameter, in lax corymbs; ray-flowers about 8. Achenes without wings or bristles.

Equatoria.

C. chippii M. B. Moss.

Undershrub up to 3 ft. high; branches puberulous. Leaves opposite, connate at the base, deeply divided, about $\frac{3}{4}$ in. long; segments linear, glabrous or nearly so. Flower-heads yellow, $\frac{2}{3}$ in. in diameter, shortly pedunculate, subcorymbose. Achenes truncate, glabrous.

Equatoria: Imatong Mountains, summit of Mount Kineti, 10,400 ft.

C. elgonensis Sherff.

Perennial herb or undershrub up to 3 ft. high; stems angular, sparsely pubescent to glabrous, woody below. Leaves opposite, numerous, sessile, 3-5-pinnatifid; segments apiculate at the apex, cuneate at the base, about $\frac{3}{4}$ in. long, sparsely pubescent to glabrous. Flower-heads few, in corymbs or sometimes solitary, on peduncles $\frac{1}{2}$ - $3\frac{1}{2}$ in. long; ray-flowers yellow, 8-12.

Equatoria: Imatong Mountains, summit of Mount Kineti, 10,400 ft.

20. **COTULA** L.**Cotula anthemoides** L.

Spreading or prostrate woolly herb. Leaves deeply sub-bipinnatifid, obovate in outline, half-clasping at the base, apiculate at the apex, $\frac{1}{3}$ - $\frac{2}{3}$ in. long. Flower-heads yellow, scarcely $\frac{1}{2}$ in. in diameter, solitary, terminal; female flowers numerous. Achenes narrowly winged; pappus absent.

Northern Sudan. Khartoum.

C. cinerea Del.

Densely villous grey-green herb 1-6 in. high. Leaves pinnatifid, obovate or spatulate in outline, $\frac{1}{4}$ - $\frac{2}{3}$ in. long. Flower-heads yellow, about $\frac{1}{4}$ in. in diameter, pedunculate, terminal; female flowers few or absent. Achenes not winged; pappus absent.

Red Sea District: Port Sudan. Kordofan.

C. kotschyi Oliv. & Hiern.

Hoary-pilose herb 1-12 in. high, much branched from the root-crown. Leaves pinnatifid, obovate, $\frac{1}{4}$ - $\frac{2}{3}$ in. long; lobes oblong, sometimes toothed. Flower-heads yellow, $\frac{1}{3}$ - $\frac{1}{2}$ in. in diameter, on peduncles $\frac{1}{2}$ -1 in. long, terminal; female flowers few. Achenes obovoid, crowned with a ring of thread-like bristles.

Northern and Central Sudan.

C. abyssinica Schultz Bip. ex A. Rich.

Pilose herb up to 12 in. high. Leaves bipinnatifid, up to $1\frac{1}{4}$ in. long including the petiole; lobes linear, acute at the apex; petiole half-clasping or shortly sheathing. Flower-heads up to

$\frac{3}{8}$ in. in diameter, on peduncles up to 6 in. long; female flowers few. Achenes oblong, those of the ray-flowers narrowly winged; pappus absent.

Blue Nile Province: White Nile.

21. **CRASSOCEPHALUM** Moench

Crassocephalum rubens (Juss.) S. Moore.

Gynura cernua Benth.

Erect branched puberulous herb 1-3 ft. high. Leaves irregularly dentate or lobed, obovate-oblong, auriculate at the base, 1-4 in. long, puberulous, the upper ones sessile, the lower ones petiolate. Flower-heads bluish-purple, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, drooping in flower, erect in fruit, solitary, terminal, on peduncles 6-12 in. long.

Red Sea Hills: Erkowit. Fung District. Equatoria.

C. vitellinum (Benth.) S. Moore.

Gynura vitellina Benth.

Nearly glabrous or pubescent ascending scrambling or erect herb 2-6 ft. high. Leaves petiolate, coarsely and doubly dentate or indistinctly lobed, ovate-triangular, 1-4 in. long; petiole $\frac{1}{2}$ - $1\frac{1}{2}$ in. long with stipule-like auricles at the base. Flower-heads orange, $\frac{3}{4}$ -1 in. in diameter, solitary, terminal, on peduncles 4-12 in. long.

Equatoria.

C. picridifolium (DC.) S. Moore.

Senecio picridifolius DC.; *Gynura vitellina* (non Benth.) Broun & Massey p.p.

Perennial herb 1-2 $\frac{1}{2}$ ft. high; stems shortly pubescent. Leaves sessile, acutely toothed, elliptic-oblong or ovate, rather narrowed towards the apex, auriculate or narrowed at the base, $1\frac{1}{2}$ - $4\frac{1}{2}$ in. long, $\frac{3}{8}$ - $1\frac{1}{2}$ in. broad. Flower-heads yellow, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, usually few together, on peduncles 3-6 in. long.

Darfur: Jebel Marra, 7200-7300 ft. Equatoria.

C. crepidioides (Benth.) S. Moore.

Gynura crepidioides Benth.

Erect branched pubescent or nearly glabrous herb 2-3 ft. high. Leaves petiolate (at least the lower ones), usually deeply lyrate-pinnatifid, sometimes not lobed, coarsely dentate, 1-10 in. long. Flower-heads orange or red, purple-tinged, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, on peduncles $\frac{1}{2}$ - $2\frac{1}{2}$ in. long in dense or lax corymbose cymes or rarely solitary.

Equatoria.

C. montuosum (S. Moore) Milne-Redh.

Herb; stems pubescent. Leaves petiolate, serrate, ovate-oblong, acuminate at the apex, unequally attenuate into the petiole, $1\frac{1}{2}$ -4 in. long, slightly scabrous; petiole up to 2 in. long, appen-

daged. Flower-heads yellow, small, in rather dense cymes; corollas projecting well beyond the involucre.

Equatoria.

C. mannii (Hook. f.) Milne-Redh.

Senecio multicorymbosus Klatt.

Much-branched soft-wooded shrub or tree up to 25 ft. high; stem green throughout its length. Leaves serrate, oblong-elliptic, acuminate at the apex, cuneate at the base, up to 18 in. long, 4 in. broad. Flowers yellow, in terminal inflorescences up to 2 ft. long.

Equatoria.

22. CREPIS L.

Crepis rueppellii Schultz Bip.

Puberulous perennial herb 2-18 in. high, with a strong woody root. Radical leaves numerous forming a rosette, denticulate, oblanceolate, rounded at the apex, attenuate at the base, $\frac{3}{4}$ -7 $\frac{1}{4}$ in. long, glabrous or pubescent with very short glandular hairs. Flower-heads $\frac{1}{2}$ - $\frac{3}{4}$ in. long, on peduncles $\frac{1}{2}$ -7 $\frac{1}{4}$ in. long in lax open cymes; inner involucre bracts 8, usually puberulous with small gland-tipped hairs. Achenes $\frac{1}{2}$ in. long, 10-15-ribbed, beaked; pappus $\frac{1}{2}$ in. long, white.

Darfur: Jebel Marra, 6500-9000 ft.

C. schimperi (Schultz Bip.) Schultz Bip.

Yellow hispid annual herb 3-15 in. high. Leaves pinnatifid or dentate, elliptic or oblong, up to 3 $\frac{1}{4}$ in. long, 1 $\frac{1}{4}$ in. broad; radical leaves several, shortly petiolate; stem-leaves fewer; upper leaves sessile, amplexicaul. Flower-heads yellow, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, on peduncles $\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, in lax open cymes; inner involucre bracts 13, puberulous. Achenes about $\frac{3}{8}$ in. long, beaked; pappus dirty-white, $\frac{1}{2}$ in. long.

Red Sea Hills: Erkowit.

C. ugandensis Bab.

Herb, probably perennial, 1 $\frac{1}{2}$ -3 ft. high, with a woody root. Radical leaves erect, closely and irregularly dentate, narrowly oblanceolate, acute or somewhat obtuse at the apex, gradually attenuate into a long winged petiole, up to 10 in. long, 1 in. broad, puberulous with minute appressed-glandular hairs especially beneath; upper leaves linear and acuminate at the apex or bract-like. Flower-heads yellow with reddish-purple stripes, on peduncles $\frac{3}{4}$ -3 $\frac{1}{2}$ in. long; inner involucre bracts 8-10, white-ciliate at the apex. Achenes gradually attenuate into a beak, 13-ribbed; pappus yellowish-white.

Equatoria: Imatong Mountains.

23. **DICHROCEPHALA** L'Hérit. ex DC.**Dichrocephala chrysanthemifolia** (Bl.) DC.

Erect herb 1-4 ft. high, slightly harsh-pubescent. Leaves at most coarsely dentate or pinnately lobulate, broadly auriculate at the base, the lower ones up to 4 in. long and $1\frac{1}{4}$ in. broad, scabrous-setulose above. Flower-heads red-purple, spherical, about $\frac{2}{3}$ in. in diameter, subsolitary or very few and racemose, on rather stout long peduncles. Achenes flat with a thick margin; pappus absent.

Darfur: Jebel Marra.

D. integrifolia (L. f.) Kuntze.*D. latifolia* DC.

Erect or ascending herb up to 5 ft. high; stems angular, pubescent. Leaves petiolate, crenate-serrate to more or less pinnately partite, not auriculate at the base, the terminal lobe more or less broadly ovate, serrate, $1\frac{1}{2}$ -3 in. long, setulose-pilose on both surfaces. Flower-heads purplish, ovoid-globose, very small, on short slender peduncles, rather numerous and paniculate. Achenes obovate, glabrous or nearly so; pappus absent.

Equatoria.

24. **DICOMA** Cass.**Dicoma tomentosa** Cass.

Woody herb 1-2 ft. high; stems cottony. Leaves linear-oblanco- late, $\frac{1}{2}$ - $2\frac{1}{2}$ in. long, white-woolly-tomentose on both surfaces, darker above. Flower-heads white, pinkish or yellowish, about $\frac{1}{2}$ in. long, numerous on very short axillary branches and terminal; involueral bracts terminating in long sharp bristles from a lanceolate base, the outer woolly. Achenes long-villous; outer pappus of bearded bristles, inner of 1-nerved membranous scales.

Central Sudan.

D. sessiliflora Harv.

Fig. 3.

Perennial herb from a woody base, a few inches to 2 ft. high; stems pithy. Leaves often wine-red-tinged, oblanceolate, up to $4\frac{3}{4}$ in. long, $\frac{3}{4}$ in. broad, glabrous above, woolly but sometimes glabrous beneath. Flower-heads yellowish, sessile, about $1\frac{1}{2}$ in. long, terminal and on very short lateral branches, solitary or a few together; involueral bracts narrowly lanceolate with a bristle-tip, glabrous. Achenes densely silky-villous; outer and inner pappus of plumose bristles.

Equatoria.



FIG. 3.—*DICOMA SESSILIFLORA* HARV.

A, portion of plant. B, outer flower. C, pappus-bristle. D, anther. E, style. F, inner flower.

25. **ECHINOPS** L.**Echinops longifolius** A. Rich.

Erect hoary perennial herb 1-2 ft. high. Leaves sessile, coarsely spinose-lobulate or dentate, linear, amplexicaul and auriculate at the base, 6-12 in. long, $\frac{1}{4}$ - $1\frac{1}{2}$ in. broad, woolly with white hairs beneath. Flower-heads greyish-white to purple, $\frac{2}{3}$ in. long when in flower, numerous in globose compound heads $1\frac{1}{2}$ -3 in. in diameter. Achenes densely pilose-setose, the hairs towards the apex over-topping the pappus; pappus of ciliate narrow scales connate at the base.

Central and Southern Sudan.

E. amplexicaulis Oliv.

Erect herb 4 or more ft. high; stems white-cottony above. Leaves pinnately lobed, ovate or elliptic, 3-9 in. long, 2-6 in. broad, scabrous above, shortly white-tomentose beneath; lobes spinous-dentate from a broad base, terminating in a spinous point. Flower-heads pink to deep-crimson, $1-1\frac{1}{2}$ in. long, very numerous in globose compound heads 3-4 in. in diameter. Achenes appressed-pilose; pappus of numerous ciliolate scales connate at the base.

Equatoria.

E. gracilis O. Hoffm.

Prickly perennial herb 1-2 ft. high from a woody rootstock, erect, branching; branchlets with crowded leaves. Leaves greenish-white, pinnatifid, linear, up to $1\frac{1}{2}$ in. long, prickly, almost glabrous. Flower-heads crowded in compound heads $\frac{1}{2}$ -1 in. in diameter.

Equatoria.

E. macrochaetus Fresen.

Erect branched herb 3-5 ft. high; branches glandular-pubescent above. Leaves much divided, sessile, oblanceolate or elliptic, semi-amplexicaul at the base, up to 8 or more in. long, glandular-puberulous above, white-tomentose beneath; segments pinnately incised or dentate, the teeth and apex terminating in a long spinous point. Flower-heads blue, about $\frac{2}{3}$ in. long, comparatively few, crowded in compound heads about $1\frac{1}{2}$ in. in diameter. Achenes densely setulose; pappus of setaceous ciliate scales connate at the base.

Red Sea Hills: Erkowit. Darfur: Jebel Marra. Nuba Mountains.

E. giganteus A. Rich.

Erect branched herb 6-16 ft. high; branches more or less cottony above. Upper leaves sessile or subsessile, deeply pinnatifid, obovate, about 12 in. long, 6 in. broad, sparingly strigose-hispid

above, whitish-tomentose beneath; lobes lanceolate, deeply toothed, the teeth terminating in a long spinous point. Flower-heads greenish-white to cream, up to $1\frac{1}{2}$ in. long, numerous in compound heads up to $3\frac{1}{2}$ in. in diameter. Achenes nearly glabrous at the apex; pappus of numerous ciliate scales connate below into a short tube.

Equatoria: Laboni; Imatong Mountains.

E. spinosus L.

Erect herb 3-5 ft. high, white-woolly. Leaves sessile, pinnatisect, 2-8 in. long; lobes spinose-incised. Flower-heads crowded in compound heads 3-4 in. in diameter with long projecting spines.

Red Sea Hills.

26. ECLIPTA L.

Eclipta prostrata (L.) L.

Fig. 4.

E. alba (L.) Hassk.

Erect or decumbent scabrous herb covered with appressed hairs, up to 2 or more ft. high. Leaves distantly serrate, lanceolate or narrowly ovate-lanceolate, subacute at the apex, narrowed at the base. Flower-heads white, about $\frac{1}{4}$ in. in diameter, axillary and terminal on slender peduncles up to $1\frac{1}{4}$ in. long. Achenes dentate at the apex, finely tuberculate.

Widespread: often near water.

27. ELEPHANTOPUS L.

Elephantopus mollis Kunth.

E. scaber (non L.) Broun & Massey.

Erect branched woody usually coarsely hairy herb 2-8 ft. high. Leaves crenate-serrate, more or less obovate-oblongate, acute to acuminate at the apex, sheathing at the base, up to 7 in. long, $2\frac{1}{4}$ in. broad, thinly and shortly pilose and minutely glandular beneath. Flower-heads white, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, with an involucre of 3-5 glabrous and shining or puberulous ovate-orbicular bracts. Achenes ribbed, minutely setulose; pappus of 5-6 bristles abruptly dilated at the base.

Equatoria.

E. scaber subsp. plurisetus (O. Hoffm.) Philipson.

Scapigerous herb. Lower leaves crowded to form a rosette. Involucral bracts appressed-pilose. Pappus-bristles 6-10, gradually dilated below.

Equatoria.

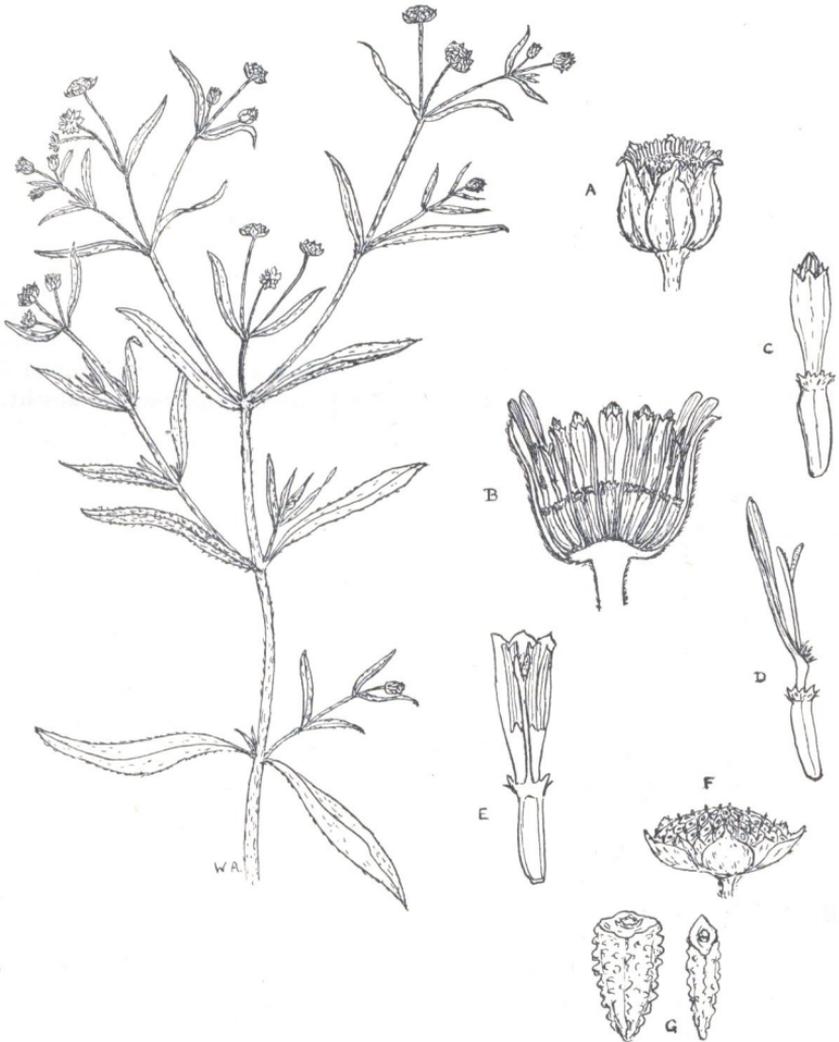


Fig. 4—*ECLIPTA PROSTRATA* (L.) L.

A, flower-head. B, longitudinal section of flower-head. C, hermaphrodite disk-flower. D, female ray-flower. E, longitudinal section of hermaphrodite flower. F, flower-head in fruit. G, achenes.

28. **EMILIA** Cass.**Emilia coccinea** (Sims) Don.*E. sagittata* DC.

Glaucous erect or scrambling branched herb. Leaves sessile, rather coarsely repand-dentate, elliptic-ovate or oblong, cordate-auriculate at the base, up to $4\frac{1}{2}$ in. long and $2\frac{3}{4}$ in. broad, glabrous, sometimes purple beneath. Flower-heads bright- or dark-yellow or reddish, $\frac{1}{4}$ - $\frac{3}{8}$ in. long, 3-4 together on slender peduncles.

*Central and Southern Sudan.*29. **ENYDRA** Lour.**Enydra fluctuans** Lour.

Perennial swamp herb; stems elongated, rooting in the lower part, glabrous. Leaves sessile, entire or distantly serrate, linear or linear-lanceolate, 2- $3\frac{1}{2}$ in. long, finely puberulous and minutely glandular beneath. Flower-heads white or yellowish-white, sessile, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter, very few, axillary; involucrel bracts 4, leafy, opposed in pairs. Achenes oblong; pappus absent.

*Southern Sudan.*30. **EPALTES** Cass.**Epaltes alata** (Sond.) Steetz.*E. gariepina* (non Steetz) Broun & Massey.

Bushy scabrous-puberulous glaucescent herb 1-3 or more ft. high. Leaves sessile, entire or serrulate, linear-oblong or lanceolate, acute at the apex, decurrent at the base forming wings along the stems, $\frac{3}{4}$ - $2\frac{1}{2}$ in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad, scabrous on both surfaces and on the margin, obscurely punctate beneath. Flower-heads heliotrope, more or less campanulate, $\frac{1}{8}$ in. broad, on short peduncles, crowded 2-4 together at the extremities of the branches; involucrel bracts pubescent-scabrous, broadly ovate, acuminate at the apex.

*Central Sudan.***E. umbelliformis** Steetz.

More or less densely pubescent or hirsute herb; stems usually narrowly winged. Leaves entire or serrate-dentate, linear-oblong or lanceolate, acute at the apex, attenuate and decurrent at the base, hirsute or pubescent on both surfaces, the margin scabrous and often ciliate. Flower-heads 3-6 at the ends of the branches, shortly and unequally pedunculate or almost sessile; involucrel bracts hirsute, narrowly ovate, pungent-acute at the apex.

*Central Sudan.*31. **ERLANGEA** Schultz Bip.**Erlangea imatongensis** M. R. F. Tayl.

Woody herb up to 6 ft. high. Leaves opposite, decussate, sessile or subsessile, dentate-serrate, ovate-lanceolate or lanceolate, sub-

amplexicaul at the base, acute at the apex, $1\frac{3}{4}$ - $2\frac{3}{4}$ in. long, $\frac{3}{4}$ - $1\frac{1}{4}$ in. broad, pale-green and glabrous or pubescent on the nerves beneath. Flower-heads heliotrope, 3-6 in terminal corymbose clusters; peduncles densely silky-villous. Achenes turbinate or oblong, glabrous, 8-10-ridged; pappus bearded, falling early.

Equatoria: *Imatong Mountains*, 7000-10,000 ft.

32. ETHULIA L.f.

Ethulia conyzoides L.f.

Erect branched herb 2-4 ft. high; stems thinly appressed-hirsute or becoming glabrous. Leaves more or less serrate, oblanceolate to obovate-oblanceolate, acute at the apex, $2\frac{1}{2}$ -6 in. long, $\frac{2}{3}$ - $1\frac{1}{2}$ in. broad, glandular and glabrous or shortly pubescent beneath; petiole narrowly winged. Flower-heads lilac or red-purple, very small, in lax corymbose terminal cymes. Achenes 4-5-ribbed; pappus a cartilaginous undulate ring.

Central and Southern Sudan.

33. EUPATORIUM L.

Eupatorium africanum Oliv. & Hiern.

Glabrous or pubescent erect branched herb 2-3 ft. high. Leaves sessile to shortly petiolate, ovate to narrowly lanceolate, 2- $2\frac{3}{4}$ in. long, up to $1\frac{1}{4}$ in. broad, scabrous and gland-dotted beneath. Flower-heads white or purple, small, crowded in dense terminal corymbose cymes. Achenes deeply sulcate, sparingly pubescent; pappus of bearded bristles.

Equatoria.

34. FELICIA Cass.

Felicia dentata (A. Rich.) Dandy, comb. nov.

Agathaea dentata A. Rich.¹; *F. richardi* Vatke.

Erect hirsute herb 3-9 in. high; branches terminating in peduncles 1-4 in. long having a single either naked or 1-2-bracteate flower-head. Leaves subsessile, entire or with 1-2 teeth, narrow-elliptic-oblong or oblanceolate, about $1-1\frac{1}{2}$ in. long, setulose-hispid or subglabrous. Flower-heads campanulate, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter. Achenes oblong, silky; pappus setaceous, tawny, scabrous.

Darfur: *Jebel Marra.*

35. FLAVERIA Juss.

Flaveria trinervia (Spreng.) Mohr.

Erect or diffuse dichotomously branched glabrous herb 1-4 ft. high. Leaves more or less remotely serrulate, linear to lanceolate, $1\frac{1}{2}$ -3 in. long, 3-nerved beneath. Flower-heads yellow, in axillary or terminal clusters $\frac{1}{2}$ -1 in. in diameter.

Kassala: *Gash Delta, Mekali.* An American species introduced into Africa.

¹*Tent. Fl. Abyss.*, vol. 1, p. 384 (1848).

36. *GALINSOGA* Ruiz & Pav.*Galinsoga parviflora* Cav.

Herb up to 2 ft. high; stems thinly pubescent to glabrous. Leaves thin, serrate-dentate, ovate-rhomboid, acuminate at the apex, broadly cuneate at the base, about $1\frac{1}{2}$ in. long, $1\frac{1}{4}$ in. broad, nearly glabrous. Flower-heads small, on slender terminal and axillary glandular-pubescent peduncles; ray-flowers white, disk-flowers yellow. Achenes pubescent; pappus paleaceous.

Nuba Mountains. Blue Nile Province: Danagla Woods. A native of America naturalized in the Sudan.

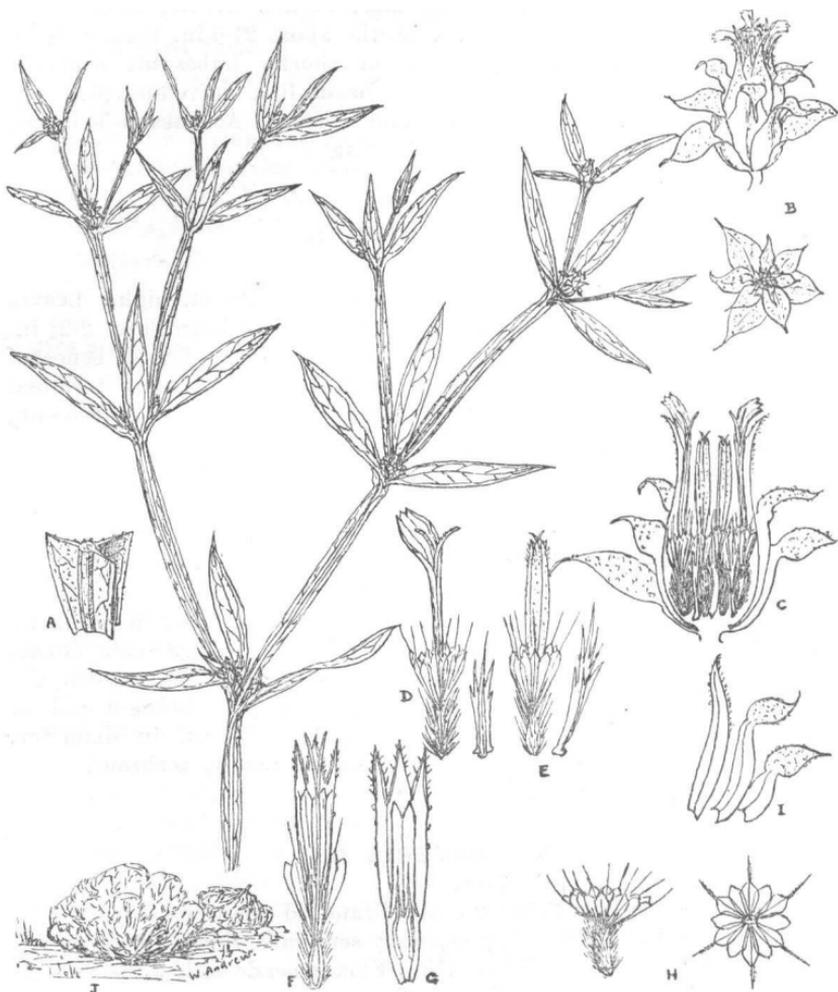


Fig. 5—*GEIGERIA ALATA* (DC.) Oliv. & Hiern.

A, 3-winged stem. B, flower-head. C, longitudinal section of flower-head. D, female ray-flower and bract. E, hermaphrodite disk-flower and bract. F, longitudinal section of disk-flower. G, taile anthers attached near the base of the corolla. H, achene, side and top. I, involucrel bracts. J, habit.

37. **GEIGERIA** Griessel.**Geigeria alata** (DC.) Oliv. & Hiern.

Fig. 5.

Glabrous branched annual herb 6-12 in. high; branches broadly winged. Leaves sessile, elliptic-oblong, mucronate at the apex, decurrent at the base, 1-3½ in. long, ¼-1 in. broad, glandular-punctate. Flower-heads yellow, campanulate, ½ in. long, sessile, solitary in the forks of the branches, with small foliaceous bracts at the base; involucrel bracts spine-tipped, puberulous.

Northern and Central Sudan.

G. acaulis Oliv. & Hiern.

Low tufted cottony herb 3-6 in. high; stems very shortly branched or rudimentary. Leaves sessile, crowded, linear or oblong, apiculate at the apex, 1-3½ in. long, ¼-½ in. broad. Flower-heads ovoid, ½ in. long, subsessile, solitary, densely cottony outside, concealed by the bases of the surrounding leaves; inner involucrel bracts ciliate. Achenes hirsute; inner pappus awned.

Central Sudan.

G. macdougallii S. Moore.

Low leafy herb 1-2 in. high. Leaves sessile, oblanceolate or lanceolate-oblong, mucronate at the apex, narrowed towards the base, ¾-1¼ in. long, glabrous except on the margin, gland-dotted. Flower-heads about ¼ in. long, terminal or axillary.

Red Sea Hills.

38. **GERBERA** Cass.**Gerbera piloselloides** (L.) Cass.*G. abyssinica* (non Schultz Bip.) Broun & Massey.

Stemless herb, with a thick silky-tomentose rootstock. Leaves entire or repand-denticulate, elliptic, rounded or mucronate at the apex, attenuate at the base into the petiole, 1½-6 or more in. long including the petiole, glabrous or nearly so above, more or less softly pilose beneath. Flower-heads ¾-1 in. long, with short reddish ray-flowers; scapes solitary or 2-4 together, pilose-tomentose or at length becoming almost glabrous, up to 15 in. long. Achenes when ripe long-beaked, papillose; pappus tawny.

Equatoria.

39. **GNAPHALIUM** L.**Gnaphalium luteo-album** L.

Erect or decumbent white-cottony herb up to 18 in. high. Leaves sessile, spatulate or linear, semi-amplexicaul at the base, up to 3½ in. long but usually less, woolly on both surfaces. Flower-heads golden-silky, small, in cymose or corymbose clusters at the ends of the branches and in the upper axils. Achenes more or less covered by very short upwardly curved glandular hairs.

Northern and Central Sudan.

G. pulvinatum Del.

Diffuse or prostrate lanate-tomentose annual herb; branches numerous, 3-5 in. long. Leaves spatulate, mucronate at the apex, attenuate at the base into a short petiole, $\frac{1}{3}$ - $\frac{2}{3}$ in. long. Flower-heads campanulate, $\frac{1}{2}$ in. long, crowded in subglobose leafy or involucrate terminal clusters about $\frac{1}{2}$ in. in diameter. Achenes glabrous or nearly so.

Northern and Central Sudan.

G. niliacum Spreng.

Diffuse thinly cottony annual branched herb 3-10 in. high. Leaves spatulate or obovate, attenuate at the base into the short petiole, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, lanate especially beneath. Flower-heads golden-silky, campanulate, $\frac{1}{2}$ in. long, sessile, in dense terminal spike-like clusters. Achenes papillose-glandular.

Widespread.

G. marranum Philipson.

Helichrysum abyssinicum (non Schultz Bip.) Broun & Massey.

Perennial or annual densely woolly plant up to about 12 in. high. Leaves alternate, sessile, linear-oblong or narrowly spatulate, up to $1\frac{1}{2}$ in. long, lanate on both surfaces, the midrib strongly keeled. Flower-heads $\frac{1}{2}$ in. long, in terminal corymbs. Achenes glabrous.

Darfur: Jebel Marra, 9000-10,000 ft.

40. **GRANGEA** Adans.**Grangea maderaspatana** (L.) Poir.

Hairy odorous herb up to 12 or more in. high; branches usually prostrate. Leaves pinnatifid, sessile, winged to the sessile base, $\frac{1}{2}$ -3 in. long; lobes oblong. Flower-heads dull-yellow, about $\frac{1}{2}$ in. in diameter, solitary or 2-3 together either terminal or lateral, on peduncles $\frac{1}{2}$ -1 in. long. Achenes with or without a cartilaginous apex.

Widespread.

41. **GUIZOTIA** Cass.**Guizotia scabra** (Vis.) Chiov.

G. schultzei Hochst. ex Schultz Bip.

Erect scabrous perennial herb 2-4 ft. high. Leaves sessile, denticulate or serrate, narrowly elliptic or lanceolate-oblong, cordate-amplexicaul and often connate at the base, $1-8\frac{1}{2}$ in. long, $\frac{1}{4}$ - $2\frac{1}{2}$ in. broad. Flower-heads yellow, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, on peduncles up to 5 in. long in lax or dense corymbose or oblong cymes; outer involucre bracts lanceolate. Achenes glabrous.

Central and Southern Sudan.

G. villosa Schultz Bip.

Erect villous annual herb 9-15 in. high; branches spreading. Leaves sessile, more or less serrate, elliptic to lanceolate, narrow at both ends and subamplexicaul at the base, $\frac{1}{2}$ -3 in. long, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad. Flower-heads $\frac{1}{4}$ - $\frac{3}{4}$ in. in diameter, on slender peduncles up to 2 in. long in open corymbose leafy cymes; outer involueral bracts lanceolate. Achenes glabrous.

Fung District.

G. schimperi Schultz Bip.

Erect annual herb 2-3 ft. high, pubescent above. Leaves sessile, denticulate, elliptic to ovate, cordate-amplexicaul at the base, $\frac{1}{2}$ -4 in. long, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. broad. Flower-heads $\frac{1}{2}$ in. in diameter, on peduncles up to 1 $\frac{1}{4}$ in. long in divaricate cymes; outer involueral bracts ovate or ovate-lanceolate. Achenes glabrous.

Darfur: Zalingei, 3100 ft.

42. **GUTENBERGIA** Schultz Bip.**Gutenbergia rueppellii** Schultz Bip.

Erlangea rueppellii (Schultz Bip.) Broun & Massey.

Erect thinly hoary-tomentose herb $\frac{1}{2}$ -2 ft. high. Leaves entire or obscurely denticulate, lanceolate to linear-lanceolate, narrowed to the base, 1-2 $\frac{1}{2}$ in. long, appressed-hoary-tomentose beneath. Flower-heads white or purple, about $\frac{1}{4}$ in. in diameter, on peduncles $\frac{1}{2}$ in. or less long in terminal corymbose cymes or laxly paniced. Achenes 8-12-ribbed, the ribs alternately narrower.

Upper Nile.

G. polycephala Oliv. & Hiern.

Erlangea polycephala (Oliv. & Hiern) Broun & Massey.

Erect branching more or less hoary-tomentose herb. Upper leaves sessile, lanceolate or ovate-lanceolate, obtuse or cordate-amplexicaul at the base, 1-2 in. long, whitish-tomentose beneath. Flower-heads small, on slender peduncles $\frac{1}{2}$ - $\frac{3}{4}$ in. long in diffuse cymose panicles. Achenes obovoid, 10-12-ribbed, the ribs equal or nearly so.

Equatoria.

G. cordifolia Benth. ex Oliv.

Erlangea cordifolia (Benth.) Broun & Massey.

Erect branching herb; stems appressed-silky-pubescent. Upper leaves sessile or subsessile, serrulate or obscurely denticulate, ovate, more or less cordate-amplexicaul at the base, 1-3 in. long, scabrous above, appressed-hoary-tomentose beneath. Flower-heads purple, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter, on hoary peduncles up to $\frac{1}{2}$ in. long in lax cymose panicles. Achenes obovoid, glabrous, obtusely 5-ribbed, the ribs grooved.

Upper Nile: Kodok.

H. odoratissimum (L.) Less.

Herb, branched from the base, $1\frac{1}{2}$ - $4\frac{1}{2}$ ft. high, more or less whitish-lanate throughout; branchlets slightly winged. Leaves 1-3-nerved, linear or linear-elliptic, acute at the apex, more or less narrowed to the sessile decurrent base, $1\frac{1}{2}$ -4 in. long, up to $\frac{1}{4}$ in. broad. Flower-heads golden-yellow, 5-6-flowered, sessile, crowded many together in dense branched terminal cymes $1\frac{1}{2}$ -6 in. in diameter.

Equatoria: *Imatong Mountains, Itobol*, 6000 ft.

H. schimperi (Schultz Bip.) Moeser.

Achyrocline schimperi Schultz Bip. ex A. Rich.

Loose straggling hoary-tomentose herb 2-6 ft. high. Leaves obscurely crenulate, ovate or elliptic, acute to obtuse at the apex, narrowed to broadly cuneate at the base, $1\frac{1}{2}$ -2 in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad, the upper ones smaller. Flower-heads whitish, shining, $\frac{1}{2}$ in. long, 4-5-flowered, sessile, crowded in dense corymbose or globose cymes. Achenes glabrous.

Red Sea Hills: *Has Has*. *Equatoria*: *Imatong Mountains, Itobol, Lomuleng*, 6000-10,000 ft.

H. formosissimum (Schultz Bip.) Schultz Bip. ex A. Rich.

Erect strong perennial herb 3 ft. high; stems lanate-pubescent above, nearly glabrous below. Leaves sessile, entire, oblong-lanceolate, apiculate at the apex, wide-clasping and somewhat decurrent at the base, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{1}{2}$ - $1\frac{1}{4}$ in. broad, scaly-asperulous above, tomentellous beneath. Flower-heads very many-flowered, $1\frac{1}{2}$ in. in diameter, on peduncles 1- $3\frac{1}{2}$ in. long, 4-8 in terminal corymbs 3-6 in. in diameter. Achenes thinly pubescent; pappus dirty-white, bearded.

Equatoria: *Imatong Mountains, Mount Kineti, rocky summit*, 10,400 ft.

H. argyranthum O. Hoffm.

Undershrub; branches lanate. Leaves linear to narrowly lanceolate, up to $2\frac{1}{2}$ in. long, glandular-hoary above. Flower-heads corymbose; involucrel bracts white, scarious, shining; disk-flowers yellow. Achenes glabrous.

Equatoria: *Imatong Mountains, summit of Mount Kineti*, 10,400 ft.

H. foetidum (L.) Moench.

Erect stout herb 1-4 or more ft. high. Leaves sessile, oblong-lanceolate, apiculate at the apex, cordate-amplexicaul at the base, 1-5 in. long, $\frac{1}{3}$ -1 in. broad, scabrous above, white-tomentose beneath. Flower-heads $\frac{1}{2}$ -1 in. in diameter, densely crowded in corymbose cymes; ray-flowers white; disk-flowers bright-yellow. Achenes oblong, very small, glabrous; pappus bearded.

Equatoria: *Imatong Mountains*, 6350-8000 ft.

H. fruticosum Vatke.

Erect much-branched woody undershrub 1-4 ft. high; branches tomentose above, almost glabrous below. Leaves sessile, entire, linear or lanceolate, cordate-amplexicaul at the base, $\frac{1}{3}$ -1 in. long, woolly-tomentose especially beneath. Flower-heads golden-yellow, very small, subsessile, crowded into subglobose clusters $\frac{3}{4}$ -1 $\frac{1}{2}$ in. in diameter.

Equatoria: Imatong Mountains, summit of Mount Kineti, 10,400 ft.

H. declinatum (L. f.) Less.

Gnaphalium unionis Schultz Bip. ex Oliv. & Hiern.

Annual prostrate or ascending lanate herb 1-12 in. high. Leaves sessile, linear, subacute or obtuse at the apex, $\frac{1}{2}$ -1 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Flower-heads $\frac{1}{8}$ - $\frac{1}{2}$ in. long, crowded in terminal sessile subglobose often involucrate or shortly pedunculate clusters $\frac{1}{2}$ -1 in. in diameter. Achenes minutely papillose.

Northern Sudan. Kordofan.

H. luzuloides (Vatke) Lanza.

Achyrocline luzuloides Vatke; *A. glumacea* Oliv. & Hiern p.p.

Erect branched herb $\frac{1}{2}$ -1 ft. high; upper branches more or less hoary, lanate, becoming glabrous, leafy except near the inflorescences. Leaves linear, acute and apiculate at the apex, somewhat narrowed below to the sessile base, lanate beneath, less so or almost glabrous above, 1-4 in. long. Flower-heads $\frac{1}{2}$ in. long, 5-8-flowered, crowded together in branched corymbose or globose cymes $\frac{1}{2}$ -2 $\frac{1}{2}$ in. in diameter.

Red Sea Hills. Darfur: Jebel Marra.

45. **HETERACHAENA** Fresen.**Heterachaena massauensis** Fresen.

Slender delicately branched annual herb 1-2 ft. high. Stem-leaves sessile, undivided or more or less deeply pinnatifid, denticulate, cordate and auriculate at the base, 1 $\frac{1}{2}$ -4 $\frac{1}{2}$ in. long; radical leaves petiolate. Flower-heads blue, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, on slender peduncles $\frac{1}{2}$ -1 in. long in paniculate cymes.

Red Sea Hills.

46. **HOCHSTETTERIA** DC.**Hochstetteria schimperl** DC.

Glabrous branched perennial herb 1 or more ft. high. Leaves minutely crenate, elliptic, obtuse at the apex, attenuate at the base into a short narrowly winged petiole, $\frac{1}{2}$ -2 in. long. Flower-

heads about $\frac{1}{2}$ in. long, usually with foliaceous bracts at the base; involueral bracts very acute, rigid, pungent.

Red Sea Hills.

47. **HYPERICOPHYLLUM** Steetz

Hypericophyllum compositarum Steetz.

Glabrous erect herb 2 or more ft. high, simple or trichotomously branched above. Leaves opposite, sessile, elliptic or elliptic-lanceolate, obtuse or scarcely acute at the apex, semi-amplexicaul at the base, $1\frac{1}{4}$ -5 in. long, $\frac{1}{4}$ - $1\frac{1}{2}$ in. broad, closely pellucid-punctate. Flower-heads orange, $\frac{1}{2}$ - $1\frac{1}{4}$ in. in diameter, the flowers much longer than the involucre; peduncles 1-3 together. Pappus-bristles glabrous.

Equatoria.

48. **INULA** L.

Inula decipiens E. A. Bruce.

I. macrophylla (Schultz Bip.) Schultz Bip., non Kar. & Kir.

Erect perennial herb $2\frac{1}{2}$ -5 ft. high. Leaves denticulate, elliptic or ovate, up to 1 or more ft. long, somewhat scabrous above, tawny-tomentose beneath; upper leaves sessile, cordate-auriculate and amplexicaul at the base; lower and radical leaves petiolate and narrowed to the base. Flower-heads yellow, about $\frac{1}{2}$ in. long, in dense corymbose terminal cymes 4-8 in. wide. Achenes about 12-ribbed; pappus scabrous, rusty.

Red Sea Hills: Karora.

49. **IPHIONA** Cass.

Iphiona scabra DC. ex Decne.

Shrubby plant with scattered short glandular scabrous pubescence. Leaves sessile, subulate, pungent at the apex, $\frac{1}{2}$ -1 in. long, with 1-3 spines about $\frac{1}{8}$ in. long at the base on each side. Flower-heads yellowish-white, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, solitary, axillary and terminal, on peduncles up to 1 in. long, often crowded together. Achenes oblong, hirsute; pappus tawny.

Red Sea Hills.

50. **KLEINIA** Mill.

Kleinia schweinfurthii (Oliv. & Hiern) A. Berger.

Notonia schweinfurthii Oliv. & Hiern.

Fleshy glabrous perennial herb up to 1 ft. high; stems leafy below, nearly leafless above. Leaves sessile, narrowly elliptic, acute at the apex, narrowed to the base, 1-2 in. long. Flower-heads purple, 1- $1\frac{1}{2}$ in. long, solitary on bracteate peduncles 6-8 in. long. Achenes glabrous, shining; pappus exceeding the corolla.

Equatoria: Dar Fertit.

K. abyssinica (A. Rich.) A. Berger.

Glabrous glaucescent fleshy herb up to 5 ft. high. Leaves scattered; radical leaves thick, elliptic, narrowed at both ends, 2-3½ in. long; stem-leaves sessile, narrowly elliptic, acute or obtuse at the apex, 1-4 in. long. Flower-heads bright-red, hemispherical, 1-2 in. in diameter, very many-flowered, on peduncles 1-6 in. long; involucre bracts 13-15. Achenes glabrous.

Equatoria: Imatong Mountains, Ibahin, 6500 ft.

51. **LACTUCA L.****Lactuca taraxacifolia** (Willd.) Schumach.

Glabrous herb up to 6 ft. high. Leaves runcinate with sharp denticulate teeth, up to 6 or more in. long, 4 in. broad; stem-leaves sessile, amplexicaul at the base; lower leaves narrowed into a short winged petiole. Flower-heads pale-yellow, ½ in. long, on very short peduncles in paniced racemose cymes; inner involucre bracts 5. Achenes dark, fusiform, about 10-ribbed, tapering to a short beak; pappus nearly white.

Northern and Central Sudan.

L. pinnatifida (Lour.) Merr.

L. goraensis (Lam.) Schultz Bip.; *Sonchus cornutus* Oliv. & Hiern p.p.

Erect glabrous glaucescent herb 1-3 or more ft. high. Leaves usually sessile, pinnatifid, often runcinate, up to 8 in. long, 4 in. broad, amplexicaul at the base or the lower ones narrowed into a short winged petiole. Flower-heads yellow, ½-¾ in. long, on very short peduncles in paniced racemose cymes; inner involucre bracts 8. Achenes dark, fusiform, about 10-ribbed, tapering to a short beak; pappus white.

Red Sea District. Kordofan.

L. schweinfurthii Oliv. & Hiern.

Unbranched herb 5 or more ft. high. Stem-leaves undivided, sessile, denticulate, lanceolate or lanceolate-oblong, up to 8 in. long, 2 in. or more broad, glabrous or nearly so; lower leaves narrowed towards the base. Flower-heads ¾-1 in. long, on peduncles up to ½ in. long in an elongated cyme. Achenes reddish-brown, elliptic, compressed with thickened margins, each side with a central nerve, very short-beaked; pappus white.

Equatoria.

L. capensis Thunb.

L. abyssinica Fresen.

Glabrous perennial herb ½-4 ft. high. Leaves linear or oblong; lower leaves runcinate-pinnatifid or entire, acuminate at the apex, 3-5 in. long; upper leaves sessile, usually entire, lanceolate or linear-lanceolate, amplexicaul and sagittate at the base.

Flower-heads usually blue or purple but sometimes white or yellow, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, on bracteolate peduncles up to $1\frac{1}{2}$ in. long in loosely paniced cymes. Achenes dark-brown, compressed, 1-ribbed on each side, narrowed into a long slender beak; pappus pale-yellowish or nearly white.

Central and Southern Sudan.

L. virosa L.

Wild Lettuce.

Erect glaucescent herb 1-3 ft. high; stems usually aculeate-setose below. Stem-leaves sessile, undivided, sinuate-toothed or runcinate, sagittate-amplexicaul at the base, 1-4 or more in. long. Flower-heads yellow, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, on very short peduncles in cymes with spreading branches. Achenes greyish- to dark-brown, compressed, with several ribs on each side, long-beaked; pappus white or nearly so.

Kordofan.

52. **LAGGERA** Schultz Bip. ex Benth.

Laggera pterodonta (DC.) Schultz Bip. ex Oliv.

Rather stout branched slightly glandular-pubescent viscid and odorous herb sometimes several ft. high; branches winged with toothed or interrupted wings. Leaves dentate, decurrent, oblong-ovovate, up to $4\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, finely puberulous on both surfaces. Flower-heads purple, $\frac{1}{2}$ - $\frac{1}{2}$ or more in. in diameter, pedunculate, numerous in leafy panicles. Achenes pilose; pappus white, minutely bearded.

Central and Southern Sudan.

L. crassifolia (A. Rich.) Schultz Bip. ex Oliv. & Hiern.

Shrubby branched herb 2-3 ft. high; branches winged with continuous wings. Leaves sessile, denticulate, narrowly elliptic or oblong, decurrent at the base, 2-3 in. long, $\frac{1}{2}$ -1 in. broad, glandular-puberulous. Flower-heads about $\frac{1}{2}$ in. in diameter, on peduncles up to $\frac{3}{4}$ in. long in pyramidal or elongate terminal panicles 2-5 in. wide. Achenes thinly silky.

Fung District.

L. alata (D. Don) Schultz Bip. ex Oliv.

Robust erect branched pubescent and slightly glandular herb 1-6 ft. high; wings of branches entire, very narrow. Leaves sessile or shortly petiolate, narrowly elliptic or elongate-oblong, up to 8 in. long, $1\frac{1}{2}$ in. broad, more or less scabrous above, more or less pubescent or somewhat scabrous beneath. Flower-heads red or purple, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, on spreading peduncles $\frac{1}{2}$ -1 in. long in wide pyramidal terminal panicles. Achenes appressed-pilose; pappus whitish.

Equatoria.

L. oblonga Oliv. & Hiern.

Erect branched herb a few inches to 2 or more ft. high; branches winged with subentire broad wings. Leaves denticulate, oblanceolate to oblong-ob lanceolate, long-decurrent at the base, up to 6 in. long, 2 in. broad, scabrous-pubescent. Flower-heads white, 1 in. in diameter, solitary or 2-3 together at the ends of short lateral winged branches. Achenes shortly pubescent.

Equatoria: Raga.

L. elatior R. E. Fr.

Erect herb up to 6 ft. high; stems winged with entire wings. Leaves numerous, serrate, oblong, acute and somewhat narrowed at the apex, up to 4 in. long, 1 in. broad, scabrous above, greyish-lanate beneath. Flower-heads white and pink, subglobose, about $\frac{3}{4}$ in. in diameter, numerous in leafy terminal panicles; peduncles not winged, grey-tomentose.

Equatoria: Imatong Mountains, Kippia.

53. **LAUNAEA** Cass.**Launaea capitata** (Spreng.) Dandy, comb. nov.

Sonchus capitatus Spreng.¹; *Lomatolepis glomerata* Cass.

Glabrous herb up to 18 in. high; stems scape-like, simple or 2-forked. Basal leaves forming a rosette, runcinate-pinnatifid, oblong, tapering towards the base, about 6 in. long; stem-leaves absent or 1-2. Flower-heads yellow, the terminal ones clustered, the lateral ones usually solitary.

Red Sea District.

54. **LEYSERA** L.**Leysera leyseroides** (Desf.) Dandy, comb. nov.

Gnaphalium leyseroides Desf.²; *L. capillifolia* (Willd.) DC.

Slender somewhat glandular-scabrous shining annual herb 3-6 in. high. Leaves narrowly linear or thread-like, up to 1 in. long. Flower-heads yellow, about $\frac{1}{2}$ in. long, solitary on slender peduncles 1-2 $\frac{1}{2}$ in. long.

Red Sea Hills.

55. **MELANTHERA** Rohr**Melanthera scandens** (Schumach.) Brenan.

M. brownii (DC.) Schultz Bip.

Scabrous herb, usually climbing, 2-10 ft. high. Leaves petiolate, dentate, sometimes 3-lobed below, deltoid-ovate, acuminate at the apex, subtruncate at the base, 2-6 in. long, 1-3 in. broad, very scabrous above, strigose beneath. Flower-heads yellow, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, on simple or branched peduncles 1 $\frac{1}{2}$ -6 in. long in lax

¹In L., *Syst. Veg.*, ed. 16, vol. 3, p. 650 (1826).

²*Fl. Atlant.*, vol. 2, p. 267 (1799).

nearly leafless terminal cymes. Pappus of 8-10 short deciduous bristles.

Southern Sudan: in the Sudd and elsewhere near water.

M. abyssinica (Schultz Bip.) Oliv. & Hiern.

Fig. 6.

Erect scabrous branched herb 2 ft. high. Leaves subsessile, serrate, ovate-lanceolate, more or less acuminate at the apex, amplexicaul at the base, $1\frac{1}{2}$ -4 in. long, $\frac{1}{4}$ - $1\frac{1}{4}$ in. broad, scabrous on both surfaces. Flower-heads $\frac{3}{8}$ - $\frac{1}{2}$ in. in diameter, on peduncles up to 3 in. long. Pappus of 2 deciduous bearded bristles.

Kassala: Red Sea Hills; Gallabat.



Fig. 6—MELANTHERA ABYSSINICA (Schultz Bip.) Oliv. & Hiern.

A, achene. B, flower, opened out.



Fig. 7—*MICROGLOSSA PYRIFOLIA* (Lam.) Kuntze.
 A, female flower. B, achene. C, hermaphrodite flower. D, bristle of pappus.
 E, stamens. F, style-arms. G, part of involucre.

M. pungens Oliv. & Hiern.

Erect rigid scabrous herb 4 or more ft. high. Leaves shortly petiolate, shallowly dentate, ovate or the upper ones lanceolate, acuminate at the apex, up to 6 in. long, $3\frac{1}{2}$ in. broad. Flower-heads yellow, $\frac{3}{8}$ - $\frac{1}{2}$ in. in diameter, pedunculate in rather lax corymbose cymes; inner involucrel bracts ending in a bearded setaceous point. Pappus of 2 scabrous bristles falling early.

Darfur: Kulme, 3600 ft. *Equatoria*.

56. **MICROGLOSSA** DC.**Microglossa pyrifolia** (Lam.) Kuntze.

Fig. 7.

M. volubilis DC.

Erect slightly viscid odorous shrub 6 or more ft. high, usually climbing or scrambling. Leaves petiolate, entire or subentire, ovate or ovate-elliptic, acutely acuminate at the apex, $2\frac{1}{4}$ -4 in. long, $1\frac{1}{4}$ -2 in. broad, more or less pubescent above and beneath. Flower-heads creamy or pale-yellow, numerous in laxly branched terminal corymbs.

Equatoria.

M. afzели O. Hoffm.

Suberect but usually climbing shrub. Leaves sessile or very shortly petiolate, linear-lanceolate to broadly lanceolate, gradually narrowed at the base, 2- $3\frac{1}{4}$ in. long, $\frac{3}{8}$ -1 in. broad, glabrous or nearly so. Flower-heads cream-white, shortly pedunculate in small subglobose terminal and axillary clusters forming terminal panicles 2-6 in. wide.

Equatoria.

57. **MICROTRICHIA** DC.**Microtrichia perrottetii** DC.

Diffuse or tufted pubescent or puberulous herb a few inches to 1 or more ft. high. Leaves coarsely toothed, obovate, rounded at the apex, narrowly cuneate at the base, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, $\frac{1}{3}$ -1 in. broad, the lowest ones long-petiolate. Flower-heads yellow, odorous, very small, in terminal subsessile clusters. Achenes pubescent; pappus of a few hooked bristles falling early.

Equatoria.

58. **MIKANIA** Willd.**Mikania cordata** (Burm. f.) B. L. Robinson.

M. scandens (non Willd.) Broun & Massey.

Climber; stems more or less pubescent. Leaves entire to coarsely lobulate-dentate, ovate-triangular, acutely acuminate at the apex, cordate to rounded-truncate at the base, 2-4 in. long, up to $2\frac{3}{4}$ in. broad, more or less puberulous and minutely glandular beneath. Flower-heads cream-white or pink-tipped, about $\frac{1}{2}$ in.

long, numerous, corymbose on slender peduncles. Achenes 4-angular with minute sessile glands between the ribs; pappus white or pink, bearded.

Equatoria.

59. OSTEOSPERMUM L.

Osteospermum vaillantii (Decne.) Norlindh.

Tripteris vaillantii Decne.; *T. lordii* Oliv. & Hiern.

Scabrous decumbent or ascending herb $\frac{1}{2}$ -2 or more ft. high. Leaves all alternate or the lower ones opposite, dentate or sub-pinnatifid, linear to narrowly elliptic, 1-4 $\frac{1}{2}$ in. long; upper leaves sessile and semi-amplexicaul at the base; lower leaves gradually narrowed into a short petiole. Flower-heads yellow, about $\frac{3}{8}$ in. in diameter, on peduncles $\frac{3}{4}$ -7 in. long in lax open corymbs. Achenes conspicuously winged.

Red Sea Hills. Darfur: Jebel Marra.

60. PEGOLETTIA Cass.

Pegolettia senegalensis Cass.

Branched slightly glandular and odorous herb, woody below; stems pubescent, ribbed. Leaves entire or slightly toothed, linear, $\frac{3}{4}$ -1 in. long, densely scabrous-setulose. Flower-heads yellow or purplish, $\frac{1}{2}$ in. long, numerous, laxly corymbose. Achenes closely ribbed; pappus in 2 rows, the outer short and multifid, the inner longer and plumose.

Red Sea Hills: Karora. Central Sudan.

61. PHAGNALON Cass.

Phagnalon schweinfurthii Schultz Bip. ex Schweinf.

Herb, shrubby below; branches densely white-tomentose. Leaves sessile, subentire, linear to narrowly oblong, acute and mucronate at the apex, subauriculate-amplexicaul at the base, 1-2 $\frac{1}{2}$ in. long, more or less hoary-lanate beneath. Flower-heads $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, on slender hoary peduncles 1-4 in. long, terminal or from the upper axils.

Red Sea Hills: Soturba.

P. scalarum Schweinf. ex Schwartz.

Woody herb or undershrub up to 15 in. high; stems appressed-white-tomentose, densely leafy. Leaves shortly and distantly denticulate, obovate-lanceolate, subacute or rounded at the apex, attenuate at the base, $\frac{1}{2}$ -2 in. long, glabrous above, grey-tomentose beneath. Flower-heads about $\frac{1}{2}$ in. in diameter, on peduncles $\frac{1}{2}$ -4 $\frac{1}{4}$ in. long and at first densely white-tomentose but later becoming glabrous at the apex.

Darfur: Jebel Marra, 6400-9300 ft.

62. **PLUCHEA** Cass.**Pluchea ovalis** (Pers.) DC.

Tawny- or grey-pubescent or -tomentose shrub or undershrub. Leaves sessile, denticulate-serrate, elliptic or ovate, auriculate-clasping towards the base and decurrent in unequally dentate wings, 1-2½ in. long, ¾-1¼ in. broad, rather densely scabrous-pubescent. Flower-heads white, ¼-½ in. in diameter, shortly pedunculate in dense corymbose terminal panicles. Achenes glabrous or nearly so; pappus dirty-white, scabrous.

Southern Sudan.

P. dioscoridis (L.) DC.

Shrub 6 or more ft. high. Leaves sessile or shortly petiolate, denticulate or subentire, elliptic-oblong to linear-lanceolate, often auriculate-cordate but not decurrent at the base, 1-3 in. long, ¼-1 in. broad, puberulous or glabrous. Flower-heads ¾-¼ in. in diameter, few together in stalked clusters collected in much-branched corymbose or globose terminal panicles. Achenes 4-7-ribbed; pappus dirty-white.

Northern and Central Sudan.

63. **PSIADIA** Jacq.**Psiadia arabica** Jaub. & Spach.

Branched shrub up to 6 or more ft. high. Leaves entire or distantly serrulate, lanceolate, more or less acuminate or cuspidate at the apex, narrowed to the base, 2-3 in. long, the younger leaves resinous-glistening and marked with minute glandular dots. Flower-heads yellow, ¼-½ in. in diameter, on peduncles up to ½ in. long in many-headed corymbose cymes.

Red Sea Hills: Karora.

64. **PULICARIA** Gaertn.**Pulicaria petiolaris** Jaub. & Spach.

Glandular-puberulous and more or less shortly appressed-pubescent bushy herb 1-1½ ft. high; branches leafless below. Leaves dentate, lanceolate or elliptic to ovate, cuneate or truncate at the base into a narrowly winged petiole, ½-2 in. long, up to 1 in. broad; petiole ½-1 in. long. Flower-heads ¾-½ in. in diameter, on peduncles ¼-4 in. long, loosely corymbose. Achenes thinly pubescent; inner pappus of about 4 deciduous bristles bearded above.

Red Sea District. Fung District.

P. grantii Oliv. & Hiern.

Erect undershrub 2 or more ft. high; branches glandular-puberulous. Leaves sessile, linear, apiculate at the apex, not amplexicaul at the base, up to 1 in. long, pubescent-tomentose. Flower-

heads yellow, about $\frac{1}{2}$ in. in diameter, solitary on terminal and subterminal peduncles $\frac{1}{2}$ -2 in. long. Achenes hirsute; inner pappus of 12-15 bearded bristles.

Kassala: Gash Delta. Khartoum.

P. undulata (L.) C. A. Mey.

Densely white-woolly branched erect herb a few inches to 2 ft. high. Leaves crowded, dentate, oblong or oblanceolate to linear, obtuse at the apex, auriculate-amplexicaul at the base, $\frac{1}{2}$ -2 in. long, $\frac{1}{8}$ - $\frac{2}{3}$ in. broad. Flower-heads yellow, $\frac{1}{3}$ - $\frac{2}{3}$ in. in diameter, solitary, terminal or subterminal on peduncules $\frac{1}{4}$ -1 $\frac{1}{2}$ in. long. Achenes setulose, obscurely ribbed; inner pappus of about 14-15 scabrous bristles.

Northern and Central Sudan.

P. crispa (Forsk.) Oliv.

Fig. 8.

More or less whitish-tomentose or occasionally nearly glabrous much-branched herb. Leaves sessile, denticulate-cripsed, obovate-oblong to linear or lanceolate, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{2}{3}$ in. broad. Flower-heads yellow, $\frac{1}{4}$ - $\frac{2}{3}$ in. in diameter, solitary at the ends of paniculate branches. Achenes glabrous; pappus sub-1-seriate with a few shorter bristles.

Northern and Central Sudan.

P. attenuata Hutch. & Burt.

Glandular and shortly pubescent herb up to 1 ft. high. Leaves shallowly dentate above, spathulate-oblanceolate, subacute at the apex, long-attenuate at the base, 1 $\frac{1}{2}$ -2 in. long, about $\frac{2}{3}$ in. broad. Flower-heads yellow, broadly campanulate, about $\frac{2}{3}$ in. in diameter, on peduncles usually about 2 in. long but sometimes reaching 4 $\frac{1}{2}$ in. Achenes costate, appressed-pubescent; inner pappus of about 10 white bristles.

Darfur: Jebel Meidob.

P. dysenterica var. *stenophylla* Boiss.

P. vulgaris (non Gaertn.) Broun & Massey p.p.

Perennial herb; stems appressed-tomentose, branched above. Leaves sparsely dentate, linear-lanceolate or linear, acute to obtuse at the apex, auriculate at the base, up to 2 $\frac{1}{2}$ in. long, with a waxy powdery secretion but later becoming glabrous above. Flower-heads yellow, on peduncles with a few or no bracts.

Darfur: Jebel Marra, 6500-9000 ft.

P. vulgaris Gaertn.

Small Fleabane.

Much-branched puberulous herb 1 or more ft. high. Leaves sessile, more or less denticulate, linear-oblong, mucronate at the apex, cordate and semi-amplexicaul at the base, $\frac{1}{2}$ -2 $\frac{1}{2}$ in. long. Flower-heads about $\frac{1}{2}$ in. in diameter, solitary or subsolitary on

peduncles $\frac{1}{3}$ -2 in. long. Achenes setulose; inner pappus of about 10-12 bristles bearded towards the tip.

Kordofan.



Fig. 8—PULICARIA CRISPA (Forsk.) Oliv.

A young plant in flower. B, hermaphrodite disk-flower. C, female ray-flower. D, achene with pappus. E, thickened end of bearded bristle of inner pappus. F, outer pappus.

65. **REICHARDIA** Roth**Reichardia tingitana** (L.) Roth.*Picridium tingitanum* (L.) Desf.

Erect glabrous herb 1-2 ft. high. Leaves radical or alternate, sessile, undivided or pinnatifid, usually denticulate; oblong, oblong-ovate or lanceolate or the lower ones obovate, usually cordate and semi-amplexicaul at the base, $1\frac{1}{2}$ -6 in. long. Flower-heads yellow, $\frac{1}{4}$ -1 in. long, on long peduncles; involueral bracts broadly ovate, $\frac{1}{4}$ - $\frac{3}{8}$ in. long. Achenes glabrous, 4-5-ribbed, not beaked; pappus white.

*Northern and Central Sudan.*66. **SCLEROCARPUS** Jacq. f. ex Murr.**Sclerocarpus africanus** Jacq. ex Murr.

Erect branched annual more or less roughly pubescent herb 1-4 ft. high. Leaves petiolate, crenate-serrate towards the apex, ovate, abruptly narrowed at the base, $2\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. broad, scabrous-setulose above, pilose or setulose beneath. Flower-heads yellow, $\frac{1}{2}$ - $\frac{3}{8}$ in. in diameter, terminal, with subtending smaller leaves; receptacle with large boat-shaped ribbed paleae enveloping the fertile flowers.

*Central Sudan.*67. **SCOLYMUS** L.**Scolymus maculatus** L.

Nearly glabrous coarse rigid annual herb 1-3 ft. high; stems and branches whitish, winged by the decurrent leaves. Stem-leaves sessile, sinuous-pinnatifid, spinous-pointed, about 2-3 in. long; radical leaves broadly spathulate, spinous-dentate, subpetiolate, 3 in. long, 1 in. broad; floral leaves pectinate. Flower-heads yellow, nearly 1 in. long, sessile, terminal or lateral.

*Kordofan.*68. **SENECIO** L.**Senecio arabicus** L.

Nearly glabrous annual herb $\frac{3}{4}$ -1 $\frac{1}{4}$ ft. high. Leaves pinnatifid or pinnatipartite, usually elliptic in outline, 1-3 $\frac{1}{2}$ in. long; upper leaves sessile, amplexicaul or subpetiolate with an auriculate base; lower leaves narrowed into a petiole. Flower-heads $\frac{1}{4}$ in. long, on slender peduncles up to $\frac{3}{4}$ in. long, in corymbose cymes; involucre with 6-9 calyx-like short bracts. Achenes ribbed, puberulous.

*Northern Sudan: islands in the Nile. Kordofan.***S. abyssinicus** Schultz Bip. ex A. Rich.

Annual erect herb 3-18 in. high. Leaves more or less toothed in the upper part, spathulate or spathulate-orbicular, the upper

ones sessile, the lower ones suddenly narrowed into a petiole, $\frac{1}{2}$ - $2\frac{1}{2}$ in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad, sparsely scattered with crisped hairs. Flower-heads yellow, about $\frac{1}{2}$ in. long, on slender glabrous often bracteolate peduncles up to $1\frac{2}{3}$ in. long in a rather close cyme; involucre not surrounded by calyx-like bracts. Achenes ribbed, setulose.

Equatoria.

S. discifolius Oliv.

Erect annual herb 12-15 in. high. Leaves repand-denticulate, orbicular except the uppermost obovate-spathulate ones, suddenly narrowed into a winged petiolar half, $\frac{3}{4}$ -2 in. broad, puberulous. Flower-heads vivid-yellow, $\frac{1}{2}$ in. long, 1-3 together on peduncles 3-7 in. long terminating the branches; involucre not surrounded by calyx-like bracts.

Equatoria.

S. tuberosus Schultz Bip. ex A. Rich.

Erect glabrous herb 7-18 in. high; root white, fleshy, tuberous, 1-3 in. in diameter. Leaves petiolate or sessile, coarsely or sinuately toothed, elliptic or ovate-elliptic, 4-8 in. long including the petiole, $1\frac{1}{2}$ -4 in. broad. Flower-heads $\frac{1}{2}$ in. long, on short peduncles in a dense subumbelliform cyme 1-3 in. in diameter; involucre surrounded by 2-3 small thread-like calyx-like bracts. Achenes silky.

Kassala: Gallabat.

S. trichopterygius Muschl.

Tall erect herb up to 9 ft. high. Upper leaves sessile, rather fleshy, minutely and densely denticulate, ovate-lanceolate, about 2 in. long, $1\frac{1}{4}$ in. broad, cottony-tomentose beneath; lower leaves densely and irregularly denticulate, narrowed to the long petiole down which the lamina is decurrent, up to 9 in. long, $7\frac{3}{4}$ in. broad. Flower-heads bright-yellow, in terminal corymbose inflorescences. Achenes linear, dark-brown, glabrous.

Equatoria: Imatong Mountains, Lomuleng Forest, 8000 ft.

S. haberka Hutch.

Perennial herb; stems a few inches to 1 ft. high, often appearing after grass fires. Leaves sessile, entire, lanceolate or linear-lanceolate, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, glabrous; lower leaves rosulate. Flower-heads bright-yellow, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, on long naked peduncles. Achenes ribbed, pubescent.

Equatoria: north-west of Said Bundas.

S. myriocephalus Schultz Bip. ex A. Rich.

Erect leafy perennial undershrub or shrub up to 10 ft. high; stems cottony above. Leaves sessile, denticulate, linear-elliptic,

narrowed to the apex, auriculate at the base, 1-4 in. long, $\frac{1}{3}$ -1 in. broad, subglabrous and dark-green above, white with rudimentary tomentum beneath. Flower-heads yellow, $\frac{1}{4}$ - $\frac{1}{3}$ in. long, very numerous on peduncles up to 1 in. long in dense much-branched corymbose cymes 4-12 in. in diameter; involucre with a few short lanceolate calyx-like bracts. Achenes setulose.

Equatoria: Imatong Mountains, Lomuleng swamp, 8000 ft.

69. SONCHUS L.

- A. Flowers and leaves appearing together; cauline leaves present:
- B. Achenes more or less compressed and narrowed at both ends, with a 4-cornered basal pit:
- C. Annual herbs; leaves elliptic or oblong:
- (a) Achenes transversely rugose, oblanceolate, never winged *S. oleraceus*.
- (aa) Achenes smooth, obovate, sometimes winged *S. asper*.
- CC. Perennial herb; leaves linear-lanceolate ... *S. schweinfurthii*.
- BB. Achenes more or less cylindrical, with a 4-5-cornered basal pit:
- (b) Achenes $\frac{1}{2}$ in. long; ribs distinctly rugose:
- (c) Inflorescences much branched, the branchlets and peduncles slender; involucre bracts without horn-shaped appendages *S. exauriculatus*.
- (cc) Inflorescences sparsely branched, the branchlets and peduncles coarser and stiffer; involucre bracts with several distinct dark horn-like appendages at the apex *S. cornutus*.
- (bb) Achenes about $\frac{1}{2}$ in. long; ribs not rugose *S. chevalieri*.
- AA. Flowers often appearing before the leaves; leaves basal:
- (d) Herb 1-2 $\frac{1}{2}$ ft. high *S. welwitschii*.
- (dd) Herb 2-4 in. high *S. elliotianus*.

Sonchus oleraceus L.

Smooth Sow-thistle.

Coarse erect annual herb 1 $\frac{1}{2}$ -3 ft. high. Leaves undivided or runcinate or pinnatifid, usually aculeate-denticulate, 1-6 in. long; stem-leaves sessile, amplexicaul-auriculate at the base. Flower-heads yellow, many-flowered, about $\frac{1}{2}$ in. long exclusive of the flowers, on usually setose-glandular peduncles in corymbose cymes. Achenes brown, oblanceolate, 10-15-striate.

Northern and Central Sudan.

S. asper (L.) Hill.

Rough Sow-thistle.

Similar to *S. oleraceus* but leaves more prominently aculeate-denticulate with rounded recurved auricles, and achenes not transversely rugose.

Darfur: *Jebel Marra*.

S. schweinfurthii Oliv. & Hiern.

Erect glabrous herb 3-4 or more ft. high. Leaves glaucescent, attenuate from a sessile hastate-lanceolate base into a long linear acute apex with aculeate denticulations directed downwards, undivided or with a few linear lateral lobes, up to 12 in. long. Flower-heads yellow, widely campanulate, many-flowered, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, woolly at the base, on usually short peduncles in subumbelliform cymes. Achenes oblong, about 12-15-ribbed, 4 of the ribs larger than the remainder.

Equatoria.

S. exauriculatus (Oliv. & Hiern) O. Hoffm.

S. bipontini (non Aschers.) Broun & Massey p.p.

Perennial glabrous herb 2-4 or more ft. high. Stem-leaves deeply pinnatifid, sessile, auriculate or toothed at the base, up to 8 in. long; lateral lobes about 2 pairs, linear-lanceolate, acute at the apex, up to 2 or more in. long. Flower-heads yellow, $\frac{3}{8}$ - $\frac{1}{2}$ in. long, narrowly cylindric, in lax corymbose cymes.

Southern Sudan.

S. cornutus Hochst. ex Oliv. & Hiern.

Fig. 9.

Erect perennial herb $\frac{1}{2}$ -2 or more ft. high. Leaves sessile, crowded near the base of the stem, denticulate, spatulate or pinnately lobed or toothed, apiculate at the apex, narrowed at the base, 1-8 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Flower-heads yellow, about $\frac{3}{8}$ in. long, on bracteolate peduncles up to $1\frac{1}{4}$ in. long in rather lax divaricate cymes. Achenes about 10-striate, transversely rugose.

Northern and Central Sudan.

S. chevalieri (Hoffm. & Muschl.) Dandy, comb. nov.

S. prenanthoides Oliv. & Hiern, non Bieb.; *Launaea chevalieri* Hoffm. & Muschl.¹

Pale-stemmed much-branched woody perennial herb 1-3 ft. high. Leaves sessile or subsessile, pinnatifid-dentate or the upper ones subtire, oblong, narrowed towards the amplexicaul base, 2-6 in. long, the upper ones smaller. Flower-heads yellow, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, on bracteolate peduncles $\frac{1}{2}$ - $1\frac{1}{2}$ in. long in divaricate cymes. Achenes smooth, 10-ribbed.

Kordofan.

S. welwitschii (Scott-Elliot) Chiov.

Erect wiry branched perennial herb 1-2 $\frac{1}{2}$ ft. high, woody below. Leaves few, confined to the base of the stem, shortly petiolate, entire or aculeate-denticulate, obovate to oblanceolate, up to 3 $\frac{1}{2}$

¹In *Mém. Soc. Bot. France*, vol. 2, 8, p. 118 (1910).

in. long. Flower-heads narrow-oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, numerous on slender peduncles in much-branched cymes. Achenes pale-brown, linear, smooth, glabrous.

Equatoria.



Fig. 9—*SONCHUS CORNUTUS* Hochst. ex Oliv. & Hiern.

A, bud showing appendages on involucre bracts. B, flower. C, fruiting flower-heads. D, achene.

S. elliotianus Hiern.

Perennial dwarf herb from a cylindric rhizome. Leaves separate from the flowering stem, doubly denticulate, oblanceolate, up to 6 in. long, $1\frac{1}{2}$ in. broad, glabrous. Flower-heads yellow, $\frac{1}{2}$ - $\frac{2}{3}$ in. long, numerous on dwarf peduncles, densely corymbose.

Equatoria: Laboni Forest.

70. **SPHAERANTHUS** L.**Sphaeranthus randii** S. Moore.

S. suaveolens (non DC.) Broun & Massey p.p.

Herb 1-2 ft. high; stems and branches winged. Leaves distantly serrate, linear, decurrent at the base. Compound flower-heads on glabrous winged to almost unwinged peduncles; subtending bracts long-ciliate on the margin. Hermaphrodite flowers 2; corolla enlarged: female flowers 4-6, subsessile; corolla with 3-4 teeth; ovary puberulous, glandular.

Equatoria.

S. suaveolens (Forsk.) DC.

Glabrous or nearly glabrous erect herb 1-2 ft. high; stems and branches winged. Leaves dentate or denticulate, oblong-elliptic or oblong, decurrent at the base, 2-5 in. long. Compound flower-heads white or rose-coloured, ovoid-globose, terminal and lateral, $\frac{1}{2}$ - $\frac{2}{3}$ in. in diameter, solitary or occasionally 2 together; peduncles $\frac{1}{2}$ -5 in. long, winged. Hermaphrodite flowers 2-4, sessile; corolla spongy, large: female flowers 8-12, sessile; corolla glabrous, constricted at the top. Achenes thinly pilose.

Kordofan. Blue Nile Province.

S. steetzii Oliv. & Hiern.

Erect herb 1-2 ft. high, glabrous or nearly so; branches winged. Leaves denticulate, linear or narrowly elliptic, mucronate at the apex, somewhat narrowed towards the sessile decurrent base, 1-2 in. long. Compound flower-heads depressed-ovoid-hemispherical, stalked, $\frac{2}{3}$ in. in diameter, terminating the branches. Hermaphrodite flowers 1-2, sessile; corolla large, glabrous, glandular: female flowers 4-6, sessile; corolla slender. Achenes puberulous.

Blue Nile Province.

S. angustifolius DC.

S. nubicus Schultz Bip. ex Oliv. & Hiern.

Annual more or less glandular-hirtellous herb 1-2 $\frac{1}{2}$ ft. high; upper branches winged. Leaves sessile, denticulate, narrowly lanceolate or linear, mucronate at the apex, decurrent at the base, 1-3 in. long, minutely glandular-scabrous. Compound flower-heads yellowish, subsessile or shortly pedunculate, about $\frac{1}{2}$ in. in diameter. Hermaphrodite flower 1 or absent; corolla large with numerous scattered sessile red glands: female flowers 2-6, shortly

stipitate; corolla slender with 3 teeth and numerous scattered red glands. Achenes thinly hairy.

Kordofan.

S. flexuosus O. Hoffm.

S. brounae Robyns.

Much-branched softly tomentose herb about 12 in. high; stems not winged. Leaves sessile, subentire, oblanceolate, cordate and conspicuously amplexicaul at the base; lower leaves up to 1 in. long; upper leaves smaller, densely pilose. Compound flower-heads red purple, globose, about $\frac{1}{3}$ in. in diameter, on slender wingless peduncles about $\frac{3}{8}$ in. long. Hermaphrodite flowers 2-4, generally 3, sessile: female flowers about 7-13, sessile.

Kordofan.

71. **SPILANTHES** Jacq.

Spilanthes caulorhiza (Del.) DC.

S. acmella L. p.p.

Annual more or less pubescent herb creeping at the base or ascending, a few inches to 1 ft. high. Leaves more or less ovate or ovate-triangular, rounded or obtuse at the apex, truncate to acute at the base, 1-2 in. long, $\frac{1}{2}$ -1 in. broad, the margin subcartilaginous and setulose. Flower-heads yellow, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, solitary on long slender peduncles. Achenes black, with a line of hairs up each side and 2 short slender bristles at the apex.

Central and Southern Sudan.

72. **STRUCHIUM** Browne

Struchium sparganophora (L.) Kuntze.

Sparganophorus vaillantii Crantz.

Erect or decumbent half-succulent herb 2-4 ft. high, occurring in damp localities. Leaves crenate-serrate, obovate-lanceolate, acute at the apex, narrowed at the base into the winged petiole, 2 $\frac{1}{2}$ -6 in. long, minutely gland-dotted and slightly pubescent beneath. Flower-heads white or pinkish, sessile and clustered in the leaf-axils. Achenes 3-4-angled, crowned by a shortly tubular obscurely toothed cartilaginous pappus.

Equatoria.

73. **TOLPIS** Adans.

Tolpis altissima (Balb.) Pers.

Erect branched herb usually 2-3 ft. high but sometimes only 2-4 in.; stems several from the pubescent-tomentose root-crown. Radical leaves more or less petiolate, pinnatifidly dentate, oblanceolate, narrowed at the base, 2-8 in. long, sparingly hairy; stem-leaves few, linear. Flower-heads $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, on peduncles up to 3 or more in. long in lax open paniculate cymes. Achenes dark-brown, ribbed.

Red Sea Hills: Erkowit.

74. **TRIDAX** L.**Tridax procumbens** L.

Perennial herb, usually branched at the base; stems more or less hirsute. Leaves incised or incised-lobed, ovate, acute at the apex, cuneate at the base, $\frac{3}{4}$ -2 in. long, densely setulose. Flower-heads yellow to cream, solitary on peduncles 8-12 in. long. Achenes usually pubescent.

Equatoria. A native of tropical America now naturalized in the Sudan.

75. **VERBESINA** L.**Verbesina encelioides** (Cav.) A. Gray.

More or less hoary branched annual herb 1-3 ft. high. Leaves dentate, ovate-triangular, $1\frac{1}{2}$ -6 in. long, 1-3 in. broad, more or less appressed-pubescent above, whitish with short appressed hairs beneath; petiole winged, auriculate, $\frac{1}{2}$ -2 in. long. Flower-heads yellow, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. in diameter, on peduncles up to 8 in. long. Achenes obovate, with a broad white wing; pappus-bristles 2, smooth.

Central Sudan. An American species introduced into Africa.

76. **VERNONIA** Schreb.

- A. Inner bracts of the involucre persistent:
- B. Bracts of the involucre without a terminal appendage:
- C. Outer pappus consisting of short scales:
 - D. Achenes glabrous, 10-ribbed *V. jugalis*.
 - DD. Achenes setulose at least on the angles or ribs:
 - (a) Flower-heads solitary, terminating the erect leafy branches *V. perrottettii*.
 - (aa) Flower-heads not solitary *V. ambigua*.
- CC. Outer pappus setaceous:
 - E. Achenes obscurely costate or without ridges:
 - F. Climber *V. syringifolia*.
 - FF. Erect herbs or shrubs:
 - G. Shrub or undershrub; leaves $\frac{3}{4}$ -1 in. long *V. cinerascens*.
 - GG. Herbs; leaves over 1 in. long:
 - (b) Leaves membranous, not silvery-silky beneath:
 - (c) Involucral bracts very acute:
 - (d) Flower-heads $\frac{1}{4}$ in. in diameter, numerous *V. cinerea*.
 - (dd) Flower-heads $\frac{3}{4}$ -1 $\frac{1}{4}$ in. in diameter *V. pauciflora*.
 - (ce) Involucral bracts obtuse or apiculate, not acute; leaves undulate *V. undulata*.
 - (bb) Leaves subcoriaceous, silvery-silky beneath *V. smithiana*.

- EE. Achenes distinctly costate:
- H. Stemless herb *V. gerberiformis*.
- HH. Stems several or branched:
- I. Achenes 4-6-costate:
- (e) Flower-heads arranged along one side of the peduncle *V. unionis*.
- (ee) Flower-heads not arranged as above:
- (f) Plant densely covered with soft appressed silvery-white pubescence *V. aschersonii*.
- (ff) Plant not as above *V. plumbaginifolia*.
- II. Achenes more than 6-costate:
- J. Involucral bracts setaceous; flower-heads on peduncles up to 3 in. long *V. pauciflora*.
- JJ. Involucral bracts not setaceous:
- K. Flower-heads with foliaceous bracts at or near the base *V. purpurea*.
- KK. Flower-heads without foliaceous bracts at the base:
- L. Shrub or small tree; pappus sub-1-seriate *V. amygdalina*.
- LL. Undershubs or herbs; pappus in 2-many rows:
- (g) Bristles of the pappus flat *V. guineensis*.
- (gg) Bristles of the pappus terete:
- (h) Involucres turbinate; pappus in many rows:
- (i) Flower-heads 1-1½ in. in diameter *V. infundibularis*.
- (ii) Flower-heads ¾-1 in. in diameter *V. schweinfurthii*.
- (hh) Involucres campanulate; pappus in 2 rows:
- (j) Plant softly pubescent *V. hochstetteri*.
- (ji) Plant scabrous *V. inulifolia*.
- BB. Bracts of the involucre (or some of them) with a terminal appendage:
- M. Outer pappus-bristles flattened; involucral bracts in 4-5 rows, thinly woolly outside *V. pumila*.
- MM. Outer pappus-bristles not flattened, terete:
- (k) Dwarf herb *V. chthonocephala*.
- (kk) Erect herb 2-5 ft. high *V. kotschyana*.
- AA. Inner bracts of the involucre falling early:
- N. Achenes glabrous:
- O. Shrub or tree up to 15 ft. high; leaves sessile *V. theophrastifolia*.
- OO. Shrub up to about 6 ft. high; leaves petiolate *V. thomsoniana*.
- NN. Achenes densely setulose *V. richardiana*.

Veronia jugalis Oliv. & Hiern.

Herb 7-8 ft. high. Leaves obovate or elliptic, cuspidate-acuminate at the apex, attenuate below into a short petiole, 1-4 in. long, subglabrous above, softly tomentellous beneath. Flower-heads

rose-lilac, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, on bracteolate peduncles up to $\frac{3}{4}$ in. long in a dense corymbose cyme about 6 in. in diameter.

Equatoria.

V. perrottettii Schultz Bip.

Erect branched herb 1-2 ft. high, woody below. Leaves linear-acicular with recurved margins, about $1\frac{1}{4}$ in. long, scabrous-setulose. Flower-heads reddish-purple, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, solitary at the ends of the numerous branches; involucral bracts villous.

Central and Southern Sudan.

V. ambigua Kotschy & Peyr.

Erect coarse annual herb $\frac{1}{2}$ -2 ft. high; stems ribbed, pubescent, woody below. Leaves oblong-lanceolate, rounded at the apex, subauriculate at the base, $1\frac{1}{2}$ - $3\frac{1}{4}$ in. long, pubescent on both surfaces. Flower-heads blue or reddish-purple, $\frac{1}{2}$ in. in diameter, often 2-3 in a cluster in a corymbose cyme. Achenes sharply angular, pubescent on the angles and glandular between.

Equatoria.

V. syringifolia O. Hoffm.

Perennial climber. Leaves petiolate, denticulate, lanceolate to ovate, acuminate at the apex, subobliquely cordate at the base, scabrous above, softly puberulous beneath. Flower-heads mauve, small, corymbose. Achenes glandular and sparsely pilose; pappus white.

Equatoria: Imatong Mountains, Loyaru.

V. cinerascens Schultz Bip.

Shrub or undershrub 1-3 ft. high; branches when young as well as the leaves covered with short white appressed pubescence (hairs medifixed) mixed with small sessile glands. Leaves sessile, alternate or apparently in pairs at the nodes, entire or with a few teeth, obovate-spathulate, $\frac{2}{3}$ -1 in. long. Flower-heads rich-purple or maroon, scarcely $\frac{1}{4}$ in. broad, on peduncles up to $\frac{1}{2}$ in. long in diffuse dichotomous cymes 1-4 in. broad.

Red Sea District: between sea-level and 4000 ft. Equatoria: foot of Maldo bluff, near Moru Yakipi, Abyssinian border.

V. cinerea (L.) Less.

Erect branched herb 2-5 ft. high; stems striate, shortly pubescent. Leaves serrulate-dentate or subentire, lanceolate or ovate to obovate, cuneate or attenuate at the base into a short petiole, 1-2 in. long, puberulous or subscabrous above, paler and pubescent beneath. Flower-heads bluish- or reddish-purple, $\frac{1}{4}$ in. in diameter, numerous, on slender peduncles $\frac{1}{4}$ -1 in. long in axillary and terminal many-headed cymes.

Kassala: Gash Delta. Equatoria.

V. pauciflora (Willd.) Less.

Annual erect herb 1-4 ft. high; stems puberulous. Leaves serrulate, elongated, acutely attenuate at each end, up to 6 in. long, $\frac{3}{4}$ in. broad, puberulous when young, slightly scabrous. Flower-heads bluish-lilac, occasionally white, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. in diameter, on peduncles up to 3 in. long in lax terminal forking often leafy cymes $\frac{1}{2}$ -1 ft. long and $\frac{1}{4}$ - $\frac{1}{2}$ ft. broad. Achenes covered with erect hairs.

Widespread.

V. undulata Oliv. & Hiern.

Erect herb 2 or more ft. high. Leaves shortly petiolate, denticulate, undulate, puberulous on both surfaces; upper leaves lanceolate, apiculate at the apex, 1-2 in. long; lower leaves ovate, over 2 in. long. Flower-heads rose-blue, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter, on bracteolate peduncles $\frac{1}{4}$ -1 $\frac{1}{4}$ in. long in a lax corymbose cyme up to 6 in. in diameter.

Equatoria.

V. smithiana Less.

Herb 1-2 ft. high; stems leafy, silvery-pubescent. Leaves sessile, narrowly-elliptic or lanceolate-oblong to ovate-elliptic, 1 $\frac{1}{4}$ -2 $\frac{1}{2}$ in. long, up to 1 in. broad, dark above, silvery-silky beneath. Flower-heads red-purple, $\frac{1}{8}$ - $\frac{1}{4}$ in. wide, on more or less densely pubescent peduncles $\frac{1}{4}$ - $\frac{3}{8}$ in. long in small terminal corymbs.

Equatoria.

V. gerberiformis Oliv. & Hiern.

Dwarf stemless herb about 6 in. high from a thickened woolly rootstock. Leaves radical, repand-denticulate, oblanceolate, rounded at the apex, attenuate towards a short clasping petiole, 4-6 in. long, sparsely pubescent to glabrous. Flower-heads bluish, $\frac{3}{8}$ -1 in. long, solitary on peduncles up to 8 in. long.

Equatoria.

V. unionis Schultz Bip.

Herb; stems 3-4 ft. high from a tomentose tufted rootstock. Leaves petiolate, dentate-serrate, ovate or ovate-elliptic, the upper ones lanceolate, acute at the apex, narrowed at the base into a dilated petiole, up to 6 in. long, 3 in. broad, slightly scabrous above, thinly appressed-tomentose or nearly glabrous beneath. Flower-heads rose-purple, $\frac{1}{2}$ in. in diameter, shortly pedunculate on the spreading branches of a terminal panicle 3-12 in. in diameter.

Kassala: Gallabat.

V. aschersonii Schultz Bip.

Diffuse much-branched herb about 1 ft. high; branch-ends as well as the leaves densely covered with a short soft appressed silvery-

white pubescence. Leaves sessile, oblanceolate, attenuate to the base, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long. Flower-heads purple, $\frac{1}{3}$ in. broad, on slender peduncles $\frac{1}{2}$ -1 in. long in numerous terminal lax cymes.

Red Sea Hills: Karora. Darfur: 20-80 miles N.E. of El Fasher.

V. plumbaginifolia Fenzl ex Oliv. & Hiern.

Herb; stems $1\frac{1}{2}$ -2 ft. high from a rhizome. Leaves sessile or subsessile, entire, obovate-oblong or the upper ones linear, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, puberulous. Flower-heads purplish, $\frac{1}{4}$ - $\frac{1}{3}$ in. in diameter, on slender peduncles up to $1\frac{3}{4}$ in. long in divaricate much-branched terminal cymes.

Fung District. Equatoria.

V. purpurea Schultz Bip.

Rigid erect herb $\frac{1}{2}$ -4 ft. high, simple or branched above; stems striate, thinly setulose-scabrous, leafy towards the top. Leaves serrulate, elliptic-oblong, acute and apiculate at the apex, narrowed at the base, up to 6 in. long, $1\frac{1}{2}$ in. broad, scabrous, more or less obscurely pellucid-punctate; petiole very short. Flower-heads dull-purple, hemispherical, many-flowered, $\frac{3}{4}$ - $1\frac{1}{2}$ in. in diameter, solitary or in few-headed terminal cymes, surrounded at or near the base with leaf-like bracts equalling or usually much overtopping the involucre. Achenes oblong, hirsute or pilose, about 13-costate; pappus in many rows, dirty-white or rust-coloured, persistent.

Equatoria.

V. amygdalina Del.

Fig. 10.

Shrub or small tree. Leaves entire or denticulate, lanceolate to obovate-lanceolate, up to 6 in. long, 2 in. broad, finely glandular and more or less pubescent beneath. Flower-heads white, sweet-scented, $\frac{1}{4}$ in. in diameter, in copious corymbose panicles. Pappus tawny; bristles equal or some shorter.

Widespread.

V. guineensis Benth.

V. firma Oliv. & Hiern.

Erect herb 2-4 or more ft. high, little branched from a thick woody rootstock; stems as well as the under-surface of the leaves whitish- or yellowish-tomentose. Leaves coarsely toothed, lanceolate to narrowly obovate, up to 6 in. long, 2 in. broad. Flower-heads pale-blue-purple, very variable in size, up to $1\frac{1}{2}$ in. in diameter but usually less, on peduncles up to $2\frac{1}{2}$ in. long in lax wide corymbose cymes.

Equatoria.

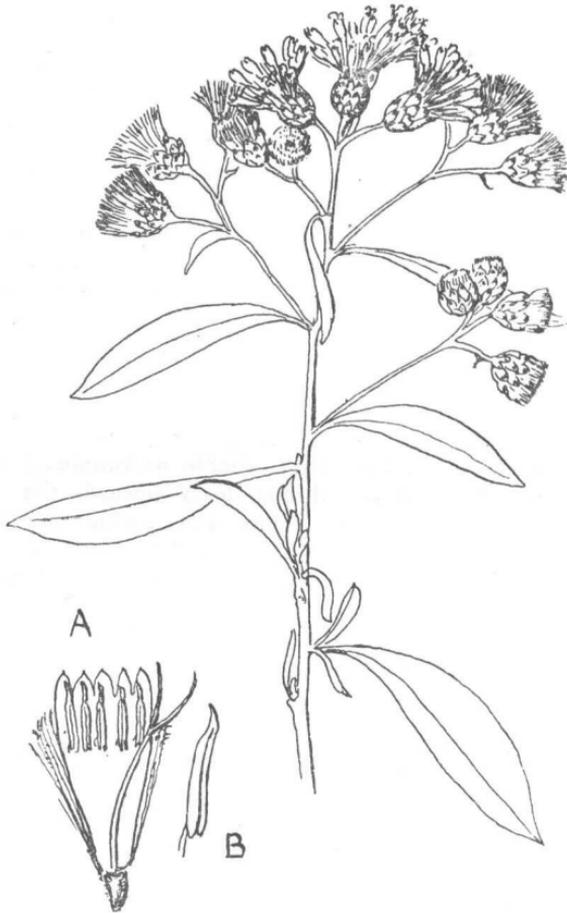


Fig. 10—VERNONIA AMYGDALINA Del.

A, flower, opened out. B, anther.

V. infundibularis Oliv. & Hiern.

Rigid glabrous herb several ft. high. Leaves linear or linear-oblong, narrowed to the subsessile base, 1-4 in. long. Flower-heads bluish-violet, 1-1½ in. in diameter, turbinate, solitary or few together on erect peduncles 1½-2½ in. long. Achenes ⅔ in. long, hairy, about 10-costate.

Equatoria.

V. schweinfurthii Oliv. & Hiern.

Herb; stems erect, virgate, about 1 ft. high. Leaves subsessile, linear, narrowed towards the base, ½-2 in. long, minutely punctate beneath. Flower-heads reddish-violet, on rigid peduncles ½-3 in. long, solitary or in stiff corymbose cymes. Achenes very hairy.

Equatoria.

V. hochstetteri Schultz Bip.

Undershrub 2 or more ft. high; branches closely tawny-tomentose. Leaves petiolate, serrulate, ovate-lanceolate or lanceolate, acutely acuminate at the apex, cuneately narrowed into the petiole, up to 5 in. long, $1\frac{3}{4}$ in. broad, scabrous above, pubescent-tomentose beneath. Flower-heads $\frac{1}{2}$ in. in diameter, many-flowered, on pubescent-tomentose peduncles up to $\frac{1}{3}$ in. long in dense terminal corymbs 2-10 in. in diameter.

Equatoria: Imatong Mountains, Loyaru.

V. inulifolia Steud. ex Walp.

Herb; stems branched at the base, erect, striate, scabrous, 1-2 ft. high, leafy. Leaves often remotely serrulate, ovate or lanceolate above, acute or shortly acuminate at the apex, rounded or narrowed at the base, 1-4 in. long, $\frac{1}{3}$ - $1\frac{1}{2}$ in. broad, scabrous above and beneath; petiole dilated and somewhat clasping at the base, about $\frac{1}{16}$ in. long, pubescent. Flower-heads $\frac{1}{2}$ - $\frac{2}{3}$ in. in diameter, many-flowered, on short scabrous peduncles in dense small terminal corymbs $1\frac{1}{2}$ -3 in. in diameter. Achenes densely setose-hirsute with erect bristles, 10-ribbed.

Equatoria.

V. pumila Kotschy & Peyr.

Perennial herb; stems pale-pubescent, up to 2 ft. high from a woody rhizome; roots thickened, spindle-shaped. Leaves serrulate, lanceolate, variable in size, up to 6 in. long, $2\frac{1}{2}$ in. broad, pustulate-scabrous above, densely tomentose beneath. Flower-heads blue-purple, $\frac{3}{4}$ -1 in. in diameter, on peduncles $\frac{1}{2}$ -2 in. long, solitary or cymose, often appearing before the leaves. Achenes strongly ribbed, pubescent and glandular.

Equatoria.

V. chthonocephala O. Hoffm.

Dwarf herb from a branched rhizome. Leaves appearing after flowering, sometimes on long petioles, minutely denticulate, elongate-oblong-lanceolate, up to 16 in. long, $3\frac{1}{2}$ in. broad, scabrous above, softly pubescent beneath. Flower-heads appearing from the ground, blue- or red-purple, 1 in. in diameter, on peduncles about $\frac{2}{3}$ in. long from a tuft of soft hairs. Achenes densely pubescent.

Equatoria: Kagelu.

V. kotschyana Schultz Bip.

Erect herb; stems pithy, sparsely pubescent, 2-5 ft. high. Leaves sessile or petiolate, coarsely toothed, oblong-lanceolate, up to 8 in. long, $2\frac{1}{2}$ in. broad, finely pubescent and minutely glandular beneath. Flower-heads pale-bluish-purple, on puberulous peduncles

$\frac{1}{2}$ -2 in. long in lax terminal cymes; involucrel bracts whitish. Achenes shortly pilose with ascending hairs.

Central and Southern Sudan.

V. theophrastifolia Schweinf. ex Oliv. & Hiern.

Shrub or tree up to 15 ft. high. Upper leaves denticulate, oblanceolate, narrowed towards the sessile auriculate-amplexicaul base, $1\frac{3}{4}$ in. long, $3\frac{1}{2}$ in. broad, somewhat scurfy above, puberulous beneath. Flower-heads sessile or subsessile, 1-4 together, $\frac{1}{2}$ in. long. Pappus in one row, dense, scabrous.

Equatoria.

V. thomsoniana Oliv. & Hiern.

Shrub. Leaves obscurely serrate, elliptic-oblong, acute at the apex, attenuate at the base into the narrowly winged petiole, 3-4 in. long, $1\frac{1}{4}$ in. broad, puberulous beneath. Flower-heads $\frac{1}{2}$ in. in diameter, on slender very short puberulous peduncles, closely crowded into corymbose terminal panicles 6 in. wide. Pappus in one row, scabrous, white.

Darfur. Equatoria.

V. richardiana (Kuntze) P.-Sermolli.

Shrub up to 10 ft. high. Upper leaves sessile, narrowly oblong or elliptic, auriculate at the base, 1-4 in. long, $\frac{1}{4}$ - $\frac{3}{4}$ in. broad, glabrous to pubescent above, more or less pale-tomentose beneath; lower leaves often much larger. Flower-heads lilac fading to white, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, subsessile in small clusters on the scorpioid branches of terminal panicles about 5 in. broad. Achenes 10-costate, the ridges concealed by hairs.

Darfur: Jebel Marra. Equatoria: Imatong Mountains.

77. **VICOA** Cass.

Vicoa leptoclada (Webb) Dandy, comb. nov.

Inula leptoclada Webb¹; *V. auriculata* (non Cass.) Broun & Massey. Erect annual herb 1-3 ft. high. Leaves sessile, denticulate or subentire, linear or lanceolate or oblong, auriculate-amplexicaul at the base, $\frac{1}{2}$ -3 in. long, puberulous or nearly glabrous. Flower-heads rayless, orange-yellow, many-flowered, about $\frac{1}{2}$ in. in diameter, solitary on slender peduncles $\frac{1}{2}$ - $1\frac{1}{2}$ in. long in a somewhat loose terminal panicle. Achenes pale, pubescent.

Widespread.

78. **WEDELIA** Jacq.

Wedelia africana Pers.

Half-woody straggling or suberect rather harshly pubescent herb. Leaves shortly petiolate, lanceolate, rounded at the base, $1\frac{1}{4}$ - $2\frac{1}{2}$ in. long, up to $\frac{3}{4}$ in. broad, setose-scabrous on both surfaces. Flower-

¹In Hook., *Niger Fl.* p. 137 (1849).

heads yellow, $\frac{3}{4}$ -1 in. in diameter, solitary, terminal on slender peduncles up to $2\frac{1}{4}$ in. long. Achenes becoming glabrous, tipped by a cup-shaped ciliate pappus without bristles.

Equatoria.

W. abyssinica Vatke.

Undershrub 3 ft. high. Leaves shortly petiolate, repand-subserate, ovate or oblong-lanceolate, $1\frac{1}{2}$ - $3\frac{1}{4}$ in. long. Flower-heads yellow or orange, on long peduncles, 1-3 at the extremities of the branches. Achenes strigose-hairy, short-beaked; outer pappus of 2 bristles, inner of several little scales.

Fung District.

79. **XANTHIUM** L.

Xanthium brasiliicum Vell.

X. strumarium (non L.) Broun & Massey.

Coarse scabrous hoary or nearly glabrous herb 1-2 ft. high. Leaves deltoid, 3-5-lobed, unequally dentate, cordate and 3-nerved and decurrent into the petiole at the base, 1-6 in. broad, puberulous; petiole $\frac{1}{2}$ -5 in. long. Flower-heads greenish-yellow, nearly sessile, clustered. Achene solitary in each loculus of the hardened prickly enclosing ellipsoid $\frac{1}{2}$ in.-long involucre.

Central Sudan.

120. **GENTIANACEAE**

Annual or perennial herbs. Leaves without stipules, opposite or rarely alternate, often connate at the base. Flowers hermaphrodite, actinomorphic. Calyx tubular or of separate sepals, imbricate. Corolla gamopetalous; lobes contorted or rarely imbricate or valvate. Stamens as many as the corolla-lobes and alternate with them, inserted on the corolla. Disk present or absent. Ovary superior, usually 1-locular with 2 parietal placentas, sometimes 2-locular with the placentas adnate to the septum; style simple; ovules often numerous. Fruit usually a capsule.

A. Leaves opposite; corolla-lobes contorted:

B. Flowers in terminal cymes or panicles:

C. Anthers exerted from the throat of the corolla-tube:

(a) Anthers all fertile; corolla-lobes with 1-2 fringed nectaries near their base SWERTIA. 6.

(aa) Anthers not all (usually only one) fertile; corolla-lobes without nectaries CANSCORA. 2.

CC. Anthers included in the corolla-tube BELMONTIA. 1.

BB. Flowers in dense axillary clusters all along the stems and/or in terminal clusters or heads:

(b) Anthers exerted from the corolla-tube; flower parts in 4's

FAROA. 4.

- (bb) Anthers not exerted; flower parts in 5's ENICOSTEMMA. 3.
 AA. Leaves alternate, floating, ovate-orbicular; flowers in clusters NYMPHOIDES. 5.

1. BELMONTIA E. Mey.

Belmontia sp.

Tiny herb 3 in. high. Leaves very small. Flowers white, on long stalks.

Equatoria: Yei River.

2. GANSCORA Lam.

Ganscora decussata (Roxb.) J. A. & J. H. Schult.

Erect branched glabrous herb; stems narrowly winged. Leaves lanceolate, acute at the apex, 3-nerved from the base, $\frac{1}{2}$ -1 in. long. Flowers white or pinkish, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, on stout 4-winged pedicels, few in leafy cymes. Calyx $\frac{2}{3}$ in. long.

Equatoria.

G. diffusa (Vahl) R. Br. ex Roem. & Schult.

Much-branched erect annual herb $\frac{1}{2}$ -2 ft. high. Leaves $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long; the upper ones ovate, acute at the apex, shorter, the lower ones narrowed to the base. Flowers pink, very numerous in lax rather diffuse panicles. Calyx $\frac{1}{2}$ in. long.

Fung District. Equatoria.

3. ENICOSTEMMA Bl.

Enicostemma verticillare (Retz.) Baill.

E. littorale Bl.

Glabrous perennial herb 4-18 in. high, branching at the base; branches angled or narrowly winged. Leaves in many pairs, sessile, linear to narrowly oblong-lanceolate, $\frac{3}{4}$ -3 $\frac{1}{4}$ in. long. Flowers white with green lines and centre, sessile, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, in axillary clusters all along the stems. Capsule oblong.

Red Sea Hills. Nuba Mountains: near Tekele.

4. FAROA Welw.

Faroa pusilla Bak.

Small herb up to 2 in. high. Leaves elliptic to lanceolate, the basal ones about 1 in. long, the others smaller. Flowers white or greenish, very small, in axillary and terminal clusters; pedicels very short.

Equatoria.

5. NYMPHOIDES Hill

Nymphoides nilotica (Kotschy & Peyr.) Léonard.*Limnanthemum niloticum* Kotschy & Peyr.

Aquatic herb. Leaves membranous, orbicular, with a deep acute sinus at the base, 1-4¼ in. in diameter. Flowers yellow, on false petioles bearing 4-8 flowers in a cluster about ½ in. below the leaf-lamina; pedicels 1-2¼ in. long. Fruit subglobose, 7-10-seeded; seeds thinly covered with small tubercles.

Central and Southern Sudan.

6. SWERTIA L.

Swertia abyssinica Hochst.

Slender weak annual herb 6-9 in. high. Leaves in 3-5 distant pairs, ovate, cordate and amplexicaul at the base, ½-1 in. long. Flowers whitish, on pedicels ¼-1¼ in. long in simple or paniced few-flowered cymes.

Darfur: Jebel Marra, 9000 ft.

121. PRIMULACEAE.

Perennial or annual herbs; stems erect or procumbent and rooting at the nodes. Leaves without stipules, basal or cauline, alternate or opposite or verticillate, simple or lobed, often dentate. Flowers solitary to paniculate, actinomorphic, hermaphrodite. Calyx persistent, often leafy. Corolla gamopetalous; lobes 5, imbricate. Stamens as many as and opposite the corolla-lobes, inserted on the corolla. Ovary superior or rarely semi-inferior, 1-locular, with a free-basal placenta; ovules numerous. Fruit a capsule, many-seeded.

A. Leaves alternate:

(a) Ovary semi-inferior; leaves entire SAMOLUS. 4.

(aa) Ovary superior; leaves lobed and dentate

ARDISIANDRA. 2.

AA. Leaves opposite:

(b) Capsule dehiscing longitudinally LYSIMACHIA. 3.

(bb) Capsule circumscissile ANAGALLIS. 1.

1. ANAGALLIS L.

Anagallis arvensis L.

Scarlet Pimpernel.

Diffuse low glabrous herb. Leaves sessile, opposite, ovate or elliptic-lanceolate, ½-1 in. long. Flowers scarlet or blue or rose, solitary, axillary, on peduncles at length recurved.

Red Sea District. Khartoum. Fung District.

2. ARDISIANDRA Hook. f.

Ardisiandra engleri var. **microphylla** Weimareck.

Herb; stems creeping, densely rusty-pilose or villous. Leaves petiolate, 5-7-lobed, cordate at the base, ¾-1½ in. long, up to 2 in.

broad, sparsely rusty- or white-pilose on both surfaces; lobes triangular-dentate. Flowers white, pedicelled, in 2-5-flowered racemes.

Equatoria: Imatong Mountains, River Imisu.

3. LYSIMACHIA L.

Lysimachia africana Engler.

Glabrous herb; stems slender, up to 3 ft. long. Leaves opposite, lanceolate to ovate, the lower ones narrowed into a petiole, the upper ones sessile. Flowers purplish, distantly arranged in spikes 10 in. long. Capsule about $\frac{1}{2}$ in. in diameter.

Equatoria: Imatong Mountains, Lomuleng.

4. SAMOLUS L.

Samolus valerandi L.

Brookweed.

Glabrous erect herb a few inches to 3 ft. high. Leaves obovate-spathulate, up to $3\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, the basal ones forming a rosette. Flowers white, small, in slender terminal racemes; pedicels up to $\frac{2}{3}$ in. long with a small bract near the middle.

Red Sea Hills: Erkowit.

122. PLUMBAGINACEAE

Erect herbs or undershrubs or climbers. Leaves without stipules, alternate or in a basal rosette. Flowers hermaphrodite, actinomorphic, often in one-sided inflorescences or subumbellate; bracts often dry and membranous, often sheathing. Calyx often ribbed, usually membranous between the ribs. Corolla gamopetalous, usually persistent; lobes imbricate. Stamens 5, opposite the corolla-lobes. Disk absent. Ovary superior, 1-locular; styles 5, free or connate; ovule solitary.

- A. Climbers; calyx tubular, clothed with stalked glands PLUMBAGO. 2.
 AA. Low maritime perennials; calyx not glandular ... LIMONIUM. 1.

1. LIMONIUM Mill.

Limonium axillare (Forsk.) Kuntze.

Fig. 11.

Statice axillaris Forsk.

Low shrub, with decumbent or ascending branches or scapes erect from a woody rootstock. Leaves fleshy, narrowly oblanceolate or oblanceolate-spathulate, with petiole 1-2 $\frac{1}{2}$ in. in length, glabrous. Scapes erect, $\frac{1}{2}$ -1 ft. high, glabrous, all the branches usually bearing rose-red flowers.

Red Sea District: coast.



Fig. 11—*LIMONIUM AXILLARE* (Forsk.) Kuntze.

A, flower.

2. PLUMBAGO L.

Plumbago zeylanica L.

Fig. 12.

Climbing undershrub; branches ribbed, glabrous. Leaves ovate or ovate-lanceolate, acute at the apex, shortly cuneate at the base, $2\frac{1}{2}$ -4 in. long, $1\frac{1}{4}$ - $2\frac{1}{2}$ in. broad, glabrous; petiole amplexicaul at the base. Flowers white, $\frac{3}{4}$ in. long, in usually branched racemes. Calyx about $\frac{2}{3}$ in. long, clothed with stiff stalked glands. Capsule membranous, included in the persistent calyx.

Widespread.

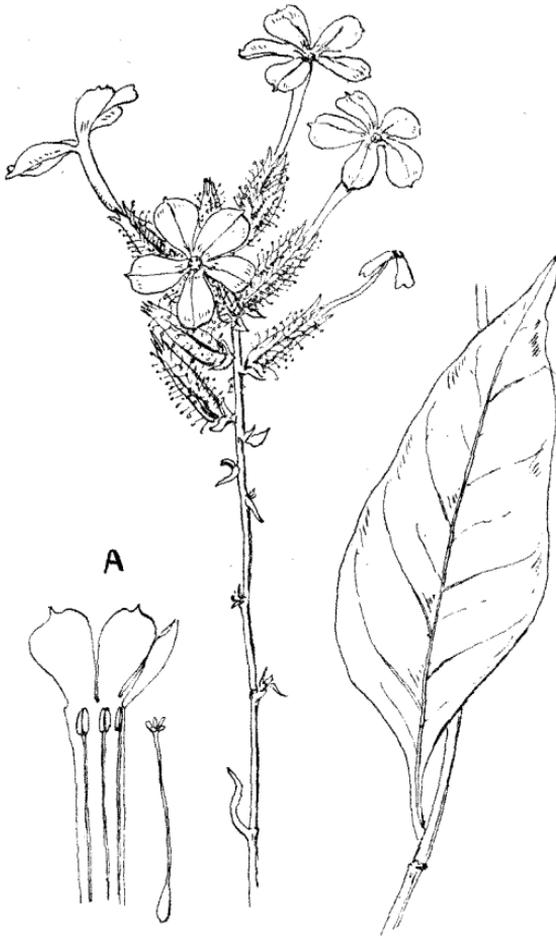


Fig. 12—PLUMBAGO ZEYLANICA L.

A, longitudinal section of corolla, with pistil on right.

123. PLANTAGINACEAE

Herbs. Leaves alternate or opposite or all radical, sometimes much reduced, often sheathing at the base. Flowers usually hermaphrodite, actinomorphic, spicate. Calyx herbaceous, 4-lobed. Corolla gamopetalous, scarious, 3-4-lobed; lobes imbricate. Stamens usually 4, inserted on the corolla-tube and alternate with the lobes or hypogynous. Ovary superior, 1-4-locular; style simple; ovules 1 or more in each loculus, axile or basal. Fruit a circumscissile capsule or a nut.

1. PLANTAGO L.

Plantago lanceolata L.

Ribwort Plantain.

Perennial stemless herb. Leaves lanceolate, gradually narrowed to the sessile base or to a short petiole. Flower-heads very dense, globose, on long slender furrowed peduncles.

Red Sea District: between sea-level and 4000 ft.

P. stricta Schousb.

Annual herb $\frac{1}{2}$ -1 ft. high; stems glabrous below, slightly pubescent above. Leaves opposite or whorled from the stem-nodes, narrowly linear. Flower-heads many to a stem, globose, on ascending peduncles.

North-eastern Sudan.

P. ciliata Desf.

Annual silky-canescens herb $1\frac{1}{4}$ - $3\frac{1}{4}$ in. high. Leaves obovate or oblanceolate-spathulate, acute at the apex, narrowed at the base into the petiole. Flowers in spikes up to $\frac{3}{4}$ in. long.

Rea Sea District.

124. CAMPANULACEAE

Herbs to small trees, usually with milky juice. Leaves without stipules, alternate or rarely opposite. Flowers hermaphrodite, actinomorphic. Calyx-tube adnate to the ovary, 3-10-lobed. Corolla gamopetalous, tubular or campanulate; lobes valvate. Stamens as many as the corolla-lobes and alternate with them, inserted towards the base of the corolla or the disk. Ovary inferior or rarely superior, 2-10-locular, with axile placentas; ovules usually numerous. Fruit capsular or baccate.

A. Flowers in dense spikes; capsule with circumscissile dehiscence

SPHENOCLEA. 5.

AA. Flowers not in dense spikes:

B. Fruit indehiscent, baccate CANARINA. 2.

BB. Fruit dehiscent, capsular:

C. Capsule dehiscing loculicidally at the apex into as many valves as loculi:

(a) Corolla deeply divided into narrow lobes:

- (b) Slender annuals with minute flowers on long thread-like peduncles CEPHALOSTIGMA. 3.
 (bb) Herbs of various habit with sessile or shortly pedicellate flowers LIGHTFOOTIA. 4.
 (aa) Corolla with short broad lobes, rarely divided below the middle WAHLENBERGIA. 6.
 CC. Capsule dehiscing below the calyx-limb by valves or pores CAMPANULA. 1.

1. CAMPANULA L.

Campanula dimorphantha Schweinf.

Erect pubescent annual herb 6-9 in. high. Leaves crenulate-dentate, the upper petiolate, the lower sessile, ovate or obovate or spatulate or lanceolate, about 1 in. long. Flowers of two kinds: the fertile ones very small, apetalous and almost closed, in terminal and axillary cymes; the sterile ones blue-petalled, solitary and scattered along the simple stems.

Northern Sudan: Halfa.

C. edulis Forsk.

C. rigidipila Steud. & Hochst. ex A. Rich.

Perennial herb from a stout rootstock; stems ascending or pro-cumbent, 6-12 in. long, covered with long hispid almost bristly hairs. Leaves sessile, elliptic-lanceolate, oblong or obovate, $\frac{1}{2}$ -1 in. long, more or less hispidly pilose. Flowers solitary, terminal, $\frac{1}{3}$ - $\frac{1}{2}$ in. in diameter.

Darfur: Jebel Marra, 6500-10,000 ft.

C. erinus L.

Hirsute herb 4-12 in. high; stems branching dichotomously from the base. Leaves sessile to shortly petiolate, obtusely serrate, obovate to elliptic, the floral leaves 3-5-lobed. Flowers pale-bluish-white, sessile, $\frac{1}{2}$ in. long. Calyx-lobes in fruit accrescent and spreading-stellate. Capsule nodding, turbinate.

Red Sea Hills: Erkowit.

2. CANARINA L.

Canarina eminii Aschers. ex Schweinf.

Herbaceous or woody climber or trailer; stems glabrous. Leaves opposite, irregularly lobed in the lower half, distantly and irregularly dentate above, lanceolate, acute at the apex, truncate at the base, up to 3 in. long, $1\frac{1}{2}$ in. broad, glabrous on both surfaces; lobes triangular; petiole about $\frac{3}{4}$ in. long. Flowers reddish-orange, funnel-shaped, 2-3 in. long, solitary on peduncles up to 1 in. long.

Equatoria: Imatong Mountains, Gilo, 5000 ft.

3. **CEPHALOSTIGMA** A. DC.**Cephalostigma erectum** (Roth) Vatke.

Erect much-branched hispidly pilose annual herb from a few inches to 1 or more ft. high. Leaves sessile, entire or undulate-dentate with a cartilaginous white margin, linear-lanceolate to broadly elliptic, up to 1 in. long, the upper leaves smaller and passing into bracts. Flowers bluish-white, small, numerous, on slender pedicels in racemose panicles. Corolla-lobes linear-lanceolate. Capsule hemispherical, hispid.

Equatoria.

C. perrottetii A. DC.

Erect usually branched annual herb 1-2 or more ft. high. Leaves with a shallowly crenulate cartilaginous margin, lanceolate, 1½-2 in. long, up to ¾ in. broad. Flowers lilac, very small, very numerous in small cymes forming an oblong panicle. Corolla-lobes ovate-lanceolate, much broader at the base than at the middle. Capsule turbinate, 5-ribbed.

Equatoria.

4. **LIGHTFOOTIA** L'Hérit.**Lightfootia abyssinica** Hochst. ex A. Rich.

Erect perennial undershrub 1½-2 ft. high. Leaves somewhat hard and coriaceous, sessile, cartilaginous on the margin, lanceolate or linear-lanceolate, 1½-3 in. long. Flowers pink to pale-mauve, small, in narrow cymose branched panicles up to 12 or more in. long. Capsule subglobose, prominently 5-ribbed.

Equatoria.

5. **SPHENOCLEA** Gaertn.**Sphenoclea zeylanica** Gaertn.

Fig. 13.

Erect glabrous herb 1-4 ft. high, often occurring in stagnant water; stems spongy. Leaves lanceolate, more or less acute at the apex, up to 4 in. long, 1½ in. broad, glabrous. Flowers greenish-white, in bracteate terminal cylindric spikes up to 2½ in. long. Capsule depressed-globose.

Central and Southern Sudan.

6. **WAHLENBERGIA** Schrad.**Wahlenbergia silenoides** Hochst. ex A. Rich.

Tufted perennial herb 6-18 in. high from a woody rootstock; stems ascending, leafy, nearly glabrous. Leaves crowded below, much less so above, sessile, lanceolate to ovate, ½-¾ in. long below, shorter above, nearly glabrous. Flowers white or cream tipped with mauve, very small, very few on long peduncles. Capsule about ½ in. long, 2-locular.

Equatoria: Imatong Mountains, Itobol.

W. virgata Engler.

Herb about 18 in. high, finely branching from a deep fleshy root; branchlets longitudinally sulcate. Leaves few, linear-oblong, very small. Flowers white fading to mauve, on long pedicels in terminal inflorescences.

Equatoria: Imatong Mountains, Itobol.

W. etbaica (Schweinf.) Vatke.

Annual herb about 10 in. high; stem almost unbranched, leafy and hispid below, leafless and glabrous above. Leaves sessile, irregularly undulate-crenate, ciliate, ovate-lanceolate, narrowed at the base, about 2 in. long, $\frac{3}{4}$ in. broad; midrib hispid beneath. Flowers white, small, terminal and lateral.

Red Sea Hills: Soturba.



FIG. 13.—SPHENOCLAEA ZEYLANICA GAERTH.

A and B, bracts. C, flower. D, the same open. E, anthers. F, longitudinal section of ovary. G, transverse section of ovary. H, seed.

125. LOBELIACEAE

Characters of *Campanulaceae* (p. 69) but corolla zygomorphic and anthers cohering into a tube around the style.

1. LOBELIA L.

Lobelia giberroa Hemsl.

Tree up to 30 ft. high. Leaves crowded, sessile, irregularly serrulate, oblong-obovate or lanceolate, very much narrowed at the base, $1\frac{1}{2}$ -2 ft. long, glabrous above, more or less pubescent beneath; midrib thick, purple. Flowers purple-blue, shortly pedicellate, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, in dense spike-like bracteate racemes up to 5 $\frac{1}{2}$ ft. long, the flowers almost completely hidden by the linear very acute bracts.

Equatoria: *Imatong Mountains*, 5500-6400 ft.

L. rubrimaris E. Wimm.

Fig. 14.

L. inconspicua (non A. Rich.) Broun & Bassey.

Small annual herb, branched from the base, $\frac{1}{2}$ -6 in. high. Leaves small, elliptic to nearly orbicular, narrowed at the base into a short petiole, glabrous or sparsely hirsute. Flowers white and blue, axillary, solitary, on peduncles often longer than the leaves.

Red Sea Hills: *Erkowit*.



Fig 14—LOBELIA RUBRIMARIS E. Wimm.

A, stamens.

L. dissecta M. B. Moss.

Procumbent herb up to 6½ in. high; stems purplish. Leaves sessile, palmate, much divided, up to ¾ in. long, glabrous. Flowers blue, terminal or 1-2 together in the axils of the upper leaves. Capsule ⅛ in. long.

Equatoria: *Imatong Mountains*, 6300-10,000 ft.

L. djurensis Engler & Diels.

Annual herb; stems erect, branched. Leaves alternate, distant, sinuate-dentate or subentire, ovate below, lanceolate above, subacute at the apex, the lower leaves about ½ in. long, the upper ones up to 1½ in. long. Flowers solitary and axillary or subracemose on pedicels up to 1½ in. long.

Equatoria.

L. senegalensis A. DC.

L. trierarchi R. Good.

Herb up to 10 in. high, glabrous except for the base; branchlets slender. Leaves about 1½ in. long, ⅓ in. broad; lower leaves sessile, remotely denticulate, very narrowly elliptic, with sparse glandular hairs above; upper leaves shortly petiolate, hardly denticulate, linear, glabrous on both surfaces. Flowers pale-lilac, about ¼ in. long, long-pedicellate in lax terminal racemes.

Darfur: *Jebel Marra*, 7300-9000 ft.

126. **HYDROPHYLLACEAE**

Annual or perennial herbs. Leaves radical, alternate, or rarely opposite, entire to pinnately or palmately lobed. Flowers hermaphrodite, actinomorphic, usually cymose. Calyx-segments 5, imbricate. Corolla gamopetalous; lobes imbricate or contorted. Stamens as many as and alternate with the corolla-lobes, usually inserted towards the base of the tube. Ovary superior, 1-locular with 2 parietal placentas, or 2-3-locular; styles 1 or 2; ovules numerous. Fruit a loculicidal or rarely septical capsule.

1. **HYDROLEA** L.**Hydrolea floribunda** Kotschy & Peyr.

H. graminifolia A. W. Benn.

Erect glabrous herb up to 3 or more ft. high, occurring in swampy places; stems spongy below. Leaves linear, acute at the apex, up to 3½ in. long. Flowers blue, in corymbs. Calyx-segments lanceolate, about ⅓ in. long. Capsule globose, glabrous.

Equatoria.

H. macrosepala A. W. Benn.

Erect branched glabrous herb up to 2 ft. high, occurring in swampy places; stems spongy in the lower part. Leaves sessile,

linear-lanceolate, $\frac{3}{4}$ -2 in. long. Flowers blue, in few-flowered very lax paniculate cymes. Calyx-segments cordate-ovate, about $\frac{1}{4}$ in. long. Capsule subglobose, hidden by the slightly accrescent calyx-segments.

Equatoria.

H. glabra Schumach.

Glabrous herb; stems erect. Leaves alternate, shortly petiolate, ribbed, lanceolate, about 3 in. long. Flowers blue, shortly pedicellate, in few-flowered axillary subracemose inflorescences. Calyx-segments ovate-lanceolate, acute at the apex, about $\frac{1}{4}$ in long, glabrous. Capsule ovate, glabrous, bilocular.

Equatoria.

127. BORAGINACEAE

Trees, shrubs or herbs, the latter often roughly scabrous or hispid. Leaves without stipules, alternate or rarely opposite, simple. Flowers often in scorpioid cymes, actinomorphic or rarely irregular, usually hermaphrodite. Calyx-lobes imbricate or rarely valvate. Corolla gamopetalous; lobes contorted or imbricate. Stamens as many as and alternate with the corolla-lobes, inserted on the corolla. Disk present or absent. Ovary superior, 2-locular or 4-locular by spurious septa, entire or deeply 4-lobed; style terminal or gynobasic; ovules paired, erect or spreading from the central axis. Fruit a drupe or of 4 nutlets.

- A. Style terminal on the top of the ovary (ovary not vertically lobed):
- B. Trees or shrubs:
- (a) Style once divided EHRETIA. 8.
- (aa) Style twice divided CORDIA. 3.
- BB. Herbs:
- (b) Styles two, separate; flowers solitary, axillary
COLDENIA. 2.
- (bb) Style one; flowers in scorpioid cymes .. HELIOTROPIUM. 9.
- AA. Style inserted between the lobes of the ovary (ovary vertically lobed):
- C. Calyx large and conspicuous, accrescent in fruit
TRICHODESMA. 12.
- CC. Calyx rather small, not or only slightly accrescent:
- D. Flowers regular:
- (c) Nutlets depressed-globose, covered with glochidiate bristles:
- (d) Bristles on the nutlets marginal and in a central row
CYNOGLOSSOPSIS. 4.
- (dd) Bristles all over the nutlets CYNOGLOSSUM. 5.
- (cc) Nutlets ovoid, without glochidiate bristles:
- (e) Calyx circumscissile in fruit; nutlets thin-walled
MOLTKIOPSIS. 11.
- (ee) Calyx not circumscissile; nutlets thick-walled:
- (f) Nutlets rugose ARNEBIA. 1.
- (ff) Nutlets smooth, white LITHOSPERMUM. 10.

DD. Flowers more or less irregular:

- (g) Filaments very short ECHIOCHILON. 6.
 (gg) Filaments long, often dilated at the base ... ECHIUM. 7.

1. ARNEBIA Forsk.

Arnebia hispidissima (Lehm.) DC,

Fig. 15.

Much-branched sometimes short and bushy herb: whole plant densely hispid with long stiff white hairs; root staining blood-red. Leaves linear-lanceolate, up to $3\frac{1}{4}$ in. long. Flowers yellow, tubular, $\frac{1}{2}$ in. long, in scorpioid cymes. Nutlets angular, rugose. *Northern and Central Sudan.*



Fig. 15—ARNEBIA HISPIDISSIMA (Lehm.) DC.

A, portion of inflorescence. B, longitudinal section of flower. C, portion of leaf-surface showing bulbous-based hairs. D, pistil. E, nutlet.

2. **COLDENIA** L.**Coldenia procumbens** L.

Annual procumbent herb, densely setose all over, often in wet places. Leaves shortly petiolate, wrinkled, dentately lobulate, oblong, rounded at each end, about 1 in. long, the hairs converging between and revealing the nerves above. Flowers scarlet or white, small, shortly pedunculate, axillary, solitary. Fruit laterally 4-lobed, glandular-pubescent.

Central and Southern Sudan.

3. **CORDIA** L.**Cordia abyssinica** R. Br.

C. holstii (non Gürke) Broun & Massey.

Shrub or tree up to 30 ft. high, occasionally attaining 60 ft.; bark pale-brown. Leaves alternate, ovate to suborbicular, usually 3-7 in. long, $1\frac{1}{2}$ -4 in. broad (exceptionally up to 12 in. long, 9 in. broad), smooth above, shortly tomentellous beneath; petiole 1-3 in. long. Flowers white, shortly pedicellate or subsessile, massed in compact panicles. Calyx brown-tomentellous, very strongly ribbed. Corolla $\frac{3}{4}$ -1 in. long. Drupe yellow, ovoid, $\frac{1}{2}$ - $\frac{1}{2}$ in. in diameter, with sweet mucilaginous pulp.

Central and Southern Sudan.

C. milleni Bak.

Tree up to 80 or more ft. high; crown spreading; buttresses short and blunt; bark pale-brown. Leaves alternate, entire or crenulate, obovate-suborbicular, usually rounded at the apex, rounded to cordate at the base, usually 3 $\frac{1}{2}$ -6 in. long, 2 $\frac{1}{2}$ -4 $\frac{1}{2}$ in. broad (occasionally up to 12 in. long, 7 in. broad), smooth above, tomentose-pilose beneath. Flowers white, $\frac{1}{2}$ in. long, subsessile in loose and straggling panicles. Calyx not or only slightly ribbed, slightly shorter than the corolla-tube. Fruit ovoid, 1 $\frac{1}{2}$ -1 $\frac{3}{4}$ in. long, cupped by the enlarged calyx.

Equatoria: Iwatoka gallery-forest; Azza Forest.

C. ovalis R. Br. ex DC.

Shrub or tree up to 20 ft. high; bark scaling in strips. Leaves usually subopposite, broadly ovate to orbicular, 2-4 in. long, $1\frac{1}{2}$ -3 in. broad, conspicuously scabrous above, pubescent beneath; petiole up to 1 $\frac{1}{4}$ in. long. Flowers pale-yellow, fragrant, pedicellate, $\frac{1}{4}$ in. long, in dense compact panicles. Calyx not ribbed, pubescent. Filaments glabrous. Fruit yellow, ovoid, $\frac{3}{4}$ in. long.

Widespread.

C. crenata Del.

Low tree; branchlets slender, pubescent when young. Leaves alternate, firm, crenate or entire in the upper half, obovate, obtuse at the apex, cuneate at the base, 2-3 in. long, $1\frac{1}{2}$ in. broad, scabrous above; petiole $\frac{1}{2}$ - $\frac{1}{2}$ in. long, pubescent. Cymes few-flowered. Calyx not ribbed, slightly pubescent outside, densely silky inside and on the margin. Filaments hairy. Fruit ovoid, $\frac{1}{2}$ in. long.

Central Sudan.

C. rothii Roem. & Schult.

Fig. 16.

Shrub or small tree up to 16 ft. high. Leaves opposite or sub-opposite, oblong-ob lanceolate, rounded at the apex, $1\frac{1}{4}$ - $4\frac{1}{2}$ in. long, $\frac{2}{3}$ - $1\frac{1}{2}$ in. broad, slightly scabrous above, fine-reticulate beneath; petiole up to $\frac{2}{3}$ in. long. Flowers white, fragrant, $\frac{1}{4}$ in. long, in rather small pubescent cymes. Calyx slightly setulose. Fruit ovoid, pointed, in a widely conical calyx.

Widespread.

4. **CYNOGLOSSOPSIS** Brand**Cynoglossopsis latifolia** (Hochst.) Brand.

Cynoglossum hochstetteri Vatke ex Engler.

Dwarf herb; stems very slender, hispid. Leaves sessile above, distinctly petiolate below, oblong, sparsely hispid. Flowers blue, in lax few-flowered cymes bracteate at the base. Nutlets with a row of glochidiate spines with united bases around the margin, and a row of smaller ones up the centre of the back.

Red Sea District: from sea-level to 4000 ft.

5. **CYNOGLOSSUM** L.**Cynoglossum lanceolatum** Forsk.

Pilose herb 4-6 ft. high. Leaves more or less broadly lanceolate, $1\frac{1}{4}$ -6 in. long, up to $1\frac{3}{4}$ in. broad, setulose-scabrous above, sparingly so beneath. Flowers white or bluish, in cymes becoming long and slender when in fruit. Nutlets ellipsoid, the spines spread all over the surface.

Darfur. Equatoria.

6. **ECHIOCHILON** Desf.**Echiochilon fruticosum** Desf.

Dwarf much-branched perennial herb; stems as well as the leaves densely covered with white bristly hairs. Leaves alternate, lanceolate, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Flowers bright-blue, sessile, in the axils of the upper leaves, crowded towards the ends of the branchlets.

Red Sea District: near Ras Kawai.



Fig. 16—*CORDIA ROTHII* Roem. & Schult.

7. ECHIUM L.

Echium rauwolfii Del.

Fig. 17.

Annual erect much-branched herb about 1 ft. high; root slender, staining purple; stems covered with copious spreading bristles. Upper stem-leaves sessile, linear-oblong, small, with copious bulbous-based bristles; lower stem-leaves oblanceolate, 4-6 in. long, narrowed into a short petiole. Flowers blue or white, in bracteate scorpioid spikes. Corolla $1\frac{1}{2}$ times as long as the calyx. Stamens exserted. Nutlets smooth, shining.

Northern and Central Sudan.



Fig. 17—ECHIUM RAUWOLFII Del.

A, inflorescence. B, flower. C, longitudinal section of flower. D, hairy mature anthers. E, calyx and bract. F, fruit (4 nutlets) and style. G, bulbous-based bristles covering whole plant.

E. longifolium Del.

Annual branched herb up to 2 or more ft. high; stems covered with copious spreading bristles. Upper stem-leaves sessile, linear-oblong, small; lower stem-leaves oblanceolate, narrowed into a short petiole, up to 7 in. long. Flowers bright-blue, in numerous lax spikes. Corolla twice as long as the calyx. Stamens exerted. Nutlets ovoid, rugose on the outer face.

Northern and Central Sudan.

E. arenarium Guss.

Annual or biennial herb; stems short, diffuse, covered with appressed or spreading hairs. Leaves all oblanceolate. Flowers bright-blue, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, in lax elongate spikes. Corolla nearly twice as long as the calyx. Stamens included. Nutlets ovoid, strongly tuberculate.

Blue Nile Province: Wad Medani; Fung District.

8. **EHRETIA** Browne**Ehretia braunii** Vatke.

Tree about 30 ft. high; bark greyish, striate; branchlets glabrous. Leaves elliptic or obovate-oblong, very obtuse or emarginate at the apex, attenuate at the base, up to 1 $\frac{1}{4}$ in. long, 1 in. broad, sparingly setose above, more so beneath. Flowers white, purple-tipped, shortly pedicellate, in terminal scorpioid panicles. Fruit a globose drupe.

Equatoria.

E. stuhlmannii Gürke.

Tree about 20 ft. high. Leaves broadly elliptic or obovate, acute or rather obtuse at the apex, rounded or acute at the base, 3-6 in. long, 2-4 $\frac{1}{4}$ in. broad, rough above, more or less pubescent beneath. Flowers white, shortly pedicellate or subsessile, in long-pedunculate lax cymes in the axils of the upper leaves. Drupe small, globose.

Equatoria.

9. **HELIOTROPIUM** L.

- A. Corolla-lobes with long linear thread-like points *H. zeylanicum.*
- AA. Corolla-lobes not as above:
 - B. Annual herbs:
 - C. Leaves obtuse at (not tapering to) the base:
 - (a) Stems densely tomentose *H. aegyptiacum.*



Fig 18--HELIOTROPIUM AEGYPTIACUM Lehm.



Fig. 19—*HELIOTROPIUM SUDANICUM* F. W. Andr.

A, portion of inflorescence. B, fruits.

H. sudanicum F. W. Andr.

H. europaeum (non L.) Broun & Massey.

Branched annual herb up to 12 or more in. high; stems sulcate, hispid with simple hairs broadened at the base. Leaves alternate or subopposite, rather sinuate on the margin, ovate, obtuse

Fig. 19.

or acute at the apex, cuneate and often unequal-sided at the base, up to $2\frac{1}{4}$ in. long, 1 in. broad, densely tuberculate and hispid on the nerves beneath, less densely so above; petiole up to $\frac{3}{4}$ in. long, hirsute like the stems. Spikes often in pairs, $2-3\frac{1}{2}$ in. long, densely flowered. Corolla white, twice as long as the calyx, pubescent outside. Stigma conical, swollen and thickened at the base. Nutlets glabrous.

Blue Nile Province: Gezira.

H. indicum L.

Robust annual herb 1-3 ft. high; stems densely pilose or villous. Leaves more or less undulate-dentate, broadly ovate, more or less triangular-pointed at the apex, more or less cuneate at the base into a winged petiole, up to $4\frac{1}{2}$ in. long, $3\frac{1}{4}$ in. broad, shortly pubescent, the surface sometimes blistered or puckered. Flowers lilac, sometimes white, small, in long slender spikes curled towards the tip and up to 8 in. long. Fruit ovoid, ribbed, glabrous.

Northern and Central Sudan.

H. ovalifolium Forsk.

Fig. 20.

Diffuse densely white-villous annual herb from a woody base. Leaves oblanceolate-obovate, $\frac{1}{3}-1\frac{1}{2}$ in. long, $\frac{1}{4}-\frac{2}{3}$ in. broad, densely to thinly villous on both surfaces. Flowers white, very small, numerous, in close slender appressed-pilose spike-like cymes 2-3 in. long. Fruit depressed, pubescent.

Widespread.

H. pterocarpum (DC.) Steud. & Hochst. ex Bunge.

Annual herb; stems short, spreading, slender, densely covered with whitish bristly hairs. Leaves sessile or shortly petiolate, thick, oblong, $\frac{3}{4}-1$ in. long, densely hispid on both surfaces with curled hairs on the margin. Flowers small, in short very dense much-curved spikes. Nutlets glabrous, cohering in pairs, margined with a broad horny wing with a rounded sinus at the apex.

Red Sea Hills.

H. supinum L.

Hairy much-branched herb, decumbent from a woody base. Leaves shortly petiolate, more or less crenate, elliptic, $\frac{1}{2}-1\frac{1}{2}$ in. long, $\frac{1}{4}-\frac{1}{2}$ in. broad, appressed-pilose between the nerves above, villous beneath. Flowers small, few, softly villous, in rather lax spikes. Nutlets 1-2, dark brown with a lighter brown border.

Central Sudan.



Fig. 20—*HELIOTROPIUM OVALIFOLIUM* Forsk.

A, inflorescence. B, flowers. C, longitudinal section of flower. D, fruit with calyx. E, nutlets.

H. arbainense Fresen.

Perennial herb; stems short, ascending, much branched, densely clothed with soft whitish hairs. Leaves petiolate, ovate or oblong, rounded or narrowed at the base, $\frac{1}{2}$ -1 in. long, densely hairy on both surfaces. Flowers white, in dense ebracteate spikes finally 2-3 in. long. Calyx very glandular, hairy. Stigma mushroom-shaped, glabrous, nearly sessile.

Red Sea District: between sea-level and 4000 ft.

H. bacciferum Forsk.

H. undulatum Vahl.

Suberect or prostrate herb from a perennial rootstock, covered with white bulbous-based bristles. Leaves with strongly undulate margins, oblanceolate, up to $3\frac{1}{4}$ in. long and $\frac{3}{8}$ in. broad but usually shorter, setulose-scabrous on both surfaces. Flowers white, small, in dense short scorpioid cymes. Nutlets almost 2-winged, finally glabrous.

Northern and Central Sudan.

H. strigosum Willd.

Branched erect or spreading perennial herb up to 1 ft. high, with appressed white bristly hairs. Leaves linear, $\frac{3}{4}$ -1 in. long, appressed-setose-pilose on both surfaces. Flowers white, small, short-pedicellate in very lax spike-like cymes finally up to 3 in. long. Nutlets sparingly setulose.

Widespread.

H. longiflorum (A. DC.) Steud. & Hochst. ex Bunge.

Erect perennial herb; stems covered with short appressed whitish hairs. Leaves lanceolate or oblong-lanceolate, appressed-bristly on both surfaces, the lower ones sometimes 2-3 in. long. Flowers densely pubescent outside, in spikes up to 9 in. long. Fruit globose; nutlets glabrous, rugose.

Red Sea District.

H. steudneri Vatke.

Perennial herb; stems slender, virgate, densely covered with short appressed whitish hairs. Leaves ovate-lanceolate, up to $1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, densely pubescent on both surfaces. Flowers small, in dense short spikes.

Red Sea Hills: Erkowit.

H. lignosum Schweinf. ex Bunge.

Fruticose; stems short, woody, ascending, densely clothed with short appressed whitish hairs. Leaves small, sessile, lanceolate with revolute margins, densely and shortly bristly on both surfaces. Spikes short, dense, 3-6-flowered. Nutlets hispid.

Red Sea District: Mukawwar Island.

H. rariflorum Stocks.

Perennial herb; stems much branched, covered with a white tomentum. Leaves sessile, linear with revolute margins, small, densely covered with short white bristly hairs. Flowers in lax 3-5-flowered bracteate spikes. Nutlets hispid.

North-eastern Sudan.

10. **LITHOSPERMUM** L.**Lithospermum officinale** L.

Gromwell.

Perennial herb 2-3 ft. high; stems erect, densely hairy. Leaves many, subsessile, oblong or oblong-lanceolate, up to 2½ in. long but usually shorter above, covered above with short bristly bulbous-based hairs, slightly pubescent beneath. Flowers yellowish-white, in long bracteate cymes. Nutlets ovoid, pearly-white.

Equatoria: Imatong Mountains, 6000-10,000 ft.

11. **MOLTKIOPSIS** I. M. Johnston**Moltkiopsis ciliata** (Forsk.) I. M. Johnston.

Low herb; stems appressed-pubescent and bulbous-setose. Leaves sessile, rigid, lanceolate or ovate-lanceolate, ¾-¾ in. long, appressed-setulose above, softly appressed-pilose beneath. Nutlets ovoid, subacute at the apex, smooth.

Northern Sudan: Libyan Desert, 17° N., 24° 30' E.

12. **TRICHODESMA** R. Br.**Trichodesma physaloides** (Fenzl) A. DC.

Perennial herb from a tuberous woody rhizome, 1-2 ft. high; stems roughly hairy at first. Leaves all sessile, lanceolate or ovate-lanceolate, narrowed at the base, 1½-4 in. long, with white tubercles more numerous above than beneath. Flowers bluish or white, blue- or yellow-spotted in the throat, 1-1½ in. in diameter, in lax panicles. Calyx usually slightly pubescent.

Fung District. Equatoria.

T. africanum (L.) Lehm.

Fig. 21.

T. zeylanicum (non R. Br.) Broun & Massey p.p.

Erect branched harshly scabrous annual herb 2-3 ft. high. Leaves (except the upper ones) petiolate, ovate to lanceolate, truncate to acute at the base, up to 4½ in. long, 2½ in. broad, scabrous on both surfaces with short bristles from a discoid base. Flowers white or blue, the throat yellow with chocolate spots, ¼ in. long, in lax terminal panicles. Calyx-lobes with large hairs on the midrib and margin. Nutlets white, scabrous, spiny.

Northern and Central Sudan.



Fig. 21—*TRICHODESMA AFRICANUM* (L.) Lehm.

A, flowers. **B**, longitudinal section of flower. **C**, stamens. **D**, Calyx. **E**, four nutlets and style. **F**, nutlet. **G**, transverse section of ovary. **H**, bulbous-based prickly hairs.

T. ehrenbergii Schweinf.*T. bentii* Bak. & Wright.

Erect herb about 1 ft. high; stems densely covered with white hairs interspersed with bristles. Leaves petiolate, ovate, $2\frac{1}{2}$ in. long, up to 2 in. broad, hispid and with scattered bulbous-based hairs above, densely hispid with a few bulbous-based hairs beneath. Flowers up to $\frac{1}{2}$ in. in diameter, in terminal paniculate cymes. Calyx hairy outside and on the margin.

*Red Sea District.***T. zeylanicum** (Burm. f.) R. Br.

Erect annual herb 3-4 ft. high; branches pubescent and with scattered bulbous-based hairs. Leaves subsessile, oblong-lanceolate, tapering at the base, 1-4 in. long, pubescent and with bulbous-based hairs on both surfaces but denser beneath; lower leaves larger, shortly petiolate. Flowers blue with a white throat, in lax terminal cymes. Calyx more or less densely pubescent on both surfaces. Nutlets grey, smooth.

Central and Southern Sudan.

128. SOLANACEAE

Herbaceous or woody plants. Leaves without stipules, alternate, simple. Flowers hermaphrodite or very rarely unisexual, usually actinomorphic. Calyx 4-6-lobed, persistent. Corolla gamopetalous, usually 5-lobed; lobes folded, contorted or valvate. Stamens inserted on the corolla-tube and alternate with the corolla-lobes, rarely 2; anther-loculi parallel. Ovary usually 2-locular, the loculi sometimes again divided by a false septum; style terminal; ovules very numerous, axile. Fruit a capsule or berry.

The following plants of this family are cultivated in the Sudan: *Capsicum annuum* L., Cayenne Pepper; *Solanum melongena* L., Egg Plant or Aubergine; *Physalis peruviana* L., Cape Gooseberry; *Lycopersicon esculentum* Mill., Tomato; *Nicotiana tabacum* L., Tobacco.

A. Fruit a capsule:

B. Capsule circumscissile; flowers axillary and in secund scorpioid cymes HYOSCYAMUS. 3.

BB. Capsule 2-4-valved or dehiscent irregularly:

(a) Capsule 2-valved:

(b) Stamens 5; flowers medium-sized NICOTIANA. 5.

(bb) Stamens 2; flowers very small SCHWENKIA. 7.

(aa) Capsule 4-valved or dehiscent irregularly; stamens 5; leaves and flowers large DATURA. 2.

AA. Fruit a berry:

C. Anthers opening by slits lengthwise:

D. Calyx not enlarged in fruit or not obviously so:

(c) Plant not spiny; corolla rotate, the lobes valvate CAPSICUM. 1.

- (cc) Plant spiny; corolla tubular, the lobes imbricate
 LYCIUM. 4.
- DD. Calyx enlarged and inflated in fruit:
- (d) Flowers solitary PHYSALIS. 6.
- (dd) Flowers in clusters WITHANIA. 9.
- CC. Anthers opening by terminal pores SOLANUM. 8.

1. **CAPSICUM L.****Capsicum frutescens L.**

Undershrub 2-3 ft. high; branchlets nearly glabrous. Leaves ovate, acuminate at the apex, attenuate into the petiole, variable in size, glabrous or slightly ciliate on the margin. Flowers white or pale-yellow, solitary or in pairs on peduncles $\frac{3}{4}$ - $\frac{1}{2}$ in. long. Berry shining-red, ovoid-oblong.

Widespread. Cultivated and now naturalized.

C. abyssinicum A. Rich.

Erect shrub; branchlets hirsute. Leaves petiolate, ovate, acuminate at the apex; obtuse and slightly unequal at the base, hirsute especially on the nerves beneath. Flowers solitary on hirsute peduncles. Berry oblong, 2 in. long, smooth, shining.

Fung District.

2. **DATURA L.****Datura metel L.**

Erect herb 3-4 ft. high, glabrous or nearly so. Leaves ovate, up to 8 in. long. Flowers white, up to 6 in. long, axillary, shortly pedunculate, at first erect, later pendulous. Corolla normally 5-lobed. Capsule globose, pendulous, spiny, dehiscing irregularly.

Equatoria.

D. stramonium L.

Thorn-apple. Fig. 22.

Erect branched annual herb or undershrub 1-2 or more ft. high; stems smooth, glabrous. Leaves more or less coarsely toothed or lobed, ovate, acuminate at the apex, unequal at the base, up to 9 in. long, $3\frac{1}{2}$ in. broad, slightly hairy when young. Flowers white, about $3\frac{1}{4}$ in. long, erect in the forks of the branches. Capsule erect, 4-valved, about 2 in. long, ovoid, spiny.

Widespread.

D. innoxia Mill.

D. metel (non L.) Broun & Massey.

Erect softly grey-pubescent herb or undershrub 3-4 ft. high. Leaves entire or repand-dentate, ovate, up to 8 in. long, densely pubescent on both surfaces. Flowers white, up to 6 in. long, pendulous. Corolla 10-toothed. Capsule globose, pendulous, spiny, dehiscing irregularly.

Central Sudan.



Fig. 22—DATURA STRAMONIUM L.

3. **HYOSCYAMUS L.****Hyoscyamus muticus L.**

Fig. 23.

Erect herb 1-2 ft. high; stems thick, glabrous or pubescent. Leaves entire or dentate, broadly lanceolate, 4-6 in. long, 2 in. broad, glabrous or pubescent; petiole $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, winged. Flowers greenish-white tipped with purple, the lower usually axillary, the upper in a secund scorpioid cyme. Capsule subglobose.

Northern Sudan.



Fig. 23—HYOSCYAMUS MUTICUS L.

4. **LYGIUM** L.**Lycium persicum** Miers.

Shrub; branches glabrous or ashy-pubescent; spines straight. Leaves spatulate-obovate or oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glabrous or puberulous. Flowers blue-purple, about $\frac{3}{4}$ in. long, solitary. Berry scarlet, globose.

Northern Sudan.

5. **NICOTIANA** L.**Nicotiana rustica** L.

Herb up to 4 ft. high. Leaves petiolate, ovate, obtuse at the apex, sometimes subcordate at the base, up to 1 ft. long, glandular-pubescent. Flowers greenish-yellow, in terminal subpaniculate racemes, with or without bracts. Capsule subglobose, slightly longer than the calyx.

Widespread.

6. **PHYSALIS** L.**Physalis minima** L.

Much-branched herb about 1 ft. high. Leaves petiolate, entire or sinuate-dentate, ovate, acuminate at the apex, sometimes subcordate at the base, 1-2 in. long, $\frac{3}{4}$ in. broad. Flowers yellow, small, axillary, solitary. Anthers yellow. Berry globose, $\frac{1}{2}$ in. in diameter, smooth.

Fung District. Equatoria.

P. angulata L.

Much-branched pubescent or nearly glabrous annual herb up to 2 ft. high. Leaves petiolate, coarsely serrate, ovate, acute or acuminate at the apex, up to 3 in. long, 2 in. broad, usually glabrous. Flowers uniformly yellow, small, axillary, solitary. Anthers blue. Berry at first green, later yellowish-green.

Kordofan.

7. **SCHWENKIA** D. Royen ex L.**Schwenkia americana** L.

S. hirta (non Klotzsch) Broun & Massey.

Freely branching glabrous or sparingly pubescent herb about 2 ft. high. Lower leaves petiolate, entire, elliptic to ovate, rounded to subacute at the apex, up to $1\frac{1}{2}$ in. long, 1 in. broad; upper leaves sessile, becoming narrowly oblong. Flowers dull-brown-purple or greenish-lilac, inconspicuous, in a lax panicle. Corolla narrowly tubular with the lobes alternating with club-shaped processes. Fruit a subglobose capsule, surrounded by the persistent calyx, dehiscing by 2 valves.

Equatoria.

8. **SOLANUM** L.

- A. Plants without spines:
- B. Inflorescences terminal and spiciform; a climber
S. welwitschii var. *strictum*.
- BB. Inflorescences lateral, axillary, extra-axillary or leaf-opposed;
not climbing:
- C. Leaves glabrous or scurfy, more or less undulate
S. aethiopicum.
- CC. Leaves more or less pubescent:
- D. Leaves with simple hairs *S. nigrum*.
- DD. Leaves with few or many stellate hairs:
- (a) Flower parts usually in 4's *S. schimperianum*.
- (aa) Flower parts always in 5's:
- (b) Flowers few in short racemes; branchlets and leaves
sparsely covered with stellate hairs ... *S. carense*.
- (bb) Flowers in short racemose 2-fid cymes; branchlets and
leaves densely covered with stellate hairs
S. polyanthemum.
- AA. Plants with spines:
- E. Leaves rarely more than $1\frac{1}{2}$ in. long:
- (c) Flowers solitary or a few racemose; leaves usually hastate or
more or less pinnately lobed *S. hastifolium*.
- (cc) Flowers in peduncled cymes; leaves not as above
S. albicaule.
- EE. Leaves exceeding $1\frac{1}{2}$ in. long:
- F. Leaves without spines:
- (d) Berry not more than $\frac{1}{2}$ in. in diameter
S. pruinatum var. *pilosulum*.
- (dd) Berry 1 or more in. in diameter:
- (e) Stems glabrous; branches tomentose *S. hybridum*.
- (ee) Stems with floccose indumentum *S. incanum*.
- FF. Leaves with spines on the lamina and/or on the midrib:
- G. Leaves 2-3-pinnatifid *S. duplosinuatum*.
- GG. Leaves not so divided:
- H. Herbs:
- I. Berry up to $\frac{1}{4}$ in. in diameter, almost enclosed in the
spiny calyx *S. dubium*.
- II. Berry more than $\frac{1}{4}$ in. in diameter, not enclosed in the
calyx:
- (f) Leaves $2\frac{1}{2}$ in. long; calyx densely pubescent
S. cerasiferum.
- (ff) Leaves up to 7 in. long; calyx sparingly pubescent ...
S. xanthocarpum.
- HH. Shrubs or undershrubs:
- J. Stems when young with stellate hairs:
- K. Flowers $\frac{3}{4}$ - $1\frac{1}{4}$ in. in diameter:

(g) Tomentum on stems floccose; flowers solitary or few together, only the lower ones fertile
S. incanum.

(gg) Tomentum on stems not floccose; flowers in few-flowered extra-axillary cymes, the upper ones fertile *S. campylacanthum.*

KK. Flowers not more than $\frac{1}{2}$ in. in diameter:

(h) Flower parts in 4's *S. anomalum.*

(hh) Flower parts in 5's *S. unguiculatum.*

JJ. Stems when young with simple appressed hairs
S. aculeatissimum.

***Solanum welwitschii* var. *strictum* C. H. Wright.**

Glabrous climbing undershrub. Leaves oblong to obovate, gradually acuminate at the apex, 2 $\frac{1}{4}$ -6 in. long, 1 $\frac{1}{4}$ -2 $\frac{1}{4}$ in. broad, glabrous. Flowers blue-purple with a yellow centre. Berry about $\frac{1}{10}$ in. in diameter.

Equatoria: Kagelu.

***S. aethiopicum* L.**

Branched herb or undershrub 1-2 ft. high. Leaves more or less undulate, oblong, unequal-sided at the base, up to 4 in. long, glabrous or very slightly scurfy on the upper surface. Flowers white, in few-flowered umbellate cymes. Berry pale-red, globose, smooth or lobed.

Equatoria.

***S. nigrum* L.**

Black Nightshade.

S. nodiflorum Jacq.

Herb or undershrub 1-2 ft. high; branches glabrous or pubescent. Leaves entire or sinuate-dentate, ovate, obovate or lanceolate, up to 4 in. long, 2 in. broad, slightly pubescent. Flowers white, about $\frac{1}{3}$ in. in diameter, in few-flowered umbellate cymes at or above the nodes. Berry black, about $\frac{1}{3}$ in. in diameter, glabrous.

Widespread.

***S. schimperianum* Hochst. ex A. Rich.**

Shrub about 5 ft. high; stems stellately hairy when young, glabrous when old. Leaves ovate, acute at the apex, about 1 in. long, $\frac{3}{4}$ in. broad, covered with more or less deciduous stellate hairs. Flowers about $\frac{1}{2}$ in. in diameter, in few-flowered cymes. Berry globose, about $\frac{1}{2}$ in. in diameter.

Northern Sudan.

S. carense Dunal.

Low much-branched shrub 3-5 ft. high. Leaves entire or slightly sinuate, ovate, about $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, with a few scattered stellate hairs on both surfaces. Flowers $\frac{3}{4}$ in. in diameter, few in short racemes. Berry globose, about $\frac{1}{2}$ in. in diameter.

Red Sea Hills: Erkowit.

S. polyanthemum Hochst. ex A. Rich.

Shrub; branches covered with yellowish stellate hairs. Leaves ovate-lanceolate, acuminate at the apex, up to 3 in. long, stellate-hairy above, more densely so beneath. Flowers in short racemose bifid cymes. Berry globose, about $\frac{1}{2}$ in. in diameter.

Southern Sudan.

S. hastifolium Hochst. ex Dunal.

Undershrub or shrub; stems sparingly pubescent. Leaves $1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, with scattered stellate hairs on both surfaces. Flowers few in racemose inflorescences (sometimes reduced to a single flower) lateral and terminal on the branches. Berry globose, $\frac{1}{2}$ in. in diameter, smooth.

Central and Southern Sudan.

S. albicaule Kotschy ex Dunal.

Undershrub or shrub; stems when young covered with white stellate tomentum. Leaves sometimes slightly lobed, ovate, acuminate at the apex, up to $1\frac{1}{2}$ in. long, 1 in. broad, with stellate hairs on both surfaces. Flowers in usually bifid extra-axillary pedunculate cymes; lower pedicels deciduous, leaving black scars. Berry globose, $\frac{1}{4}$ in. in diameter, glabrous, pendulous.

Red Sea District. Darfur. Kordofan.

S. pruinatum var. **pilosulum** Dunal.

Herb; branches covered with fine white bloom. Leaves rhomboid, cuneate at the base, 2-3 in. long, about 1 in. broad, almost glabrous above, minutely white-hairy beneath. Flowers white, about $\frac{1}{2}$ in. in diameter, in 6-7-flowered racemes; peduncle, pedicel, calyx and corolla hispid with short white hairs.

Fung District.

S. hybridum Jacq.

Undershrub or shrub 2-5 ft. high; stems glabrous; branches tomentose. Leaves sinuate or entire, ovate, acute at the apex, 3 in. long, 2 in. broad, stellately tomentose on both surfaces. Flowers pale-purple, 1 in. in diameter, in umbellate racemose cymes, these sometimes reduced to a single flower. Berry orange-red, 1 in. in diameter, pendulous.

Kassala: Gallabat.

S. incanum L.

Fig. 24.

Densely stellate-tomentose shrub 3-5 ft. high. Leaves sinuate, ovate or ovate-elliptic, obtuse at the apex, unequal at the base, up to 7 in. long, 6 in. broad, dark-green above, paler beneath, densely stellate-hairy on both surfaces. Flowers purple or white, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. in diameter, some unisexual, solitary or a few together, pendulous. Berry yellow, subglobose, 1 $\frac{1}{2}$ in. in diameter, pendulous.

Widespread.



Fig. 24—SOLANUM INCANUM L.

A, longitudinal section of flower. B, anthers with terminal pores.
C, transverse section of fruit. D, seeds.

S. duplosinuatum Klotzsch.

Undershrub or shrub about 3 ft. high; stems when young covered with stellate hairs and simple bristles; spines straight, about $\frac{1}{4}$ in. long. Leaves sessile, 2- or 3-pinnatifid, up to 12 in. long, 9 in. broad, with straight spines up to $\frac{1}{2}$ in. long, with simple straight hairs above and stellate hairs beneath. Flowers mauve, about $1\frac{1}{2}$ in. in diameter, in few-flowered racemose cymes. Berry globose, $1\frac{1}{2}$ in. in diameter.

Equatoria.

S. dubium Fresen.

Fig. 25.

Woody herb; branches covered with whitish scurfy tomentum. Leaves long-petiolate, repand-sinuate, ovate or ovate-lanceolate, acuminate or obtuse at the apex, up to 4 in. long, 2 in. broad, pale-green above, whitish beneath, appressed-stellate-tomentose on both surfaces. Flowers violet, in short few-flowered cymes. Berry yellow, globose.

Northern and Central Sudan.

S. cerasiferum Dunal.

Herb; stems minutely stellate-hairy. Leaves pinnately lobed, oblong, acute at the apex, $2\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, minutely stellate-hairy on both surfaces. Flowers violet, $\frac{3}{4}$ in. in diameter, in racemose cymes. Berry yellow.

Fung District.

Var. *cinereotomentosum* Dunal.

Branches, undersurface of leaves, peduncles, pedicels and outside of calyx and corolla ashy-grey-tomentose.

Fung District.

S. xanthocarpum Schrad.

Bushy herb; stems slightly stellate-hairy when young. Leaves pinnately 5-9-lobed, more or less broadly oblong or oblong-lanceolate, up to 7 in. long, 5 in. broad, with a few minute stellate hairs on both surfaces. Flowers blue-purple, about 1 in. in diameter, in 5-8-flowered extra-axillary cymes. Berry shining-yellow, globose, $\frac{3}{4}$ -1 in. in diameter.

Central and Southern Sudan.

S. campylacanthum Hochst. ex A. Rich.

Stellately tomentose undershrub 2-5 ft. high. Leaves entire or slightly sinuate, broadly lanceolate to elliptic, up to 6 in. long, $2\frac{1}{2}$ in. broad, stellately pubescent on both surfaces. Flowers lilac, 1 in. in diameter, in extra-axillary few-flowered cymes. Berry globose, 1 in. in diameter, pendulous.

Darfur. Equatoria.

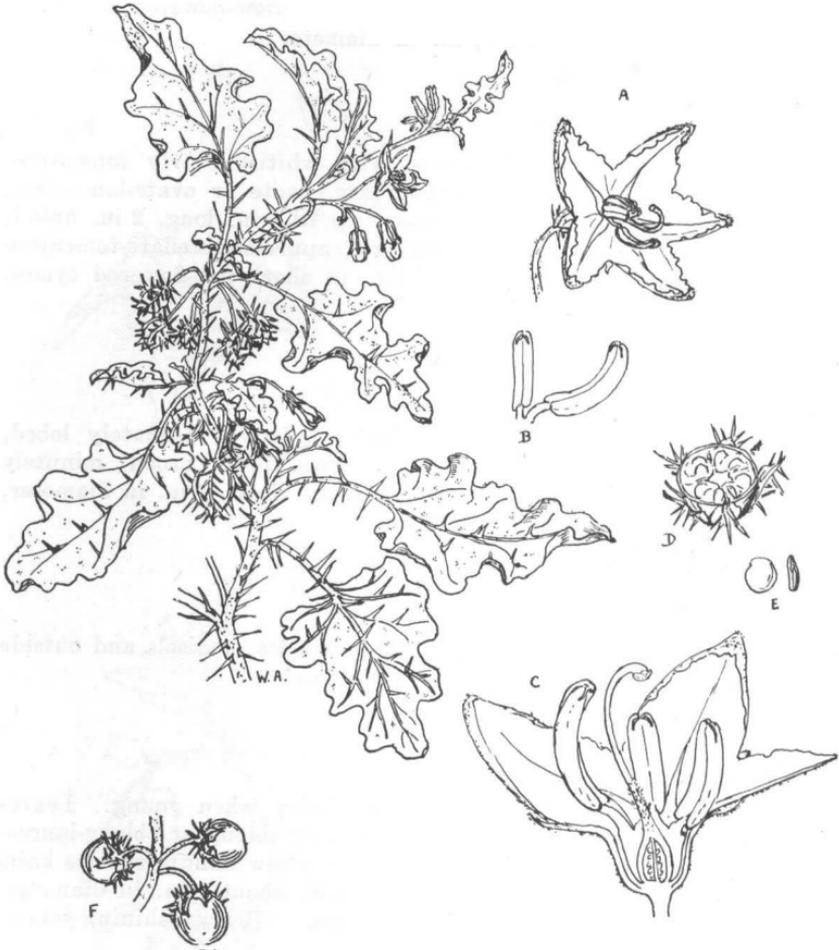


Fig. 25—*SOLANUM DUBIUM* Fresen.

A, flower. B, anthers. C, longitudinal section of flower. D, transverse section of fruit. E, seeds. F, ripe fruits.



Fig. 26—*WITHANIA SOMNIFERA* (L.) Dunal.

A. flowers. B. longitudinal section of flower. C. fruits. D. longitudinal section of fruit.

S. anomalum Thonn.

Coarse tomentose shrub or undershrub up to a few feet high. Leaves pinnatifid, ovate-oblong, more or less acute at the apex, stellately hairy on both surfaces. Flowers white or lilac, pendulous, in racemose axillary cymes. Berry red, globose, $\frac{1}{2}$ - $\frac{1}{2}$ in. in diameter.

Equatoria.

S. unguiculatum A. Rich.

Densely tomentose shrub. Leaves faintly sinuate, elliptic, acute or subobtuse at the apex, unequally cordate at the base, yellowish-green-tomentose on both surfaces or sometimes paler beneath.

Red Sea Hills.

S. aculeatissimum Jacq.

Undershrub 1-2 ft. high; spines on stems interspersed with stiff bristles. Leaves pinnately 5-7-lobed, broadly ovate, often cordate at the base, 4 in. long, 3 in. broad, with rigid appressed hairs on both surfaces. Flowers white, 1 in. in diameter, in few-flowered extra-axillary cymes. Berry orange, globose, 1 in. in diameter, smooth.

Upper Nile.

9. **WITHANIA** Pauq.

Withania somnifera (L.) Dunal.

Fig. 26.

Much-branched undershrub 2-7 ft. high; stems stellate-tomentose. Leaves entire or sinuate, elliptic to broadly ovate-lanceolate, acute to rounded at the apex, abruptly acute to long-decurrent at the base, $1\frac{1}{2}$ -4 in. long, $\frac{3}{4}$ -3 in. broad. Flowers colourless or pale-green, $\frac{1}{2}$ in. in diameter, 2-6 together in axillary clusters. Calyx campanulate, divided to about the middle into 5 acute triangular lobes, inflated in fruit, $\frac{3}{4}$ - $\frac{3}{4}$ in. long. Berry red when mature, globose, enclosed by the brown papery inflated calyx.

Widespread.

129. **CONVOLVULACEAE**

Herbaceous or woody plants, often climbing, usually with a milky juice. Leaves without stipules, alternate, simple or compound (absent in the parasitic genus *Cuscuta*). Flowers hermaphrodite, actinomorphic; bracts often forming an involucre. Sepals usually free, imbricate, persistent. Corolla gamopetalous, usually funnel-shaped; lobes 5, contorted. Stamens 5, inserted towards the base of the corolla-tube and alternate with the lobes. Ovary often surrounded by a disk, 1-4-locular; style terminal; ovules solitary or paired, erect. Fruit a capsule or fleshy and indehiscent; seeds sometimes hairy.

The following introduced plants of this family are cultivated in the Sudan: *Ipomoea batatas* (L.) Lam., Sweet Potato; *I. alba* L. (*Calonyction speciosum* Choisy), Moonflower; *I. muricata* (L.) Jacq. (*Calonyction muricatum* (L.) Don).

- A. Leafy plants, not parasitic:
- B. Pollen-grains smooth:
- C. Styles 2, or single and bifid:
- (a) Fruit indehiscent, 1-seeded DICHONDRA. 5.
- (aa) Fruit dehiscent:
- (b) Small herbs with very small flowers:
- (c) Styles 2, forked EVOLVULUS. 6.
- (cc) Styles 2, not forked; stamens and styles exserted CRESSA. 3.
- (bb) Small shrubs with prostrate or suberect branches; stamens and styles not exserted SEDDERA. 12.
- CC. Style 1, entire or shortly lobed:
- D. Outer sepals not much larger than the inner:
- (d) Stigmas thread-like or ellipsoid:
- (e) Stigmas thread-like CONVULVULUS. 2.
- (ee) Stigmas ellipsoid JACQUEMONTIA. 9.
- (dd) Stigma biglobular MERREMIA. 11.
- DD. Outer sepals conspicuously larger than the inner HEWITTIA. 7.
- BB. Pollen-grains spinose:
- E. Fruit a capsule:
- F. Stamens inserted at the base of scales ... LEPISTEMON. 10.
- FF. Stamens not attached to scales:
- (f) Indumentum stellate; erect herbs, woody at the base ASTROCHLAENA. 1.
- (ff) Indumentum, if present, not stellate IPOMOEA. 8.
- EE. Fruit fleshy and indehiscent; cymes few-flowered and sessile; leaves long-petiolate STRICTOCARDIA. 13.
- AA. Leafless parasitic plants with usually thread-like stems and clusters of small flowers CUSCUTA. 4.

1. **ASTROCHLAENA** Hallier f.

Astrochlaena lachnosperma (Choisy) Hallier f.

Fig. 27.

Perennial herb, woody at the base; stems 1-1½ ft. long, clothed with whitish stellate tomentum. Leaves entire or slightly repand, ovate to broadly ovate-elliptic, obtuse to subacute at the apex, broadly rounded or subcuneate at the base, 1½-3½ in. long, 1½-3 in. broad, thinly covered above with whitish stellate tomentum, more densely so beneath; petiole 1-2 in. long. Flowers solitary or umbellately arranged. Corolla purple, up to ¾ in. long. Capsule pale-brown, globose, ¼-½ in. in diameter, glabrous, with 4 brittle valves; seeds villous.

Red Sea District. Darfur. Kordofan.



Fig. 27—ASTROCHLAENA LACHNOSPERMA (Choisy) Hallier f.

A, opened corolla with stamens. B, pistil and stamen.

A. malvacea (Klotzsch) Hallier f.

A. engleriana Dammer; *A. volkensii* Dammer; *A. stuhlmannii* Dammer ex Hallier f.

Robust herb 2-3 ft. high; stems more or less densely covered with short white pubescence. Leaves entire or repand, rounded at the base, 1½-5 in. long, dull-green or slightly pubescent above, matted with whitish tomentum beneath. Flowers purple, in 2-5-flowered inflorescences. Corolla 1½-2 in. long. Capsule globose, 4-valved, glabrous; seeds 4, black, glabrous.

Central and Southern Sudan.

Convolvulus rhyniospermus Hochst. ex Choisy.

Fig. 28.

Annual herb; stems slender, densely tufted, 3-12 in. long, clothed with short bright-brown hairs. Leaves oblong or oblanceolate, obtuse at the apex, narrowed at the base, 1-2 in. long, smaller on the flowering stems, sparsely pubescent. Flowers in heads along the stems, surrounded by oblong to oblong-lanceolate bracts, the outer foliaceous, the inner resembling the sepals. Corolla twice as long as the calyx, pubescent. Capsule globose, glabrous, $\frac{1}{4}$ in. in diameter, beaked with the persistent style-base; seeds minutely papillose.

Northern and Central Sudan.

C. glomeratus Choisy.

Perennial herb, woody at the base; stems long, slender, trailing or twining, finely hairy. Leaves lanceolate to oblong-lanceolate, $\frac{1}{4}$ -1 in. long, sparsely appressed-pilose on both surfaces. Flowers in dense globose bracteate rust-coloured heads on slender peduncles; outer bracts foliaceous, up to $\frac{3}{4}$ in. long. Corolla pinkish-white, pubescent, $\frac{1}{2}$ in. long. Capsule globose, glabrous, pale-brown; seeds blackish-brown, scabrous.

Red Sea District.

C. hystrix Vahl.

Erect shrub or undershrub; branchlets numerous, short, hairy, ending in sharp spines. Leaves sessile, stiff, oblong, $\frac{1}{2}$ in. or less long, silky. Flowers axillary, sessile, usually solitary.

Northern Sudan.

C. microphyllus Sieber ex Spreng.

Fig. 29.

Undershrub; stems slender, densely tufted, more or less softly hairy. Stem-leaves oblong or oblong-lanceolate, generally less than $\frac{1}{2}$ in. long, hairy on both surfaces; radical leaves narrowly spatulate, nearly 1 in. long. Flowers 1-3 together at the upper nodes of the stems. Corolla pinkish-white, funnel-shaped, twice as long as the calyx, hairy outside. Capsule globose; seeds glabrous.

Northern Sudan. Kordofan.

C. deserti Steud. & Hochst. ex Bak. & Rendle.

Low undershrub; stems slender, spreading, somewhat harshly hairy with spreading or appressed hairs. Leaves subsessile, linear-oblong with a tapering base to linear-spatulate, the lower reaching $1\frac{1}{4}$ in. long, appressed-hairy on both surfaces; midrib prominent. Flowers axillary, on 1-2-flowered peduncles.

Red Sea District: between sea-level and 4000 ft.

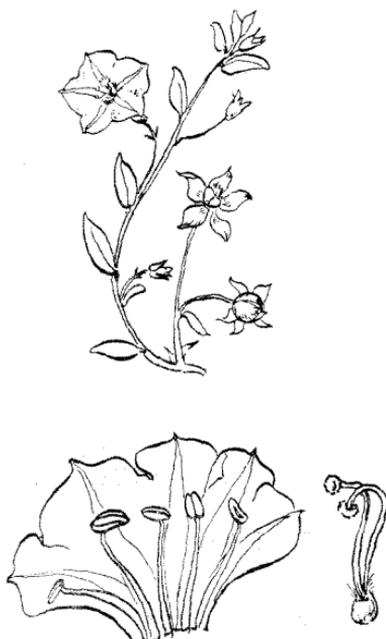


Fig. 29—CONVOLVULUS MICROPHYLLUS Steber ex Spreng.

C. agrestis (Schweinf.) Hallier f.

Evolvulus agrestis Schweinf.

Annual herb; stems 1-1½ ft. long, several from the base, the upper portions sometimes climbing, with spreading somewhat tawny hairs. Leaves shortly petiolate, lanceolate, truncate at the base, ¾-1½ in. long, more or less hairy with short appressed reddish-brown hairs. Flowers 1-2 on slender ascending axillary peduncles ¼-1 in. long. Capsule membranous, ¼ in. in diameter, opening irregularly; seeds black, glabrous, tuberculate.

Red Sea District.

C. arvensis L.

Bindweed.

Perennial climbing herb; stems glabrous or slightly pubescent. Leaves ovate, hastate with spreading or deflexed usually acute basal lobes, 1-2 in. long; petiole ½-1 in. long. Flowers 1-3 on long slender flexuous peduncles. Corolla pinkish-white, broadly funnel-shaped, ¾ in. long. Capsule globose, glabrous, ¼ in. in diameter; seeds glabrous.

Northern and Central Sudan.

C. fatmensis Kunze.

Herb; stems slender, diffuse, 1-2 ft. long, pubescent towards the tip. Leaves distinctly petiolate, ovate, obtuse at the apex, cordate at the base with rounded auricles and a broad sinus, deeply and irregularly crenate, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, thinly pubescent. Flowers 1-2 on short sparsely pubescent axillary peduncles up to $\frac{3}{4}$ in. long. Corolla white with brown stripes, less than $\frac{1}{2}$ in. long, hairy outside. Capsule globose, $\frac{1}{2}$ in. in diameter; seeds glabrous.

Kordofan.

3. **GRESSA** L.**Gressa cretica** L.

Herb; stems slender, woody, a few inches to 1 ft. long, with numerous spreading hairy densely leafy branchlets. Leaves sessile, ovate to lanceolate, acute at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers aggregated in dense spikes at the ends of the branchlets, each bracteate by a reduced leaf. Corolla about $\frac{1}{2}$ in. long. Capsule ovoid, $\frac{1}{2}$ in. long.

Red Sea District. Kordofan.

4. **CUSCUTA** L.**Cuscuta cordofana** (Engelm.) Yuncker.

C. obtusiflora var. *cordofana* Engelm.

Stems stout, yellow. Flowers few in a cluster, more or less glandular, sessile or shortly stalked, subtended by a persistent bluntly ovate somewhat fleshy bract about $\frac{1}{2}$ in. long. Calyx- and corolla-lobes orbicular or rounded-ovate; infrastaminal scales well developed. Stigmas capitate, much shorter than the elongated styles. Capsule depressed-globose, $\frac{1}{2}$ in. in diameter, not circumscissile.

Fung District.

C. hyalina Heyne ex Roth.

Stems very slender. Flowers stalked, in few- (often 3-) flowered cymes; bract ovate, acute at the apex, about $\frac{1}{2}$ in. long. Calyx- and corolla-lobes acuminate-triangular or acuminate-lanceolate; infrastaminal scales absent. Stigmas capitate, much shorter than the elongated styles. Capsule irregularly circumscissile.

Kordofan.

Var. nubiana Yuncker.

Scales present as a fringe of few teeth along the sides of the stamen attachment, or free in a few flowers.

Red Sea District.

C. brevistyla A. Braun ex A. Rich.*C. planiflora* (non Ten.) Broun & Massey.

Stems very slender, reddish. Flowers sessile or subsessile in dense globose clusters $\frac{1}{2}$ - $\frac{1}{4}$ in. in diameter. Calyx- and corolla-lobes ovate. Stigmas thread-like, longer than the abbreviated styles. Capsule regularly circumscissile.

*Red Sea District. Darfur: Jebel Marra.***C. killimanjari** Oliv.

Stems dark-coloured when dry. Flowers in umbellate clusters subtended by a broadly ovate blunt bract barely $\frac{1}{2}$ in. long, shortly pedicellate. Corolla yellowish-white, the lobes broadly ovate; infrastaminal scales present. Stigmas capitate.

*Equatoria: Imatong Mountains.*5. **DICHONDRA** J. R. & G. Forst.**Dichondra repens** J. R. & G. Forst.

Perennial herb, with slender trailing pubescent stems rooting from the nodes. Leaves long-petiolate, reniform, $\frac{1}{2}$ -1 in. broad, more or less silky especially on the lower surface. Flowers pale-green to yellow, axillary, solitary.

*Equatoria.*6. **EVOLVULUS** L.**Evolvulus alsinoides** (L.) L.

Annual or perennial herb; stems tufted, slender, hairy. Leaves elliptic or oblanceolate-oblong to lanceolate, obtuse to acute and often mucronate at the apex, usually narrowed to the base, $\frac{1}{2}$ -1 in. long, villous on both surfaces. Flowers usually bright-blue, rarely white, on 1-3-flowered slender hairy peduncles often 1-1 $\frac{1}{2}$ in. long. Capsule globose, 4-valved.

*Widespread.***E. nummularius** (L.) L.

Perennial herb with the habit of *Dichondra repens*; stems shortly hairy, trailing, $\frac{1}{2}$ -1 ft. long, rooting from the nodes. Leaves shortly petiolate, orbicular or orbicular-obovate or elliptic, very obtuse at the apex, truncate or retuse at the base, about $\frac{1}{2}$ in. in diameter. Flowers white, few, solitary in the leaf-axils on very short recurving peduncles. Capsule globose, $\frac{1}{2}$ in. in diameter, 1-locular, 2-valved.

*Equatoria.*7. **HEWITTIA** Wight & Arn.**Hewittia sublobata** (L. f.) Kuntze.

Climbing perennial herb; stems more or less pubescent. Leaves sometimes grossly dentate, ovate, acute or obtuse at the apex, entire or forming a pair of blunt rounded lobes at the base, 1 $\frac{1}{2}$ -5 in.

long, varyingly pubescent on both surfaces. Flowers yellow or buff with a purple eye, 1 or few in dense heads on long or short peduncles. Corolla 1 in. long. Capsule small, hairy, $\frac{1}{2}$ in. in diameter.

Equatoria.

8. IPOMOEA L.

A. Flowers in dense heads:

B. Leaves not lobed:

C. Flower-heads subtended by a leafy boat-shaped bract:

(a) Sepals lanceolate, acute at the apex *I. involucrata*.

(aa) Sepals oblong-spathulate, blunt at the apex *I. pileata*.

CC. Flower-heads bracteate but not subtended by a leafy boat-shaped bract, hairy:

(b) Leaves cordate-ovate *I. amoenula*.

(bb) Leaves suborbicular; bracts large *I. chaetocaulos*.

BB. Leaves palmately 7-9-lobed *I. pes-tigridis*.

AA. Flowers not in dense heads:

D. Flowers up to $\frac{1}{4}$ in. long, the corolla scarcely exceeding the calyx:

(c) Leaves entire or very shallowly lobed:

(d) Leaf-base cordate or rounded:

(e) Capsule glabrous; stems prostrate *I. verticillata*.

(ee) Capsule hairy:

(f) Sepals acuminate at the apex; corolla white, rose or purple *I. eriocarpa*.

(ff) Sepals blunt at the apex; corolla yellow ... *I. vagans*.

(dd) Leaf-base gradually narrowed or rounded; corolla red or purplish *I. coscinosperma*.

(cc) Leaves 1-2-pinnatifid *I. kotschyana*.

DD. Flowers more than $\frac{1}{4}$ in. long:

E. Flowers up to $1\frac{1}{2}$ in. long:

F. Leaves covered with white tomentum beneath *I. aitoni*.

FF. Leaves not so covered:

G. Stems erect or procumbent:

(g) Stems finely pubescent *I. eurysepalis*.

(gg) Stems covered with appressed yellow hairs *I. convolvulifolia*.

GG. Stems trailing or climbing, not erect or procumbent:

H. Leaves palmately divided:

(h) Leaf-lobes pinnatifid to pinnatisect (serrate only in var. *malvifolia*) *I. coptica*.

(hh) Leaf-lobes elliptic, blunt at the apex ... *I. pulchella*.

HH. Leaves entire:

I. Corolla yellowish or whitish with a dark-purple eye:

J. Corolla $1\frac{1}{2}$ in. long, yellow with a dark-purple eye *I. kentrocarpa*.

JJ. Corolla less than $1\frac{1}{2}$ in. long, white or whitish with a dark-purple eye:

- (i) Stems densely clothed with yellowish spreading hairs; sepals densely and minutely hirsute on the back and margin, the hairs yellowish
I. tenuirostris.
- (ii) Stems and sepals not as above:
 - (j) Margin of sepals long-ciliate, the back sparsely puberulous *I. mombassana.*
 - (jj) Sepals not as above *I. obscura.*
- II. Corolla white or purplish:
 - K. Corolla hairy *I. curtipes.*
 - KK. Corolla glabrous:
 - L. Bracts foliaceous *I. cordofana.*
 - LL. Bracts minute:
 - (k) Capsule tipped with the sharp persistent style-base *I. acanthocarpa.*
 - (kk) Capsule not so tipped:
 - (l) Seeds densely tomentose ... *I. blepharosepala.*
 - (ll) Seeds puberulous *I. fragilis.*
- EE. Flowers more than $1\frac{1}{2}$ in. long:
 - M. Leaves divided or some of them lobed:
 - N. Leaves more or less deeply divided; calyx glabrous:
 - (m) Outer sepals gibbous and tuberculate at the base
I. tuberculata.
 - (mm) Outer sepals not as above:
 - (n) Leaves 4-8 in. long and broad *I. digitata.*
 - (nn) Leaves 1-3 in. long and broad *I. cairica.*
 - NN. Leaves (at least some of them) shallowly 3-lobed; calyx hairy:
 - (o) Calyx $\frac{3}{4}$ -1 in. long; corolla 2-3 in. long *I. nil.*
 - (oo) Calyx $\frac{1}{4}$ - $\frac{1}{2}$ in. long; corolla $1\frac{1}{2}$ -2 in. long *I. riparia.*
- MM. Leaves entire:
 - O. Shrubs, erect or with climbing branches:
 - P. Erect shrubs:
 - (p) Sepals 1 or more in. long; corolla about 5 in. long
I. magnifica.
 - (pp) Sepals $\frac{1}{2}$ in. long; corolla 3-4 in. long
I. verbascoidea.
 - PP. Shrub with climbing branches; sepals $\frac{1}{2}$ -1 in. long; corolla 4-5 in. long *I. stenosphon.*
 - OO. Herbs:
 - Q. Stems prostrate or creeping:
 - R. Leaves reniform *I. repens.*
 - RR. Leaves not reniform:
 - (q) Leaves linear to linear-oblong, obtuse at the apex, rounded at the base, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long
I. blepharophylla.
 - (qq) Leaves usually ovate, subacute at the apex, cordate but sometimes hastate or rounded or subtruncate at the base, 3-6 in. long ... *I. aquatica.*

QQ. Stems twining or climbing:

S. Annual herb; flowers usually solitary on long axillary peduncles *I. mombassana*.

SS. Perennial herbs; peduncles few-many-flowered:

(r) Leaves glabrous on both surfaces; root tuberous
I. hellebarda.

(rr) Leaves more or less pubescent on both surfaces
I. riparia.

***Ipomoea involocrata* Beauv.**

Annual herb; stems slender, twining, more or less densely pubescent. Leaves ovate, acute at the apex, cordate at the base, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, 1 - $2\frac{1}{2}$ in. broad, green and thinly pubescent above, paler and often densely pubescent beneath. Flowers mauve-pink. Capsule globose, small, glabrous.

Equatoria.

***I. pileata* Roxb.**

Annual herb; stems slender, twining, shortly pilose. Leaves ovate, acute at the apex, cordate at the base, $1\frac{1}{2}$ -2 in. long and broad, green and thinly pubescent above, paler and thinly hairy beneath. Flowers red. Capsule globose, small, glabrous.

Fung District. Equatoria.

***I. amoenua* Dandy, nom. nov.**

I. amoena Choisy¹, non Bl.

Annual herb; stems twining, densely clothed with fine soft spreading golden-yellow hairs sometimes associated with short appressed white hairs. Leaves entire, cordate-ovate, $1\frac{1}{4}$ - $3\frac{1}{2}$ in. long, $\frac{3}{4}$ -2 in. broad, slightly hairy above, densely covered with long appressed whitish silky hairs beneath with longer yellow hairs on the nerves and margin; petiole $\frac{1}{2}$ -3 in. long. Flowers purple-violet or milky with a purple-crimson throat, in densely hairy heads; bracts persistent, foliaceous. Capsule small, glabrous; seeds 4, with short brown pubescence.

Central Sudan.

***I. chaetocaulos* Hallier f.**

Stems climbing, covered with spreading golden-yellow bristly hairs. Leaves long-petiolate, suborbicular, acuminate at the apex, cordate at the base, $3\frac{1}{2}$ in. long, about 3 in. broad, densely strigose above, paler and less hairy beneath; petiole up to 4 in. long. Flowers in dense heads on stiffly spreading peduncles; bracts large, broadly ovate, acute at the apex.

Equatoria.

¹In DC., *Prodr.*, vol. 9, p. 365 (1845).

I. pes-tigridis L.

Annual herb; stems twining, hirsute with long spreading yellowish hairs. Leaves palmately 7-9-lobed, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, $1\frac{3}{4}$ - $3\frac{1}{4}$ in. broad; lobes rather thinly hairy on both surfaces with stiff hairs. Flowers purple, about $1\frac{1}{2}$ in. long, in dense hirsute few-flowered bracteate heads; bracts foliaceous, the two outer up to 1 in. long.

Kordofan. Fung District.

I. verticillata Forsk.

Annual herb; branches prostrate. Leaves ovate, obtuse at the apex, cordate at the base, 1-2 in. long, becoming glabrous or obscurely pubescent on both surfaces. Flowers whitish, 1-2 on short pedicels lengthening in fruit with a pair of minute lanceolate bracts at the base. Capsule globose, glabrous; seeds densely pubescent.

Northern and Central Sudan.

I. eriocarpa R. Br.

Annual herb; stems prostrate or twining, pubescent. Leaves varying from ovate to linear-oblong with a cordate or subhastate base, acute at the apex, $1\frac{1}{4}$ -5 in. long, $\frac{1}{4}$ - $2\frac{1}{2}$ in. broad, slightly hairy on both surfaces chiefly on the nerves. Flowers white with a purple eye or sometimes rose or purple, few or many in dense subsessile clusters. Capsule globose, hairy, $\frac{1}{4}$ in. in diameter, 4-seeded.

Widespread.

I. vagans Bak.

I. sulphurea Hochst. ex Choisy, non Don.

Annual herb; stems trailing, pubescent. Leaves elliptic-ovate, obtuse at the apex, rounded or shallowly cordate at the base, 1-3 in. long, slightly hairy on both surfaces. Flowers yellow, few or many on short pedicels in the leaf-axils. Capsule globose, hairy, $\frac{1}{2}$ in. in diameter.

Kordofan.

I. coccinosperma Hochst. ex Choisy.

Annual herb; stems trailing, slightly hairy. Leaves linear-lanceolate or oblong-lanceolate, subobtuse at the apex, rounded or gradually narrowed to the base, sparsely hairy chiefly on the nerves. Flowers red or purplish, 1-2 on very short pedicels in the leaf axils. Capsule globose, glabrous, $\frac{1}{4}$ in. in diameter; seeds punctate.

Kordofan.

var. **glabra** Schimp. ex Bak. & Rendle.

Stems and leaves nearly or quite glabrous. Leaves linear-oblong, reaching $3\frac{1}{2}$ in. long and $\frac{3}{4}$ in. broad but generally narrower. Sepals glabrous or sometimes with bristly-ciliate margins. *Blue Nile Province: foot of Jebel Arashkol.*

var. **hirsuta** A. Rich.

Stems and leaves more hairy. Leaves varying greatly in size especially in width, from narrowly linear-lanceolate to narrowly ovate, $1\frac{1}{4}$ - $3\frac{1}{2}$ in. long, $\frac{1}{3}$ - $1\frac{1}{4}$ in. broad. Sepals densely hairy on the back, ciliate on the margin.

Kordofan. Kassala: Gallabat.

I. kotschyana Hochst. ex Choisy.

Annual herb; stems trailing, pubescent, 1-2 ft. long. Leaves orbicular, 1-2-pinnatifid, 1- $1\frac{1}{2}$ in. in diameter, pubescent; lobes linear. Flowers solitary, axillary, subsessile. Capsule globose, glabrous, $\frac{1}{4}$ in. in diameter.

Darfur. Kordofan.

I. altoni Lindl.

I. pilosa Sweet, non Cav.

Perennial herb; stems twining, hirsute with rather long spreading yellowish-white hairs. Leaves ovate, palmately 3-lobed, cordate at the base, acute at the apex, 2-4 in. long and broad, green and thinly hairy above. Flowers purplish-white, 1 in. long, laxly cymose on slender peduncles 1-2 in. long. Calyx hairy and glandular like the bracts. Capsule globose; seeds glabrous.

Widespread.

I. eurysepala Hallier f.

Annual erect dwarf branched herb, hairy all over. Leaves elongate-ovate, acute at the apex, rounded at the base, the longest nearly 2 in. long and about 1 in. broad. Sepals densely shortly pilose. Capsule glabrous; seeds 4, pale-yellow, finely punctate.

Kordofan.

I. convolvulifolia Hallier f.

Stems long, procumbent with a woody base. Leaves rounded and often mucronate at the apex, ovate, cordate to subsagittate at the base with rounded parallel basal lobes, 1 in. long, $\frac{3}{4}$ in. broad, deep-green and thinly pubescent above, grey-pubescent with prominent yellowish veins beneath. Flowers rose-red, about 1 in. long, 1-2 on short peduncles. Capsule glabrous.

Equatoria.

I. coptica (L.) Roth.*I. dissecta* Willd.

Annual herb; stems trailing, glabrous. Leaves digitate with deeply pinnatifid to pinnatisect segments, 1-1½ in. in diameter, glabrous. Flowers white, about ½ in. long, on 1-3-flowered peduncles. Capsule globose, ½ in. in diameter, 3-locular.

*Central and Southern Sudan.***var. malvifolia** Hallier f.

Leaves palmately 5-lobed; lobes short, serrate, the median one larger than the lateral.

*Kordofan.***I. pulchella** Roth.

Glabrous herb; stems climbing, very slender. Leaves divided almost to the base of the lamina into 5 segments, the two lower often having a small lobe on the outer side; segments elliptic, ¾-1 or more in. long. Flowers purple, ½ in. long, solitary, axillary, on thread-like pedicels. Capsule about ⅓ in. in diameter; seeds densely pubescent with longer hairs on the angles.

*Central and Southern Sudan.***I. kentrocarpa** Hochst. ex A. Rich.

Herb; stems wide-climbing, pubescent. Leaves ovate, acuminate at the apex, cordate at the base, 1-3½ in. long, ¾-2¼ in. broad, becoming glabrous on the upper surface, paler and shortly pubescent to almost glabrous beneath. Flowers about 1½ in. long, on 1-many-flowered peduncles. Capsule globose-conical, about ½ in. long, glabrous, tipped with the persistent hard style-base; seeds large, dirty-brown.

*Equatoria.***I. tenuirostris** Choisy.

Perennial herb; stems twining. Leaves ovate, mucronate and acute to acuminate at the apex, cordate at the base, 1½-3½ in. long, somewhat sparsely clothed on both surfaces with short appressed hairs. Flowers in usually dense many-flowered compound cymes on peduncles 1-3 in. long. Capsule globose, glabrous, ½ in. in diameter, beaked by the hardened persistent style-base; seeds brown, minutely velvety, bearing long cottony-white hairs on the upper angles.

*Equatoria: Imatong Mountains.***I. mombassana** Vatke.

Annual herb; stems slender, twining, more or less pilose. Leaves ovate, cordate-sagittate at the base, 1-3 in. long, slightly pilose on both surfaces. Flowers whitish with a purple throat, usually solitary on long axillary peduncles bearing above the middle a pair of minute lanceolate acuminate bracteoles, or in lax few-flowered cymes. Capsule glabrous.

Southern Sudan.

I. obscura (L.) Ker-Gawl.

Herb; stems slender, twining, more or less pubescent. Leaves ovate or triangular, acute at the apex, cordate at the base, $1\frac{1}{2}$ -2 in. long and broad, obscurely pubescent on both surfaces. Flowers on short 1-3-flowered peduncles. Capsule globose, glabrous, about $\frac{1}{2}$ in. in diameter; seeds pubescent.

Widespread.

I. curtipes Rendle.

Annual herb; stems twining, finely pubescent. Upper leaves linear-oblong and narrowed towards the apex, the lower ones ovate and cordate at the base, more or less pubescent with appressed hairs on both surfaces, $1\frac{1}{4}$ -2 in. long. Flowers purplish, $\frac{1}{2}$ in. long, solitary in the leaf-axils. Corolla very hairy.

Equatoria.

I. cordofana Choisy.

Fig. 30.

Annual or perennial herb; stems slender, trailing, laxly pilose. Leaves ovate-orbicular, obtuse or subacute at the apex, cordate at the base with a broad open sinus, 1-3 in. long and broad, glabrous or sparsely pubescent on both surfaces. Flowers white, on 1-3-flowered hairy peduncles. Capsule globose, $\frac{1}{2}$ in. in diameter; seeds glabrous.

Central and Southern Sudan.

I. acanthocarpa (Choisy) Hochst. ex Aschers. & Schweinf.

Perennial herb; stems twining, glabrous, longitudinally striate. Leaves ovate, acute at the apex, cordate at the base, $1\frac{1}{2}$ -3 in. long, glabrous. Flowers white or pale-purple, on short 1-3-flowered peduncles. Capsule globose, glabrous, $\frac{1}{2}$ - $\frac{1}{3}$ in. in diameter, tipped with the sharp persistent style-base; seeds silky.

Kordofan.

I. blepharosepala Hochst. ex A. Rich.

Fig. 31.

I. cardiosepala Hochst. ex Vatke, non Meisn.

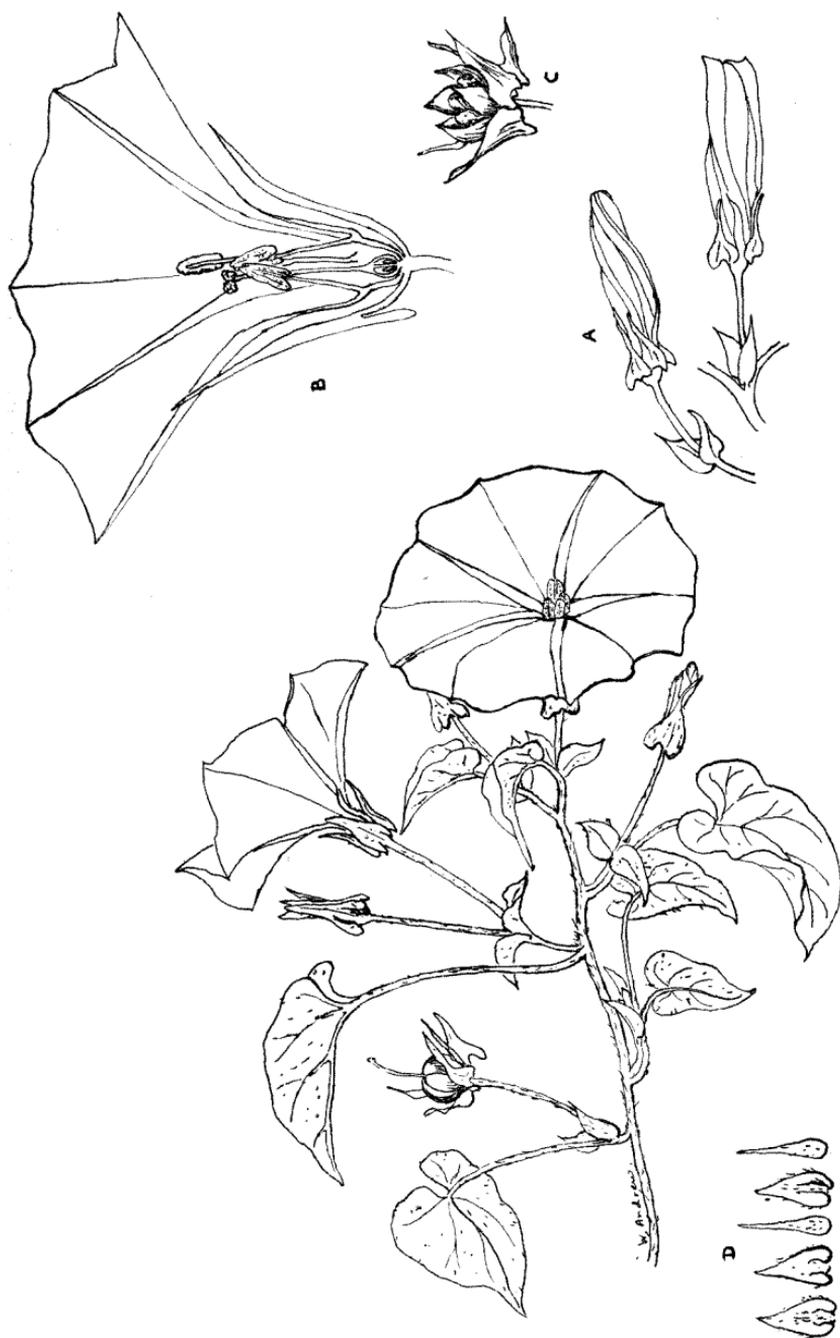
Annual herb; stems trailing or twining, pilose but sometimes becoming glabrous. Leaves ovate, acute or obtuse at the apex, cordate at the base, 1-2 in. long, thinly pubescent. Flowers white or purplish, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, on 1-3-flowered peduncles. Capsule globose, about $\frac{1}{2}$ in. in diameter, glabrous; seeds densely tomentose.

Northern and Central Sudan.

I. fragilis Choisy.

Herb; stems very slender, twining, glabrous or sparsely pilose. Leaves rather narrowly ovate or triangular, acuminate at the apex, cordate at the base, 1- $1\frac{1}{2}$ in. long. Flowers solitary or in pairs, axillary, on long slender peduncles. Capsule glabrous; seeds puberulous.

Kordofan. Equatoria.

FIG. 36.—*IPOMOEA CORDOFANA* Choisy.

A, flower buds. B, longitudinal section of flower. C, dehiscent capsule. D, sepals.

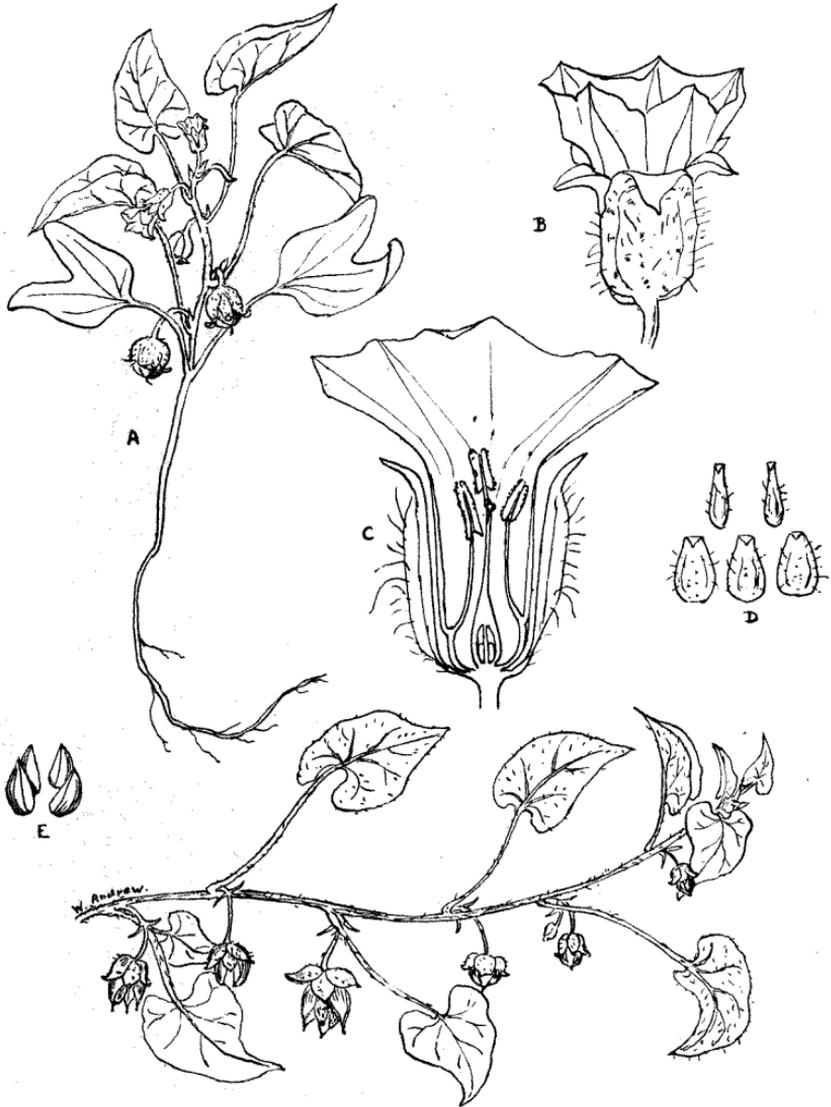


Fig. 31—*IPOMOEA BLEPHAROSEPALA* Hochst. ex A. Rich.

A, young plant showing both cotyledons and fruit. B, flower. C, longitudinal section of flower. D, sepals, E, seeds.

***I. tuberculata* Ker-Gawl.**

I. dasysperma Jacq. f.

Annual glabrous herb; stems slender, climbing. Leaves up to about 3 in. broad, doubly tripartite; ultimate segments linear-lanceolate, acute at the apex. Flowers on 1-3-flowered peduncles. Corolla 2 in. long, the tube violet, the lobes sulphur-yellow. Capsule globose; seeds 4, covered with silky tomentum.

Central Sudan.

I. digitata L.

Perennial herb, with fleshy inedible tuberous roots; stems wide-climbing, glabrous, woody, hollow. Leaves shallowly or deeply palmately 3-9-lobed, usually shallowly cordate at the base, 4-8 in. long and broad; lobes obtuse to acuminate at the apex; petiole long. Flowers bright-red-purple, 2-3 in. long, in several-many-flowered compound cymes. Capsule globose, glabrous, $\frac{1}{3}$ - $\frac{1}{2}$ in. in diameter; seeds covered with long tawny-white hairs.

Equatoria.

I. cairica (L.) Sweet.

I. palmata Forsk.

Perennial glabrous herb; stems twining, smooth or tubercled or muricate. Leaves divided nearly or quite to the base into usually 5 segments, the lowest of which are sometimes unequally bifid or bipartite, 1-3 in. long and broad; segments narrowly elliptic to lanceolate; base of petiole appearing stipulate from the presence of a pair of small similarly palmatipartite axillary leaves. Flowers bright-red-purple, $1\frac{1}{2}$ -2 in. long, in lax few-many-flowered cymes. Capsule globose, glabrous, about $\frac{1}{2}$ in. in diameter.

Central and Southern Sudan.

I. nil (L.) Roth.

I. hederacea (non Jacq.) Broun & Massey.

Annual herb; stems slender, twining, hairy. Leaves usually more or less shallowly 3-lobed, orbicular or ovate, cordate at the base, acute at the apex, $1\frac{1}{2}$ -5 in. broad. Flowers usually lilac, 2-3 in. long, on 2-3-flowered peduncles. Capsule subglobose, small; seeds 6, smooth.

Widespread.

I. riparia Don.

I. lilacina Bl., non Schrank.

Perennial herb; stems woody, twining, pubescent (sometimes densely so). Leaves entire or sometimes shallowly 3-lobed, ovate, acuminate at the apex, cordate at the base, 3-4 in. long, slightly pubescent above, paler and densely pubescent beneath when young, becoming less pubescent when older. Flowers bright-purple, $1\frac{1}{2}$ -2 in. long, on long pubescent many-flowered peduncles. Capsule globose, glabrous, $\frac{1}{2}$ in. in diameter; seeds densely tomentose.

Southern Sudan: common in the Sudd.

I. magnifica Hallier f.

Shrub; stems stout, woody, grey-pubescent, densely leafy. Leaves minutely petiolate, undulate on the margin, ovate-sub-orbicular, shortly acuminate at the apex, nearly 5 in. long, over 3 in. broad, glabrous above, grey-pubescent beneath. Flowers about 5 in. long, solitary, axillary.

Equatoria.

I. verbascoidea Choisy.

Erect shrub 3-5 ft. high; stems stout, woody, covered like the under-surface of the leaves and peduncles with tawny or whitish woolly tomentum. Leaves oblong, subacute or obtuse with a short apiculus at the apex, cordate at the base, 3-6 in. long, 2-5 in. broad, densely white- or rusty-tomentose beneath, with a gland on each surface at the junction of the lamina and petiole; petiole stout, 1-4 in. long. Flowers rose-purple, 3-4 in. long, on 1-3-flowered peduncles. Capsule globose, $\frac{1}{2}$ in. in diameter, glabrous; seeds brown, $\frac{1}{2}$ in. long, densely covered with tawny wool.

Equatoria.

I. stenosphon Hallier f.

Shrub; stems whip-like and climbing, some sterile and with a smooth thin ochre-coloured separable bark, others more robust, erect, densely leafy and flowering, greyish with a rugose bark. Leaves ovate, emarginate and mucronate at the apex, up to $2\frac{1}{2}$ in. long, 2 in. broad, sparsely puberulous on the upper surface and on the nerves beneath, usually conspicuously dotted with numerous dark circular glands beneath. Flowers pale-greenish-yellow or cream, 4-5 in. long, with a very narrow corolla-tube, solitary or clustered on peduncles on very short branchlets. Capsule dirty-brown, elongate-conical, cuspidate with the long persistent style-base, $1\frac{1}{2}$ in. long including the $\frac{1}{2}$ in. cusp.

Equatoria: summit of Mount Baraka near Loka, 3800 ft.

I. repens Lam.

Fig. 32.

Perennial herb; stems hollow, woody, trailing very widely, often on river-banks. Leaves firm, reniform, 3-6 in. in diameter, glabrous; petiole 1-4 in. long. Flowers bright-red, 2-3 in. long, in few-many-flowered cymes on peduncles 1-4 in. long. Capsule globose, $\frac{1}{2}$ in. in diameter, glabrous; seeds glabrous.

Central and Southern Sudan.

I. blepharophylla Hallier f.

Herb, with a woody rootstock; stems trailing, densely covered with short yellowish spreading hairs. Leaves linear to linear-oblong, obtuse and mucronate at the apex, rounded at the base, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, about $\frac{1}{2}$ in. broad, sparsely pilose on both surfaces or only on the nerves beneath, the margin ciliolate; petiole very short. Flowers reddish, 2 in. long, solitary on short peduncles. Capsule glabrous.

Fung District. Equatoria.

Fig. 32—*IPOMOEA REPENS* Lam.

A, portion of stem rooting at the node. B, flower. C, calyx. D, longitudinal section of flower. E, dehiscent capsules, seeds and transverse section of ovary. F, habit.

***I. aquatica* Forsk.**

Fig. 33.

Annual glabrous herb, often growing in or near water; stems trailing on mud or floating on water, stout, hollow, rooting from the nodes. Leaves very variable in shape, usually ovate and cordate or sometimes hastate or rounded or subtruncate at the base, 3-6 in. long. Flowers bright-purple, 2-3 in. long, on 1- or few-flowered peduncles. Capsule globose, $\frac{1}{2}$ in. in diameter; seeds minutely silky.

Widespread.

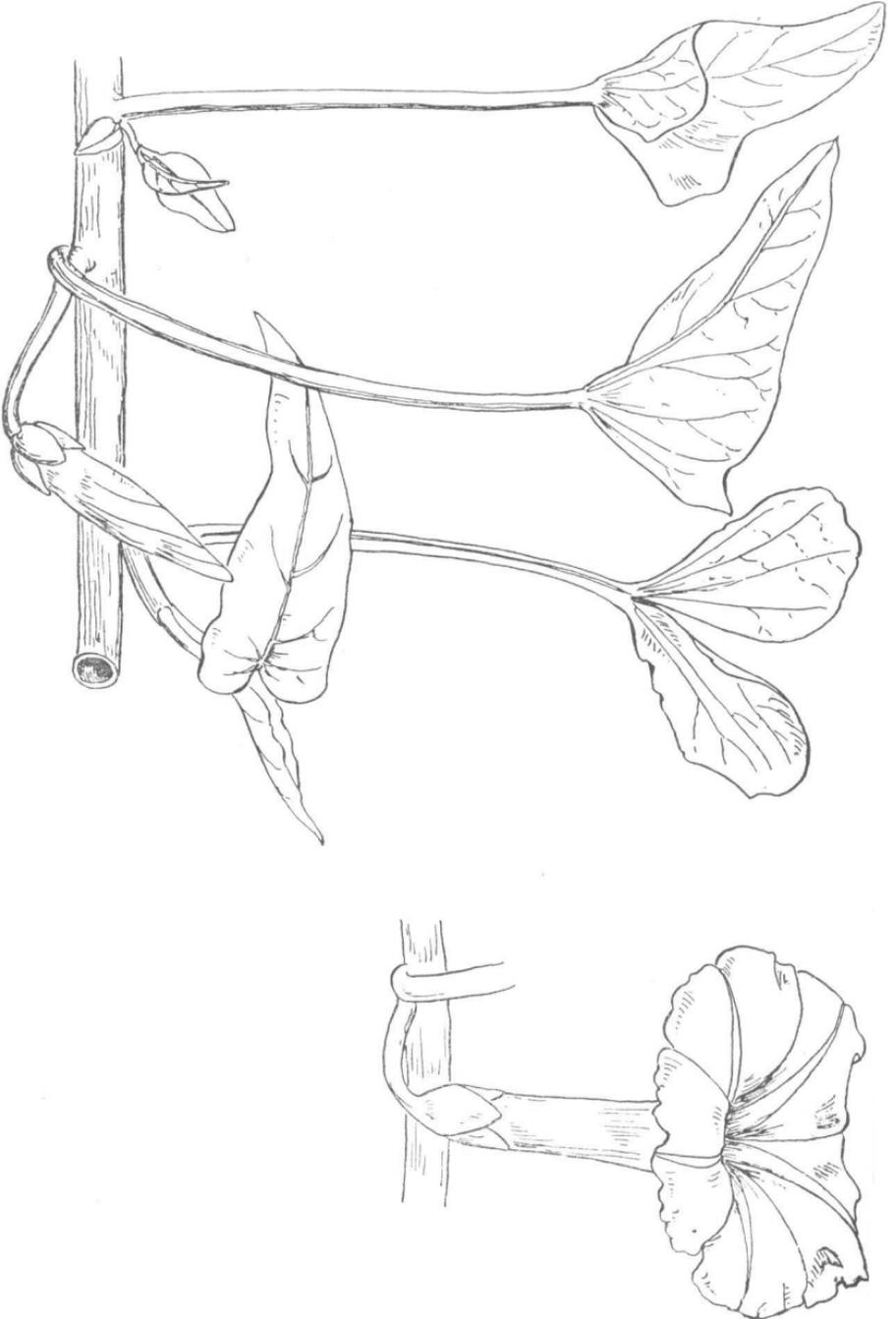


FIG. 33.—IPOMOEA AQUATICA FORSK.

1. *hellebarda* Schweinf. ex Hiern.

Perennial herb from a soft and woody tuberous root; stems herbaceous, twining, glabrous or with soft spreading hairs. Leaves ovate, usually acuminate at the apex, hastate or sagittate at the base with basal lobes of variable length, 2-3 in. long, glabrous on both surfaces. Flowers bright-purple-red, about 2 in. long, in few-flowered cymes on stout glabrous peduncles 1½-3 in. long. Capsule globose, glabrous, ½ in. in diameter; seeds pale-brown, velvety.

Kassala: Gallabat. Equatoria.

9. **JACQUEMONTIA** Choisy***Jacquemontia tamnifolia*** (L.) Griseb.

J. capitata (Desr.) Don.

Annual herb; stems slender, twining or trailing, finely pilose. Leaves ovate, usually acute at the apex, shallowly cordate to abruptly acute at the base, 2-3 in. long, more or less pilose (the hairs often rust-coloured) or becoming glabrous on both surfaces. Flowers blue, soon withering, about ½ in. long, many in dichotomously forked cymes forming globose heads about 1 in. in diameter bracteated by reduced leaves. Calyx shaggy with soft brown hairs. Capsule bright-brown, globose, about ⅓ in. in diameter, glabrous.

Central and Southern Sudan.

10. **LEPISTEMON** Bl.***Lepistemon owariensis*** (Beauv.) Hallier f.

L. africanus Oliv.

Herb; stems wide-climbing, clothed with long spreading pale-brown stinging hairs. Leaves usually irregularly sinuate with deltoid lobes, ovate, acute to obtuse at the apex, cordate at the base, 2-6 in. long and broad, more or less hirsute on both surfaces. Flowers greenish-white, in sessile or shortly pedunculate many-flowered cymes. Capsule shortly ovoid, coriaceous, ½ in. long, setose except in the upper part, tardily dehiscent.

Equatoria.

11. **MERREMIA** Dennst.

A. Corolla 1½-2½ in. long:

B. Sepals ¾-1½ in. long:

(a) Leaf-segments entire *M. kentrocaulos.*

(aa) Leaf-segments irregularly dentate *M. dissecta.*

BB. Sepals ¼ in. long *M. pterygocaulos.*

AA. Corolla less than 1½ in. long:

C. Corolla about 1 in. long:

D. Leaves palmately or pedately divided:

(b) Leaf-segments narrow, linear; sepals glabrous

M. semisagitta.

- (bb) Leaf-segments broad, elliptic; sepals with long spreading hairs *M. aegyptia*.
- DD. Leaves ovate-oblong, irregularly lobed but not palmately divided *M. gallabatensis*.
- CC. Corolla up to $\frac{3}{4}$ in. long:
- E. Corolla $\frac{1}{2}$ - $\frac{3}{4}$ in. long:
- (c) Leaves pinnatilobed *M. xanthophylla*.
- (cc) Leaves linear to linear-oblong, hastate at the base
M. tridentata subsp. *angustifolia*.
- EE. Corolla $\frac{1}{3}$ in. or less long:
- (d) Leaves pinnatisect *M. pinnata*.
- (dd) Leaves entire or shallowly lobed:
- (e) Leaves reniform *M. emarginata*.
- (ee) Leaves ovate-cordate *M. hederacea*.

Merremia kentrocaulos (C. B. Clarke) Rendle.

Perennial glabrous herb; stems twining. Leaves 3-6 in. in diameter; segments 5-7, lanceolate to oblong-lanceolate, acuminate or acute at the apex. Flowers sulphur-yellow with a maroon centre, 2-2 $\frac{1}{2}$ in. long, few or several in lax cymes on long or short peduncles. Capsule narrowly ellipsoid, $\frac{1}{4}$ - $\frac{3}{8}$ in. long, 2-locular; seeds black, about $\frac{1}{4}$ in. long, glabrous.

Central and Southern Sudan.

M. dissecta (Jacq.) Hallier f.

Perennial herb; stems twining, more or less densely covered with spreading yellow hairs. Leaves orbicular in outline, 3-6 in. in diameter; segments 7, irregularly dentate, lanceolate, acute at the apex, glabrous on both surfaces. Flowers white with a purple centre, 1 $\frac{1}{2}$ -2 in. long, opening in the evening, on 2-8-flowered long or short peduncles. Capsule globose, $\frac{1}{2}$ or more in. in diameter, glabrous; seeds dark-coloured, $\frac{1}{4}$ in. long, nearly or quite glabrous.

Khartoum.

M. pterygocaulos (Choisy) Hallier f.

Perennial glabrous herb, the whole plant often reddish; stems twining, distinctly winged. Leaves palmately 3-5-lobed to the middle or more deeply, more or less deeply cordate at the base; apex of at least the median segment aristiform. Flowers white or cream with a purple throat, sometimes sulphur-yellow, 1 $\frac{1}{2}$ -1 $\frac{3}{4}$ in. long, usually in few-many-flowered cymes on winged peduncles 2-4 in. long or rarely less than 1 in. long, but sometimes solitary. Capsule globose, glabrous, barely $\frac{1}{2}$ in. in diameter; seeds grey to blackish.

Central and Southern Sudan.

M. semisagitta (Griseb.) Dandy, comb. nov.

Ipomoea pedata Steud. & Hochst. ex Choisy, non Don; *I. semisagitta* Griseb. ex Peter¹; *M. pedata* Hallier f.

Herb, with a woody rootstock; stems long, slender, climbing, glabrous above the hairy base. Leaves shortly petiolate, pedately cut nearly to the base into 5 unequal linear segments, the central ones 1½-2 in. long, ¼-⅓ in. broad, glabrous. Flowers pale-mauve, 1 in. long, usually solitary.

Red Sea District.

M. aegyptia (L.) Urb.

M. pentaphylla Hallier f.

Annual herb; stems slender, twining, covered like the petioles and peduncles and pedicels with fine yellowish spreading hairs. Leaves digitate; segments 5, elliptic, acuminate at the apex, narrowing to the base, sparsely appressed-pilose, 2-4 in. long. Flowers white or yellowish, 1 in. long, on few- or many-flowered usually long peduncles. Capsule about ½ in. in diameter, enveloped by the persistent densely hairy sepals; seeds brown, glabrous.

Central Sudan.

M. gallabatensis Hallier f.

Herb. Leaf (only one present on type which is the only specimen) long-petiolate, ovate-oblong, acute at the apex, subcordate at the base, 4 in. long, 2½ in. broad, the sides irregularly lobed, pale-green and scabrous above with prominent veins, glaucescent and finely rugulose beneath. Flowers in two paired shortened monochasial cymes on a very long peduncle. Calyx about ½ in. long. Corolla twice as long as the calyx.

Kassala: Gallabat.

M. xanthophylla Hallier f.

Herb; stems prostrate or climbing, herbaceous, covered like the whole plant with short yellow-brown hairs. Leaves pinnately 5-9-lobed, shallowly cordate at the base, about 2½ in. long, 2 in. broad in the lower part. Flowers whitish, ¾ in. long, densely covered with yellow-brown hairs in bud, in dense few-flowered cymes on peduncles 1½-2 in. long.

Equatoria.

M. tridentata subsp. **angustifolia** (Jacq.) Van Ooststr.

M. angustifolia (Jacq.) Hallier f.

Annual glabrous herb; stems prostrate, then twining. Leaves linear, obtuse and mucronate at the apex, hastate at the base with small toothed basal auricles, 1-3 in. long. Flowers pale-yellow, ¼-¾ in. long, on 1-3-flowered very slender peduncles 1-1½ in. long. Capsule globose, ¼ in. in diameter, glabrous.

Central and Southern Sudan.

¹In Engler & Prantl, *Nat. Pflanzenfam.*, vol. 4, 3, a, p. 31 (1891).

M. pinnata (Hochst.) Hallier f.

Annual herb; stems slender, trailing or twining, pubescent with soft spreading hairs. Leaves sessile, pinnatisect with 8-10 pairs of entire linear segments spaced out on the rachis, about 1 in. long, more or less hairy like the stems. Flowers yellow, on 1-3-flowered peduncles. Capsule globose, $\frac{1}{4}$ in. in diameter, hairy; seeds glabrous.

Central and Southern Sudan.

M. emarginata (Burm. f.) Hallier f.

Perennial herb, with a long woody root; stems slender, trailing, glabrous or slightly pubescent. Leaves orbicular- or ovate-reniform and rarely obscurely 3-lobed, $\frac{1}{2}$ -1 in. broad, very obtuse at the apex and with a broad rounded basal sinus. Flowers yellow, often with a dark eye, 1-2 nearly sessile in the leaf-axils. Capsule globose, glabrous, $\frac{1}{4}$ in. in diameter.

Widespread.

M. hederacea (Burm. f.) Hallier f.

M. convolvulacea Dennst.

Perennial herb; stems slender, twining, usually glabrous. Leaves usually shallowly lobed, ovate, acute at the apex, cordate at the base, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long and broad, glabrous on both surfaces. Flowers yellow, solitary or few to many on peduncles $\frac{1}{2}$ -2 in. long. Capsule ovoid-globose, glabrous, warty.

Central and Southern Sudan.

12. **SEDDERA** Hochst.**Seddera arabica** (Forsk.) Choisy.

Much-branched undershrub; branchlets slender, covered with yellowish pubescence. Leaves elliptic, subsessile, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, obtuse and mucronate at the apex, rounded at the base, pubescent on both surfaces. Flowers white, small, on usually 1-flowered axillary peduncles $\frac{1}{2}$ -1 in. long. Capsule globose, $\frac{1}{8}$ in. long.

Red Sea District.

S. latifolia Steud. & Hochst.

Much-branched low undershrub, with slender woody branchlets clothed with dense short velvety-white pubescence. Leaves shortly petiolate, broadly elliptic, apex and base usually rounded, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, covered with short appressed white hairs above and beneath. Flowers subsessile, solitary in the leaf-axils or aggregated into short bracteate terminal spikes. Capsule $\frac{1}{8}$ in. in diameter, splitting into 4 valves; seeds blackish, glabrous.

Red Sea District.

S. bagshawei Rendle.

S. virgata (non Steud. & Hochst.) Broun & Massey p.p.

Undershrub from a woody rhizome; stems rigid, repeatedly branching, ascending, sparsely covered with appressed white hairs. Leaves subsessile, linear-lanceolate, shortly acute at the apex, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, glabrous or sparsely appressed-pubescent. Flowers about $\frac{1}{4}$ in. long, numerous, axillary, shortly pedunculate. Capsule $\frac{1}{10}$ in. long.

Equatoria.

S. virgata Steud. & Hochst.

Much-branched undershrub; branches very slender, covered with appressed white hairs. Leaves distant, sessile, linear to narrowly linear-lanceolate, $\frac{1}{2}$ -1 in. long, thinly covered with appressed white hairs. Flowers in sparse racemes at the ends of the branchlets. Capsule globose, $\frac{1}{8}$ in. in diameter, splitting into 4 thinly rigid valves; seeds black, glabrous.

Northern Sudan. Khartoum.

13. **STICTOCARDIA** Hallier f.**Stictocardia beraviensis** (Vatke) Hallier f.

Woody climber, with puberulous stems. Leaves petiolate, ovate, acute at the apex, cordate at the base, 3 in. long and broad, finely pubescent on both surfaces and minutely black-punctate beneath. Flowers cerise with yellow inside the corolla-tube, 2-2 $\frac{1}{2}$ in. long, in few-flowered sessile or shortly pedunculate cymes. Sepals orbicular to orbicular-oblong, much imbricate, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, finely pubescent. Stamen-bases densely hairy.

Equatoria.

130. **SCROPHULARIACEAE**

Herbs (often parasitic) or shrubs or rarely small trees. Leaves without stipules, alternate or opposite or verticillate, sometimes reduced to scales. Flowers hermaphrodite, usually zygomorphic. Calyx imbricate or valvate. Corolla gamopetalous, the limb 4-5- or rarely 6-8-lobed, often more or less 2-lipped, the lobes imbricate. Stamens often 4, didynamous, or 2, inserted on the corolla-tube and alternate with the lobes, the fifth (adaxial) stamen represented by a staminode or absent or rarely perfect; filaments free from each other. Ovary superior, usually 2-locular; style terminal; ovules numerous on axile placentas. Fruit a capsule or berry.

A. Leaves reduced to scales; parasitic plants:

- (a) Anthers 2-locular, with 1 fertile loculus and 1 empty sterile loculus HARVEYA. 11.
 (aa) Anthers 1-locular STRIGA. 28.

- AA. Leaves not reduced to scales:
- B. Leaves alternate, never all radical:
- C. Stamens 5 VERBASCUM. 30.
- CC. Stamens 4 or 2:
- (b) Stamens 4:
- (c) Corolla-tube very short CELSIA. 7.
- (cc) Corolla-tube narrow at the base, then suddenly expanded into a long throat APTOSIMUM. 3.
- (bb) Stamens 2 ANTICCHARIS. 2.
- BB. Leaves (at least the lower ones) opposite or verticillate, sometimes all radical:
- D. Perfect stamens 4:
- E. Stamens all inserted within the corolla-tube:
- F. Adaxial corolla-lobes or -lobe outside in bud:
- G. Corolla-tube spurred or gibbous at the base in front:
- (d) Base of corolla-tube spurred KICKXIA. 13.
- (dd) Base of corolla-tube gibbous, not spurred:
- (e) Loculi of capsule equal or nearly so, both many-seeded and dehiscent by pores; corolla $\frac{1}{4}$ - $\frac{1}{2}$ in. long MISOPATES. 19.
- (ee) Upper loculus of capsule much smaller than the lower one, 1-3-seeded or empty; corolla $\frac{1}{4}$ - $\frac{1}{2}$ in. long SCHWEINFURTHIA. 22.
- GG. Corolla-tube not spurred nor gibbous at the base in front:
- H. Calyx tubular, 5-toothed MIMULUS. 18.
- HH. Calyx 5-partite or deeply 5-fid:
- (f) Anther-loculi more or less confluent:
- (g) Anther-loculi 2, confluent at the apex; capsule turned downwards STEMODIOPSIS. 27.
- (gg) Anther-loculus 1 by confluence; capsule not turned downwards:
- (h) Corolla urceolate; leaves dentate or bidentate SCROPHULARIA. 24.
- (hh) Corolla with a slender tube; leaves incised-dentate, pinnatifid or dissected JAMESBRITTENIA. 12.
- (ff) Anther-loculi distinct, not confluent:
- (i) Leaves (at least the lower ones) verticillate, usually multifid LIMNOPHILA. 14.
- (ii) Leaves opposite, entire or serrate:
- (j) Anther-loculi distinct and separate; calyx-segments narrow, subulate-linear STEMODIA. 26.
- (jj) Anther-loculi distinct but contiguous; calyx-segments (at least the adaxial one) broad ...
BACOPA. 4.

- FF. Adaxial corolla-lobes or -lobe inside in bud:
- I. Anthers with 2 fertile equal or nearly equal loculi:
- J. Calyx-segments 5:
- (k) Corolla 2-lipped, the upper lip emarginate or 2-lobed, the lower lip larger and 3-lobed; leaves ovate LINDENBERGIA. 15.
- (kk) Corolla with 5 subequal lobes:
- (l) Leaves ovate to oblong or lanceolate, toothed
ALECTRA. 1.
- (ll) Leaves linear or filiform, entire
MICRARGERIA. 17.
- JJ. Calyx-segments 4:
- (m) Calyx 4-partite; corolla 4-fid, rotate
SCOPARIA. 23.
- (mm) Calyx 4-toothed; corolla 2-lipped, with an elongated tube:
- (n) Capsule ovoid-globose, hirsute
BELLARDIA. 5.
- (nn) Capsule slender, glabrous
PARENTUCELLIA. 20.
- II. Anthers 1-locular or with 1 fertile locus and 1 variously modified sterile locus or appendage:
- K. Anthers (at least 2 of them) 2-locular with 1 fertile locus and 1 sterile locus or appendage
SOPUBIA. 25.
- KK. Anthers all 1-locular:
- L. Corolla-tube more or less sharply curved at or above the middle STRIGA. 28.
- LL. Corolla-tube straight or slightly curved:
- M. Fruit fleshy and indehiscent; corolla large, somewhat 2-lipped CYCNIUM. 9.
- MM. Fruit a capsule, dry and dehiscent:
- (o) Capsule straight, oblong to subovoid; corolla with subequal lobes BUCHNERA. 6.
- (oo) Capsule obliquely ovoid, long-beaked; corolla more or less distinctly 2-lipped
RHAMPHICARPA. 21.
- EE. Stamens (at least the abaxial pair) inserted at the mouth of the corolla:
- N. Calyx 2-lipped TORENIA. 29.
- NN. Calyx not 2-lipped:
- (p) Calyx 5-partite, with linear segments
LINDERNIA. 16.
- (pp) Calyx 5-toothed, more or less tubular
CRATEROSTIGMA. 8.
- DD. Perfect stamens 2:
- O. Adaxial lobe of the corolla inside in bud; corolla-tube short, the limb spreading VERONICA. 31.

- OO. Adaxial lobes (upper lip) of the corolla outside in bud; corolla-tube elongated, the limb 2-lipped:
- (q) Staminodes (representing the abaxial stamens) present, variously modified LINDERNIA. 16.
- (qq) Staminodes absent or minute DOPATRIUM. 10.

1. **ALECTRA** Thunb.

Alectra communis Hemsl.

Erect pubescent slightly hispid herb; stem rather stout, 1-2 ft. high, with numerous short slender branches from about the middle. Leaves rather thick, coarsely and distantly toothed, lanceolate or oblong-lanceolate or ovate-lanceolate, narrowed into a short petiole, 1-2 in. long. Flowers usually very numerous, crowded, shortly pedicellate; bracts leaf-like, usually much longer than the flowers.

Equatoria.

A. asperrima Benth.

A. communis (non Hemsl.) Broun & Massey.

Erect scabrous herb $\frac{1}{2}$ -1 or more ft. high; stems simple or slightly branched. Leaves sometimes irregularly toothed, ovate or oblong, obtuse at the apex, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, rough with the bristles on both surfaces having large white tubercular bases. Flowers almost sessile, solitary in the axils of leafy bracts; bracts lanceolate, longer than the flowers. Calyx nearly $\frac{1}{2}$ in. long, rough with tubercular bristles.

Darfur: Jebel Marra, Mid Robo, 8300 ft.

2. **ANTICHARIS** Endl.

Anticharis arabica Endl.

Slender erect branched shortly glandular-pubescent annual herb about 1 ft. high. Leaves oblong-lanceolate to lanceolate-linear, attenuate at the base, up to 1 $\frac{1}{4}$ in. long, $\frac{1}{4}$ in. broad. Flowers rose-coloured, about $\frac{1}{4}$ - $\frac{1}{2}$ in. long, solitary; bracts minute, subulate, inserted at or below the middle of the peduncle. Capsule narrowly ovoid, acuminate or beaked at the apex, about twice as long as the calyx.

North-eastern Sudan.

A. glandulosa Aschers.

Erect densely long-glandular-hispid branched annual herb 6-9 in. high. Leaves spatulate-oblong to oblong or elliptic, obtuse at the apex, attenuate at the base, up to $\frac{3}{4}$ in. long and $\frac{1}{4}$ in. broad. Flowers rose-coloured, about $\frac{1}{2}$ - $\frac{1}{2}$ in. long, solitary; bracts subulate, inserted at or below the middle of the peduncle. Capsule narrowly ovoid, acuminate, not much longer than the calyx.

Red Sea District.

A. linearis (Benth.) Hochst. ex Aschers.

Fig. 34.

Erect much-branched glandular-pubescent annual herb a few inches to more than a foot high, usually becoming blue-black on drying. Leaves sessile, linear to narrow-lanceolate, acute at the apex, attenuate at the base, up to 2 in. long, sometimes becoming glabrous. Flowers about $\frac{1}{2}$ in. long, solitary, on peduncles about $\frac{1}{4}$ in. long; bracts subulate, $\frac{1}{8}$ – $\frac{1}{4}$ in. long, inserted above the middle of the peduncle. Capsule about $\frac{1}{2}$ in. long, ovoid, acuminate or beaked at the apex.

Northern and Central Sudan.

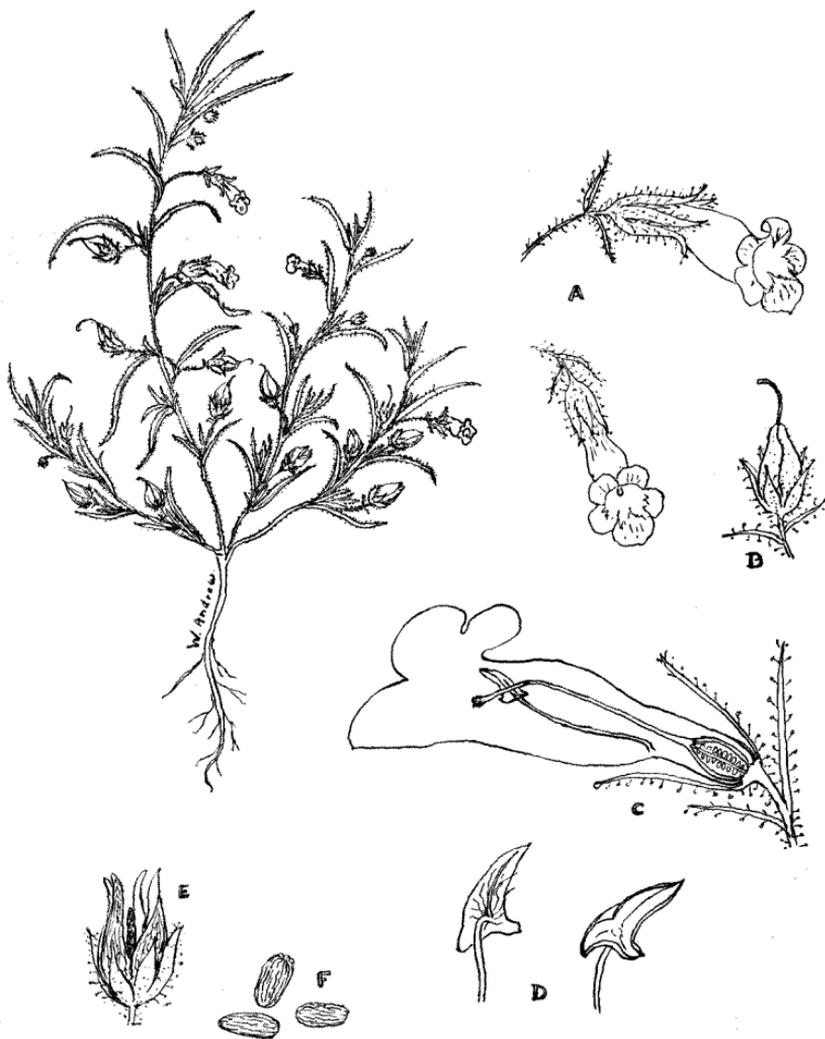


Fig. 34—*ANTICHARIS LINEARIS* (Benth.) Hochst. ex Aschers.
 A, flowers. B, fruit. C, longitudinal section of flower. D, anthers.
 E, dehiscent capsule. F, seeds.

3. **APTOSIMUM** Burch.**Aptosimum pumilum** (Hochst.) Benth.

Densely tufted annual or biennial herb 3-4 in. high. Leaves linear to linear-lanceolate or linear-oblong, 1-3 in. long, up to $\frac{1}{2}$ in. broad, minutely pubescent, slightly scabrous especially on the margin and on the underside of the midrib, attenuate and conspicuously ciliate at the base; midrib hard but scarcely spinescent. Flowers white outside, blue inside, scarcely $\frac{1}{2}$ in. long, sessile, solitary or 2 or more together. Capsule globose, compressed at the apex.

Darfur. Kordofan.

4. **BACOPA** Aubl.**Bacopa floribunda** (R. Br.) Wettst.

Moniera floribunda (R.Br.) Cooke.

Erect slender branched herb up to 15 in. high, glandular-punctate. Leaves sessile, linear or linear-lanceolate or narrowly oblong, sometimes semi-amplexicaul at the base, $\frac{1}{2}$ -2 $\frac{1}{2}$ in. long. Flowers blue or violet, sulphur-yellow at the throat, axillary, usually solitary on peduncles $\frac{1}{2}$ - $\frac{1}{3}$ in. long. Capsule ellipsoid, $\frac{1}{2}$ in. long, glabrous.

Equatoria.

B. calycina (Benth.) Engler ex De Wild. & Dur.

Fig. 35.

Moniera calycina (Benth.) Hiern, non Kuntze.

Almost glabrous gland-dotted branched herb 6-12 in. high; stems and branches stout, ascending or decumbent. Leaves crenate-serrate, lanceolate to ovate, narrowed at the base into a short broad petiole or sometimes sessile and semi-amplexicaul, up to 1 $\frac{1}{2}$ in. long, $\frac{3}{8}$ in. broad. Flowers white, axillary, solitary, on peduncles up to $\frac{1}{2}$ in. long. Capsule ellipsoid, $\frac{1}{2}$ in. long, densely gland-dotted.

Equatoria.

B. punctata Engler.

Moniera punctata (Engler) Skan.

Erect slender glandular-punctate herb 4-12 in. high; stem simple or sparingly branched, quadrangular. Leaves sessile, linear or linear-lanceolate, narrowed at the apex, often semi-amplexicaul at the base, usually about 1 in. long. Flowers $\frac{1}{2}$ in. long, axillary, solitary, subsessile. Capsule ovoid-globose, about $\frac{1}{8}$ in. long, bisulcate, glabrous.

Equatoria.



Fig. 35—*BACOPA CALYCINA* (Benth.) Engler ex De Wild. & Dur.

A. flower. B. corolla laid open. C. one sepal. D. another sepal. E. a third sepal. F. pistil. G. calyx enveloping the fruit.

5. **BELLARDIA** All.

***Bellardia trixago* (L.) All.**

Annual somewhat hispid herb 6-18 in. high; stem simple or slightly branched in the inflorescence. Leaves sessile, thick, distantly and coarsely toothed or shallowly pinnatifid, 1-2½ in. long. Flowers sessile, yellow, ½-¾ in. in diameter, in a very dense usually unbranched terminal inflorescence usually 2-3 but ranging from 1 to 5 in. long; bracts nearly as long as the flowers. Seeds longitudinally ribbed.

Darfur: Jebel Marra. Equatoria: Imatong Mountains, 10,000 ft.

6. **BUCHNERA** L.

***Buchnera capitata* Benth.**

Erect annual herb 1-2½ ft. high; stem simple or sparingly branched, glabrous or minutely pubescent. Leaves sessile, entire or obscurely few-toothed, oblong-lanceolate to linear, ¾-3 in. long, ¼-¾ in. broad, scabrous. Flowers white, about ½ in. long, in terminal crowded ovoid or ellipsoid or cylindric spikes ¾-1½ in. long. Capsule subovoid, about ½ in. long.

Equatoria.

B. hispida Buch.-Ham. ex D. Don.

Erect annual herb $\frac{1}{2}$ -2 ft. high, more or less densely covered with hispid hairs, scabrous. Lower leaves coarsely or somewhat obscurely toothed, elliptic to oblong, up to $3\frac{1}{2}$ in. long, often scabrous with minute white points; upper leaves entire or sparingly toothed, narrowly oblong-lanceolate or linear, much narrowed at the base, usually $1-1\frac{1}{2}$ in. long. Flowers heliotrope, in loose interrupted terminal spikes up to 6 or more in. long. Capsule elliptic-oblong, about $\frac{1}{4}$ in. long.

Darfur: Jebel Marra. Nuba Mountains. Fung District: Ingesanya Hills.

7. **CELSIA** L.**Celsia brevipedicellata** Engler.

Herb up to 4 ft. high; stems simple, leafy, more or less pilose and with glandular hairs. Leaves biserrate, oblong, obtuse at the apex, rounded at the base, sparingly pilose above, more or less densely so beneath, the lower leaves $1\frac{1}{2}$ in. long with a slender petiole $\frac{3}{4}$ in. long, the upper ones sessile and smaller. Flowers pale-yellow, on pedicels about $\frac{1}{2}$ in. long in terminal racemes.

Equatoria: Imatong Mountains, Ibahin to Itobol, 6400 ft.

8. **CRATEROSTIGMA** Hochst.**Craterostigma schweinfurthii** (Oliv.) Engler.

Erect perennial herb 6-18 in. high; stems quadrangular, glabrous or sparingly pilose at the base. Leaves 3-nerved, entire or with a few small teeth, elliptic, obtuse at the apex, $\frac{3}{4}$ -1 in. long, glabrous or minutely ciliate, the lower ones crowded, the upper ones distant and becoming gradually smaller. Flowers violet, in terminal subcapitate inflorescences.

Equatoria.

C. plantagineum Hochst.

Fig. 36.

Pilose stemless perennial herb with a short thick rhizome. Leaves rosulate, ovate or rarely lanceolate, broadly obtuse to subacute at the apex, narrowed at the base into a short broad petiole, 5-9-nerved, $\frac{3}{4}$ -3 in. long, $\frac{1}{2}$ - $2\frac{3}{4}$ in. broad, sometimes ciliate on the margin, usually pilose beneath, glabrous or sometimes sparingly pilose above. Scapes quadrangular, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long; inflorescence a raceme, sometimes with the pedicels short or sometimes with the lower pedicels up to $1\frac{1}{2}$ in. long forming a corymb. Corolla yellow and white, or yellow, white and purple, or blue, about $\frac{1}{2}$ in. long.

Darfur.



Fig. 36—CRATEROSTIGMA PLANTAGINEUM Hochst.

9. **CYCNIIUM** E. Mey. ex Benth.

Cygnium adonense E. Mey. ex Benth.

Pubescent scabrous perennial robust herb from a woody base; stems often branched, procumbent or ascending, a few inches to 1 ft. or more long. Leaves shortly petiolate or sessile, serrate or crenate-serrate or incised-dentate, oblong or oblong-lanceolate, cuneate at the base, 1-3 in. long, $\frac{1}{4}$ -1 in. broad. Flowers white or lilac, sweet-scented, pedunculate, axillary. Calyx $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long. Corolla-tube $2\frac{1}{4}$ -3 in. long, glandular-pilose; lobes about 1 in. long. Fruit ovoid or ellipsoid, about $\frac{1}{2}$ in. long, fleshy.

Equatoria.

C. camporum Engler.

Herb; stems 1 or more ft. high, densely and shortly pilose, leafy. Leaves sessile or very shortly petiolate, serrulate or crenate-serrate, lanceolate to oblong-lanceolate, narrowed to the base, 1-3½ in. long, ½-1 in. broad, shortly pilose chiefly on the midrib and nerves beneath, often scabrous on both surfaces. Flowers white or pale-yellow, usually opposite, supra-axillary, on peduncles ½-¾ in. long. Calyx ¼-⅓ in. long. Corolla-tube 1½-1¾ in. long, densely glandular-pilose. Fruit broadly oblong, ⅓-½ in. long.

Equatoria.

C. brachycalyx Schweinf.

Pubescent herb, woody at the base; stems 1 ft. high, sparingly branched, angular. Leaves subsessile, coarsely serrate-dentate, lanceolate, cuneate at the base, 2½ in. long, 1 in. broad, pubescent-scabrous on both surfaces. Flowers solitary, opposite, somewhat remotely supra-axillary, equalling the leaves. Calyx 1 in. long, 5-lobed almost to the middle. Corolla-tube 1-1¼ in. long, pubescent outside.

Kassala: Gallabat.

10. **DOPATRIUM** Buch.-Ham. ex Benth.**Dopatrium schweinfurthii** Wettst.

D. luteum Engler.

Herb; stems slender, erect, simple or once branched in the upper part, ¾-1 ft. high. Radical and lower cauline leaves elliptic to linear-oblong, ½-1 in. long, ⅓-¼ in. broad; upper cauline leaves scale-like, ovate to suborbicular, connate at the base. Flowers bright-yellow, ¾-1 in. long, in terminal few-flowered racemes. Capsule subglobose, ¼ in. long.

Equatoria.

D. tricolor Wettst.

Herb; stems erect, simple, about 1½ ft. high. Radical leaves rather crowded, broadly linear, 1½-2½ in. long; cauline leaves becoming scale-like and membranous, oblong to suborbicular, connate at the base, ½-¾ in. long. Flowers in a short terminal raceme. Calyx ½ in. long. Corolla whitish, violet on the upper lip and the lateral lobes of the lower lip, golden-yellow on the median lobe at the base; tube about ½ in. long.

Equatoria.

11. **HARVEYA** Hook.**Harveya** sp.

Gregarious root-parasite in humus of forest floor, 3-5 in. high. Flowers waxy-white with a little sulphur-yellow in the throat.

Equatoria: Laboni, gallery-forest of River Laneka.

12. **JAMESBRITTENIA** Kuntze**Jamesbrittenia dissecta** (Del.) Kuntze.*Sutera glandulosa* Roth.

Dwarf diffuse much-branched viscid-pubescent herb; stems 4-12 in. long, decumbent or ascending. Leaves petiolate, incised-dentate, pinnatifid or dissected, ovate or oblong in outline, narrowed at the base, $\frac{1}{2}$ -1 in. long. Flowers nearly white, small, axillary or the upper ones in terminal racemes.

*Northern and Central Sudan.*13. **KICKXIA** Dumort.**Kickxia hastata** (R. Br.) Dandy, comb. nov.*Linaria hastata* R. Br. ex Benth.¹

Very slender diffusely branched erect or ascending annual herb 9-12 in. high, glabrous except sometimes at the base. Leaves opposite below, alternate above, linear to lanceolate, acute at the apex, hastate or rarely rounded or cuneate at the base, $\frac{1}{2}$ -1 in. long. Flowers yellow, $\frac{1}{4}$ in. long including the spur, on thread-like axillary peduncles up to $1\frac{1}{2}$ in. long. Capsule ovoid, glabrous, dehiscing by valve-like lids.

*Red Sea District.***K. nubica** (Skan) Dandy, comb. nov.*Linaria nubica* Skan².

Glandular-pubescent more or less climbing sparingly branched annual herb. Leaves opposite on the stem, alternate on the branches, triangular to ovate, broad at the apex, broadly cordate at the base, 1-1 $\frac{1}{2}$ in. long. Flowers nearly $\frac{1}{2}$ in. long, on solitary axillary peduncles $\frac{1}{2}$ - $\frac{3}{4}$ in. long; corolla hairy. Capsule ovoid, slightly pubescent, $\frac{1}{2}$ in. long, dehiscing by valve-like lids.

*Red Sea District: about 21° N., between sea-level and 4000 ft.***K. heterophylla** (Schousb.) Dandy, comb. nov.*Antirrhinum heterophyllum* Schousb.³; *Linaria sagittata* (Poir.) Hook. f.

Slender diffusely branched more or less climbing glabrous perennial herb. Leaves narrowly linear to lanceolate, sagittate or hastate or sometimes cuneate or rounded at the base, $\frac{1}{2}$ -2 in. long; petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long, sometimes tendril-like. Flowers yellow, $\frac{3}{4}$ -1 in. long including the spur, distant, axillary, on peduncles $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Capsule globose, glabrous; seeds tuberculate.

*Red Sea District.*¹In DC., *Prodr.*, vol. 10, p. 269 (1846).²In *Fl. Trop. Afr.*, vol. 4, 2, p. 290 (1906).³In *K. Danske Vidensk.-Selsk. Skrivt.*, vol. 1, 1, p. 194, t. 3 (1800).

K. bentii (Skan) Dandy, comb. nov.*Linaria bentii* Skan¹.

Erect densely pubescent freely branched undershrub about 1 ft. high. Leaves rather crowded, somewhat fleshy, triangular or ovate, cordate at the base, about $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. broad; petiole $\frac{1}{2}$ - $\frac{1}{3}$ in. long. Flowers about $\frac{1}{2}$ in. long including the spur, solitary, axillary. Capsule globose-ovoid, $\frac{1}{2}$ in. long, dehiscing by valve-like lids; seeds minutely tuberculate.

Red Sea District: about 21° N., between sea-level and 4000 ft.

14. **LIMNOPHILA** R. Br.**Limnophila indica** (L.) Druce.*L. gratiolooides* R. Br.

Slender glabrous or slightly glandular-pubescent herb, branched or simple, a few inches to 2 ft. high. Leaves very variable; lower submerged leaves in whorls of 6 to many, usually multifid; upper leaves whorled or sometimes opposite, dentate, incised or multifid; uppermost leaves opposite, linear to elliptic-oblong. Flowers white, axillary; pedicels up to $\frac{1}{2}$ or more in. long, usually glandular-pubescent.

Central and Southern Sudan: occurring in mud or submerged in water.

15. **LINDENBERGIA** Lehm. ex Link & Otto**Lindenbergia abyssinica** Hochst. ex Benth.

Branched glandular-pubescent or pilose perennial herb or undershrub. Leaves petiolate to subsessile, coarsely crenate-dentate or acutely dentate, usually broadly ovate, cuneate or rounded or slightly cordate at the base, $\frac{1}{2}$ -2 in. long, $\frac{1}{3}$ -1 $\frac{1}{2}$ in. broad in the lower part of the branches, decreasing in size above but usually longer than the calyx. Flowers opposite on very short pedicels in leafy terminal secund racemes. Capsule pubescent.

Red Sea District.

16. **LINDERNIA** All.**Lindernia debilis** Skan.

Weak much-branched prostrate annual herb; branches up to 2 $\frac{1}{2}$ in. long, glabrous, quadrangular. Leaves sessile, very thin, lanceolate to linear-lanceolate, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, glabrous; floral leaves more or less unequal in the same pair. Flowers solitary in the axils of the smaller leaves of the upper pairs. Upper lip of corolla purple; lower lip yellow with purple lines, deeply 3-lobed. Stamens 4.

Equatoria.

¹In *Fl. Trop. Afr.*, vol. 4, 2, p. 289 (1906).

L. oliverana Dandy, nom. nov.

Vandellia lobelioides Oliv.¹, non F. Muell.; *L. lobelioides* Wettst., non F. Muell.

Erect or ascending almost glabrous herb $\frac{1}{2}$ -1 ft. high. Leaves linear, 1 in. long, the lower ones sometimes purplish on the under-side, the upper ones unequal in the same pair. Flowers blue, yellow in the throat, axillary, solitary; peduncles $\frac{1}{4}$ - $1\frac{1}{2}$ in. long. Stamens 4.

Darfur: *Jebel Marra, Niurnya*, 6500 ft. *Equatoria*.

L. parviflora (Roxb.) Haines.

Ilysanthes parviflora (Roxb.) Benth.

Slender more or less glabrous herb, erect or decumbent, 3-9 in. high. Leaves sessile or the lower ones very shortly petiolate, ovate or ovate-lanceolate to elliptic or oblong, $\frac{1}{8}$ - $\frac{1}{2}$ in. long, gland-dotted. Flowers white or blue, axillary or in terminal racemes; pedicels $\frac{1}{4}$ - $\frac{3}{4}$ in. long. Stamens 2.

Widespread.

L. schweinfurthii (Engler) Dandy, comb. nov.

Ilysanthes schweinfurthii Engler².

Slender tufted glabrous or sparingly pubescent herb 4-8 in. high; stems quadrangular. Leaves rather thick, linear, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Flowers pale-blue, in loose racemes; pedicels $\frac{1}{2}$ - $\frac{1}{2}$ in. long, deflexed in fruit. Stamens 2. Capsule fusiform, $\frac{1}{4}$ in. long.

Equatoria.

L. madiensis Dandy, nom. nov.

Bonnaya trichotoma Oliv.³, non *L. trichotoma* Schlechter; *Ilysanthes trichotoma* (Oliv.) Urb.

Diffuse glabrous branched herb about 3 $\frac{1}{2}$ in. high; stems quadrangular. Leaves sessile, linear-oblong, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Flowers blue and white, on alternate peduncles in the axils of the upper reduced leaves. Stamens 2.

Equatoria: *Opari, Acholi Hills*, 5500 ft.

17. **MICRARGERIA** Benth.**Micrargeria filiformis** (Schumach.) Hutch. & Dalziel.

M. scopiformis (Klotzsch) Engler.

Slender rigid erect very scabrous annual herb 1-2 $\frac{1}{2}$ ft. high; stem usually simple below, very much branched above. Leaves opposite, narrowly linear or thread-like, $\frac{1}{2}$ -2 in. long. Flowers pale-purple or whitish-rosy, purple-striate near the base of the tube, usually opposite in loose terminal racemes $1\frac{1}{2}$ -6 in. long. Capsule about $\frac{1}{2}$ in. in diameter, usually quite glabrous.

Equatoria.

¹In *Trans. Linn. Soc. Lond.*, vol. 29, p. 120, t. 121 B (1875).

²*Bot. Jahrb.*, vol. 23, p. 504 (1897).

³In *Trans. Linn. Soc. Lond.*, vol. 29, p. 121, t. 122 B (1875).

18. **MIMULUS** L.**Mimulus gracilis** R. Br.

Glabrous perennial herb $\frac{3}{4}$ -2 ft. high; stems stout, quadrangular, very narrowly 4-winged. Leaves lanceolate to narrowly oblong, usually amplexicaul at the base, $\frac{3}{4}$ -2 in. long, decreasing in size in the upper part of the stems. Flowers whitish or whitish-violet, solitary, axillary, forming rather leafy loose racemes. Corolla tubular, very unequally bilabiate.

Darfur: Jebel Marra, 5000-6000 ft.

19. **MISOPATES** Raf.**Misopates orontium** (L.) Raf.

Corn Snapdragon.

Antirrhinum orontium L.

Erect branched annual or biennial herb a few inches to 2 ft. high; stems and branches more or less glandular-hairy or becoming glabrous. Leaves lanceolate to linear, 1-2 in. long, usually about $\frac{1}{8}$ in. broad, glabrous or sometimes remotely ciliate. Flowers rose-coloured with purple veins, $\frac{1}{3}$ - $\frac{3}{4}$ in. long, in a rigid distant-flowered raceme; pedicel very short. Capsule obliquely ovoid, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, hispidly hairy.

Red Sea District. Darfur: Jebel Marra, 6500-10,000 ft.

20. **PARENTUCELLIA** Viv.**Parentucellia latifolia** var. **flaviflora** (Boiss.) Dandy, comb. nov.

Eufragia latifolia var. *flaviflora* Boiss.¹

Small slender herb 2-12 in. high, glandular-viscous. Leaves subsessile, the lowest crenate, the upper nearly palmatilobed, about $\frac{1}{2}$ in. long. Flowers yellow, in an ovoid spike at length elongated and interrupted below. Calyx-teeth oblong, shorter than the tube. Anthers glabrous.

Darfur: Jebel Marra, 9000-10,000 ft.

21. **RHAMPHICARPA** Benth.**Rhamphicarpa fistulosa** (Hochst.) Benth.

Erect usually much-branched herb a few inches to 4 ft. high; stems glabrous. Leaves pinnatisect or sometimes bipinnatisect, up to 3 in. long; segments 2-4 or more on each side, often opposite, narrowly linear, the lower $\frac{1}{2}$ - $\frac{3}{4}$ in. long, densely covered along the margin with minute whitish callosities. Flowers white, 1-1 $\frac{1}{2}$ in. long, solitary in the upper leaf-axils; peduncle $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long. Calyx glabrous. Capsule ovoid, almost 2-winged.

Widespread.

¹*Fl. Or.*, vol. 4, p. 473 (1879).

R. recurva Oliv.

Erect branched slender annual herb about 1 ft. high; branches strigillose. Leaves pinnatisect or bipinnatisect, about 1 in. long, opposite or the upper ones alternate; segments narrowly lanceolate, scabrous with fine points. Flowers white, in the axils of the upper leaves; peduncle $\frac{1}{2}$ in. long. Calyx sparingly setulose. Corolla-tube about $\frac{1}{2}$ in. long, glandular-puberulous.

Equatoria: summit of Mount Iro, Opari-Torit road; Imatong Mountains, Mount Kineti.

R. tenuisecta Standl.

Herb; stems erect or ascending, 1-1 $\frac{1}{2}$ ft. high. Leaves about 1 in. long, pinnatifid or bipinnatifid with rigid scabrous linear segments. Flowers solitary in the upper leaf-axils; peduncle about $\frac{1}{2}$ in. long. Calyx setulose. Corolla-tube $\frac{3}{4}$ in. long.

Equatoria: Imatong Mountains, 8000-10,000 ft.

R. heuglini Hochst, ex Schweinf.

Erect herb 3-9 in. high, branched chiefly from the base; stems slender, sparingly and shortly pubescent or sometimes villous. Leaves more or less toothed or rarely entire, lanceolate-linear or lanceolate, acuminate or acute at the apex, much narrowed towards the base, $\frac{1}{2}$ -2 in. long, hispidly pubescent, sometimes scabrous. Flowers white, mauve or violet, in the axils of the uppermost leaves. Corolla-tube $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long, glandular-pubescent. Capsule $\frac{1}{2}$ - $\frac{3}{4}$ in. long including the beak, dehiscent by the upper suture only.

Central and Southern Sudan.

22. **SCHWEINFURTHIA** A. Braun**Schweinfurthia pterosperma** (A. Rich.) A. Braun.

Much-branched erect annual herb 6-9 in. high. Leaves elliptic-spathulate to linear-oblong, obtuse at the apex, narrowed at the base, up to 1 in. long; petiole up to $\frac{3}{4}$ in. long. Flowers white, rose-tinted at the throat, solitary on thread-like peduncles up to $\frac{1}{2}$ in. long. Capsule about $\frac{1}{2}$ in. in diameter, the upper loculus 1-3-seeded or quite empty.

Red Sea District.

23. **SCOPARIA** L.**Scoparia dulcis** L.

Erect slender much-branched undershrub 1-3 ft. high, glabrous or minutely hairy chiefly at the nodes. Leaves usually in whorls of 3 or more or opposite, more or less distinctly serrate above the middle, elliptic-lanceolate or lanceolate to linear-lanceolate, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, densely punctate. Flowers white, solitary or in pairs in the axils of the leaves, often forming many-flowered raceme-like inflorescences.

Darfur: Kulme. Southern Sudan.

24. **SCROPHULARIA** L.**Scrophularia arguta** Ait.

Erect more or less glandular-pubescent annual herb $\frac{1}{2}$ -2 ft. high. Leaves irregularly dentate or bidentate, broadly ovate, acute or truncate or cuneate at the base; petiole $\frac{1}{2}$ -1 in. long. Flowers maroon-coloured, in 2-5-flowered cymes (sometimes reduced to one flower) forming a rigid leafy or sometimes almost leafless thyrus. Capsule about $\frac{1}{2}$ in. long, ovoid, beaked, glabrous.

Red Sea District.

25. **SOPUBIA** Buch.-Ham. ex D. Don**Sopubia parviflora** Engler.

Erect slender annual herb 1-1 $\frac{3}{4}$ ft. high; stems freely branching. Leaves opposite, narrowly linear or thread-like, $\frac{1}{3}$ -1 in. long, revolute on the margin, scabrous chiefly on the margin. Flowers pale-brownish with a purple ring at the throat, usually opposite, very numerous in loose terminal racemes. Calyx $\frac{1}{10}$ - $\frac{1}{8}$ in. long. Corolla about $\frac{1}{2}$ in. long.

Equatoria.

S. simplex (Hochst.) Hochst.

Perennial herb 1-3 or more ft. high; stems several, arising from a woody base, prominently angled, many-furrowed. Leaves simple, alternate or whorled (often ternate), usually closely appressed, narrowly linear, $\frac{1}{2}$ to 1 in. long, revolute, scabrous on the margin and midrib beneath. Flowers pink or rose, numerous, alternate or whorled, in loose terminal racemes up to 1 ft. long. Calyx about $\frac{1}{2}$ in. long, minutely puberulous and scabrous outside. Corolla $\frac{1}{2}$ - $\frac{2}{3}$ in. long. Capsule oblong-globose or ovoid-elliptic, about $\frac{1}{2}$ in. long.

Equatoria.

S. ramosa (Hochst.) Hochst.

Robust erect scabrous undershrub 2-4 or more ft. high; stems often rather densely pubescent, densely leafy. Leaves usually in whorls of 4 or 3, linear or linear-lanceolate, up to 1 $\frac{1}{2}$ in. long, more or less pubescent, scabrous, revolute. Flowers coppery-purple or pink with a dark centre or white, usually in whorls of 3 or 4 in long terminal racemes. Calyx about $\frac{1}{2}$ in. long, short-pubescent and scabrous outside, 10-ribbed. Corolla about $\frac{1}{2}$ in. long. Capsule ovoid, about $\frac{1}{2}$ in. long.

Darfur: Jebel Marra. Equatoria.

26. **STEMODIA** L.**Stemodia serrata** Benth.

Erect much-branched viscid glandular-pubescent herb $\frac{1}{2}$ -1 ft. high. Leaves sometimes rather crowded, serrate from the middle to the apex, oblong or lanceolate, acute at the apex, narrowed or sometimes dilated and semi-amplexicaul at the base, up to 2 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Flowers about $\frac{1}{2}$ in. long, crowded in leafy spike-like racemes; pedicels up to $\frac{1}{2}$ in. long.

Central and Southern Sudan.

27. **STEMODIOPSIS** Engler**Stemodiopsis** sp.

Low rather densely leafy pubescent herb attached to the under-surface of overhanging rocks. Leaves dentate in the upper half, ovate, narrowed at the base into a winged petiole, up to $\frac{3}{4}$ in. long. Flowers white with violet throat, small, axillary, solitary or in small clusters.

Equatoria: near summit of Mount Konyi near Loka.

28. **STRIGA** Lour.

A. Calyx 5-ribbed:

B. Corolla-tube curved above the middle:

(a) Spikes rather loosely flowered; corolla almost glabrous outside:

(b) Stems usually stout, with small broad scale-like leaves
S. gesnerioides.

(bb) Stems slender, with distinct linear leaves *S. aspera.*

(aa) Spikes usually very densely flowered; corolla very hairy outside:

(c) Leaves closely appressed to the stems, $\frac{1}{8}$ - $\frac{1}{2}$ in. long
S. strictissima.

(cc) Leaves spreading, $\frac{1}{2}$ -1 in. long *S. barberi.*

BB. Corolla-tube curved about the middle:

(d) Corolla-limb $\frac{3}{4}$ -1 $\frac{1}{4}$ in. in diameter *S. hermonthica.*

(dd) Corolla-limb $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter *S. senegalensis.*

AA. Calyx 10-13-ribbed:

C. Plant hairy, with distinct leaves:

(e) Leaves usually linear, $\frac{1}{4}$ -1 $\frac{1}{2}$ in. long, entire; flowers numerous in dense or loose spikes *S. asiatica.*

(ee) Leaves usually lanceolate, 1-2 $\frac{1}{4}$ in. long, more or less toothed; flowers rather few in the axils of the upper distant pairs of leaves *S. forbesii.*

CC. Plant glabrous, with scale-like leaves $\frac{1}{2}$ - $\frac{1}{2}$ in. long
S. baumannii.

Striga gesnerioides (Willd.) Vatke.

Fig. 37.

S. orobanchoides (R. Br.) Benth.

Erect parasitic herb 3-18 in. high, usually much branched from the base, more or less covered with short hairs or almost glabrous; root tuberous. Leaves scale-like, lanceolate, up to about $\frac{1}{2}$ in. long. Flowers rose or lavender to white, in usually much interrupted terminal spikes often as long as the branches themselves. Capsule ovoid-oblong, about $\frac{1}{4}$ in. long.

Widespread.

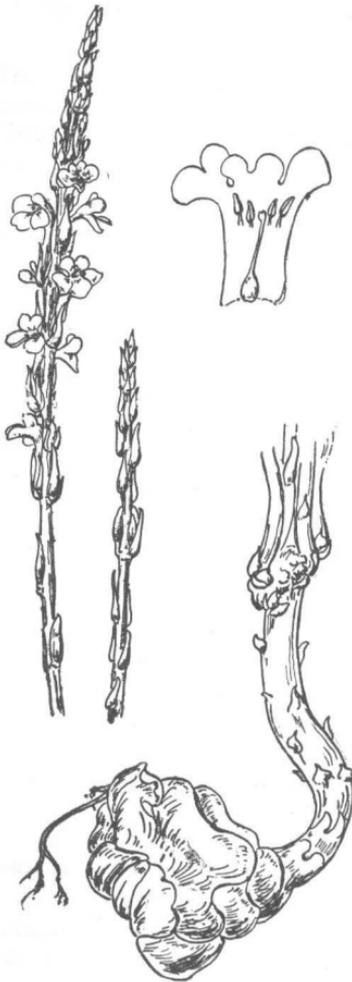


Fig. 37—STRIGA GESNERIOIDES (Willd.) Vatke.

S. aspera (Willd.) Benth.

Rather slender erect sparingly pubescent scabrous herb 6-18 in. high; stems usually freely branched from the middle upwards. Leaves linear, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, hispidly pubescent and often scabrous with small white points. Flowers purple or red, in slender lax-flowered terminal spikes up to 8 in. long. Capsule ellipsoid, $\frac{1}{4}$ in. long.

Central and Southern Sudan.

S. strictissima Skan.

Erect rigid annual herb 10-15 in. high, densely covered with short fine hispid closely appressed hairs; stems quadrangular. Leaves in distant pairs, closely appressed, linear-subulate or lanceolate-subulate, $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Flowers dull-pink, densely covered outside with short appressed hairs.

Equatoria.

S. barteri Engler.

S. glandulifera Engler.

Erect parasitic densely and finely pubescent herb 6-8 in. high, with a perpendicular rhizome; stems freely branched. Leaves linear to linear-lanceolate, $\frac{1}{2}$ -1 in. long, scabrous. Flowers lilac or rose or white, usually in pairs in spikes up to $5\frac{1}{2}$ in. long. Corolla-tube densely glandular-pubescent outside.

Equatoria.

S. hermonthica (Del.) Benth.

Fig. 38.

Erect usually branched parasitic herb up to 2 or more ft. high, hispidly hairy and scabrous; stems stout, quadrangular. Leaves linear-lanceolate or lanceolate, acute or acuminate at the apex, 1-3 in. long, hispidly hairy chiefly on the margins and nerves, very scabrous. Flowers rose-red, purplish or rarely white, in terminal more or less densely flowered spikes about 6 in. long. Corolla-tube $\frac{1}{2}$ -1 in. long.

Widespread.

S. senegalensis Benth.

Closely resembles *S. hermonthica* and may be a small-flowered form of it.

Central and Southern Sudan.

S. asiatica (L.) Kuntze.

S. lutea Lour.

Erect slender usually branched parasitic herb usually 6-9 in. high, scabrously hairy or sometimes villous. Leaves narrowly linear or sometimes lanceolate, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long. Flowers red or yellow or white, in terminal dense or loose spikes usually 4-6 in. long. Corolla-tube $\frac{1}{2}$ - $\frac{1}{2}$ in. long, very slender. Capsule oblong-ovoid or ellipsoid, about $\frac{1}{2}$ in. broad.

Central and Southern Sudan.

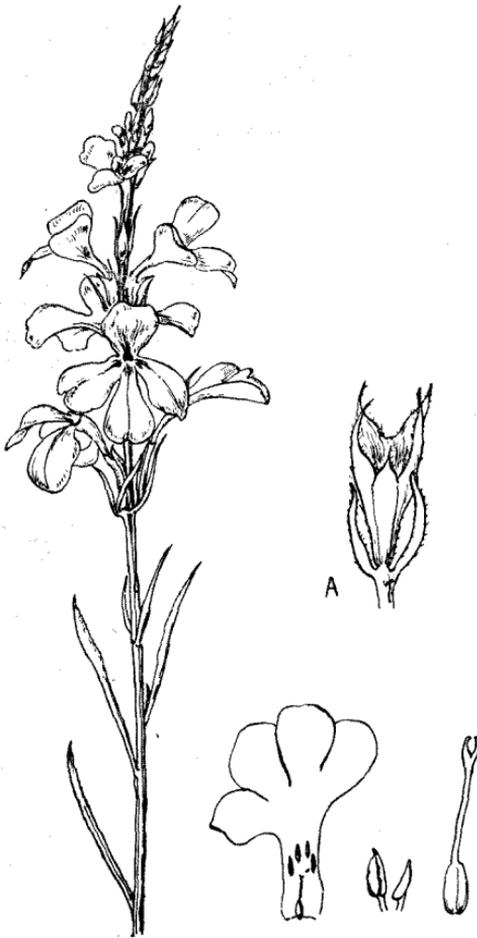


Fig. 38—*STRIGA HERMONTICA* (Del.) Benth.

A, calyx and bracts.

***S. forbesii* Benth.**

Erect herb up to 15 in. high; stems scabrously pubescent. Leaves more or less toothed and often callose at the apex of the teeth, lanceolate-linear or lanceolate, 1-2½ in. long, shortly pubescent and very scabrous. Flowers pink or scarlet or bright-yellow, solitary in the axils of the upper leaves. Corolla-tube about 1 in. long.

Central and Southern Sudan.

S. baumannii Engler.

Tall glaucous-green glabrous herb, with a short rootstock and strong branched roots; stems 2-4 or more, slender, 1½-3 ft. high, terete below with long internodes, quadrangular above with shorter internodes. Leaves scale-like, closely appressed to the stem, the lower ones ovate or oblong-ovate, acuminate at the apex, about ½-¾ in. long. Flowers dark-yellow, in very slender spikes 4-12 in. long remotely flowered below. Capsule narrowly oblong, about ¼ in. long.

Equatoria.

29. **TORENIA** L.**Torenia spicata** Engler.

Slender erect glabrous annual herb 2-4 in. high; stems quadrangular, narrowly 4-winged. Leaves sessile, those of the lower pairs equal or subequal, those of the upper pairs often very unequal, lanceolate, up to ¾ in. long. Flowers rose-coloured, blue or whitish, the lower ones axillary, the upper ones in spike-like racemes. Capsule oblong-ovoid, about ½ in. long.

Equatoria.

T. thouarsii (Cham. & Schlecht.) Kuntze.

T. parviflora Buch.-Ham. ex Benth.

Slender straggling more or less pilose or almost glabrous herb; stems a few inches to 1½ ft. high, sometimes rooting at the lower nodes. Leaves petiolate, ovate to ovate-lanceolate, rounded or truncate or somewhat cuneate at the base, serrate-crenate. Flowers white, white and blue, blue or purple, about ¼ in. long, solitary or in clusters of 2-6 on abbreviated branches.

Equatoria.

30. **VERBASCUM** L.**Verbascum sinaiticum** Benth.

V. ternacha Hochst. ex A. Rich.

Perennial herb 2-6 ft. high; stems erect, branched above, more or less densely covered with floccose stellate tomentum. Leaves densely yellow-stellate-tomentose on both surfaces; basal leaves petiolate, denticulate or crenulate, oblong or ovate-oblong, cuneate at the base, up to 7½ or more in. long; cauline leaves smaller and shortly petiolate. Flowers yellow, ¾-1 in. in diameter, in 2-7-flowered clusters along the stems; bracts ovate-triangular. Connectives of the 2 abaxial stamens bearded. Capsule more or less ovoid, about ½ in. long.

Northern Sudan. Darfur.

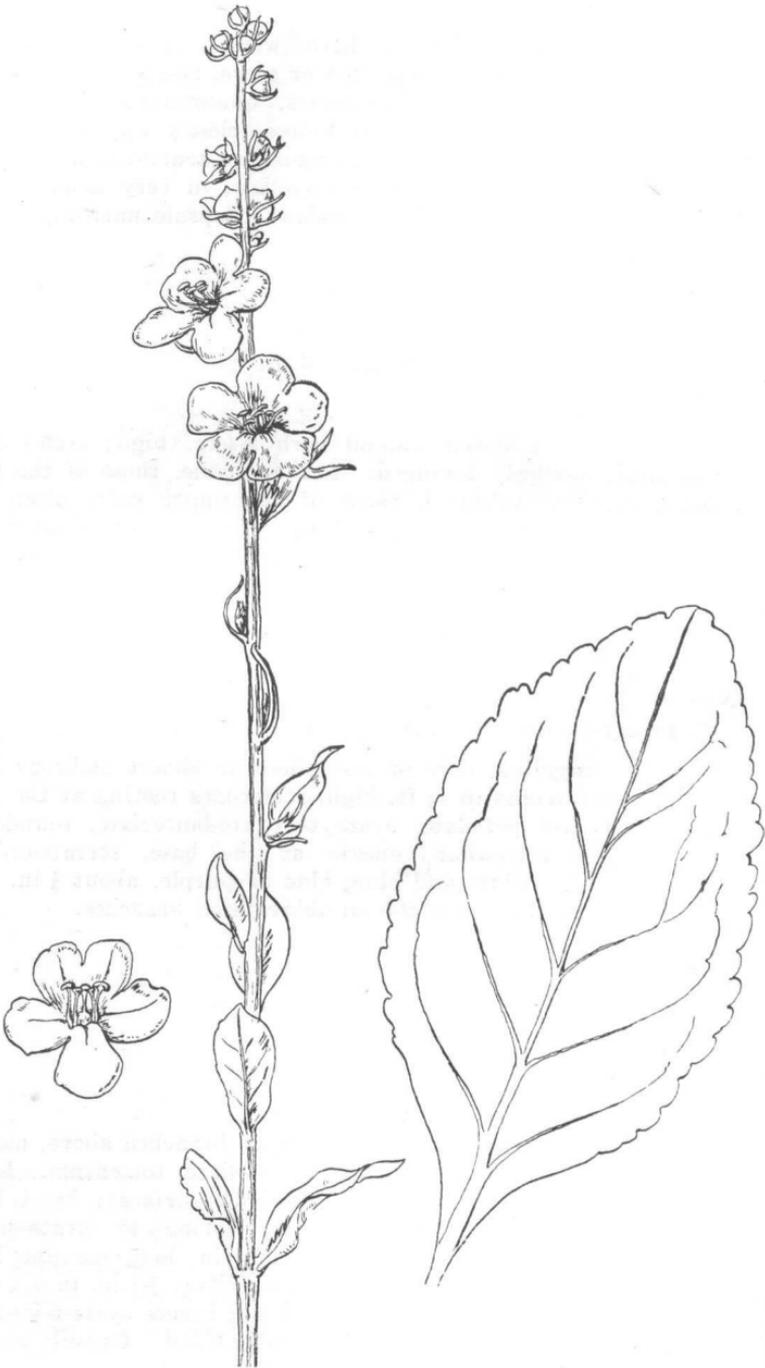


Fig. 39—*VERBASCUM NUBICUM* Murbeck.

V. nubicum Murbeck.

Fig. 39.

V. ternacha (non Hochst.) Broun & Massey p.p.

Perennial herb $1\frac{1}{2}$ - $2\frac{3}{4}$ ft. high; stems erect, not branched above, densely covered when young with a whitish floccose tomentum, later almost glabrous. Leaves shallowly crenulate, densely greyish-woolly-tomentose on both surfaces; basal leaves petiolate, elliptic-oblong, broadly cuneate at the base, $1\frac{1}{4}$ - $4\frac{3}{4}$ in. long, $1-2\frac{1}{2}$ in. broad; lower cauline leaves shortly petiolate, elliptic; upper cauline leaves sessile, lanceolate, much smaller. Flowers yellow, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, in 2-4-flowered clusters; bracts linear. Connectives of the 2 abaxial stamens glabrous. Capsule ellipsoid-ovoid, $\frac{1}{8}$ - $\frac{1}{4}$ in. long.

*Red Sea Hills: Erkowit.*31. **VERONICA** L.**Veronica anagallis-aquatica** L.

Water Speedwell.

Succulent glabrous or glandular-pubescent herb 1-2 ft. high; stems creeping and rooting at the base, then erect, stout and hollow. Leaves sessile, more or less remotely serrate or entire, lanceolate or lanceolate-oblong or ovate-lanceolate, semi-amplexicaul, $1-3\frac{1}{2}$ in. long. Flowers blue, pale-blue, white or flesh-coloured, in racemes $2-3\frac{1}{2}$ in. long in the axils of all or nearly all the upper leaves. Capsule orbicular.

*Northern and Central Sudan.***V. abyssinica** Fresen.

Prostrate herb diffusely branched from the base, sometimes rooting at the nodes, more or less pilose; branches usually 9-12 in. long, hollow, herbaceous or sometimes becoming almost woody. Leaves petiolate, crenate-serrate or crenate, ovate or elliptic-ovate or rarely suborbicular, rounded or slightly cordate to truncate or somewhat cuneate at the base, $\frac{1}{2}$ - $1\frac{1}{4}$ in. long, more or less pilose on both surfaces or sometimes almost glabrous. Flowers blue, in racemes $1-2\frac{1}{2}$ in. long. Corolla about $\frac{1}{2}$ in. long. Capsule obovate, compressed, pilose or rarely glabrous.

*Equatoria: Imatong Mountains, Lomuleng, 8000 ft.*131. **OROBANCHACEAE**

Herbaceous root-parasites, often covered with scales at the base, never green; stems with alternate often crowded scales. Flowers solitary in the axils of bracts, often crowded, hermaphrodite, zygomorphic. Calyx 3-5-toothed or lobed or variously split, the lobes open or valvate. Corolla gamopetalous, often curved; limb oblique or 2-lipped with 5 imbricate lobes, the adaxial 2 interior. Stamens 4, didynamous, inserted below the middle of the corolla-tube, alternate with the lobes, the fifth (adaxial) one reduced to a staminode or absent; anthers often connivent in pairs. Ovary superior, 1-locular, with 4 parietal placentas; style terminal; ovules numerous. Capsule often enveloped by the calyx, opening by 2 valves.

- A. Calyx tubular-campanulate, obtusely 4-5-lobed CISTANCHE. 1.
 AA. Calyx campanulate, acutely 3-5-dentate or 3-5-fid or split to the base in front and at the back OROBANCHE. 2.

1. **CISTANCHE** Hoffmanns. & Link

Cistanche phelypaea (L.) Cout.

Fig. 40.

C. lutea (Desf.) Hoffmanns. & Link.

Stem swollen at the base and often more than 1 in. in diameter, stout, fleshy, glabrous. Scales fleshy, purplish or tinged with yellow, the lower ones crowded and triangular, the upper ones scattered and ovate-lanceolate or lanceolate, $\frac{1}{2}$ -1 in. long. Flowers bright-yellow, in a cylindric spike from a few inches to 1 ft. long. Corolla-tube 1-2 in. long, at first straight, then more or less curved. Filaments hairy towards the base; anthers woolly.

Northern and Central Sudan.

2. **OROBANCHE** L.

Orobanche ramosa L.

Stems slender, usually branched, yellowish, up to 12 or more in. high, more or less glandular-hairy. Scales ovate to ovate-lanceolate, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, sometimes almost glabrous. Flowers pale-yellow with a bluish limb, about $\frac{1}{2}$ in. long, in many-flowered spikes (with sometimes the lowest flowers pedicellate) at length elongated and loose; bracts ovate-oblong to lanceolate, about $\frac{1}{3}$ in. long; bracteoles linear-subulate, usually exceeding the calyx-tube. Calyx divided to about the middle into 4 triangular acuminate 3-nerved teeth.

Northern Sudan. Khartoum.

O. cernua var. **desertorum** (G. Beck) Stapf.

Stems solitary or clustered, stout, like the whole plant glandular and pubescent, rarely becoming glabrous, up to 16 in. high. Scales ovate or ovate-lanceolate, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Flowers whitish with a bluish throat, $\frac{5}{8}$ - $\frac{3}{4}$ in. long, in many-flowered dense cylindric spikes up to 8 in. long; bracts ovate to ovate-lanceolate, up to $\frac{1}{2}$ in. long; bracteoles absent. Calyx yellowish or bluish, split to the base or almost so in front and at the back, the divisions ovate and either entire or more or less deeply bifid. Corolla conspicuously inflated below the stamens which are inserted near the middle of the tube.

Red Sea District: 21° N., between sea-level and 4000 ft.

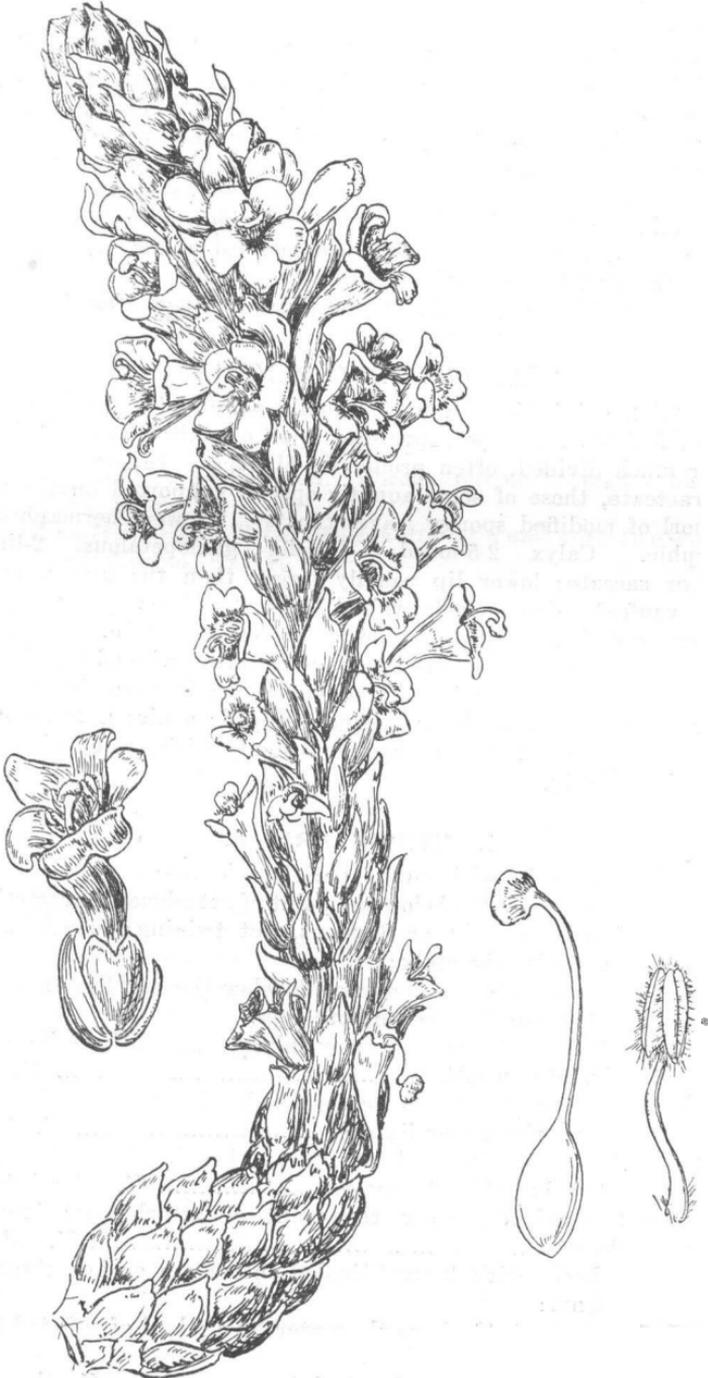


Fig. 40—*CISTANCHE PHELYPAEA* (L.) Cout.

O minor Sm.

Lesser Broomrape.

Stems solitary or clustered, rather slender, 4-20 in. high, like the whole plant more or less glandular-hairy. Scales crowded near the base of the stems, distant higher up, ovate-oblong to lanceolate, $\frac{1}{4}$ - $\frac{3}{8}$ in. long. Flowers yellow with purplish veins towards the limb, up to $\frac{3}{8}$ in. long, in many- or few-flowered cylindric spikes up to 12 or more in. long; bracts like the scales but more acuminate; bracteoles absent. Calyx divided as in *O. cernua* var. *desertorum*. Corolla scarcely widened below the stamens which are inserted low down in the tube.

Red Sea Hills: Erkowit. Equatoria: Imatong Mountains.

132. LENTIBULARIACEAE

Terrestrial, epiphytic or aquatic usually perennial herbs, often with much-modified parts for the capture of small organisms (traps). Leaves entire or much divided, often producing bladders. Inflorescences racemose, bracteate, those of some aquatic species supported on the water by a whorl of modified spongy leaves (floats). Flowers hermaphrodite, zygomorphic. Calyx 2-5-lobed. Corolla gamopetalous, 2-lipped, spurred or saccate; lower lip usually larger than the upper, usually with a vaulted often much raised and 2-gibbous palate and a spreading or deflexed entire crenulate or lobed margin. Stamens 2, attached at the base of the corolla; filaments often winged on the outer side; anthers 2-locular, dorsifixed, the loculi sometimes confluent. Ovary superior; style terminal, short; stigma 2-lipped; ovules numerous on a free-basal placenta. Fruit a capsule, usually globose, opening by 2 valves or irregularly.

1. UTRICULARIA L.

- A. Terrestrial herbs with entire petiolate leaves:
 - B. Bracts not produced below the point of attachment; bracteoles 2:
 - C. Peduncle straight or flexuous, not twining; mouth of trap opposite the stalk:
 - (a) Upper corolla-lip constricted below the middle; traps plentifully fringed on both lips:
 - (b) Palate with transverse wrinkles *U. tribracteata*.
 - (bb) Palate smooth *U. exilis*.
 - (aa) Upper corolla-lip ovate; traps shortly and sparsely fringed on the upper lip only *U. firmula*.
 - CC Peduncle twining; mouth of trap close to the stalk and with two horn-like tentacles *U. schweinfurthii*.
 - BB Bracts produced below the point of attachment; bracteoles absent *U. subulata*.
- AA. Aquatic herbs with leaves divided into more or less thread-like segments:
 - D. Inflorescence held above the water by a whorl of inflated floats; leaves auricled:
 - (c) Leaf-auricles large, denticulate *U. thonningii*.
 - (cc) Leaf-auricles deeply cut into ciliate segments ... *U. stellaris*.

DD. Inflorescence without floats:

- (d) Peduncles with a whorl of stolons at its base; fruiting pedicels erect *U. exoleta*.
 (dd) Peduncle without a whorl of stolons at its base; fruiting pedicels reflexed *U. reflexa*.

Utricularia tribracteata Hochst. ex A. Rich.

Delicate dwarf terrestrial herb $1\frac{1}{2}$ - $4\frac{1}{2}$ in. high including the inflorescence; stolons finely thread-like, much branched, forming small matted tufts; rhizoids numerous from the base of the peduncle, $\frac{1}{4}$ - $\frac{1}{3}$ in. long. Leaves few at the base of the scape or scattered, or in very small tufts from the stolons usually decayed at the time of flowering; lamina spatulate-cuneate, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, rarely more than $\frac{1}{4}$ in. broad, gradually passing into a very slender petiole. Traps from the leaves (particularly the petioles) and stolons, globose-ovoid, up to $\frac{1}{4}$ in. long. Peduncle thread-like, simple, 1-4-flowered. Corolla purple or purple and yellow, $\frac{1}{2}$ - $\frac{1}{2}$ in. long.

Equatoria: Abu Satta Hills north of Tambura; Imatong Mountains, Kippia, 8500 ft.

U. exills Oliv.

Delicate very dwarf terrestrial herb; stolons thread-like. Leaves often decayed at the time of flowering, in small clusters at the base of the scape or scattered along the stolons, narrowly spatulate or strap-shaped, narrowed into a long slender petiole, up to $\frac{1}{2}$ in. long. Traps from the stolons and leaves, subglobose, $\frac{1}{3}$ - $\frac{1}{2}$ in. long. Scape thread-like, 1-2 in. high, 1-3-flowered, simple, rarely with 1-2 branchlets; flowers, if more than 1, distant. Corolla $\frac{1}{2}$ - $\frac{1}{2}$ in. long, white, yellow or more or less purplish, with a yellow palate sometimes streaked with purple.

Equatoria.

U. firmula Welw. ex Oliv.

Delicate annual terrestrial herb; rhizoids thread-like, more or less branched. Leaves in scanty rosettes at the base of the scape and scattered on the rhizoids, usually decayed at the time of flowering, obovate-spatulate to linear-spatulate, more or less gradually attenuate into a long slender petiole, with it up to $\frac{1}{2}$ in. long. Traps from the leaves and rhizoids, ovoid; mouth narrow. Scape thread-like, simple or branched with stiff or suberect branches, up to 8 in. high; flowers usually numerous, up to 20 or in branched specimens even more. Corolla about $\frac{1}{2}$ in. long, yellow with an orange palate.

Equatoria: about 14 miles N.W. of Uyanga village, Said Bundas.

U. schweinfurthii Bak. ex Stapf.

Delicate twining annual herb. Scape thread-like, up to 6 in. long; flowers few to 6, distant. Corolla pale-yellow, about $\frac{1}{2}$ in. long.

Equatoria.

U. subulata L.

Delicate dwarf subterrestrial herb 3-4 in. high; stolons in false whorls from the base of the scape, up to $\frac{3}{4}$ in. long; branches short, thread-like, with 1 or several branchlets, the latter frequently replaced by bladders. Leaves in a small rosette at the base of the scape (below the stolons), with a narrow linear-lanceolate lamina, up to $\frac{1}{4}$ in. long. Traps on the stolons, rarely on the leaves, ovoid; mouth small. Scape thread-like, straight, 2-6- (or rarely 1-) flowered; axis of inflorescence often flexuous or zig-zag. Corolla yellow, $\frac{1}{4}$ in. long.

Equatoria.

U. thonningii Schumach.

Submerged aquatic herb floating close to the surface; stems up to 12 or more in. long, thread-like. Leaves of more than one kind: normal leaves up to $\frac{1}{2}$ or more in. apart, 3-6-partite, auricled; rays up to $1\frac{1}{2}$ in. long; traps usually solitary from a lower part of a pinna: float-leaves in a false whorl of 6 or rarely fewer or more, $1\frac{1}{4}$ - $2\frac{1}{2}$ in. below the lowest flower, linear-oblong to oblong in outline, terete, $\frac{3}{4}$ -1 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. in diameter. Racemes few-many-flowered; peduncle below the floats 2-4 in. long or occasionally very short. Corolla yellow or white with purple veins, about $\frac{1}{4}$ in. long.

Central and Southern Sudan.

U. stellaris L. f.

Fig. 41.

U. incerta Kamienski.

Submerged aquatic herb floating near the surface; stems up to 12 or more in. long, thread-like. Leaves of different kinds: normal leaves up to $\frac{1}{2}$ or more in. apart, 4-6-partite, usually auricled; rays $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, thread-like; auricles orbicular-cordate in outline, up to $\frac{1}{4}$ in. in diameter; traps from the angles of the divisions, 1 or 2 with each pinna, obliquely globose-ovoid, up to $\frac{1}{2}$ in. in diameter: float-leaves in a false whorl of 4-6 or rarely fewer or more, usually $\frac{1}{4}$ - $\frac{1}{2}$ in. below the lowest flower, broad-ellipsoid to ovoid, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Raceme few- to 12-flowered; peduncle 1-9 in. long, slender. Corolla yellow, $\frac{1}{8}$ - $\frac{1}{4}$ in. long.

Central and Southern Sudan.

U. exoleta R. Br.

Aquatic herb floating in water or creeping on liquid mud; stolons of varying length, much branched; branches often clustered, from a few to 12 in. long, very slender, flat, green and leafy or bleached and almost naked. Leaves very variable in development, rarely more than $\frac{1}{2}$ in. long, very sparingly dissected, usually with 1 or several of the segments represented by traps or the whole leaf replaced by a trap; traps obliquely globose-ovoid, rarely more than $\frac{1}{2}$ in. long, the mouth truncate with delicate branched cilia. Raceme 2-3-flowered or reduced to a single flower; peduncle



Fig. 41—UTRICULARIA STELLARIS L. f.

A, flower. B, trap.

slender, thread-like, 2-3 or more in. long. Corolla yellow, about $\frac{1}{4}$ in. long.

Central and Southern Sudan.

U. reflexa Oliv.

Floating aquatic herb; stolons long, branched, often matted together, slender, glabrous. Leaves all alike, $\frac{1}{8}$ - $\frac{1}{2}$ in. apart, 2-5-partite, $\frac{1}{4}$ - $\frac{2}{3}$ in. long; traps rather conspicuous, numerous, up to 8 on a leaf, often from the forks of the leaf-divisions, very obliquely ovoid, dark-green or purplish. Scapes lateral, 1-6 in. long, slender, 1-2- or rarely 3-flowered. Corolla yellow, up to $\frac{1}{4}$ in. long.

Equatoria.

133. BIGNONIACEAE

Trees or shrubs, sometimes climbing, or very rarely herbs. Leaves without stipules, opposite, ternate or rarely alternate, usually, compound, digitate or pinnate, sometimes the terminal leaflet tendril-like. Flowers often showy, hermaphrodite, more or less zygomorphic. Calyx campanulate, closed or open in bud, truncate or 5-toothed. Corolla gamopetalous, with 5 imbricate lobes sometimes forming 2 lips, the upper of 2, the lower of 3 lobes. Stamens alternate with the corolla-lobes, only 4 or 2 perfect; anthers connivent in pairs or rarely free, 2-locular; staminode representing the fifth stamen often short, sometimes absent, or often 3 staminodes present when only 2 stamens. Disk usually present. Ovary superior, 2-locular with 2 placentas in each locus or 1-locular with parietal bifid placentas; style terminal; stigma 2-lipped; ovules numerous. Fruit capsular or fleshy and indehiscent; seeds often winged.

A. Calyx not spathaceous:

B. Ovary 1-locular; fruit indehiscent, sausage-shaped; seeds not winged KIGELIA. 2.

BB. Ovary 2-locular; fruit dehiscent; seeds winged:

(a) Ovules in 2 rows in each locus; septum of capsule cylindrical with deep pits in which the seeds are fitted STEREOSPERMUM. 5.

(aa) Ovules in 4-8 rows in each locus; septum of capsule flat FERNANDOA. 1.

AA. Calyx spathaceous:

(b) Ovules in many series; valves of the capsule boat-shaped; calyx recurved, acuminate, ribbed SPATHODEA. 4.

(bb) Ovules in 4-6 series; valves of the capsule flat; calyx beaked in bud MARKHAMIA. 3.

1. FERNANDOA Welw. ex Seem.

Fernandoa adolfi-friderici Gilg & Mildbr.

Tree up to 100 ft. high and 1½ ft. in bole-diameter; bark light-brown. Leaves opposite; leaflets in 4-6 pairs, ovate or ovate-oblong or oblong, acute or acuminate at the apex, more or less obliquely cuneate at the base into a petiolule, 2¼-4¼ in. long, usually glabrous except in the nerve-axils. Flowers bright-yellow with purple lines inside, appearing before the leaves, about 2 in. long, in few-flowered short or very short racemes. Calyx purplish. Anthers purple.

Equatoria: Azza Forest.

2. KIGELIA DC.

Kigelia aethiopum (Fenzl) Dandy, comb. nov. Sausage Tree. Fig. 42.

Sotor aethiopum Fenzl¹; *K. aethiopica* Decne.

Wide-spreading low-branched savannah tree up to 50 ft. high; bark stone-grey to pale-brown. Leaves in threes, up to 1½ ft. long;

¹In Langer & Schrötter, *Amtl. Ber. xxi Versamml. Deutsch. Naturforsch. & Aerzte (Gratz)*, p. 1-68 (1844).

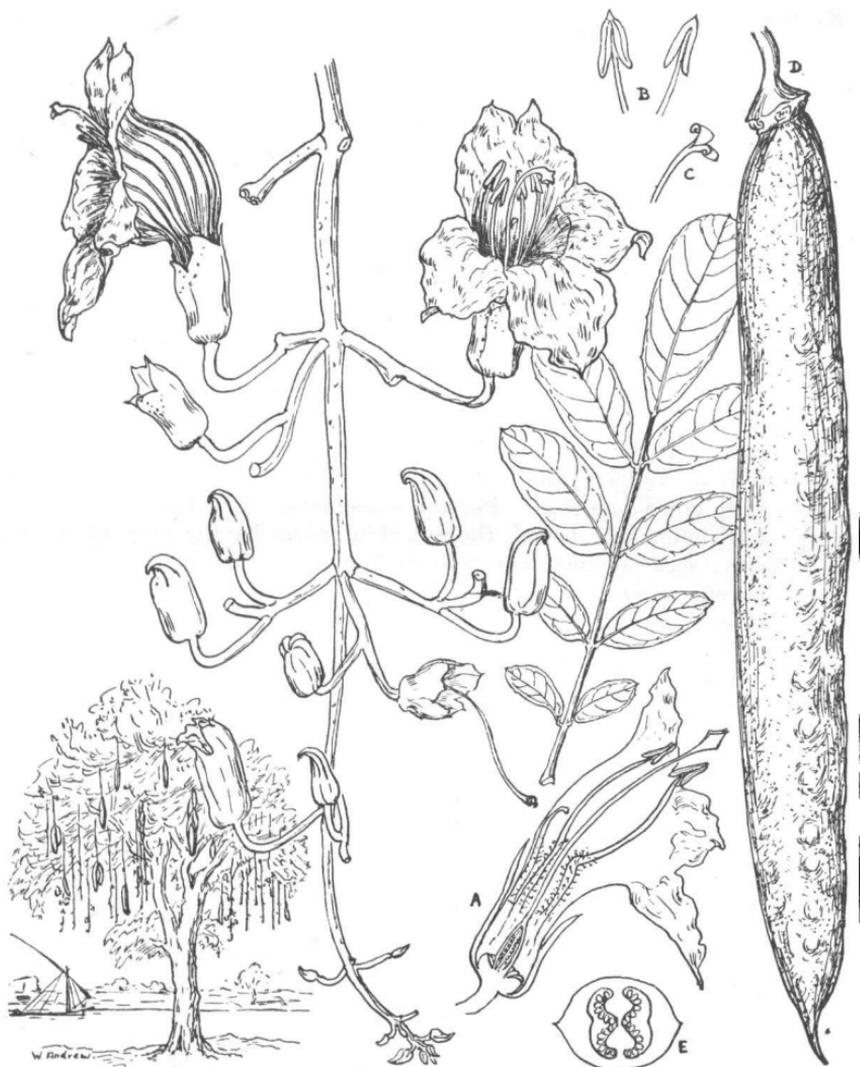


Fig. 42—*KIGELIA AETHIOPUM* (Fenzl) Dandy.

A, longitudinal section of flower. B, anthers. C, stigma. D, young fruit. E, transverse section of ovary.

leaflets usually 7-9, elliptic-oblong to obovate, rounded at the apex, 2½-5 in. long, scabrous. Flowers unpleasantly scented. Corolla pale with reddish lines outside, reddish-purple or maroon, up to 4½ in. long. Fruit grey-green, sausage-shaped, 1-3 ft. long, 3-4 in. broad, usually rounded at both ends, fibrous, slightly rough on the surface.

Central and Southern Sudan.

K. moosa Sprague.

Shrub or tree up to 30 ft. high; bark grey. Leaves opposite, up to 2½ ft. long; leaflets usually 11 or 13, elliptic-oblong to obovate, acuminate at the apex, 3-5 in. long, 1½-2¼ in. broad, scabrous. Flowers orange, fading to reddish. Fruit up to 15 in. long, 4 in. broad, sharp-pointed, usually curved.

Equatoria: *Laboni Forest*.

3. **MARKHAMIA** Seem. ex K. Schum.**Markhamia platycalyx** (Bak.) Sprague.

Tree up to 40 ft. high, rarely up to 60 ft.; bole fairly straight, fluted towards the base; bark grey-brown, flaking in irregular strips and patches. Leaves opposite, 8-18 in. long; leaflets 7-11, entire or slightly serrate, elliptic to oblong-lanceolate, 2-8 in. long; false stipules orbicular, foliaceous, up to 1½ in. in diameter, paired in the leaf-axils. Flowers yellow, striped and spotted with red, in axillary and terminal panicles. Calyx about 1 in. long, split down one side. Perfect stamens 4. Fruit capsular, up to 4 ft. long, ¾ in. broad, the flat thin valves having very prominent ribs; seeds oblong, about 1 in. long including the almost transparent wing.

Equatoria.

4. **SPATHODEA** Beauv.**Spathodea nilotica** Seem.

Tree up to 40 ft. high. Leaves pinnate, opposite or in threes; leaflets usually 9-13, ovate to ovate-oblong, acutely acuminate at the apex, 2½-5 in. long, 1-2 in. broad, densely tomentose beneath. Flowers showy, crimson or flame-coloured edged with yellow, in short dense terminal corymbose racemes. Calyx recurved, long-acuminate, 1½-2½ in. long, split down one side, tomentose. Corolla trumpet-shaped, 3½-5 in. long, with crisped lobes. Capsule lanceolate-oblong, 6-10 in. long, blackish-brown; seeds ¾ in. long including the almost transparent surrounding wing.

Equatoria.

5. **STEREOSPERMUM** Cham.**Stereospermum kunthianum** Cham.

Fig. 43.

Savannah tree 15-30 ft. high; bark grey, flaking to expose contrasting light patches. Leaves pinnate; leaflets 5-9, oblong to oblong-elliptic, usually 2-4 in. long and 1-2 in. broad but sometimes much larger, entire on adult trees, crenate-serrate on saplings. Flowers pale-pink or lilac, occasionally dark-pink or rarely almost white, fragrant, appearing before the leaves, borne in large drooping panicles. Calyx 5-lobed, ½ in. long. Corolla funnel-shaped, 1½-2 in. long, with 5 crumpled lobes bearing red or violet lines on their inner face. Capsule dark-brown, cylindrical, spirally twisted, 1½-2 ft. long, ¼ in. broad; valves very persistent; seeds 1-1½ in. long, winged at each end.

Central and Southern Sudan.



Fig. 43—*STEREOSPERMUM KUNTHIANUM* Cham.
A, seeds. B, stamens and pistil.

134. *PEDALIACEAE*

Annual or perennial herbs. Leaves without stipules, opposite or the upper alternate. Flowers hermaphrodite, zygomorphic. Calyx of 4 or 5 segments or spathaceous. Corolla gamopetalous, often oblique; lobes 5, imbricate. Stamens 4, or rarely only 2 perfect, alternate with the corolla-lobes; anthers connivent in pairs, the loculi distinct and parallel or divaricate; staminode representing the fifth stamen often present. Disk hypogynous, fleshy. Ovary superior, sessile, 1-locular with 2 intrusive parietal placentas or 2-4-locular with the loculi often divided by spurious septa; style terminal; ovules solitary or numerous on each placenta. Fruit a capsule or nut or subdrupaceous.

Sesame (*Sesamum indicum* L.) is cultivated in the Sudan.

- A. Loculi of the ovary and capsule very unequal, the posticous one small and indehiscent ROGERIA. 2.
- AA. Loculi of the ovary and capsule equal-sized:
- (a) Capsule acute or beaked, without lateral appendages SESAMUM. 3.
- (aa) Capsule with 2 divergent horns or prickles at the apex CERATOTHECA. 1.

1. **CERATOTHECA** Endl.**Ceratotherca sesamoides** Endl.

Erect or suberect branched herb $\frac{1}{2}$ -2 ft. high; stems pubescent. Leaves dentate, ovate-deltoid to ovate or linear-oblong, more or less truncate or hastate at the base, $1\frac{1}{4}$ - $2\frac{1}{2}$ in. long, pubescent, very densely mealy-glandular and glaucous or whitish beneath. Flowers pink or light-red-purple outside, paler with purple streaks inside, sometimes white, $\frac{3}{4}$ -1 in. long, solitary in the leaf-axils. Capsule about $\frac{3}{4}$ in. long, pubescent, the horns about $\frac{1}{2}$ in. long.

Central and Southern Sudan.

2. **ROGERIA** Gay ex Del.**Rogeria adenophylla** Gay ex Del.

Fig. 44.

Stout rather woody herb up to 6 or more ft. high; stems mealy-glandular in the upper part. Leaves broadly obovate, more or less 3-lobed, truncate or shortly cuneate at the base, 2-4 in. long and broad, mealy-glandular particularly beneath, glaucous and boldly 3-nerved or penninerved. Flowers tubular, pink, $1\frac{1}{2}$ -2 in. long, subsessile, 1-3 together in the leaf-axils. Capsule about 1 in. long, with 4 spreading horns below the middle, often with 4 smaller ones between.

Widespread.



Fig. 44—*ROGERIA ADENOPHYLLA* Gay ex Del.
A, flower opened out.

3. **SESAMUM L.****Sesamum alatum** Thonn.

Fig. 45.

Erect herb 2-3 ft. high; stems sulcate, 4-angled, finely glandular when young. Lower leaves digitately divided almost to the base, the upper ones undivided; segments linear-lanceolate or oblanceolate, 1-3 in. long, densely covered with small mealy glands beneath. Flowers pink or bright-red with a dark spot at the throat, about $1\frac{1}{4}$ in. long, solitary, axillary. Capsule $1\frac{1}{2}$ -2 in. long, long-beaked, strigillose; seeds muriculate, with a broad wing at each end.

Northern and Central Sudan.



Fig. 45—**SESAMUM ALATUM** Thonn

A, winged seeds.

S. radiatum Schumach.

Erect simple or branched herb up to 4 or more ft. high, more or less glandular-pubescent. Leaves not divided, sparingly and persistently hairy and mealy-glandular beneath; lower leaves coarsely toothed, ovate, acute at both ends, up to 2½ in. long, 1½ in. broad, on petioles up to 1 in. long; upper leaves entire or rarely dentate, lanceolate, up to 4 in. long, ¾ in. broad. Flowers reddish-purple, 1-1½ in. long, axillary, solitary. Capsule 1-1½ in. long, with a short broad beak; seeds not winged.

Equatoria.

S. angustifolium (Oliv.) Engler.

Erect branched herb several ft. high; stems sparingly pubescent or becoming glabrous, with very few sessile glands among the hairs. Leaves subsessile or the lowest shortly petiolate, linear to linear-lanceolate, acute or subacute at the apex, cuneate at the base, 1-3 in. long, sparingly pubescent above, more pubescent and glaucous with sessile glands beneath. Flowers dull-rose-coloured, 1-1½ in. long. Corolla obliquely campanulate, whitish-pubescent. Capsule ¾-1 in. long, pubescent, obtusely quadrangular, 4-sulcate, the beak slender; seeds not winged.

Central and Southern Sudan.

135. ACANTHACEAE

Erect or climbing herbs, rarely somewhat shrubby. Leaves without stipules, opposite, often with distinct cystoliths. Flowers hermaphrodite, zygomorphic, often with conspicuous bracts. Calyx-segments or lobes 4 or 5, imbricate or valvate, or rarely the calyx reduced to a ring. Corolla gamopetalous, often 2-lipped or sometimes 1-lipped; lobes imbricate or contorted. Stamens 4, didynamous, or 2 with or without imperfect stamens, inserted on the corolla-tube and alternate with its lobes; filaments free amongst themselves or partially connate in pairs; anthers 2-locular or 1-locular by reduction, the loculi confluent or separated, sometimes one much smaller than the other. Disk present. Ovary superior, sessile on the disk, 2-locular; style terminal; ovules 1 or more in each loculus. Capsule usually elastically dehiscent from the apex downwards, the valves recurved and leaving the central axis; seeds usually with a hardened funicle.

A. Corolla-lobes contorted in bud:

B. Perfect stamens 4:

C. Anther-loculi (at least two of them) tailed at the base:

(a) Ovules 3 or more in each ovary-loculus; anther-loculi 6 rounded and 2 long-tailed at the base

MIMULOPSIS. 19.

(aa) Ovules 2 in each ovary-loculus; anther-loculi all pointed and tailed at the base DYSCHORISTE. 9.

- CC. Anther-loculi not tailed at the base:
- D. Ovules superimposed in each ovary-loculus, or rarely 1:
- E. Ovules 3 or more in each loculus:
- F. Corolla 2-lipped:
- (b) Stems with whorls of spines
ASTERACANTHA. 2.
- (bb) Stems without spines HYGROPHILA. 13.
- FF. Corolla not 2-lipped:
- (c) Flowers axillary, running into quasi-terminal inflorescences:
- (d) Flowers in axillary scorpioid cymes running into a quasi-terminal panicle; leaves irregularly toothed EREMOMASTAX. 11.
- (dd) Flowers in small axillary clusters running into quasi-terminal spikes; leaves entire
HEMIGRAPHIS. 12.
- (cc) Flowers axillary, solitary or in cymes, not running into quasi-terminal inflorescences
RUELLIA. 26.
- EE. Ovules 1-2 in each loculus:
- (e) Placentas rising elastically from the base of the ripe capsule and throwing out the seeds
PHAULOPSIS. 24.
- (ee) Placentas not rising elastically from the base of the capsule:
- (f) Calyx divided nearly to the base, petaloid
WHITFIELDIA. 30.
- (ff) Calyx tubular, inflated, shortly 5-toothed, not petaloid SATANOCRATER. 28.
- DD. Ovules 2 and collateral in each ovary-loculus
THUNBERGIA. 29.
- BB. Perfect stamens 2:
- (g) Corolla conspicuously 2-lipped; ovules 3 or more in each ovary-loculus BRILLANTAISIA. 6.
- (gg) Corolla not 2-lipped; ovules 1-2 in each ovary-loculus
LANKESTERIA. 17.
- AA. Corolla-lobes imbricate in bud:
- G. Perfect stamens 4:
- H. Anthers (at least of one pair of stamens) 2-locular:
- I. Calyx divided more or less to the base into 5 segments:
- (h) Corolla conspicuously 2-lipped; inflorescences capitate or subcylindric, densely compounded of small scorpioid cymes LEPIDAGATHIS. 18.
- (hh) Corolla not conspicuously 2-lipped; flowers in 1-sided racemes frequently several forming a terminal panicle ASYSTASIA. 3.
- II. Calyx divided more or less into 2 segments
NEURACANTHUS. 22.
- HH. Anthers 1-locular:
- (i) Calyx-segments 5 CROSSANDRA. 7.

- (ii) Calyx-segments 4:
- (i) Seeds covered with rope-like hairy bundles which unroll when moistened BLEPHARIS. 5.
- (j) Seeds glabrous ACANTHUS. 1.
- GG. Perfect stamens 2, with or without 2 or 3 shorter imperfect stamens added:
- J. Anthers 2-locular:
- K. Anther-loculi at equal or nearly equal heights, the loculi not tailed:
- L. Ovules numerous in each ovary-loculus; sepals 4 NELSONIA. 21.
- LL. Ovules 1-2 in each ovary-loculus:
- (k) Calyx divided more or less to the base into 5 equal segments:
- (l) Bracts large, imbricate, enclosing the small calyx ECBOLIUM. 10.
- (ll) Bracts not as above ... PSEUDERANTHEMUM. 25.
- (kk) Calyx divided more or less to the base into 4 unequal segments BARLERIA. 4.
- KK. Anther-loculi at unequal heights:
- M. Anther-loculi tailed at the base:
- (m) Capsule 4-seeded; seeds rough or tubercled JUSTICIA. 16.
- (mm) Capsule 2-seeded; seeds smooth MONECHMA. 20.
- MM. Anther-loculi not tailed at the base:
- N. Corolla-tube twisted with the anterior lobe at the back:
- (n) Placentas rising elastically in fruit and throwing out the seeds DICLIPTERA. 8.
- (nn) Placentas not rising elastically in fruit PERISTROPHE. 23.
- NN. Corolla-tube not twisted ISOGLOSSA. 15.
- JJ. Anthers 1-locular:
- (o) Flowers appearing as though enclosed between 2 opposite bracts which are often connate into a tube HYPOESTES. 14.
- (oo) Flowers not appearing as above; bracts very small RUSPOLIA. 27.

1. ACANTHUS L.

Acanthus arboreus Forsk.

Stout pubescent or almost glabrous shrub 3-19 ft. high. Leaves pinnatifid half-way down or lobed, with a doubly spinous margin, up to 12 in. long and 6 in. broad (often only half this size); petiole up to $\frac{1}{2}$ in. long. Flowers rose or pale-purple, $1\frac{1}{2}$ in. long, in 1-3 terminal often pubescent spikes 3-10 in. long; bracts ovate-lanceolate, acuminate at the apex, more or less densely tomentose, $1\frac{1}{2}$ in. long, with many strong spines on the margin $\frac{1}{2}$ in. long; bracteoles spinous on the margin. Abaxial calyx-segment 1 in. long with entire tip. Capsule $\frac{2}{3}$ in. long, $\frac{1}{3}$ in. broad.

Fung District.

A. montanus (Nees) T. Anders.

Similar to *A. arboreus* but the bracts more glabrous and with fewer spines on the margin.

Equatoria.

A. eminens C. B. Clarke.

Almost glabrous shrub 6-8 ft. high. Leaves pinnatifid, spinous, 10 in. long, 4 in. broad. Flowers 2 in. long, in spikes 9 in. long and 2½ in. broad; bracts ovate, scarcely 1 in. long, with several spines on the margin; bracteoles ¼ in. long, subulate, not spinous. Calyx soft, not spinous, the lobes of the abaxial segment short and rounded.

Equatoria: Torit.

2. **ASTERACANTHA** Nees**Asteracantha longifolia** (L.) Nees.

Hygrophila spinosa T. Anders.

Stout erect herb of wet places, 2-3 or up to 6 or more ft. high; stems stout, erect, 4-angled, usually hispid. Leaves oblanceolate, acute at the apex, tapering very gradually to the base, 3-14 in. long, ¼-1¼ in. broad, sparingly hispid on both surfaces. Flowers bluish or purple, 1-1¼ in. long, in dense axillary clusters with usually 6 strong spines in each whorl and many lanceolate or linear bracts. Capsule about ¼ in. long, linear-oblong, 4-8-seeded.

Central and Southern Sudan.

3. **ASYSTASIA** Bl.**Asystasia gangetica** (L.) T. Anders.

A. coromandeliana Nees.

Perennial herb 1-4 ft. high or often scrambling. Leaves ovate or ovate-triangular, rounded or truncate at the base, 1½-3½ in. long, 1-2 in. broad, pubescent to almost glabrous on both surfaces. Flowers white with a pale-violet mark on the lower lip, about ¾ in. long, tending to be on one side of the stem in racemes 2-6 in. long, frequently several of these forming a terminal panicle. Capsule 1 in. long, pubescent.

Central and Southern Sudan.

4. **BARLERIA** L.

A. Interpetiolar spines present:

- B. Spines in fours on stalks often longer than the spines themselves *B. tetraglochis*.

BB. Spines not as above:

C. Capsule never having more than 2 seeds:

- D. Bracts next the calyx rigid spines, simple or rarely with one lateral basal spiny tooth:

- (a) Stems and leaves covered with a dense white tomentum ...

B. candida.

(aa) Stems and leaves not so covered:

(b) Corolla 2-lipped:

(c) Floral leaves elliptic or oblong or oblanceolate, hardly imbricate:

(d) Spines of barren shoots $\frac{1}{4}$ - $\frac{3}{4}$ in. long ... *B. prionitis*.

(dd) Spines of barren shoots often paired, up to 1 in. long *B. diacantha*.

(cc) Floral leaves broadly ovate, imbricate
B. trispinosa.

(bb) Corolla subequally 5-lobed, yellow ... *B. eranthemoides*.

DD. Bracts next the calyx linear spines, often with 1-2 spinous teeth *B. triacantha*.

CC. Capsule with more than 2 seeds:

(e) Bracts next the calyx simple spines *B. grandicalyx*.

(ee) Bracts next the calyx toothed or pinnatifid spines
B. acanthoides.

AA. Spines absent; bracts and sepals entire or scarcely toothed:

E. Capsule never having more than 2 seeds:

(f) Leaves sessile, ovate-elliptic *B. parviflora*.

(ff) Leaves shortly petiolate, elliptic *B. hochstetteri*.

EE. Capsule with more than 2 seeds:

(g) Leaves glabrous or with small bristles on the nerves
B. calophylla.

(gg) leaves strigose with tawny hairs *B. ventricosa*.

***Barleria tetraglochin* Milne-Redh.**

Woody spinous perennial herb; stems up to $1\frac{1}{2}$ or more ft. high. Leaves subsessile, oblanceolate, acute and mucronate at the apex, narrowed at the base, about $1\frac{1}{2}$ in. long, densely covered with cystoliths above, sparsely and minutely strigose beneath, the margin minutely strigose-ciliate. Flowers white, about $1\frac{1}{2}$ in. long, 2-lipped, axillary, in 1-2-flowered inflorescences.

Nuba Mountains. Fung District.

***B. candida* Nees.**

White-tomentose spinous undershrub. Leaves subsessile or shortly petiolate, suborbicular, mucronate at the apex, about $\frac{1}{2}$ in. broad, densely white-tomentose on both surfaces. Flowers white.

Khartoum: rocky hills.

***B. prionitis* L.**

Glabrous or slightly hairy spinous herb 1-3 ft. high. Leaves sessile or shortly petiolate, entire, elliptic, narrowed at both ends, up to 7 in. long and 2 in. broad but usually much smaller, covered with cystoliths; floral leaves glabrous or with a few stiff erect hairs. Flowers buff-coloured, in short or long simple spikes, frequently with solitary flowers in the lower distant axils. Capsule $\frac{1}{2}$ - $\frac{3}{4}$ in. long, ovoid-conic, beaked, 2-seeded.

Nuba Mountains: Jebel Daier.

B. diacantha Hochst. ex Nees.

Fig. 46.

Similar to *B. prionitis* but the interpetiolar spines often paired and the floral leaves obovate-lanceolate, spine-tipped and rigid.
Red Sea Hills: Erkowit.

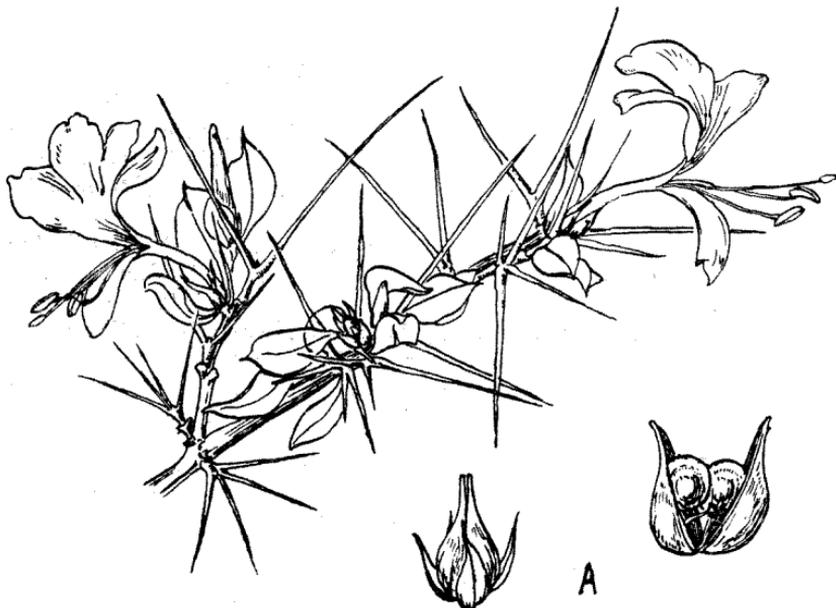


Fig. 46—*BARLERIA DIACANTHA* Hochst. ex Nees.

A, fruit, before and after dehiscence.

B. trispinosa (Forsk.) Vahl.

Similar to *B. prionitis* but the flowers in terminal strobilate heads 1-2 in. long and the floral leaves ovate from a rounded base, $\frac{3}{4}$ in. long, $\frac{1}{2}$ in. broad, imbricate.

Red Sea Hills: near Erkowit.

B. eranthemoides R. Br. ex C. B. Clarke.

Similar to *B. prionitis* in habit but the corolla-tube 1 in. long, linear to the top, not slit on one side, with 5 yellow subequal elliptic lobes $\frac{1}{2}$ - $\frac{3}{4}$ in. long, not at all 2-lipped.

Equatoria.

B. triacantha Hochst. ex Nees.

Small harsh shrub; internodes of branches short, minutely and densely hairy. Leaves obovate, subsessile, $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. broad, densely hairy when young, less so when mature. Flowers solitary, axillary. Adaxial and abaxial calyx-segments spinous on the margin, the two interior hardly half as long and not spinous.

Red Sea Hills.

B. grandicalyx Lindau.

Herb; branches up to 12 in. long, hispid; spines simple, hairy, straight or curved near the top. Leaves petiolate, elliptic to ovate, obtuse-triangular at the apex, narrowed at the base, 2 in. long, 1 in. broad, with short and long white and tawny hairs. Flowers pale-blue, solitary. Adaxial calyx-segment $\frac{3}{4}$ in. long, $\frac{1}{2}$ in. broad, coarsely spinous-toothed in the upper half. Corolla scarcely 2-lipped; tube $\frac{3}{4}$ in. long.

Darfur. Equatoria.

var. **vix-dentata** C. B. Clarke.

Leaves usually 1 in. long. Adaxial calyx-segment $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, hardly at all toothed.

Southern Sudan.

B. acanthoides Vahl.

Harsh prickly branched undershrub; branches densely canescent. Leaves oblong-elliptic, obtuse and mucronate at the apex, narrowed at the base, 1-2 in. long, more or less densely pubescent particularly beneath. Flowers white, in 1-8-flowered condensed unilateral scorpioid racemes; bracts appearing as flattened toothed more or less leaf-like or pinnatifid spines. Corolla-tube often 3 or more in. long. Capsule $\frac{1}{2}$ in. long, 4-seeded.

Northern and Central Sudan.

B. parviflora R. Br. ex T. Anders.

Perennial herb; branches with closely appressed white hairs. Leaves sessile, ovate-elliptic, obtuse at the apex, rounded at the base, when young with some medifixed hairs on the margin, glabrous when mature. Flowers purple, about $\frac{3}{4}$ in. long, in lax 1-3-flowered cymes. Capsule $\frac{1}{2}$ in. long, pubescent, beaked.

Red Sea Hills: Erkowit.

B. hochstetteri Nees.

Small branched shrub; young branches canescent with minute strigillose hairs. Leaves elliptic, obtuse at the apex, narrowed at the base into a petiole $\frac{1}{2}$ - $\frac{1}{3}$ in. long, up to $1\frac{3}{4}$ in. long, $\frac{3}{4}$ in. broad. Flowers pale-pink with a crimson spot in the throat, in lax few-flowered cymes. Corolla-tube $\frac{1}{2}$ in. long; lobes $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Capsule about $\frac{1}{2}$ in. long.

Northern and Central Sudan.

B. calophylla Lindau.

More or less glabrous herb from a woody rootstock; branches 15 in. long. Leaves sessile, oblong, scarcely acute at the apex, narrowed or rounded or cordate at the base, up to 4 in. long, $1\frac{1}{2}$ in. broad. Flowers white flushed with pink, in 1-3-flowered racemes condensed in the upper axils and running into an oblong head. Corolla-tube $1\frac{1}{2}$ in. long; lobes $1\frac{1}{2}$ in. long. Capsule $\frac{3}{4}$ in. long, stout.

Equatoria.

B. ventricosa Hochst. ex Nees.

B. grantii (non Oliv.) Broun & Massey.

Erect herb; stems strigose with tawny hairs. Leaves yellow-green, elliptic, narrowed at both ends, 2 in. long, $\frac{3}{4}$ in. broad, strigose on both surfaces with tawny hairs. Flowers blue, in short 1-3-flowered cymes scattered in the remoter axils and in the upper ones running into dense spikes. Corolla-tube $\frac{3}{4}$ -1 in. long; lobes $\frac{1}{2}$ in. long. Capsule $\frac{1}{2}$ in. long, compressed, ellipsoid, narrowed at each end.

Nuba Mountains. Equatoria.

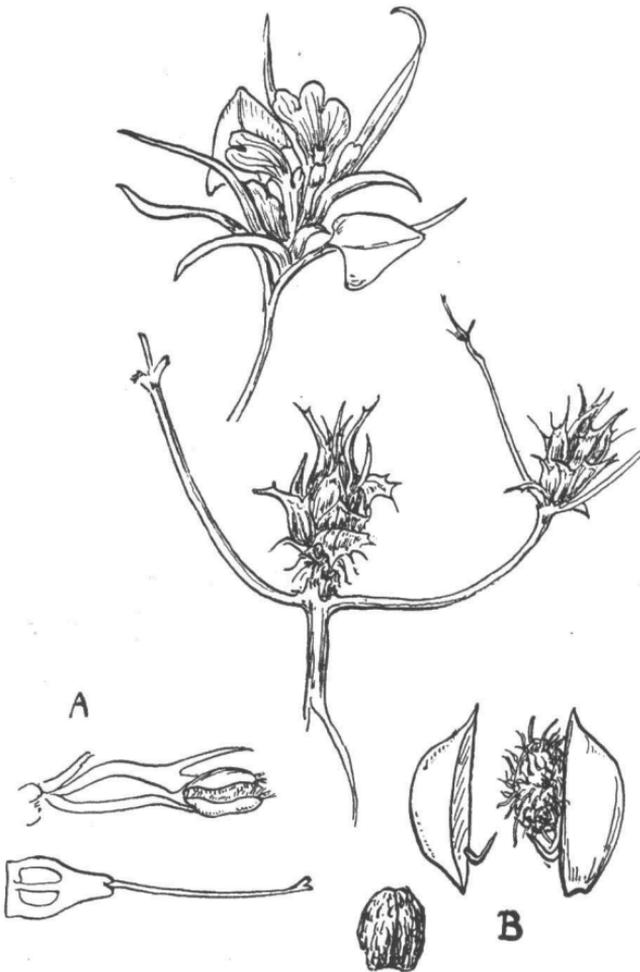


Fig. 47—BLEPHARIS LINARIIFOLIA Pers.
A, stamens and pistil. B, fruit, opened.

5. BLEPHARIS Juss.

Blepharis linariifolia Pers.

Fig. 47.

Low-growing coarse woody undershrub about 12 in. high, hairy on the younger parts. Leaves entire or sparingly toothed, sometimes with a few small spines, linear, up to $4\frac{3}{4}$ in. long, $\frac{3}{4}$ in. broad, scabrous-setose above, glabrous beneath except on the midrib. Flowers blue or lilac, $\frac{3}{4}$ -1 in. long, arranged like pine-cones (strobilate) in inflorescences 1-3 in. long and $\frac{3}{4}$ in. broad often in the forks of branches; bracts ovate, $\frac{3}{4}$ -1 in. long, suddenly and shortly acuminate, more or less recurved, spinous.

Central Sudan.

B. maderaspatensis (L.) Heyne ex Roth.

B. boerhaviaefolia Juss.

Usually procumbent woody herb, coarsely pubescent on the younger parts. Leaves about 4 in a whorl, obovate or broadly oblanceolate, rounded to acutely acuminate at the apex, up to $2\frac{1}{2}$ in. long, $\frac{3}{4}$ in. broad, scabrous above, sparingly setulose beneath and on the margin. Flowers white, $\frac{1}{2}$ in. long, in short finely spiny spikes about $\frac{1}{2}$ in. long; bracts broadly obovate, with long stiff bristles on the margin, the bristles with short *reflexed hairs*.

Widespread.

B. persica (Burm. f.) Kuntze.

Fig. 48.

B. edulis (Forsk.) Pers.

Grey-pubescent or nearly glabrous woody herb; stems short, rigid, branched. Leaves in fours at the sterile nodes; the upper pair sessile, spinous-margined, oblong or narrow-elliptic, 2 in. long, $\frac{1}{2}$ in. broad, the lower pair smaller but similar. Flowers blue, $\frac{3}{4}$ or rather more in. long, in strobilate inflorescences up to 4 in. long; bracts ovate, acuminate at the apex, 1-1 $\frac{1}{2}$ in. long, spinous.

Northern and Central Sudan.

6. BRILLANTAISIA Beauv.

Brillantaisia nyanzarum Burkill.

Riparian herb up to 10 ft. high; stems glandular-pubescent above. Leaves regularly dentate-serrate, ovate, more or less acuminate at the apex, narrowed into a petiole, up to 13 in. long, 8 in. broad but usually much smaller, sparsely pubescent above, pubescent beneath. Flowers violet, in lax panicles with very glandular-pubescent short lateral branches. Corolla-tube $\frac{1}{2}$ in. long; lips 1 in. long. Staminodes with a few glandular hairs.

Equatoria.



Fig. 48—BLEPHARIS PERSICA (Burm. f.) Kuntze.

B. emini Lindau.

Tall herb; stems pilose above. Upper leaves sessile, ovate, acuminate at the apex, cordate at the base, pilose. Flowers blue or violet in loose glandular panicles. Corolla-tube $\frac{1}{2}$ in. long; lips 1-1 $\frac{1}{2}$ in. long, both with glandular hairs outside. Staminodes densely glandular.

Equatoria.

7. **CROSSANDRA** Salisb.

Crossandra subacaulis C. B. Clarke.

C. nilotica var. *acuminata* S. Moore.

Almost stemless herb. Leaves basal, crowded, sessile, narrowly obovate, obtuse to rounded at the apex, up to 8 in. long, 2 $\frac{1}{4}$ in. broad, pilose on both surfaces, more densely so beneath. Flowers salmon-pink, in spikes up to 4 in. long on peduncles up to 10 in. long. Corolla-tube $\frac{3}{4}$ - $\frac{1}{2}$ in. long; lobes $\frac{1}{2}$ in. long.

Southern Sudan.

8. **DICLIPTERA** Juss.**Dicliptera verticillata** (Forsk.) Christens.*D. micranthes* Nees.

Herb 1-2 ft. high; stems 6-angular, the angles whitish, glabrous or sparsely hairy. Leaves elliptic, narrowed at both ends, $1\frac{1}{2}$ -3 in. long, 1-2 in. broad, glabrous or nearly so; petiole 1- $1\frac{1}{2}$ in. long. Flowers pink, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, in spikelets forming dense terminal and axillary globose heads $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter; 2 bracts of spikelet $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Capsule $\frac{1}{8}$ in. long.

*Central and Southern Sudan.***D. maculata** Nees.

Herb 2-3 ft. high; stems glabrous or hairy. Leaves ovate-lanceolate, cuneate at the base, $3\frac{1}{2}$ in. long, $1\frac{1}{4}$ in. broad, glabrous or sparsely hairy; petiole up to 1 in. long. Flowers white to purple, $\frac{3}{8}$ - $\frac{3}{4}$ in. long; spikelets solitary or several fairly close together on axillary and terminal peduncles 1-3 in. long.

*Fung District: Fazoghli.***D. umbellata** (Vahl) Juss.

Similar to *D. verticillata* but the heads of spikelets loose, not dense, and the 2 bracts of the spikelet more unequal, the lower one often $\frac{1}{2}$ - $\frac{5}{8}$ in. long.

*Equatoria: Imatong Mountains.***D. pumila** (Lindau) Dandy.*Peristrophe usta* C. B. Clarke.

Small pubescent herb; branches 3-5 in. long, very numerous, arising after grass-fires from a woody rootstock. Leaves elliptic, up to 1 in. long, narrowed to the base; petiole up to $\frac{1}{2}$ in. long. Spikelets 1-flowered, in mainly terminal lax spikes up to 1 in. long and $\frac{1}{2}$ in. broad; bracts $\frac{1}{2}$ in. long, linear-oblong. Calyx scarcely $\frac{1}{2}$ in. long. Corolla mauve, $\frac{1}{2}$ in. long, slender. Capsule $\frac{3}{4}$ in. long.

*Equatoria.*9. **DYSCHORISTE** Nees**Dyschoriste perrottetii** (Nees) Kuntze.

Herb or undershrub 1-3 ft. high, sometimes decumbent and rooting at the lower nodes. Leaves lanceolate or oblanceolate, obtuse at the apex, up to $3\frac{1}{2}$ in. long, $\frac{7}{8}$ in. broad, glabrous. Flowers pink or purplish or white with purple markings, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, 3 or more in each leaf-axil, sessile or subsessile. Capsule $\frac{1}{2}$ - $\frac{1}{2}$ in. long, suberect, glabrous.

Central and Southern Sudan.

10. **ECBOLIUM** Kurz**Ecboium viride** (Forsk.) Alston.

Fig. 49.

E. linneanum Kurz.

Undershrub or shrub. Leaves varying from narrowly oblong to broadly ovate, triangular and obtuse at the apex, narrowed at the base into a petiole, variable in size, often 3 in. long and $1\frac{1}{2}$ in. broad; petiole up to $\frac{1}{2}$ in. long. Flowers crowded in spikes often 4 in. long and 1 in. broad; bracts ovate, apiculate at the apex, $\frac{3}{4}$ in. long, $\frac{2}{3}$ in. broad, often pubescent. Corolla-tube $\frac{1}{2}$ -1 in. long, linear to the top. Capsule $\frac{3}{4}$ in. long.

*Red Sea District.***E. anisacanthus** (Schweinf.) C. B. Clarke.

Small undershrub; branches minutely and densely white-hairy. Leaves lanceolate, narrowed at both ends, $1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, densely and minutely hairy. Flowers blue, in 8-12-flowered terminal spikes $1\frac{3}{4}$ in. long and $\frac{1}{2}$ in. broad; bracts elliptic, acute at both ends, $\frac{1}{2}$ in. long, about $\frac{1}{3}$ in. broad. Corolla-tube $\frac{1}{2}$ in. long, linear-cylindric. Capsule $\frac{1}{2}$ in. long, obovoid, compressed, hairy.

*Red Sea District.*11. **EREMOMASTAX** Lindau**Eremomastax polysperma** (Benth.) Dandy, comb. nov.*Paulowilhelmia polysperma* Benth.¹; *P. sclerochiton* (S. Moore) Lindau.

Coarse herb up to 5 ft. high. Leaves irregularly toothed or lobed, ovate, truncate or subcordate at the base, 2-5 in. long, sparsely pubescent or nearly glabrous; petiole 1-2 $\frac{1}{2}$ in. long. Flowers blue, in lax divided subscorpioid cymes 1-2 $\frac{1}{2}$ in. long. Corolla-tube 1-1 $\frac{1}{2}$ in. long, linear; lobes elliptic, $\frac{1}{2}$ in. long. Capsule about $\frac{1}{2}$ in long, usually 4-8-seeded.

*Equatoria.*12. **HEMIGRAPHIS** Nees**Hemigraphis abyssinica** (Hochst.) C. B. Clarke.

Pubescent wiry herb; branches 4-12 in. long. Leaves sessile, elliptic, $\frac{2}{3}$ in. long, about $\frac{1}{2}$ in. broad. Flowers about $\frac{1}{2}$ in. long, in spikes 2-4 in. long. Capsule $\frac{1}{2}$ in. long, narrowly oblong.

*Central and Southern Sudan.***H. schweinfurthii** (S. Moore) C. B. Clarke.

Pubescent erect herb $\frac{1}{2}$ -1 ft. high. Leaves lanceolate, tapering at both ends, up to 2 $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad. Flowers in dense axillary and quasi-terminal heads $\frac{1}{2}$ in. in diameter; bracts oblong, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Corolla less than $\frac{1}{2}$ in. long. Capsule oblong-lanceolate, $\frac{1}{2}$ in. long, 10-12-seeded.

*Southern Sudan.*¹In Hook., *Niger Fl.*, p. 479 (1849).



Fig. 49—*ECBOLIUM VIRIDE* (Forsk.) Alston.
 A. fruit and two seeds. B. stamens and pistil.

13. **HYGROPHILA** R. Br.**Hygrophila coerulea** (Hochst.) T. Anders.

Much-branched rather woody low pubescent herb. Leaves sessile, narrowly obovate, $\frac{1}{2}$ -1 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, pilose. Flowers about $\frac{1}{3}$ in. long, in short terminal spikes often very small on the lateral branches. Capsule $\frac{1}{3}$ in. long.

Central Sudan.

H. uliginosa S. Moore.

Herb; stems erect, with few leaves, somewhat hispid below, becoming more so above. Leaves sessile or very shortly petiolate, lanceolate, or in the upper part of the stems linear-lanceolate, $2\frac{1}{2}$ -3 in. long, $\frac{3}{8}$ - $\frac{3}{4}$ in. broad, with scattered rough hairs on both surfaces. Flowers purple, whorled, 4-12 at a node. Corolla-lips about $\frac{1}{3}$ in. long, pubescent outside.

Equatoria.

H. acutisepala Burkill.

Stems erect, pubescent. Leaves lanceolate, 2 in. long, about $\frac{3}{4}$ in. broad, scabrid-pubescent on both surfaces; petiole up to $\frac{1}{4}$ in. long in the lower leaves. Flowers whorled, usually 6 at a node. Corolla-lips nearly $\frac{1}{2}$ in. long, pubescent outside.

Equatoria.

14. **HYPOESTES** Soland. ex R. Br.**Hypoestes aristata** (Vahl) Soland. ex Roem. & Schult.

Pubescent undershrub 8-30 in. high. Leaves ovate, narrowed at both ends, 1-2 in. long, $\frac{1}{2}$ -1 in. broad; petiole up to 1 in. long. Flowers white, dotted with mauve, $\frac{3}{8}$ -1 or more in. long, in axillary heads of numerous 1-flowered spikelets frequently with reduced petiolate leaves $\frac{1}{3}$ in. long; 2 bracts of spikelet free, with long green points. Capsule $\frac{1}{2}$ in. long, glabrous; seeds smooth.

Equatoria: Imatong Mountains, Itobol, edge of forest, 6550 ft.

H. cancellata Nees.

More or less pilose herb; stems up to 2 ft. long, often in pairs. Leaves sessile or shortly petiolate, oblong, narrowed at both ends, up to 2 in. long, $\frac{1}{3}$ in. broad. Flowers red or purple, $\frac{3}{8}$ - $\frac{3}{4}$ in. long; heads mainly terminal (a few axillary added), up to $1\frac{1}{2}$ in. long, $\frac{3}{4}$ in. broad, very dense, in congested panicles, prominently yellow-hispid; spikelets 1-flowered; 2 bracts of spikelet free, with linear green points. Capsule $\frac{1}{4}$ in. long, very slender; seeds tubercled.

Equatoria.

H. triflora (Forsk.) Roem. & Schult.

Straggling herb; stems ribbed, laxly pilose or almost glabrous. Leaves entire or crenulate, obscurely toothed, ovate, up to 3 in. long, 1½ in. broad, hispid with scattered white hairs; cystoliths irregularly scattered, conspicuous. Flowers white with purple lines, ¾ in. long, in heads of 1-5 (often 3) 1-flowered spikelets often apparently terminal on lateral branches ½-2 in. long; 2 bracts of spikelet free, ⅓ in. long, narrowly obovate-oblong. Capsule ½ in. long; seeds 4, tubercled.

Equatoria: *Imatong Mountains*, 8000-10,000 ft.

H. strobilifera S. Moore.

Herb, closely pubescent; stems 1-2 ft. high. Leaves linear or linear-oblong, often rounded at the base, up to 5½ in. long, ½ in. broad; cystoliths on both surfaces numerous, prominent; petiole up to ⅓ in. long. Flowers ⅔ in. long, in densely strobilate ovoid terminal heads 1-1½ in. long; 2 bracts of spikelet free.

Equatoria.

H. verticillaris (L. f.) Soland. ex Roem. & Schult.

H. forskalei (Vahl) Soland. ex Roem. & Schult.

Herbaceous undershrub 1-3 ft. high, pubescent, becoming glabrous. Leaves elliptic, acuminate to an obtuse point, up to 4 in. long, 1¾ in. broad, almost glabrous. Flowers white, purple-streaked, ½-¾ in. long, in spikelets forming unilateral axillary cymes ½-1½ in. long and also running into narrow terminal panicles; 2 bracts of spikelet united for half their length into a tube. Capsule ¼ in. long; seeds smooth.

Central and Southern Sudan.

15. **ISOGLOSSA** Oerst.**Isoglossa ovata** E. A. Bruce.

Erect herb up to 5 ft. high; branches becoming glabrous. Leaves petiolate or the upper ones subsessile, ovate, acute or acuminate at the apex, rounded to very acute at the base, up to 4 in. long, 2¼ in. broad, more or less strigose-pubescent on both surfaces. Flowers white or rose, up to 1 in. long, in lax terminal and axillary panicles. Capsule about ½ in. long, becoming glabrous.

Equatoria: *Imatong Mountains*, 6400-9000 ft.

16. **JUSTICIA** L.

- A. Spikes strobilate, i.e. flowers arranged like a pine-cone:
- B. Bracts white, reticulated with green nerves; spikes more than 1 in. long:
- (a) Leaves often petiolate; shrubby herb 1½-2 ft. high *J. betonica*.
- (aa) Leaves sessile; small procumbent herb *J. trinervia*.
- BB. Bracts green, reticulate-veined; spikes up to 1 in. long *J. tenella*.

- AA. Spikes not strobilate:
- C. Flowers in terminal or quasi-terminal spikes or panicles:
- D. Flowers in spikes interrupted at the base:
- (b) Bracts and bracteoles densely hairy *J. nyassana*.
- (bb) Bracts and bracteoles pubescent or sparsely pubescent:
- (c) Sepals hispid and also with minute moniliform hairs
J. flava.
- (cc) Sepals hispid, without moniliform hairs ... *J. palustris*.
- DD. Flowers in compound panicles *J. glabra*.
- CC. Flowers or inflorescences axillary:
- E. Flowers in weak axillary one-sided spikes, a few distant and solitary:
- (d) Nearly glabrous herb; leaves linear to lanceolate or oblong *J. anselliana*.
- (dd) Pilose or pubescent herb; leaves elliptic to ovate
J. matammensis.
- EE. Flowers solitary or clustered:
- F. Capsule $\frac{1}{2}$ in. long; flowers yellow *J. odora*.
- FF. Capsule less than $\frac{1}{2}$ in. long; flowers not yellow:
- G. Capsule villous *J. whytei*.
- GG. Capsule glabrous or shortly pubescent:
- (e) Corolla more than $\frac{1}{4}$ in. long:
- (f) Sepals $\frac{1}{2}$ - $\frac{3}{4}$ in. long, broadly lanceolate
J. schimperi.
- (ff) Sepals $\frac{1}{4}$ or more in. long, linear *J. galeopsis*.
- (ee) Corolla less than $\frac{1}{4}$ in. long:
- (g) All capsules normal, 4-seeded *J. kotschyi*.
- (gg) Normal capsules mixed with abnormal 1-seeded ones *J. heterocarpa*.

Justicia betonica* L.J. betonicoides* C. B. Clarke.

Shrubby nearly glabrous herb 1½-2 ft. high. Leaves lanceolate to ovate, 2-4 in. long, $\frac{1}{4}$ -1½ in. broad. Flowers white, rose-spotted, $\frac{1}{2}$ in. long, in strobilate spikes 4½ in. long and $\frac{3}{4}$ in. broad; bracts somewhat 4-ranked, ovate, acute at the apex, $\frac{1}{2}$ in. long. Capsule $\frac{1}{2}$ in. long.

*Kordofan. Equatoria.****J. trinervia* Vahl.**

Small procumbent nearly glabrous herb. Leaves sessile, oblong-elliptic, obtuse at the apex, 1½ in. long, $\frac{1}{3}$ in. broad. Flowers in strobilate spikes 1½ in. long, $\frac{1}{2}$ in. broad; bracts ovate, acute at the apex, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, green-veined.

*Fung District.****J. tenella* (Nees) T. Anders.**

Slender nearly glabrous herb; stems 4-12 in. long, creeping and rooting at the lower nodes. Leaves ovate-triangular, obtuse at the apex, slightly decurrent at the base, up to 1 in. long, $\frac{3}{4}$ in. broad;

petiole up to $\frac{1}{2}$ in. long. Flowers bluish-white, about $\frac{1}{2}$ in. long, in very dense strobilate spikes $\frac{1}{2}$ -1 in. long; bracts somewhat 4-ranked, $\frac{1}{2}$ in. broad, obovate, rounded or subtruncate at the apex. Capsule $\frac{1}{2}$ in. long, glabrous; seeds smooth.

Equatoria.

J. nyassana Lindau.

Herb 1-3 ft. high; stems striate, glabrous or nearly so. Leaves ovate-lanceolate, shortly decurrent into a petiole, up to 3 in. long, $1\frac{1}{2}$ in. broad, sparsely pilose above, more densely so beneath. Flowers pale-pink, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, in terminal spikes continuous or interrupted at the base, the lower whorls sometimes distant and passing into axillary clusters; bracts lanceolate or linear-lanceolate, very acute at the apex and covered with yellow hairs.

Equatoria: Imatong Mountains, Ibahin, 6500 ft.

J. flava (Vahl) Vahl.

Erect or straggling perennial herb 1-4 ft. high, with pubescent sulcate stems. Leaves ovate-lanceolate, shortly decurrent into a petiole, pubescent on both surfaces, up to 4 in. long, $1\frac{1}{2}$ in. broad; petiole up to $\frac{5}{8}$ in. long. Flowers yellow, in terminal spikes 4-8 in. long continuous or interrupted at the base, the lower whorls sometimes distant and passing into axillary clusters; bracts broad-lanceolate to linear-oblong, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, subtending 1-3 flowers. Capsule about $\frac{1}{2}$ in. long, densely retrorse-hairy.

Widespread.

J. palustris (Hochst.) T. Anders.

Similar to *J. flava* but the plant annual, the leaves oblong and up to $6\frac{1}{2}$ in. long, and the sepals hispid without moniliform hairs.

Central Sudan.

J. glabra Koen. ex Roxb.

Slender erect or rambling pubescent or nearly glabrous herb. Leaves ovate, acuminate at the apex, $2\frac{1}{2}$ in. long, 1 in. broad (occasionally up to 5 in. long, 3 in. broad); petiole up to $\frac{1}{2}$ in. long or in the lower leaves 1-2 in. long. Flowers $\frac{1}{3}$ - $\frac{1}{2}$ in. long, in loose cymes, the upper peduncles running into large loose panicles. Capsule $\frac{3}{4}$ in. long, shortly pubescent.

Equatoria.

J. anselliana (Nees) T. Anders.

Nearly glabrous herb, erect or decumbent, 1-2 ft. high. Leaves linear to lanceolate or oblong, $1\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, glabrous or nearly so. Flowers white and purple-streaked, $\frac{1}{2}$ in. long, few in short one-sided inflorescences. Capsule $\frac{1}{2}$ in. long, glabrous; seeds deeply wrinkled.

Central and Southern Sudan.

J. matammensis (Schweinf.) Oliv.*J. anselliana* (non T. Anders.) Broun & Massey p.p.Similar to *J. anselliana* but the plant pilose or pubescent and the leaves elliptic to ovate.*Central and Southern Sudan.***J. odora** (Forsk.) Lam.Undershrub 1-2 ft. high; branchlets woody, glaucous. Leaves oblong or elliptic, obtuse at the apex, narrowed at the base, up to 1 in. long, $\frac{1}{3}$ in. broad, glabrous; petiole up to $\frac{1}{8}$ in. long. Flowers yellow, $\frac{1}{2}$ in. long, axillary, solitary or more rarely 2-3 together. Capsule rather stout, $\frac{1}{2}$ in. long, glabrous.*Red Sea Hills.***J. whytei** S. Moore.Herb from a stout woody rootstock; branches 1-2 ft. long, villous. Leaves very shortly petiolate, lanceolate, the lower ones often ovate, about 1 in. long, villous. Flowers purple, $\frac{1}{2}$ in. long, axillary, 1-3 together. Capsule villous.*Red Sea Hills: Erkowit. Equatoria: Imatong Mountains, Mount Kineti, 8000-10,000 ft.***J. schimperi** (Hochst.) Dandy, comb. nov.*Tyloglossa schimperi* Hochst.¹; *J. calcarata* Hochst. ex C. B. Clarke, non Wall.; *J. insularis* (non T. Anders.) Broun & Massey. Herb; branches up to 3 ft. long, straggling, angular, more or less hispid. Leaves lanceolate, narrowed at both ends, up to $3\frac{1}{2}$ in. long, 1 in. broad, glabrous or with scattered hairs on both surfaces. Flowers purple, sessile, 1-3 in each leaf-axil. Capsule about $\frac{1}{2}$ in. long, glabrous, with a short thick solid stalk; seeds reticulate-rugose.*Central and Southern Sudan.***J. galeopsis** T. Anders, ex C. B. Clarke.Herb; branches 3 ft. long, straggling, angular, more or less hispid. Leaves sessile, oblong, up to $3\frac{1}{2}$ in. long, $\frac{3}{4}$ -1 in. broad. Flowers 1-3 in each leaf-axil, sessile. Corolla purple. Capsule $\frac{1}{2}$ in. long, glabrous.*Darfur: Kulme. Nuba Mountains. Equatoria.***J. kotschyi** (Hochst.) Dandy, comb. nov.*Tyloglossa kotschyi* Hochst.²; *J. serangularis* T. Anders. ex Lindau, non L.Herb; stems 20 in. high, branched, 6-angular, slightly scabrous-hairy. Leaves sessile, oblong, up to 2 in. long, $\frac{1}{3}$ in. broad, minutely and sparsely scabrous-hairy. Flowers purple, $\frac{1}{2}$ in. long, 1-3 in each leaf-axil. Capsule $\frac{1}{2}$ - $\frac{3}{4}$ in. long, narrow-ellipsoid; seeds densely tubercled.*Kordofan.*¹In *Flora*, vol. 26, 1, p. 73 (1843).²In *Flora*, vol. 26, 1, p. 74 (1843).

J. heterocarpa T. Anders.

Pubescent annual herb 8-20 in. high. Leaves ovate or ovate-lanceolate, up to $1\frac{1}{2}$ in. long, $\frac{3}{4}$ in. broad, shortly pubescent to almost glabrous. Flowers pink, about $\frac{1}{4}$ in. long, in dense axillary clusters of 2-4 or more flowers. Capsule $\frac{1}{8}$ - $\frac{1}{6}$ in. long; normal capsules mixed with abnormal 1-seeded ones.

Red Sea District.

17. **LANKESTERIA** Lindl.**Lankesteria elegans** (Beauv.) T. Anders.

Undershrub up to 10 ft. high in forest undergrowth. Leaves elliptic, acuminate at both ends, 5-9 in. long, $1\frac{1}{2}$ - $2\frac{1}{4}$ in. broad, glabrous when mature but with conspicuous hair-like cystoliths on the upper surface; petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers bright-orange, in terminal or subterminal strobilate spikes 3- $7\frac{1}{2}$ in. long; bracts ovate, laxly overlapping, $\frac{3}{4}$ -1 in. long. Corolla-tube $1\frac{1}{2}$ in. long, scarcely $\frac{1}{8}$ in. broad; lobes nearly $\frac{1}{2}$ in. long, obovate.

Equatoria.

18. **LEPIDAGATHIS** Willd.

- A. Adaxial stamens with 2-locular anthers:
- B. Inflorescences terminal *L. scariosa*.
- BB. Inflorescences not terminal:
- C. Inflorescences sterile at the apex *L. appendiculata*.
- CC. Inflorescences not as above:
- D. Flowers in dense heads near the crown of the root, the elongated leafy branches without flowers or rarely with a small axillary head:
- (a) Leaves hairy above and on the nerves beneath, up to 2 in. long, $\frac{1}{2}$ in. broad *L. collina*.
- (aa) Leaves when mature very slightly hairy, up to $4\frac{1}{2}$ in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad *L. schweinfurthii*.
- DD. Flowers in several axillary heads towards the middle or upper part of the stems:
- (b) Flowers in short globose or ovoid heads:
- (c) Mature leaves glabrous:
- (d) Leaves elliptic, 1 in. long, $\frac{1}{2}$ in. broad
L. myrtifolia.
- (dd) Leaves linear, $3\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad
L. perglabra.
- (cc) Mature leaves hairy at least beneath *L. diversa*.
- (bb) Flowers in oblong erect dense 1-sided spikes:
- (e) Bracts without or with very short erect tails
L. peniculifera.
- (ee) Bracts and sepals with long recurved tails
L. medusae.
- AA. Adaxial stamens with usually 1-locular anthers; slender plant ...
L. laguroideae.

Lepidagathis scariosa Nees.

Shrubby herb up to 3 ft. high; branchlets stellate-hairy. Leaves elliptic, narrowed to the apex, broadly cuneate to almost rounded at the base, up to $2\frac{3}{4}$ in. long, 1 in. broad, when mature minutely hairy above, grey-tomentose beneath, the primary nerves raised on the under-surface. Flowers pale-heliotrope, $\frac{2}{3}$ -1 in. long, in terminal ovoid innocuously prickly heads up to $1\frac{1}{2}$ in. in diameter. Capsule $\frac{1}{2}$ in. long.

Central Sudan.

L. appendiculata Lindau.

L. radicalis (non Hochst.) Broun & Massey p.p.

Herb about 6 in. high; stems decumbent or ascending. Leaves sessile, more or less narrowly lanceolate, somewhat narrowed at the base, acuminate and mucronate at the apex, 1-2 in. long, white-woolly. Flowers yellow, in very dense spicate inflorescences.

Nuba Mountains. Equatoria.

L. collina (Endl.) Milne-Redh.

Herb; branches pubescent. Leaves sessile, subobtusate at both ends, up to 2 in. long, $\frac{1}{2}$ in. broad; primary lateral nerves raised beneath, prominent, hairy; upper surface hairy and with transverse cystoliths. Inflorescences radical, up to 2-3 in. in diameter, of several softly hairy heads. Corolla $\frac{1}{2}$ - $\frac{2}{3}$ in. long, yellow with purple spots.

Fung District.

L. schweinfurthii Lindau.

Similar to *L. collina* but the leaves up to $4\frac{1}{2}$ in. long and sparingly hairy.

Equatoria.

L. myrtifolia S. Moore.

Herb; stems 2-3 ft. high, slender, creeping, pubescent. Leaves nearly sessile, elliptic, triangular-apiculate at the apex, 1 in. long, $\frac{1}{2}$ in. broad, glabrous and shining when mature, not 3-nerved; cystoliths obscure. Flowers $\frac{2}{3}$ in. long, in radical and scattered dense small ovoid softly white-hairy hardly prickly heads; bracts lanceolate, acuminate at the apex, $\frac{1}{2}$ in. long, white-hairy.

Equatoria.

L. perglabra C. B. Clarke.

Plant glabrous except for the margins of the bracts; branches 20 in. long, divided. Leaves linear, narrowed at both ends, $3\frac{1}{2}$ in. long, $\frac{1}{4}$ in. broad, 3-nerved, with transverse cystoliths on the upper surface. Flowers in numerous scattered heads axillary in the upper parts of the branches.

Equatoria.

L. diversa C. B. Clarke.

Herb; branches stout, minutely hairy. Leaves up to 5 in. long, $\frac{3}{4}$ in. broad, 5-nerved. Inflorescences axillary, 2 in. in diameter, very dense; points of floral leaves long, numerous, pale-brown, hairy, strongly deflexed. Sepals with falcately recurved points. Corolla yellow with purple spots, $\frac{3}{4}$ in. long.

Equatoria.

L. peniculifera S. Moore.

Robust plant; branches at length almost glabrous. Leaves $1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, 3-nerved, the apex almost spinescent, with long white simple hairs. Flowers $\frac{3}{4}$ in. long, in erect compound spikes 2 in. long and $\frac{3}{4}$ in. broad occurring 1-2 together in the upper leaf-axils; bracts ovate, uniseriate, densely packed, leathery.

Equatoria.

L. medusae S. Moore.

Rather stout-branched villous woody undershrub. Leaves linear or narrowly elliptic, narrowed at both ends, up to 4 in. long, $\frac{1}{2}$ in. broad, 5-nerved, when mature almost glabrous above with transverse cystoliths, villous beneath. Flowers $\frac{3}{4}$ in. long, in compound spikes; spikes $1\frac{1}{4}$ in. long, $\frac{1}{4}$ - $\frac{3}{4}$ in. broad, 1-2 together, erect, in the upper leaf-axils; bracts uniseriate, densely packed, ovate with long deflexed white-hairy tails.

Equatoria.

L. laguroidea (Nees) T. Anders.

Decumbent slender branching herb, woody below and rooting at the lower nodes. Leaves ovate to narrowly elliptic, narrowed at both ends, 2 in. long, $\frac{1}{2}$ in. broad, subglabrous; cystoliths irregularly scattered on the upper surface; petiole up to $\frac{1}{4}$ in. long. Flowers pink or purplish, $\frac{1}{2}$ in. long, in often lax or interrupted terminal spikes 2 in. long and $\frac{1}{2}$ in. broad; bracts linear-lanceolate.

Equatoria.

19. **MIMULOPSIS** Schweinf.**Mimulopsis solmsii** Schweinf.

Woody climber; stems light-brown, up to 1 in. in diameter. Leaves toothed, lanceolate to ovate, acute to acuminate at the apex, more or less rounded at the base, up to 4 in. long, $2\frac{3}{4}$ in. broad, sparingly pubescent; petiole up to $1\frac{1}{2}$ in. long. Inflorescences viscid-hairy, loosely subtrichotomously cymose; pedicels up to $\frac{1}{2}$ in. long. Calyx-segments up to $\frac{3}{4}$ in. long, linear. Corolla pale-mauve with a brownish throat, $\frac{3}{4}$ -1 in. long.

Equatoria: Imatong Mountains, Ibahin forest, 6200 ft.

20. **MONECHMA** Hochst.**Monechma ciliatum** (Jacq.) Milne-Redh.*M. hispidum* Hochst.

Annual hispid-scabrous or almost glabrous herb 1-2 ft. high, woody below. Leaves linear or narrowly linear-lanceolate, up to $4\frac{3}{4}$ in. long, $\frac{1}{2}$ in. broad. Flowers cream-white with purple and orange streaks, 2-lipped, in short spikes; bracts pectinate with long stiff white bristles, lanceolate, leafy, about $\frac{1}{2}$ in. long. Seeds with a tuft of rigid thick hairs at the hilum, and a similar tuft at the other end.

*Central and Southern Sudan.***M. debile** (Forsk.) Nees.*M. bracteatum* Hochst.

Herb 1-3 ft. high; stems pubescent. Leaves lanceolate, obtuse at the apex, up to $4\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, almost glabrous when mature. Flowers $\frac{1}{2}$ - $\frac{3}{4}$ in. long, in subsessile strobilate spikes 2 in. long and $\frac{3}{4}$ in. broad; bracts orbicular or slightly elliptic, pubescent, ciliate with long white hairs on the margin. Capsule $\frac{1}{4}$ in. long, densely clothed with short white mostly deflexed hairs; seeds yellow-brown without a tuft of hairs.

*Northern and Central Sudan.*21. **NELSONIA** R. Br.**Nelsonia canescens** (Lam.) Spreng.*N. campestris* R. Br.

Small softly pubescent prostrate branching herb. Lower leaves petiolate, the upper ones subsessile, elliptic to ovate, up to $2\frac{3}{4}$ in. long and $1\frac{1}{4}$ in. broad but usually much smaller, pubescent or often woolly on both surfaces. Flowers pink or purple, small, in cylindric villous spikes up to 4 in. long; bracts imbricate, broadly ovate, about $\frac{1}{4}$ in. long. Calyx-lobes 4, lanceolate, unequal, the largest often shortly 2-lobed.

*Central and Southern Sudan.*22. **NEURACANTHUS** Nees**Neuracanthus niveus** S. Moore.

White stellate-tomentose herb or undershrub; branches 2 ft. long from a short woody rootstock. Leaves broadly elliptic, acute at the apex, up to 4 in. long, $2\frac{1}{2}$ in. broad, finally almost glabrous above with conspicuous cystoliths, densely white-stellate-tomentose beneath. Flowers violet, in inflorescences of dense axillary heads 1- $1\frac{1}{2}$ in. in diameter made up of few-flowered condensed unilateral spikes with long white hairs; bracts dark-brown, ovate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long.

Equatoria.

23. **PERISTROPHE** Nees**Peristrophe bicalyculata** (Retz.) Nees.

Erect branched herb 2-4 ft. high; stems several-angled, sparingly setose-pilose. Leaves ovate-lanceolate, acute at the apex, abruptly narrowed into a winged petiole, up to 4 in. long, $1\frac{1}{2}$ in. broad, with conspicuous rod-like cystoliths on both surfaces. Flowers pink or pale-purple, narrow, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, very numerous in lax leafy panicles; pedicels angular and scabrous.

Widespread.

P. lanceolata (Lindau) Dandy, comb. nov.

Nicotaba lanceolata Lindau¹; *P. luteoviridis* C. B. Clarke.

Yellow-green stout herb, glabrous except the inflorescences. Leaves elliptic, narrowed at both ends, up to $3\frac{1}{2}$ in. long, 1 in. broad; petiole $\frac{1}{4}$ in. long. Flowers rose, purple-spotted, $\frac{3}{4}$ -1 in. long, in clusters forming rather dense spikes 3 in. long and 1 in. broad; spikelets 1-flowered; bracts lanceolate, $\frac{1}{3}$ - $\frac{1}{2}$ in. long. Capsule $\frac{3}{4}$ in. long, stout, solid-stalked.

Equatoria.

24. **PHAULOPSIS** Willd.**Phaulopsis barteri** T. Anders.

Weak undershrub 2-4 ft. high. Leaves long-petiolate, ovate-lanceolate, gradually acuminate at the apex, shortly cuneate at the base, up to 7 in. long and $1\frac{3}{4}$ in. broad but usually smaller, pubescent on the nerves beneath. Flowers white, $\frac{2}{3}$ in. long, well exerted from the bracts, in dense strobilate spikes 1-3 in. long and 1 in. broad. Corolla-tube $\frac{1}{3}$ in. long.

Equatoria.

P. falcisepala C. B. Clarke.

Herb or weak undershrub, erect or decumbent, up to 4 ft. high. Leaves long-petiolate, crenate except towards the base, ovate to ovate-lanceolate, up to $4\frac{3}{4}$ in. long, 2 in. broad. Flowers red or white with purple markings, $\frac{1}{3}$ in. long, in dense ovoid or short cylindric spikes; bracts broadly ovate-orbicular, about $\frac{1}{2}$ in. long, thin, reticulate. Abaxial 2 calyx-segments oblong-falcate.

Equatoria.

P. imbricata (Forsk.) Sweet.

Herb; stems 1-2 ft. high, branched, decumbent or suberect, hairy, becoming glabrous or nearly so below. Leaves up to 3 in. long and $\frac{1}{2}$ in. broad (many on the same stem only $\frac{1}{2}$ -1 in. long), those of a pair sometimes very unequal, acuminate at both ends, sometimes very unequal and oblique at the base, pubescent; petiole up to $1\frac{1}{2}$ in. long. Inflorescences some cylindric up to $2\frac{1}{2}$ in. long and $\frac{3}{8}$ in. broad, dense, strobilate, some ovoid. Abaxial 2 calyx-teeth linear-strap-shaped. Corolla white or purplish, $\frac{1}{3}$ in. long.

Equatoria.

¹In Engler, *Bot. Jahrb.*, vol. 20, p. 38 (1894).

25. **PSEUDERANTHEMUM** Radlk.***Pseuderanthemum ludovicianum*** (Bütt. n.) Lindau.

Forest undershrub up to 12 ft. high. Leaves elliptic to obovate, acuminate at the apex, cuneate at the base, up to 8 in. long, 3 in. broad, glabrous when mature, the upper surface with scattered cystoliths, the lower surface closely and minutely round-dotted; petiole up to 1 in. long. Flowers white, speckled with purple, 1½ or more in. long, forming spike-like inflorescences 4-10 in. long; axillary condensed cymes 3-8-flowered.

Equatoria.



Fig. 50—*RUELLIA PATULA* Jacq.
A, fruit. B, stamens and pistil.

26. **RUELLIA** L.**Ruellia patula** Jacq.

Fig. 50.

Decumbent grey-pubescent or sparsely hairy undershrub. Leaves ovate-elliptic to lanceolate, subacute at the apex, 1-2 in. long, setulose-pubescent on both surfaces; petiole $\frac{1}{4}$ -1 in. long. Flowers white or heliotrope, up to $1\frac{1}{2}$ in. long, in small axillary cymes; bracteoles 2 or 3 times the length of the calyx, spatulate-oblong, often petiolate. Capsule glabrous.

Widespread.

R. praetermissa Lindau.

Similar to *R. patula* but the leaves ovate, up to 3 in. long, $1\frac{1}{2}$ in. broad, thinly pubescent on both surfaces and thinly interspersed with cystoliths.

Equatoria.

R. sudanica (Schweinf.) Lindau.

Similar to *R. patula* but the leaves sessile or subsessile and sparsely hispid, and the bracteoles ligulate and hardly spatulate-oblong.

Equatoria.

R. gendwana (Schweinf.) C. B. Clarke.

Herb or undershrub. Leaves petiolate, elliptic-lanceolate, up to 3 in. long, $1\frac{1}{2}$ in. broad, almost glabrous when mature, the middle stem-leaves sometimes orbicular. Capsule pubescent.

Kassala: Gallabat.

27. **RUSPOLIA** Lindau**Ruspolia decurrens** (Hochst.) Milne-Redh.

Eranthemum decurrens Hochst. ex Nees.

Perennial herb. Leaves ovate, suddenly narrowed at the base into a long attenuation, usually 4 in. long and 2 in. broad but sometimes up to 9 in. long and 4 in. broad, becoming glabrous when mature; petiole (excluding the winged portion) rarely $\frac{1}{2}$ in. long. Flowers yellowish, mostly solitary, sometimes 2-3 together, in spikes 4-6 in. long; rhachis pubescent and with stalked glands. Calyx glandular-hairy. Corolla-tube 1 in. long, pubescent. Capsule 1 in. long, glabrous.

Central and Southern Sudan.

R. hypocrateriformis (Vahl) Milne-Redh.

Eranthemum hypocrateriforme (Vahl) R.Br. ex Roem. & Schult.

Shrub 3-4 ft. high; branches glabrous. Leaves ovate or elliptic, 2-3 $\frac{1}{2}$ in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, glabrous when mature, minutely white-dotted on both surfaces, reticulate-veined beneath. Flowers scarlet with a darker centre, in linear panicles 2-7 in. long; axillary cymes dense, several-flowered, the lower ones more or less

spreading, sometimes up to 1 in. long, compound. Calyx glabrous or very nearly so. Corolla-tube 1 in. long. Capsule $1\frac{1}{4}$ in. long.

Fung District.

28. **SATANOCRATER** Schweinf.

Satanocrater fellatensis Schweinf.

Undershrub about 2 ft. high; stems slightly pubescent. Leaves elliptic or broadly lanceolate, narrowed at both ends, 3 in. long, $1-1\frac{1}{4}$ in. broad, sparsely pubescent; petiole up to $\frac{1}{4}$ in. long. Flowers solitary, opposite in the leaf-axils. Corolla-tube $1\frac{1}{2}$ in. long; lobes $\frac{1}{2}$ in. long.

Kassala: Gallabat.

29. **THUNBERGIA** Retz.

- A. Stigma 2-lipped; calyx usually with long teeth:
- B. Shrubs or woody climbers; anthers without spurs at the base but with a spiny crest on each lobe:
- (a) Bracteoles more than 1 in. long; calyx about $\frac{1}{2}$ in. long *T. affinis.*
- (aa) Bracteoles less than 1 in. long; calyx less than $\frac{1}{2}$ in. long *T. ikbaliana.*
- BB. Herbs, often climbing; anthers usually spurred below and with long hairs:
- C. Leaves sessile:
- (b) Leaves 2-4 in. long, more or less hirsute *T. annua.*
- (bb) Leaves 1 in. long, hispid *T. hispida.*
- CC. Leaves petiolate:
- D. Flowers solitary; petioles winged *T. alata.*
- DD. Flowers not solitary:
- (c) Flowers 2-3 together between 2 large sessile leaves *T. fasciculata.*
- (cc) Flowers not as above *T. battiscombei.*
- AA. Stigma funnel-shaped; calyx truncate:
- (d) Leaves petiolate, narrowly lanceolate, $2\frac{1}{2}$ in. long; stems more or less hairy *T. schweinfurthii.*
- (dd) Leaves sessile, linear, 9 in. long; stems glabrous ... *T. longifolia.*

Thunbergia affinis S. Moore.

Woody climber or shrub up to 10 ft. high. Leaves slightly and irregularly dentate on the margin, ovate or elliptic, acuminate at the apex, up to $5\frac{1}{4}$ in. long, $2\frac{3}{4}$ in. broad, glabrous; petiole $\frac{1}{4}-\frac{5}{8}$ in. long, with short stipule-like thorns at the base. Flowers violet, solitary on short glabrous peduncles; bracteoles membranous, ovate, acute at the apex, up to $1\frac{1}{4}$ in. long.

Equatoria.

T. ikbaliana De Wild.

Much-branched shrub up to 3 ft. high; branches quadrangular when young. Leaves shortly petiolate, ovate to obovate or oblanceolate, sometimes 3-lobed towards the apex, acuminate at the apex, cuneate at the base, $1\frac{1}{2}$ -3 in. long, $\frac{3}{4}$ - $1\frac{1}{4}$ in. broad, glabrous on both surfaces. Flowers violet-purple with a yellow throat, 2-2 $\frac{1}{2}$ in. long, on slender peduncles 2-2 $\frac{1}{2}$ in. long; bracteoles very thin, obtuse at the apex, $\frac{3}{4}$ in. long.

Equatoria.

T. annua Hochst. ex Nees.

Weak herb, branching from the root; stems with long white hairs when young. Leaves sessile, oblong-lanceolate, obtuse or rounded above, tapering to an acute base, 2-4 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, with scattered hairs along the veins of the lower surface. Flowers white, about $\frac{3}{4}$ in. long, on short peduncles; bracteoles ovate, strongly keeled and pilose along the keel, 5-7-nerved. Capsule thin-walled, pubescent, the fertile part globose, the beak arising from it very abruptly; seeds smooth.

Central Sudan. Upper Nile.

T. hispida Solms.

Hispidly white herb; stems 4-angled. Leaves sessile, oblong-elliptic, about 1 in. long, scarcely $\frac{1}{4}$ in. broad, hispid with white hairs. Flowers on peduncles $\frac{1}{2}$ - $\frac{1}{4}$ in. long; bracteoles ovate, acuminate at the apex. Capsule nearly 1 in. long, glandular; seeds nearly round, ribbed.

Fung District: near Roseires. Upper Nile: between Abwong and Nasir.

T. alata Boj. ex Sims.

Fig. 51.

Softly pubescent herbaceous twiner. Leaves entire or undulate-dentate, ovate-triangular, sagittate or hastate at the base, $1\frac{1}{2}$ -2 $\frac{3}{4}$ in. long, 1-1 $\frac{3}{4}$ in. broad, pubescent beneath, less so above; petiole $\frac{3}{4}$ -1 in. long, more or less winged. Flowers pale to dark yellow (sometimes white), usually red or dark-purple in the throat, solitary, axillary; bracteoles ovate, subcordate, about $\frac{3}{4}$ in. long, pubescent on both surfaces. Corolla-tube about $\frac{3}{4}$ in. long. Capsule $\frac{3}{4}$ in. long, pubescent.

Equatoria.

T. fasciculata Lindau.

Climbing herb; stems sparsely pilose. Leaves repand-dentate, broadly ovate, acutely acuminate at the apex, cordate at the base, 2 $\frac{3}{4}$ -3 $\frac{1}{2}$ in. long, up to 2 $\frac{1}{2}$ in. broad, with scattered short hairs above and on the nerves beneath; petiole up to 2 $\frac{1}{2}$ in. long. Flowers vivid-purple with a yellow tube, about 2 $\frac{1}{2}$ in. long, 2-3 together on lateral branchlets, completely hidden until full-blown between two sessile leaves; bracteoles ovate-elliptic, mucronate at the apex, $\frac{3}{4}$ in. long.

Equatoria: Laboni, gallery forest of River Laneka.



Fig. 51—*THUNBERGIA ALATA* Boj. ex Sims.

T. battiscombei Turrill.

Erect or climbing herb; stems glabrous. Leaves ovate or obovate-elliptic, rounded or obtuse and shortly apiculate at the apex, cuneate or subcordate at the base, up to 9 in. long, $5\frac{1}{2}$ in. broad; petiole up to $1\frac{3}{4}$ in. long. Flowers blue with a yellow throat, about 2 in. long, in about 10-flowered axillary inflorescences 4 in. long; bracteoles elliptic-ovate, $\frac{3}{4}$ in. long, accrescent, pubescent on both surfaces.

Equatoria.

T. schweinfurthii S. Moore.

Erect herb; stems strigose, densely hairy at the nodes. Leaves narrowly lanceolate, tapering to the apex and shortly mucronate, narrowed and hastate and 3-nerved at the base, up to $2\frac{3}{4}$ in. long, $\frac{5}{8}$ in. broad, strigose above, the lower surface covered with tawny pubescence. Flowers solitary, on peduncles 1- $1\frac{1}{2}$ in. long.

Equatoria.

T. longifolia Lindau.

Stems herbaceous, glabrous. Leaves linear, 9 in. long, $\frac{1}{2}$ in. broad, glabrous. Flowers solitary or 2 together on short glabrous peduncles; bracteoles ovate, densely hairy, with 4 parallel nerves. Corolla-tube 1 in. long; lobes $\frac{1}{2}$ in. long, deep-violet.

Equatoria.

30. **WHITFIELDIA** Hook.**Whitfieldia elongata** (Beauv.) C. B. Clarke.

W. longifolia T. Anders.

Shrub 8-20 ft. high, or straggling and half-climbing. Leaves elliptic, acuminate at the apex, narrowed into a petiole at the base, the upper ones up to 8 in. long and 3 in. broad, glabrous, closely dotted on the upper surface; petiole about 1 in. long. Flowers white, in terminal panicles 2-5 in. long; bracts elliptic, acuminate at the apex, $\frac{1}{2}$ in. long. Calyx petaloid. Corolla-tube about 2 in. long, pubescent.

Equatoria.

136. **SELAGINACEAE**

Herbs or undershrubs. Leaves without stipules, alternate or subopposite, simple, usually linear. Flowers hermaphrodite, zygomorphic, often spicate. Calyx persistent, 2-5-lobed or spathaceous. Corolla gamopetalous; tube sometimes split down the front; limb 4-5-lobed, the lobes imbricate. Stamens 4 or 2, inserted on the corolla-tube and alternate with the lobes; anthers 1-locular. Ovary superior, 2-locular; style terminal, simple; ovules solitary from the top of each loculus. Fruit indehiscent or separating into 2 1-seeded nutlets.

1. **HEBENSTRETIA** L.

Hebenstretia dentata L.

Herb or undershrub 1-4 ft. high, more or less copiously branched. Leaves numerous, linear or rarely linear-lanceolate, acute at the apex, 1-1½ (rarely up to 3½) in. long. Flowers white with an orange centre, ¼-½ in. long, in terminal many-flowered usually dense spikes up to 6 or more in. long. Fruit oblong, ½-¾ in. long.

Equatoria: Imatong Mountains, 7000-10,000 ft.

137. **VERBENACEAE**

Herbaceous or woody plants, often with quadrangular branches. Leaves without stipules, usually opposite or whorled, simple or compound. Flowers hermaphrodite, zygomorphic. Calyx 2-5-lobed or -toothed or truncate, persistent. Corolla gamopetalous, 4-5-lobed, the lobes imbricate. Stamens 4 or rarely 2, inserted on the corolla-tube; anthers 2-locular, the loculi often divergent. Ovary superior, 2-8-locular, often 4-locular; style terminal, simple; ovules solitary or paired, erect or rarely pendulous. Fruit drupaceous or separating into 2 or 4 pyrenes, rarely capsular.

The cultivated Lemon Verbena, *Lippia triphylla* (L'Hérit.) Kuntze (*L. citrodora* Kunth), has been introduced into the Sudan.

- A. Flowers spicate or racemose; fruit a drupe or separating into 2 or 4 pyrenes:
- B. Ovary 2-4-locular:
- C. Ovary 2-locular with 2 ovules:
 - (a) Calyx less than ½ in. long:
 - (b) Fruit fleshy, drupaceous LANTANA. 5.
 - (bb) Fruit dry, of 2 bony pyrenes:
 - (c) Trailing herbs, rooting at the nodes; pubescence of sessile forked hairs PHYLA. 7.
 - (cc) Erect woody herbs or undershrubs; pubescence not as above LIPPIA. 6.
 - (aa) Calyx more than ½ in. long:
 - (d) Perfect stamens 2, staminodes 2; flowers spicate, more or less immersed in the often swollen rhachis STACHYTARPHETA. 10.
 - (dd) Perfect stamens 4:
 - (e) Fruit winged at the apex SVENSONIA. 11.
 - (ee) Fruit not winged at the apex CHASCANUM. 2.
- CC. Ovary 4-locular with 4 ovules:
 - (f) Fruiting calyx closed over the fruit; pyrenes 2 PRIVA. 9.
 - (ff) Fruiting calyx open; pyrenes 4 VERBENA. 12.
- BB. Ovary 8-locular with 8 ovules DURANTA. 4.
- AA. Flowers capitate or in compound cymes:
 - D. Fruit a 2-valved capsule; flowers capitate ... AVICENNIA. 1.

- DD. Fruit drupaceous; flowers in compound cymes, sometimes capitate:
- E. Leaves simple:
- (g) Fruit a 4-locular drupe, not separating into pyrenes PREMNA. 8.
- (gg) Fruit separating into 4 pyrenes ... CLERODENDRUM. 3.
- EE. Leaves usually digitately compound VITEX. 13.

1. AVICENNIA L.

Avicennia marina (Forsk.) Vierh.

White-tomentose shrub or small tree. Leaves opposite, coriaceous, oblong or oblong-ob lanceolate, acute at the apex, cuneate at the base, $1\frac{1}{2}$ -3 in. long, glabrous above, densely white-tomentose beneath. Flowers bright-yellow, in terminal and axillary globose heads. Fruit ovoid, 1 in. long.

Red Sea District: coast.

2. CHASCANUM E. Mey.

Chascanum marrubifolium Fenzl ex Walp.

Bouchea marrubifolia (Fenzl) Schau.

Much-branched perennial herb; stems covered with short white pubescence. Leaves conspicuously crenate, ovate or suborbicular, obtuse at the apex, cuneate or subtruncate at the base, $1-1\frac{1}{2}$ in. long, pubescent on both surfaces; petiole $\frac{1}{2}$ -1 in. long. Flowers white, about $\frac{1}{2}$ in. long, in moderately dense spikes with all the flowers appressed to the pubescent rhachis; end-spikes about 6 in. long.

Northern and Central Sudan.

3. CLERODENDRUM L.

- A. Segments of the corolla-limb subequal, flat:
- B. Corolla-tube less than 2 in. long:
- C. Cymes dense, sometimes capitate:
- (a) Leaves entire, 2-3 in. long *C. acerbianum*.
- (aa) Leaves often sharply serrate, 6-8 in. long *C. schweinfurthii*.
- CC. Cymes lax:
- D. Corolla-tube $\frac{1}{2}$ - $\frac{3}{4}$ in. long:
- (b) Leaves oblong, cuneate at the base; flowers in subumbellate panicles *C. formicarum*.
- (bb) Leaves ovate, rounded at the base; flowers in lax terminal cymes *C. melanocrater*.
- DD. Corolla-tube $\frac{3}{4}$ -1 in. long:
- (c) Leaves oblong or oblong-lanceolate, narrowed to the base *C. triflorum*.
- (cc) Leaves ovate, cordate at the base *C. cordifolium*.
- BB. Corolla-tube 2 or more in. long:
- (d) Flowers in heads *C. capitatum*.
- (dd) Flowers in compact panicles *C. poggei*.

- AA. Segments of the lower lip of the corolla longer than the upper,
 concave:
- E. Stems winged *C. alatum*.
- EE. Stems not winged *C. myricoides*.

***Clerodendrum acerbianum* (Vis.) Benth.**

Erect or scrambling shrub; branchlets densely pubescent. Leaves opposite or in whorls of 3-4, shortly petiolate, ovate, acute at the apex, rounded or slightly cordate at the base, the lower ones 2-3 in. long, pubescent especially beneath. Flowers white, in dense terminal and axillary pedunculate clusters. Calyx densely pubescent, $\frac{3}{4}$ in. long. Corolla-tube 1 in. long, pubescent. Fruit globose, $\frac{1}{3}$ in. in diameter, covered with spongy processes.

Widespread.

***C. schweinfurthii* Gürke.**

Woody climber; branchlets glabrous. Leaves shortly petiolate, often sharply serrate, obovate to oblanceolate, acute or acuminate at the apex, 6-8 in. long, 2 $\frac{1}{2}$ -5 in. broad, glabrous on both surfaces. Flowers white, in axillary long-pedunculate dense cymes. Corolla-tube 1 $\frac{1}{4}$ -1 $\frac{1}{2}$ in. long, glabrous. Fruit black, $\frac{1}{3}$ in. long.

Equatoria.

***C. formicarum* Gürke.**

Climbing shrub; branchlets very slender, finely pubescent. Leaves opposite or in whorls of 3-4, entire, thin, oblong, acute to acuminate at the apex, cuneate at the base, 2-3 in. long, glabrous on both surfaces. Flowers white, in numerous many-flowered long-pedunculate cymes forming subumbellate terminal panicles. Corolla-tube $\frac{1}{3}$ - $\frac{1}{2}$ in. long.

Equatoria.

***C. melanocrater* Gürke.**

Climbing shrub; branchlets pubescent above. Leaves petiolate, ovate or ovate-oblong, acuminate at the apex, rounded or subcordate at the base, 2-5 in. long, 1-3 in. broad, glabrous on both surfaces, black when dry. Flowers white, in lax terminal cymes 4-5 in. long. Corolla-tube $\frac{1}{4}$ in. long, puberulous.

Equatoria.

***C. triflorum* Vis.**

C. harnierianum Schweinf.

Shrub; branchlets herbaceous, tetragonous. Leaves opposite or in threes, petiolate, membranous, oblong or oblong-lanceolate, acute at the apex, narrowed to the base, about 2 in. long, 1 in. broad, pubescent on both surfaces. Flowers white, in lax cymes forming terminal panicles. Corolla pubescent, $\frac{2}{3}$ -1 in. long.

Fung District. Southern Sudan.

C. cordifolium (Hochst.) A. Rich.

Climbing shrub; branchlets pubescent. Leaves opposite, petiolate, subcoriaceous, entire, ovate, cordate at the base, 3-4½ in. long, glabrous above when mature, more or less finely pubescent beneath. Flowers white with a magenta throat, in lax cymes forming ample panicles. Calyx claret-coloured in fruit. Corolla-tube ¾ in. long. Fruit shining-black.

Central and Southern Sudan.

C. capitatum (Willd.) Schumach.

Erect or shraggly shrub; branchlets densely pubescent. Leaves opposite, petiolate, entire or slightly sinuate, oblong or obovate-oblong, acute or cuspidate at the apex, 6-12 in. long, glabrous above when mature, pubescent beneath. Flowers white, in dense sessile terminal heads. Corolla-tube slender, 3-4 in. long, pubescent; lobes obovate, ½ in. long.

Nuba Mountains. Equatoria.

C. poggei Gürke.

Tree or shrub. Leaves long-petiolate, repand and strongly toothed, ovate-orbicular, acuminate at the apex, cordate at the base, 8-10 in. long, 5-6 in. broad, thinly hairy on both surfaces. Flowers white, in compact panicles formed of dense subsessile cymes. Corolla-tube curved, 4-5 in. long; lobes unequal.

Equatoria.

C. alatum Gürke.

Erect herb 5 ft. high; stems stout, fluted, narrowly winged, glabrous. Leaves sessile, opposite, sharply toothed in the upper third, oblanceolate, acute at the apex, the lower ones nearly 12 in. long, 1¾ in. broad above the middle, glabrous. Flowers in many-flowered lax pedunculate cymes forming thyrsoid terminal panicles 1 ft. long. Calyx-lobes obtuse at the apex. Corolla-tube very short; limb white outside, pale-lilac inside; lower lobe deep-violet with 2 white blotches in the middle.

Equatoria.

C. myricoides (Hochst.) R. Br. ex Vatke.

C. ugandense Prain.

Erect shrub 3-10 ft. high; branchlets glabrous or pubescent. Leaves opposite or in whorls of 3-4, shortly petiolate or subsessile, more or less deeply toothed, oblong, acute at the apex, cuneate at the base, 2-6 in. long, glabrous above, more or less finely pubescent beneath. Flowers in lax few-flowered cymes forming short terminal panicles. Calyx glabrous. Corolla-tube very short; upper lobes white or pale-blue, obovate, ½ in. long; lower lobe usually violet-blue, obovate-cuneate, concave, ¾ in. long.

Widespread.

var. **floribundum** Bak.

Plant glabrous. Leaves narrowly elliptic to lanceolate, 4-5 in. long, $\frac{1}{2}$ - $\frac{3}{8}$ in. broad. Cymes forming lax thyrsoid panicles 12 or more in. long.

Equatoria.

4. DURANTA L.

Duranta repens L.

D. plumieri Jacq.

Unarmed or spinous shrub 5-10 ft. high; branches glabrous or finely pubescent. Leaves opposite, distinctly petiolate, entire or inciso-crenate, ovate to obovate-elliptic, acute or obtuse at the apex, cuneate at the base, up to $3\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, glabrous. Flowers bluish-lilac, $\frac{1}{2}$ or more in. long, in copious terminal racemes forming panicles. Drupe bright-yellow, much shorter than the closed accrescent calyx.

Equatoria. Native of tropical America, cultivated and now naturalized.

5. LANTANA L.

Lantana viburnoides (Forsk.) Vahl.

L. salvifolia (non Jacq.) Broun & Massey.

Erect little-branched shrub; young branchlets densely pubescent above. Leaves opposite, shortly petiolate, conspicuously crenate, ovate, 2-4 in. long, scabrous above, slightly rugose, more or less pubescent beneath. Flowers in long-pedunculate axillary elongated spikes finally 1- $1\frac{1}{2}$ in. long; bracts ovate, very hairy, the upper ones $\frac{1}{2}$ in. long, the lower ones $\frac{1}{4}$ in. long. Corolla-tube $\frac{1}{2}$ in. long; limb $\frac{1}{2}$ in. in diameter. Drupe purple, ribbed vertically when dry.

Red Sea District. Equatoria.

L. trifolia L.

L. petitiana (non A. Rich.) Broun & Massey.

Harshly hairy undershrub; branchlets hairy above. Leaves in 3's, shortly petiolate, more or less crenate, ovate or ovate-lanceolate, 2-4 in. long, scabrous above, very slightly rugose, more or less pubescent beneath. Flowers pink or lilac with a yellow eye, in axillary pedunculate heads becoming oblong spikes in fruit; bracts ovate, acute at the apex, the lower ones $\frac{1}{4}$ in. long. Corolla-tube $\frac{1}{4}$ in. long; limb $\frac{1}{4}$ in. in diameter.

Equatoria.

L. rhodesiensis Moldenke.

Coarse herb or undershrub; stems many-sulcate, rather densely pubescent. Leaves in whorls of 3-4, shortly petiolate, regularly and coarsely serrate from the apex almost to the base, ovate, gradually attenuate to the acute apex, abruptly acute or rounded

at the base, $2\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $1\frac{1}{4}$ - $2\frac{1}{4}$ in. broad, densely puberulous beneath. Flowers in capitate axillary inflorescences much shorter than the subtending leaves; peduncles $\frac{1}{4}$ - $\frac{5}{8}$ in. long in fruit, densely pubescent; bracts foliaceous, broadly ovate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, long-attenuate at the apex, densely appressed-puberulous.

Equatoria.

6. LIPPIA L.

Lippia grandifolia Hochst. ex A. Rich.

L. adoensis (non Hochst.) Broun & Massey p.p.

Tall woody herb or undershrub up to 7 ft. high; stems hexagonal, tubercular-hispid. Leaves in threes, subsessile, more or less serrate, oblong-elliptic or lanceolate, acute at the apex, gradually narrowed to the base, up to 6 in. long and $1\frac{3}{4}$ in. broad (but usually smaller), hispid and harsh to the touch on both surfaces. Flowers white with a yellow throat, in shortly pedunculate axillary heads 4-6 at a node.

Equatoria.

L. radula Bak.

Undershrub 3-4 or more ft. high; stems stout, shortly pubescent. Leaves in whorls of 3, sessile, rigidly coriaceous, distinctly crenate, lanceolate, the lower ones 3-4 in. long, $1\frac{1}{2}$ -2 in. broad, very scabrous on the upper surface, densely pubescent beneath with raised veins. Flowers in oblong or ovoid spikes $\frac{1}{2}$ in. long aggregated a few together at the ends of long stiff ascending peduncles forming ample panicles; bracts closely imbricated, orbicular, very hairy, the outer ones $\frac{1}{8}$ in. broad.

Equatoria.

L. multiflora Moldenke.

L. adoensis (non Hochst.) Broun & Massey p.p.

Undershrub; stems sparsely appressed-strigillose, not scabrous, often purplish. Leaves whorled principally in 3's, rather thick-textured and stiff, serrate upwards, elliptic, $2\frac{1}{4}$ - $7\frac{1}{2}$ in. long, $\frac{1}{2}$ - $2\frac{1}{4}$ in. broad, covered with bulbous-based hairs above, densely puberulous beneath. Flowers white, in heads aggregated at the tips of the stems and branches and forming panicles often up to 8 in. long and 4 in. broad, heads becoming cylindric-oblong in fruit.

Equatoria.

7. PHYLA Lour.

Phyla nodiflora (L.) Greene.

Lippia nodiflora (L.) Michx.

Perennial nearly glabrous prostrate herb, rooting at the nodes, or ascending from a half-woody base, often in wet places. Leaves dentate in the upper third, oblanceolate, up to $1\frac{1}{2}$ in. long, minutely pubescent. Flowers lilac or pinkish, small, in solitary dense cylindric spikes $\frac{1}{2}$ -1 in. long.

Northern and Central Sudan.

8. **PREMNA** L.**Premna resinosa** (Hochst.) Schau.

Erect shrub; branchlets slender, white, glabrous or slightly pubescent. Leaves petiolate, entire or sometimes crenate, ovate or oblong, obtuse at the apex, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, glabrous or obscurely pubescent beneath. Flowers greenish-white, very small, in small terminal pedunculate corymbose panicles. Drupe black, about the size of a small pea.

Northern and Central Sudan.

P. schimperi Engler.

Erect shrub; branchlets densely pubescent. Leaves petiolate, entire, ovate, obtusely cuspidate at the apex, broadly rounded or subcordate at the base, 2-3 in. long, nearly glabrous above when mature, pubescent beneath. Flowers shortly pedicellate in dense many-flowered terminal cymes. Drupe black, about $\frac{1}{4}$ in. in diameter.

Equatoria: Imatong Mountains.

P. zenkeri Gürke.

Tree up to 40 ft. high; young branchlets more or less puberulous. Leaves broadly elliptic, acute to acuminate at the apex, cuneate or rounded at the base, 4- $5\frac{1}{2}$ in. long, $3\frac{1}{4}$ - $4\frac{1}{2}$ in. broad, sparsely puberulous above, pubescent beneath; petiole up to 2 in. long. Flowers sessile or subsessile in cymes forming terminal lax thyrsoïd inflorescences up to 8 in. long.

Equatoria.

9. **PRIVA** Adans.**Priva adhaerens** (Forsk.) Chiov.

P. leptostachya (non Juss.) Broun & Massey p.p.

Herb up to 3 ft. high; stems acutely quadrangular, pubescent or almost glabrous. Leaves opposite and decussate, coarsely serrate, ovate, abruptly acute at the apex, $\frac{3}{4}$ - $3\frac{1}{4}$ in. long, $\frac{1}{2}$ - $1\frac{1}{4}$ in. broad, hirsute on both surfaces with whitish barbed hairs; petiole $\frac{1}{2}$ -1 in. long. Flowers distant in erect terminal subspicate-racemose inflorescences 6-12 in. long. Pyrenes densely short-puberulous, each with 2 parallel longitudinal marginal rows of straight spines.

Red Sea District.

P. cordifolia var. **abyssinica** (Jaub. & Spach) Moldenke.

P. leptostachya (non Juss.) Broun & Massey p.p.

Herb up to 3 ft. high; stems erect, acutely quadrangular, strigillose-puberulous or almost glabrous. Leaves opposite and decussate, serrate, ovate, $\frac{3}{4}$ - $3\frac{1}{4}$ in. long, $\frac{1}{2}$ -3 in. broad, more or less strigillose above, usually more densely so beneath; petiole $\frac{1}{2}$ - $1\frac{1}{2}$ in. long. Flowers in many-flowered terminal subspicate-racemose inflorescences $3\frac{1}{4}$ -14 in. long. Pyrenes densely short-puberulous, with 2 single rows of spines on the dorsal surface.

Red Sea District: Wadi O-Mareg.

P. meyeri Jaub. & Spach.

Perennial herb up to 20 in. high; stems erect, usually branching, acutely tetragonal, rather densely puberulous; nodes annulate with a band of dense bristles. Leaves serrate, ovate, $\frac{1}{2}$ - $1\frac{3}{4}$ in. long, $\frac{2}{3}$ - $1\frac{1}{4}$ in. broad, obtuse or acute at the apex, more or less strigillose-puberulous above, more densely puberulous beneath; petiole $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Flowers in many-flowered terminal inflorescences $1\frac{1}{4}$ -18 in. long. Pyrenes usually warty, without spines.

Equatoria.

10. **STACHYTARPHETA** Vahl**Stachytarpheta angustifolia** (Mill.) Vahl.

Much-branched rather woody annual herb; stems quadrangular, nearly or quite glabrous. Leaves opposite, petiolate, deeply incised-crenate, oblong-lanceolate, acute at the apex, 2-4 in. long, glabrous. Flowers lilac, in very slender spikes 6-9 in. long; rhachis glabrous, tetragonal, hollowed out behind the flowers.

Southern Sudan.

11. **SVENSONIA** Moldenke**Svensonia laeta** (Fenzl) Moldenke.

Bouchea pterygocarpa Schau.

Much-branched perennial herb; stems covered with soft white pubescence. Leaves deeply toothed, ovate, obtuse at the apex, cuneate or subtruncate at the base, $1-1\frac{1}{2}$ in. long, puberulous on both surfaces. Flowers about $\frac{1}{2}$ in. long, in moderately dense spikes 6-9 in. long, all the flowers finally appressed to the pubescent rhachis. Fruit linear-oblong, with 2 pyrenes ending in an obtuse wing.

Northern and Central Sudan.

12. **VERBENA** L.**Verbena supina** L.

Densely pubescent annual herb, erect or decumbent; stems much branched from the base. Leaves bipinnatifid, deltoid in outline, cuneate at the base, $\frac{1}{2}$ -1 in. long; final segments oblong. Flowers lilac, in spikes at first dense. Corolla-tube about $\frac{1}{2}$ in. long.

Northern and Central Sudan.

V. officinalis L.

Vervain.

Nearly or quite glabrous perennial herb; stems erect. Leaves usually simply pinnatifid, rhomboid-ovate in outline. Flowers lilac, in very lax slender spikes forming terminal panicles.

Central Sudan.

13. VITEX L.

Vitex madiensis Oliv.

Savannah shrub or tree up to 15 ft. high; branchlets pubescent when young. Leaves 1-5-foliolate, subcoriaceous, fragrant when crushed; petiole 2-4 in. long; leaflets deeply crenate to subentire, obovate to obovate-elliptic, cuspidate or obtuse at the apex, cuneate at the base, 2-6 in. long, 1½-3 in. broad, glabrous above when mature, sometimes wholly pubescent beneath or sometimes only slightly hairy on the nerves. Flowers creamy-white and violet, pubescent, in rather lax axillary cymes; peduncle slender, 2½-5 in. long. Fruit oblong, about 1 in. long, edible.

Equatoria.

V. doniana Sweet.

Fig. 52.

V. cienkowskii Kotschy & Peyr.

Deciduous savannah tree usually 30-40 ft. high, occasionally taller; crown dark-green, rounded; bark pale-brown to grey-white, with long narrow vertical fissures and stringy ridges. Leaves usually 5-foliolate or rarely 7-foliolate; petiole 2-3½ in. long; leaflets entire, coriaceous, obovate, slightly apiculate or rounded or emarginate at the apex, cuneate at the base, 2-6 in. long, 1½-3 in. broad. Flowers in dense-flowered axillary cymes mostly short and stout. Corolla white except the largest lobe which is violet, very villous outside, ¾ in. long. Fruit black when ripe, oblong-ellipsoid, ¾ in. long, glabrous, edible.

Central and Southern Sudan.

V. simplicifolia Oliv.

V. schweinfurthii Bak., non Gürke.

Tree; branchlets stout, woody, glabrous or clothed with soft drab pubescence. Leaves subcoriaceous, simple or 3-foliolate, glabrous above when mature, pubescent beneath with raised veins; leaflets entire, obovate to orbicular, obtuse or minutely cuspidate at the apex, cuneate or subcordate at the base, the terminal leaflet reaching 5-6 in. long. Flowers in lax axillary pedunculate cymes.

Nuba Mountains. Equatoria.

V. fischeri Gürke.

Savannah bush or tree up to 30 ft. high; bark grey; young branchlets and petioles densely covered with orange-tawny tomentum. Leaves 5-foliolate; petiole 2½-5½ in. long; leaflets entire, ovate-elliptic to elliptic or slightly obovate-elliptic, shortly acuminate at the apex, broadly cuneate to rounded at the base, 2½-6 in. long, 1¼-2½ in. broad, scabrous and almost glabrous above when mature, tomentose beneath. Flowers white and mauve, pubescent, in densely flowered axillary cymes on peduncles 3½-5 in. long. Fruit oblong-globose, about ¾ in. long, black when ripe, cupped in the enlarged membranous calyx.

Equatoria: frequent on edge of Azza Forest.

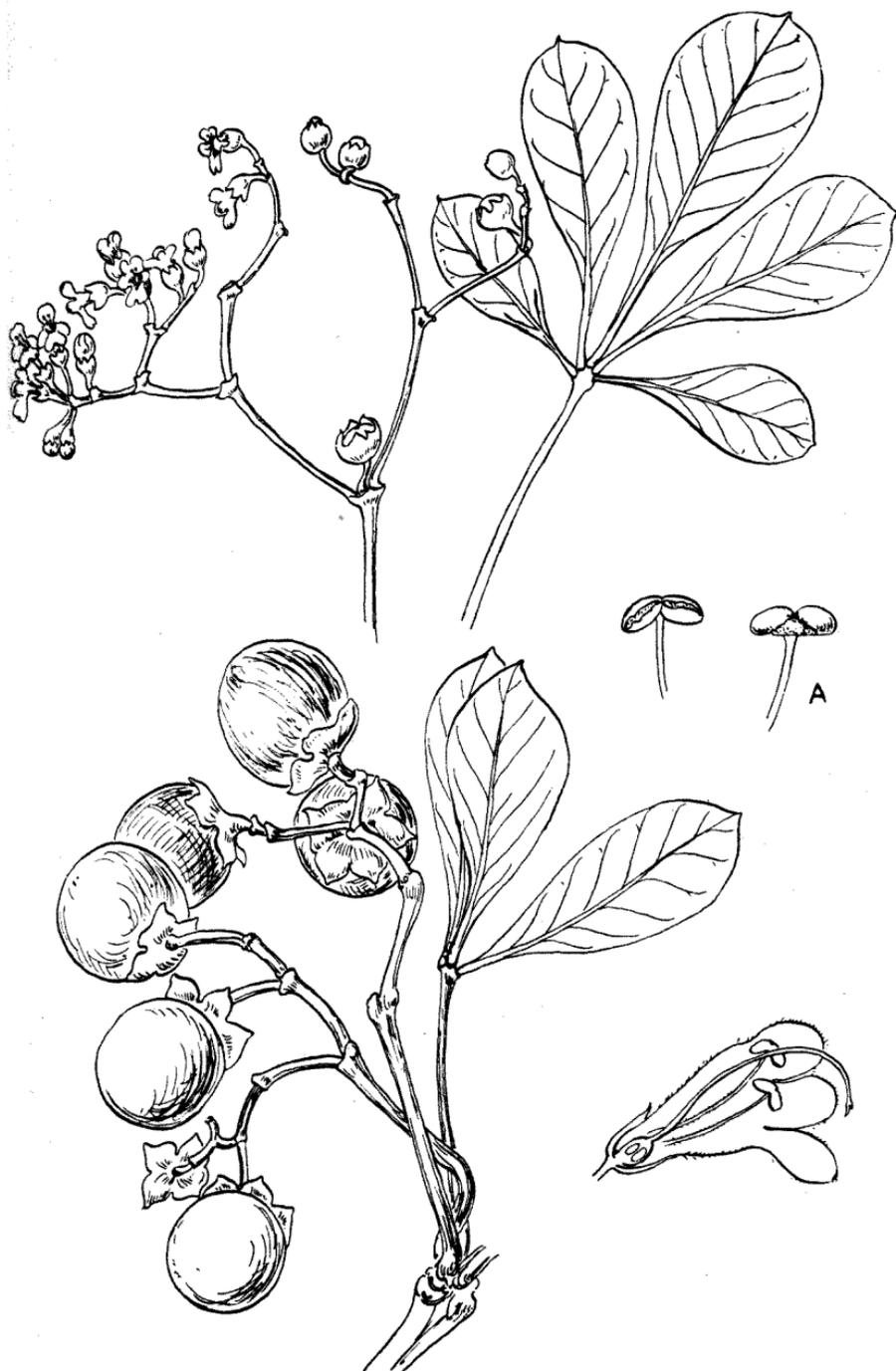


Fig. 52—*VITEX DONIANA* Sweet.
A, anthers.

V. amboniensis Gürke.

Under-storey forest tree up to 45 ft. high; branchlets covered with yellow-brown hairs. Leaves 5-7-foliolate; petiole 3-5 in. long, pubescent; leaflets entire, oblanceolate-oblong, narrowly acuminate at the apex, cuneate at the base, 2-5½ in. long, 1¼-2¼ in. broad, glabrous above, finely tawny-pubescent beneath. Flowers white and lilac, in dense axillary cymes on peduncles ¼-¾ in. long. Fruit green spotted with white when young, probably black when ripe, ellipsoid, 1-1½ in. long, glabrous.

Equatoria: Lotti Forest.

138. **LABIATAE**

Herbs, rarely woody, often odoriferous; stems usually quadrangular. Leaves without stipules, opposite or whorled or very rarely alternate, simple. Flowers hermaphrodite, zygomorphic or rarely almost actinomorphic, axillary or whorled. Calyx persistent, often 2-lipped; sepals 5, variously united. Corolla gamopetalous, hypogynous; lobes 4-5, imbricate, often forming 2 lips or rarely only 1. Stamens 4 or 2, inserted on the corolla-tube and alternate with the lobes; anther-loculi often divergent. Ovary superior, of 2 united deeply 2-lobed carpels, the style arising from the inner base of the lobes (gynobasic); stigma usually bifid; ovules 1 in each ovary-lobe. Fruit of 4 achene-like nutlets, free or cohering in pairs.

Some species of this family are cultivated in the Sudan, e.g. *Ocimum sanctum* L. (*O. johnstonii* (non Bak.) Broun & Massey; ? *O. citriodorum* Vis.), Holy Basil; and *O. thyrsoiflorum* L.

A. Fertile stamens 4:

B. Stamens bent or curved downwards and then forwards or upwards:

C. Calyx-tube not closely ribbed:

D. Lower lip of corolla small, not or very slightly concave:

E. Style bifid at the apex; corolla-tube usually short:

F. Upper tooth of calyx decurrent on the tube:

(a) Calyx-tube with a broad oblique or truncate space at its mouth separating the upper tooth from the others, ciliate; corolla-tube equalling or exerted beyond the calyx-teeth **BECIUM**. 5.

(aa) Calyx-tube with no broad space at its mouth; corolla-tube not or scarcely longer than the calyx-tube **OCIMUM**. 21.

FF. Upper tooth of calyx not decurrent:

(b) Whorls of flowers separated:

(c) Calyx with 2 entire lips **PLATOSTOMA**. 24.

(cc) Calyx 5-toothed:

(d) Lower bracts large, ovate, white; flowers in dense cylindric or spike-like racemes

GENIOSPORUM. 11.

- (dd) Bracts minute; flowers in lax panicle racemes
BASILICUM. 4.
- (bb) Whorls of flowers congested into dense globose heads ACROCEPHALUS. 1.
- EE. Style not bifid at the apex, sometimes shortly bilobed; corolla-tube long:
 - (e) Corolla subequally 4-lobed ENDOSTEMON. 9.
 - (ee) Corolla distinctly 2-lipped ORTHOSIPHON. 22.
- DD. Lower lip of corolla large, concave:
 - G. Lower lip of corolla abruptly deflexed HYPITIS. 13.
 - GG. Lower lip of corolla not abruptly deflexed:
 - H. Filaments free to the base or rarely irregularly united:
 - I. Fruiting calyx circumscissile above the base
AEOLANTHUS. 2.
 - II. Fruiting calyx not circumscissile:
 - (f) Fruiting calyx with 5 large prickle-like teeth; flower-whorls condensed into dense terminal spikes PYCNOSTACHYS. 26.
 - (ff) Fruiting calyx 5-toothed, the teeth not prickle-like; flowers in open or spike-like panicles
PLECTRANTHUS. 25.
 - HH. Filaments united towards the base:
 - (g) Calyx-teeth all orbicular, very accrescent
CAPITANYA. 7.
 - (gg) Calyx-teeth ovate or narrower:
 - (h) Calyx-teeth subequal ENGLERASTRUM. 10.
 - (hh) Upper calyx-tooth broadly ovate, the 4 lower ones narrower and acute or the 2 lateral ones rounded COLEUS. 8.
- CC. Calyx-tube with many close ribs, cylindric, with short teeth ...
LAVANDULA. 15.
- BB. Stamens arching or rarely straight:
 - J. Corolla 2-lipped:
 - K. Upper pair of stamens the longer NEPETA. 20.
 - KK. Lower pair of stamens the longer:
 - L. Calyx 2-lipped:
 - (i) Lips of the calyx more or less entire:
 - (j) Calyx becoming bladder-like and splitting to the base after flowering TINNEA. 30.
 - (jj) Calyx not becoming bladder-like:
 - (k) Calyx-lips closing after flowering
SCUTELLARIA. 28.
 - (kk) Calyx-lips not closing after flowering
OTOSTEGIA. 23.
 - (ii) Lips of the calyx divided, the upper 3-fid, the lower 2-fid CALAMINTHA. 6.
 - LL. Calyx not 2-lipped, 5-10-toothed:
 - M. Calyx 5-toothed:
 - (l) Calyx-tube campanulate:

- (m) Corolla-tube naked inside TEUCRIUM. 29.
 (mm) Corolla-tube annular-pilose inside AJUGA. 3.
 (ll) Calyx-tube tubular; upper corolla-lip erect, nearly flat, entire or emarginate ... MICROMERIA. 19.
MM. Calyx 6-10-toothed:
 (n) Upper lip of corolla as long as the lower; corolla small, white LEUCAS. 17.
 (nn) Upper lip of corolla longer than the lower; corolla large, yellow or orange-red LEONOTIS. 16.
JJ. Corolla not or scarcely 2-lipped:
 (o) Flowers hermaphrodite MENTHA. 18.
 (oo) Flowers unisexual, dioecious, the male flowers with a non-fertile ovary IBOZA. 14.
AA. Fertile stamens 2:
N. Stamens with shortly united filaments; calyx becoming much enlarged and fleshy in fruit HOSLUNDIA. 12.
NN. Stamens with free filaments; calyx not becoming enlarged and fleshy in fruit SALVIA. 27.

1. ACROCEPHALUS Benth.

Acrocephalus lilacinus Oliv.

Perennial herb; stems much-branched, 2-3 ft. high, densely villous. Leaves congested into whorls with short internodes, deflexed, sessile, denticulate, linear-lanceolate, 1-1½ in. long, villous on both surfaces. Flowers pale-lilac, ⅜ in. long, in globose heads ¼ in. in diameter forming dense corymbs at the ends of the branches; basal bracts large, ovate, pale with foliaceous tips.

Equatoria.

A. galeopsifolius Bak.

Annual herb; stems slender, much branched, 1-2 ft. high, sparsely villous. Leaves petiolate, crenate, oblong to narrowly elliptic, acute at the apex, cuneate at the base, 1½-2 in. long, slightly hairy. Flowers bluish-white, in globose heads ¼-½ in. in diameter, the heads solitary or 2-3 together at the ends of the branches; basal bracts lanceolate, all green.

Equatoria: Imatong Mountains, Katire, 4700 ft.

A. schweinfurthii Briq.

A. heudelotii Briq.

Herb; stems tall, branched, the branches clothed upwards with grey appressed hairs. Leaves petiolate, minutely and shortly serrate, linear, acuminate at the apex, 1-2 in. long, clothed with appressed grey hairs. Flowers in numerous globose tomentose heads ⅓ in. in diameter forming ample corymbs; basal bracts ovate-lanceolate, tipped with blue-purple.

Equatoria.

2. **AEOLANTHUS** Mart.**Aeolanthus heliotropioides** Oliv.

Annual herb, with much-branched robust stems 2 ft. high; branchlets slender, pubescent. Leaves sessile, thin, entire or obscurely crenate, oblong or linear-oblong, obtuse to rounded at the apex, 1-2 in. long, glabrous or nearly so. Flowers pale-blue, in moderately large lax panicles; final spikes slender, 1-3 in. long; bracts minute. Corolla pubescent.

Equatoria.

A. repens Oliv.

Perennial herb, with many erect very slender pubescent branchlets from a decumbent woody stem. Leaves sessile, firm, subentire, oblong or oblanceolate, 1-2 in. long, pubescent. Flowers mauve, in spikes $\frac{1}{2}$ -1 in. long forming panicles 2-6 in. long; bracts very small, densely pubescent. Corolla pubescent.

Equatoria: Imatong Mountains, 6350-7600 ft.

A. virgatus Gürke.

Much-branched erect annual herb; stems 1-1 $\frac{1}{2}$ ft. high; branchlets pubescent. Leaves sessile, entire, ascending, linear, glabrous, 1-2 in. long. Flowers in slender elongated spikes; bracts oblong-lanceolate, ascending, imbricate, $\frac{1}{4}$ in. long.

Equatoria.

3. **AJUGA** L.**Ajuga integrifolia** Buch.-Ham. ex D. Don.

A. bracteosa Wall. ex Benth.

Perennial herb, much branched at the base; stems ascending, hairy, 3-12 in. long. Leaves usually in many pairs; upper leaves sessile, entire or crenate, obovate-oblong, slightly hairy; lower leaves oblong, with a cuneate base and an obscure petiole. Flowers blue, in many-flowered whorls in the axils of the leaves all along the stems.

Upper Nile: Meshra el Zeraf.

4. **BASILICUM** Moench**Basilicum polystachyon** (L.) Moench.

Moschosma polystachyon (L.) Benth.

Annual herb; stems much branched, slender, glabrous or nearly so, 1-2 ft. high. Leaves membranous, petiolate, crenate, ovate, acute at the apex, 1-1 $\frac{1}{2}$ in. long, glabrous or nearly so. Flowers pale-lilac, in 6-10-flowered whorls forming copious lax racemes 2-4 in. long. Upper calyx-tooth orbicular, obtuse at the apex; lateral teeth ovate; lower teeth cuspidate.

Widespread.

5. **BECIUM** Lindl.**Becium knyanium** (Vatke) N. E. Br.

Perennial herb; stems erect, branched, pubescent. Leaves nearly sessile, crenate, oblong or oblong-lanceolate or linear, cuneate at the base, 1-2 in. long, more or less sparsely pubescent. Flowers white, 4-6 in a whorl in long lax racemes; pedicels very short. Two upper filaments with a tuft of hairs above the base.

Equatoria.

B. affine (Hochst.) Chiov.

Perennial herb; stems erect, slender, branched, subglabrous, 1-1½ ft. high. Leaves nearly sessile, in distant pairs, obscurely toothed, oblong-lanceolate, cuneate at the base, 1½-2 in. long, nearly glabrous. Flowers in whorls forming long racemes dense at the top but with the lower whorls remote. Corolla white, the upper lip striped with purple. Filaments purple, the 2 upper ones with a tooth at the base.

Equatoria: Imatong Mountains, Itobol, 6500 ft.

B. obovatum (E. Mey.) N. E. Br.

Perennial herb from a woody rootstock; stems several, 5-10 in. high, puberulous. Leaves petiolate, entire or slightly toothed, lanceolate to suborbicular, acute or obtuse at the apex, usually tapering at the base into the petiole, ¾-2¼ in. long, ¼-1¼ in. broad, usually glabrous on both surfaces. Flowers in whorls densely crowded into heads or spike-like racemes. Upper pair of filaments with a retrorse ciliate crest at the bend near the base.

Equatoria.

B. schweinfurthii (Briq.) N. E. Br.

Perennial herb; stems tall, robust, branched, pubescent above, glabrous below. Leaves subsessile, crenate above the base, oblong, acute at the apex, cuneate at the base, the lower ones 3-4 in. long, slightly scabrous on the upper surface, pubescent beneath. Flowers in short dense terminal racemes, the lower flowers abortive; rhachis densely pubescent. Corolla about ½ in. long.

Equatoria.

6. **CALAMINTHA** Mill.**Calamintha** sp.

Herb 18 in. high; stems villous. Leaves subsessile, slightly serrate, broadly ovate, obtuse at the apex, rounded to truncate at the base, ½-¾ in. long, sparsely pubescent on both surfaces. Flowers mauve, in whorls subtended by leaves; pedicels densely hairy. Calyx densely hairy.

Equatoria: Imatong Mountains, Loyaru, 7600 ft.

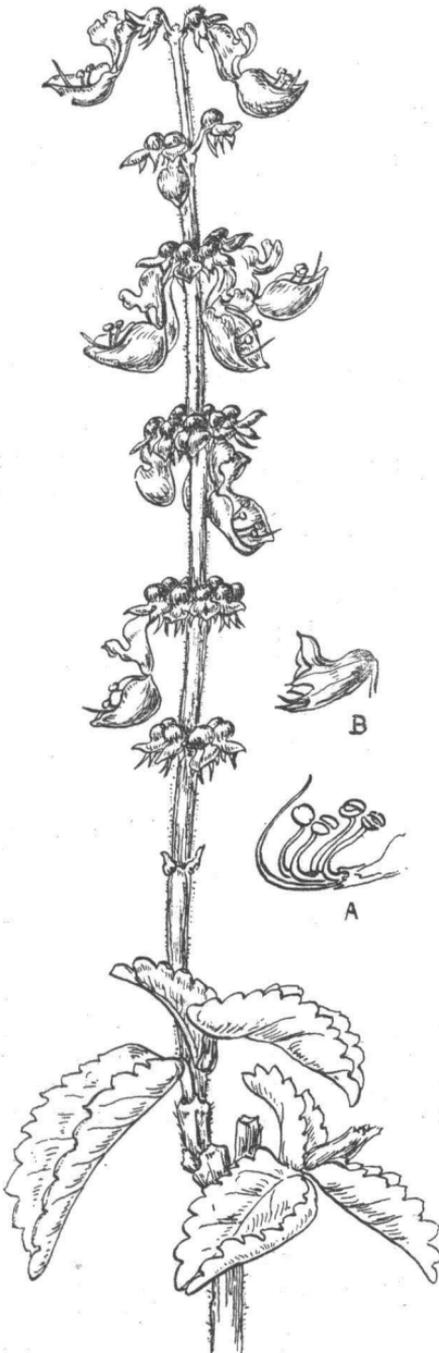


Fig. 53—*COLEUS BARBATUS* (Andr.) Benth.
A, stamens. B, calyx.

7. **CAPITANYA** Schweinf. ex Gürke**Capitanya otostegioides** Gürke.

Low sprawling fleshy undershrub, covered with grey pubescence and red glands; stems decumbent with ascending flowering branchlets. Stem-leaves in distant pairs, fleshy, shortly petiolate, crenate, obovate, cuneate at the base, about 1 in. long, grey-pubescent on both surfaces. Flowers white, in 6-flowered whorls aggregated in lax terminal racemose panicles 3-4 in. long.

Red Sea Hills: Erkowit; Karora, Kadow Pass.

8. **COLEUS** Lour.**Coleus barbatus** (Andr.) Benth.

Fig. 53.

Erect perennial herb or undershrub 2-4 ft. high; main stems woody; branchlets pubescent. Leaves petiolate, crenate, ovate or oblong, obtuse at the apex, cuneate at the base, 1-5 in. long, $\frac{3}{4}$ -3 in. broad, very pubescent on both surfaces. Flowers bright-blue, in many-flowered whorls forming lax racemose panicles $\frac{1}{2}$ -1 ft. long.

Red Sea Hills: Erkowit, 3000-4000 ft.

C. grandicalyx E. A. Bruce.

Erect viscid branched perennial herb. Lower leaves long-petiolate, deeply crenate above, elliptic or ovate-elliptic, rounded or subacute at the apex, narrowed into the petiole at the base, $3\frac{1}{4}$ - $5\frac{1}{4}$ in. long, 2- $3\frac{1}{4}$ in. broad, sparsely white-pilose; upper leaves smaller, sessile, oblong-ovate or narrowly obovate. Flowers blue, about 1 in. long, in about 6-flowered whorls forming compact inflorescences $1\frac{1}{2}$ - $3\frac{1}{4}$ in. long and up to $4\frac{3}{4}$ in. long in fruit; bracts purplish. Calyx purple or bluish; tube about $\frac{1}{2}$ in. long; upper lobe very broadly ovate, cordate at the base, $\frac{1}{2}$ in. long, $\frac{2}{3}$ in. broad.

Equatoria: Imatong Mountains, Lomuleng, 8000 ft.

C. lactiflorus Vatke.

Undershrub or shrub; young stems villous-lanate, the older ones pubescent and up to 9 ft. high. Leaves petiolate, crenate, ovate, more or less acuminate at the apex, narrowed at the base into the petiole, puberulous above, white-tomentose beneath. Flowers violet, in many-flowered whorls forming racemes branched at the base.

Equatoria.

C. igniarius Schweinf.

Shrubby plant; branches thick, woody, without leaves at the time of flowering. Leaves petiolate, deeply crenate, broadly ovate, 2 in. long, subglabrous above, pubescent beneath. Flowers purple, about $\frac{1}{2}$ in. long, in usually 3-5-flowered whorls, the lowest whorls 10-15-flowered; pedicels pubescent, finally 1 in. long.

Red Sea Hills: Khor Ashat.

C. briquetii Bak.*Plectranthus bongensis* Bak.

Tall branched herb; stems green, becoming glabrous. Leaves petiolate, serrate, oblong-lanceolate, acuminate at the apex, narrowed to the base, 2-3 in. long, 1-1½ in. broad, glabrous on both surfaces. Flowers in many-flowered whorls of cymes forming narrow panicles. Lateral 2 calyx-lobes rounded.

*Equatoria.***C. latifolius** Hochst. ex Benth.

Annual herb, growing among rocks or epiphytic on palm-trunks; stems erect, pubescent. Leaves petiolate, crenate, ovate, acute at the apex, 1-3 in. long, pubescent. Flowers violet, in whorls of cymes forming narrow panicles. Lateral 2 calyx-lobes rounded. Corolla ¼ in. long.

*Southern Sudan.***C. darfurensis** R. Good.

Herb up to 3 ft. high, growing in damp places; stems glandular-pubescent. Lower leaves petiolate, the upper ones subsessile, crenate-serrate, ovate-rhomboid, more or less acute at the apex, up to 2½ in. long, 1½ in. broad, glandular-hispid above, densely covered beneath with a short dense glandular grey pubescence. Flowers violet, in whorls of cymes forming narrow panicles. Lateral 2 calyx-lobes rounded.

*Darfur: Jebel Marra, 6500-8200 ft.*9. **ENDOSTEMON** N. E. Br.**Endostemon gracilis** (Benth.) M. Ashby.

Erect annual herb; stems much branched, pubescent, ½-1 ft. long. Leaves shortly petiolate, crenate, oblong, obtuse at the apex, narrowed at the base, up to 1 in. long, shortly pubescent on both surfaces. Flowers in 2-3-flowered whorls in many simple racemes. Calyx villous at the throat.

*Nuba Mountains.***E. tereticaulis** (Poir.) M. Ashby.

Erect much-branched annual herb; stems pubescent, ½-1 ft. high. Leaves shortly petiolate, entire or serrate, oblong or oblong-lanceolate, cuneate at the base, 1-1½ in. long, pubescent on both surfaces. Flowers purple, about ¼ in. long, about 4 in a whorl in lax racemes with a pubescent rhachis. Calyx glabrous at the throat.

Kordofan-Darfur boundary: Jebel Surin.

10. **ENGLERASTRUM** Briq.**Englerastrum schweinfurthii** Briq.

Much-branched erect annual herb $\frac{1}{2}$ - $2\frac{1}{2}$ ft. high; branches covered with fine spreading hairs. Leaves sessile, membranous, crenate, ovate, about 1 in. long, very sparsely pubescent on both surfaces. Flowers purple, in 1-2-flowered whorls forming copious lax pedunculate racemose axillary cymes; pedicels very short. Calyx $\frac{1}{10}$ in. long, finely glandular-pubescent.

Equatoria.

11. **GENIOSPORUM** Wall. ex Benth.**Geniosporum paludosum** Bak.

Erect perennial herb up to 4 ft. high; stems branched, pubescent. Leaves shortly petiolate, crenate, ovate to oblong, rounded to subcordate at the base, $1-2\frac{1}{4}$ in. long, thinly pubescent above, more densely pubescent beneath. Flowers pale-lilac, in whorls forming dense cylindric racemes 1-3 in. long; lower bracts large, ovate, white.

Equatoria: Laboni; Imatong Mountains, Itobol, 6350 ft.

12. **HOSLUNDIA** Vahl**Hoslundia opposita** Vahl.

Much-branched erect shrub sometimes reaching a height of 10-15 ft.; branchlets slender, glabrous or slightly pubescent. Leaves petiolate, dentate, oblong or oblong-lanceolate, acute at the apex, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, slightly pubescent above, more densely so beneath. Flowers white, in ample lax terminal deltoid panicles. Berry-like fruiting calyx bright-deep-orange.

Widespread.

13. **HYPTIS** Jacq.**Hyptis lanceolata** Poir.

H. brevipes (non Poit.) Broun & Massey.

Stout herb; stems glabrous or nearly so. Leaves unequally serrate, lanceolate, narrowed to the base, 2-3 in. long, glabrous on both surfaces. Flowers small, in dense globose heads about $\frac{1}{2}$ in. in diameter on ascending peduncles from the nodes all along the stems; bracts ciliate, sharp-pointed.

Equatoria.

H. spicigera Lam.

Annual herb; stems tall, erect, branched, pubescent. Leaves petiolate, incised-crenate, oblong or ovate, cuneate at the base, up to 4 in. long, $1\frac{1}{2}$ in. broad, glabrous above, glabrous or nearly so beneath. Flowers white, small, in many-flowered whorls forming dense oblong or oblong-cylindric racemose panicles, the end ones 2-4 in. long.

Central and Southern Sudan.

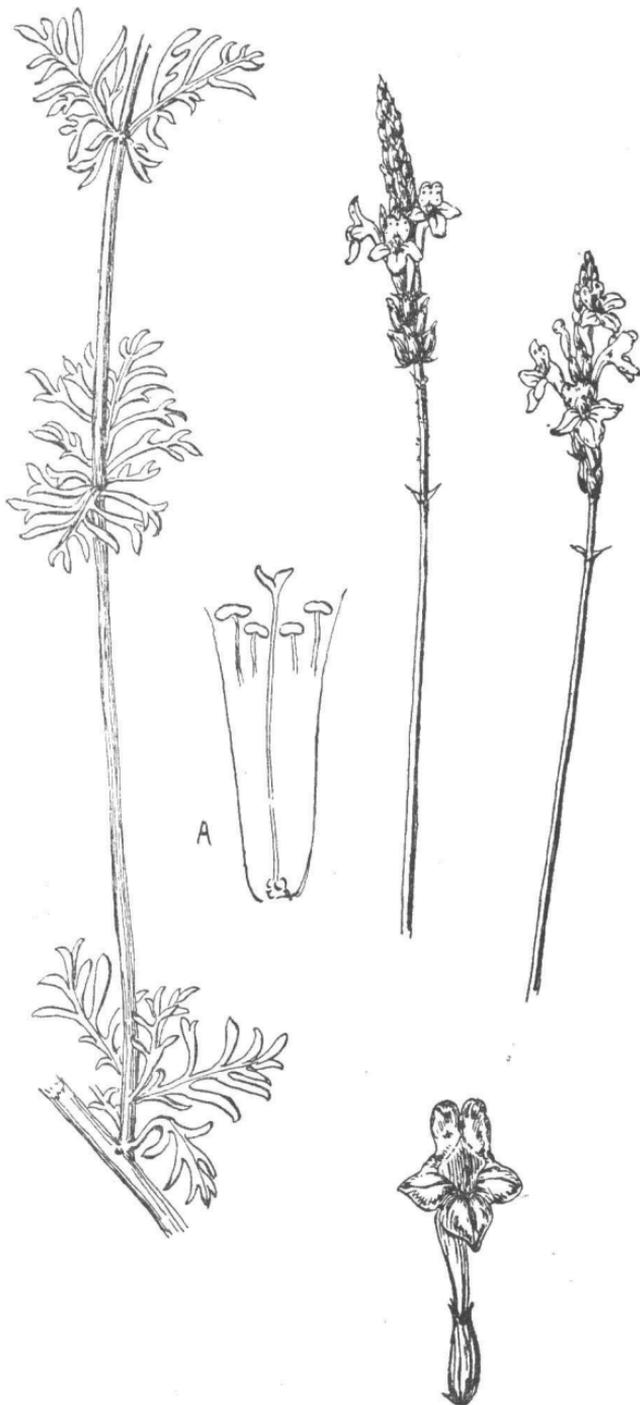


Fig. 54 -LAVANDULA CORONOPIFOLIA Poir.
A, stamens and pistil.

H. pectinata (L.) Poit.

Annual herb; stems erect, branched, 4-6 ft. high, pubescent. Leaves petiolate, thin, crenate, ovate, $\frac{3}{4}$ -2 in. long, more or less pubescent. Flowers small, in compound cymes forming racemose panicles.

Darfur. Fung District: Fazoghli.

14. **IBOZA** N. E. Br.**Iboza multiflora** (Benth.) E. A. Bruce.

Shrub; branchlets densely pubescent. Leaves petiolate, deeply crenate, ovate, rounded to cordate at the base, 2 $\frac{1}{4}$ -6 in. long, pubescent on both surfaces. Flowers about 12 in a whorl forming lax panicles often 1 ft. long; staminate whorls less dense than the pistillate; rhachis densely puberulous or pubescent.

Fung District. Equatoria: summit of Mount Kacha, 10 miles south of Yei.

15. **LAVANDULA** L.**Lavandula coronopifolia** Poir.

Fig. 54.

Erect much-branched perennial herb; branchlets quadrangular, more or less glabrous. Leaves sessile, deeply divided to a narrowly winged rhachis; segments linear with turned-in edges, simple or pinnatifid. Flowers blue, in slender cylindrical panicles 2-3 in. long. Calyx-teeth lanceolate.

Red Sea District. Darfur: Jebel Meidob.

L. pubescens Decne.

L. coronopifolia (non Poir.) Broun & Massey p.p.

Erect much-branched perennial herb; branchlets quadrangular, pubescent. Leaves bipinnatifid with linear segments. Flowers in 2-flowered whorls in long slender panicles. Calyx-teeth deltoid.

Darfur: Jebel Marra.

16. **LEONOTIS** (Pers.) R. Br.**Leonotis nepetifolia** (L.) Ait. f.

Erect branched annual herb 4-5 ft. high; stems stout, finely pubescent. Leaves petiolate, crenate, ovate, the lower ones 3-4 in. long, nearly glabrous. Flowers deep-bright-yellow, about $\frac{1}{4}$ in. long, in very dense whorls 2-2 $\frac{1}{4}$ in. in diameter; bracts large, linear, rigid.

Fung District.

L. africana (Beauv.) Briq.

L. pallida (Schumach.) Benth.

Branched annual herb up to 4-5 ft. high; stems finely hairy. Leaves petiolate, crenate, ovate, finely hairy on the nerves beneath, the lower ones 3-4 in. long. Flowers pale-yellow, in very

dense whorls 2-2½ in. in diameter; bracts lanceolate, rigid, spine-tipped.

Widespread.

L. raineriana Vis.

L. velutina Fenzl ex Benth.

Tall branched perennial herb; stems stout, finely hairy. Leaves petiolate, crenate, ovate, finely pubescent beneath. Flowers bright-orange, 1 in. long, in very dense whorls 3 in. in diameter; bracts small, linear. Corolla densely pilose.

Central and Southern Sudan.

17. **LEUCAS R. Br.**

A. Calyx-tube not oblique at the throat:

(a) Bracts large; leaves ovate, slightly hairy *L. nubica*.

(aa) Bracts small; leaves suborbicular, softly hairy on both surfaces *L. inflata*.

AA. Calyx-tube oblique at the throat:

B. Calyx-tube produced on the upper side *L. martinicensis*.

BB. Calyx-tube produced on the lower side:

C. Bracts minute:

(b) Leaves sessile or subsessile:

(c) Leaves oblong-lanceolate *L. neufizeana*.

(cc) Leaves oblong *L. schweinfurthii*.

(bb) Leaves shortly petiolate, ¾-1 in. long *L. paucijuga*.

CC. Bracts large:

(d) Leaves sessile or subsessile; perennial herb

L. calostachys.

(dd) Leaves petiolate; annual herb *L. urticifolia*.

Leucas nubica Benth.

Much-branched erect annual herb; stems pale, finely pubescent. Leaves petiolate, crenate, ovate, acute at the apex, the lower ones 1½-2 in. long, very sparsely pubescent. Flowers small, in numerous many-flowered distant whorls; bracts large, linear, strongly ciliate.

Central Sudan.

L. inflata Benth.

Fig. 55.

Branched erect perennial herb, woody at the base; stems densely clothed with short soft hairs. Leaves nearly sessile, crenate at the apex, suborbicular, ¾-1 in. long, softly hairy on both surfaces. Flowers in very numerous 6-10-flowered whorls, many of the upper whorls approximated and with reduced leaves; bracts minute.

Red Sea District.

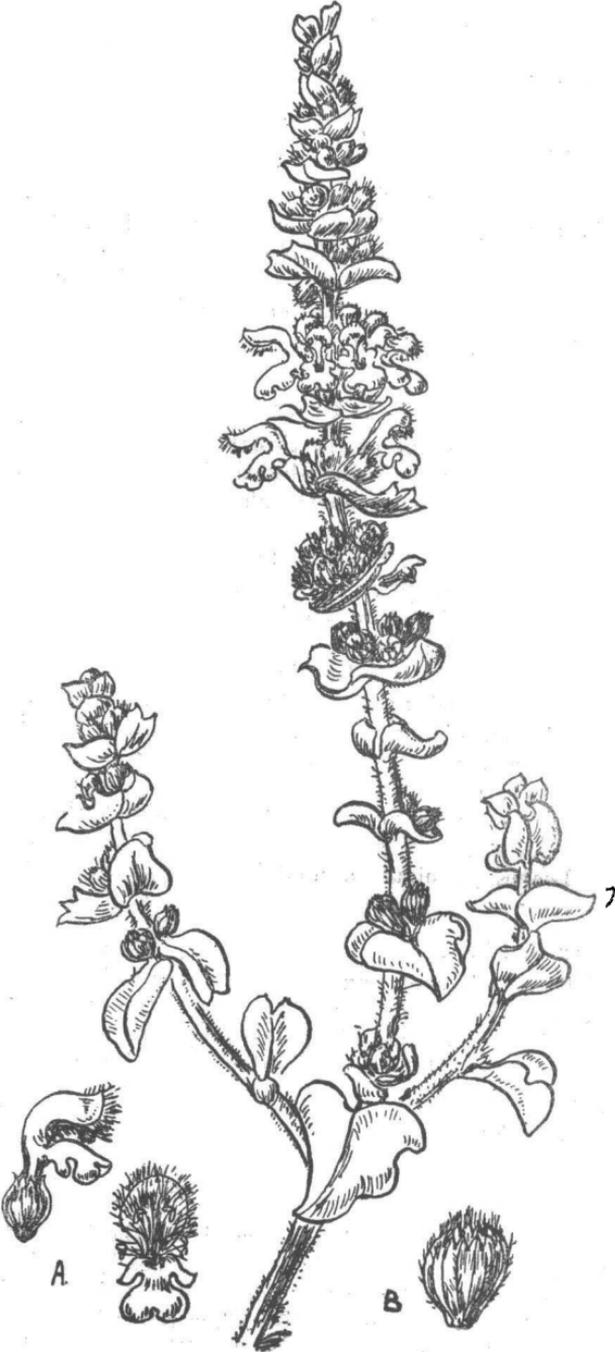


Fig. 55—LEUCAS INFLATA Benth.
A, flowers. B, calyx.

L. martinicensis (Jacq.) Ait. f.

Erect branched annual herb 2-3 ft. high; branches pubescent. Leaves petiolate, distinctly crenate, oblong to lanceolate, 2-3 or more in. long, pubescent on both surfaces. Flowers in very dense remote whorls; bracts large, subulate. Calyx very hairy, $\frac{1}{3}$ - $\frac{1}{4}$ in. long, oblique at the throat with the upper lip produced.

Widespread.

L. neufizeana Courb.

Annual herb; stems erect, densely pubescent, $\frac{1}{2}$ -1 ft. high. Leaves sessile, deeply crenate, oblong-lanceolate, pubescent, $\frac{3}{4}$ -2 in. long. Flowers in many 8-12-flowered whorls, the upper whorls close together, the lower ones spaced out; bracts minute. Calyx densely pubescent, the tube oblique at the throat and produced on the lower side.

Red Sea District: 21° N., between sea-level and 4000 ft.

L. schweinfurthii Gürke.

Perennial herb; stems long, simple, densely covered with short white hairs. Leaves sessile, oblong, about 1 in. long, pubescent on both surfaces, with a few shallow obtuse teeth in the upper half. Flowers in many distant few-flowered whorls; bracts linear, minute. Calyx $\frac{1}{4}$ in. long, pubescent; tube oblique at the throat and produced on the lower side.

Equatoria.

L. paucijuga Bak.

Perennial herb; stems slender, pubescent. Leaves shortly petiolate, remote, deeply crenate, ovate, rounded at the base, $\frac{3}{4}$ -1 in. long, pubescent on both surfaces. Flowers in few-flowered whorls subtended by large leaves; bracts minute, rigid, linear-subulate. Calyx pilose, $\frac{1}{4}$ in. long; tube 10-ribbed, oblique at the throat and produced on the lower side.

Red Sea Hills: Erkowit.

L. calostachys Oliv.

Perennial herb; stems densely pubescent, woody towards the base. Leaves subsessile, crenate in the upper half, 1-2 in. long, thinly pubescent above, densely and softly so beneath. Flowers in numerous close many-flowered whorls about 1 in. in diameter, their leaves much reduced; bracts setaceous, about $\frac{1}{4}$ as long as the calyx. Calyx $\frac{1}{4}$ in. long, pubescent; tube oblique at the throat and produced on the lower side.

Equatoria: Imatong Mountains, Lomuleng, 8000 ft.

L. urticifolia (Vahl) Benth.

Fig. 56.

Annual herb; branches erect, finely hairy, $\frac{1}{2}$ -2 ft. high. Leaves petiolate, crenate, ovate, 1-2 in. long, finely hairy on both surfaces. Flowers in distant many-flowered globose whorls $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter; bracts large, linear, densely ciliate. Calyx $\frac{1}{2}$ in. long; tube oblique at the throat and produced on the lower side.

Red Sea District. Blue Nile Province: Gezira.

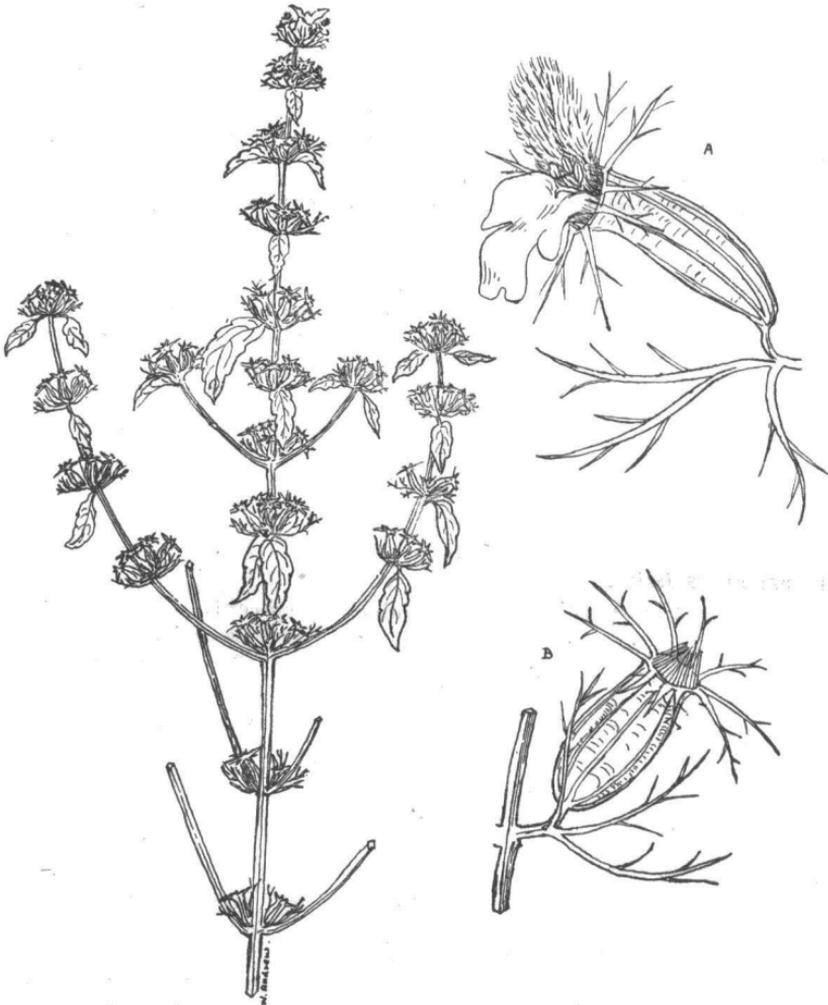


Fig. 56—**LEUCAS URTICIFOLIA** (Vahl) Benth.

A, flower. B, persistent calyx subtended by a much-divided bract.

18. **MENTHA** L.**Mentha longifolia** subsp. **schimperi** (Briq.) Briq.*M. sylvestris* (non L.) Broun & Massey.

Perennial herb; stems erect, pubescent. Leaves sessile, obscurely serrate, lanceolate, densely pubescent. Flowers in many-flowered whorls aggregated into cylindric spike-like racemes 2-3 in. long.

*Darfur: Jebel Marra.*19. **MICROMERIA** Benth.**Micromeria abyssinica** Benth.

Much-branched perennial herb; stems slender, ascending, finely pubescent, 1-2 ft. high. Leaves distinctly petiolate, membranous, crenate, ovate, finely pubescent, the lower leaves 1-1½ in. long. Flowers in many-flowered distant sessile whorls, only the lowest whorls subtended by well-developed leaves. Calyx nearly ¼ in. long; tube cylindric, strongly ribbed; teeth small, lanceolate.

*Red Sea Hills: Erkowit.***M. biflora** (Buch.-Ham.) Benth.

Much-branched perennial herb; stems slender, pubescent, ½-1 ft. high. Leaves obscurely petiolate, rigid, entire, ovate or oblong-lanceolate, finely pubescent, ¼-½ in. long. Cymes 2-6-flowered, sessile or shortly pedunculate in the axils of well-developed leaves. Calyx ¼-½ in. long. Corolla pink to pale-lilac.

*Red Sea District. Darfur: Jebel Marra. Equatoria: Imatong Mountains.*20. **NEPETA** L.**Nepeta ballotifolia** Hochst, ex A. Rich.

Perennial herb; stems short, erect, branched, pubescent. Leaves sessile, crenate, ovate, 1-1½ in. long, pubescent. Flowers in moderately dense racemose inflorescences; lower whorls distinct, subtended by leaves; bracts linear, large. Calyx ¼ in. long; tube subcylindric, pubescent. Corolla-tube longer than the calyx.

*Darfur: Jebel Marra.***N. sudanica** F. W. Andr.*N. biloba* (non Hochst.) Broun & Massey.

Perennial herb or undershrub; stems erect, canescent. Leaves petiolate, crenate, ovate or broadly ovate, obtuse or rounded at the apex, truncate or cordate at the base, up to 3 in. long and 1½ in. broad, densely canescent beneath; petiole up to ¾ in. long in the lower leaves. Flowers blue or pale-purple, in pedunculate axillary many-flowered cymes aggregated upwards into dense oblong panicles; bracts linear-lanceolate, densely villous. Calyx ½ in. long, densely villous. Corolla-tube equalling or somewhat longer than the calyx.

Red Sea Hills: Erkowit.

21. **OCIMUM** L.**Ocimum americanum** L.*O. canum* Sims.

Erect much-branched annual herb; stems densely pubescent, 1-2 ft. high. Leaves petiolate, entire or obscurely crenate, ovate or lanceolate, 1-2 in. long, more or less pubescent. Flowers white, in moderately dense racemes 3-6 in. long. Filaments of upper stamens with a tooth near the base.

*Central and Southern Sudan.***O. basilicum** L.

Fig. 57.

Erect much-branched annual herb; stems glabrous or very slightly pubescent, 1-2 ft. high. Leaves petiolate, ovate, 1-2 in. long, glabrous or very slightly pubescent. Flowers white or more or less tinged with purple, in moderately dense racemes, the end raceme finally 6-9 in. long. Filaments of upper stamens with a tooth near the base.

*Northern and Central Sudan.***O. hadiense** Forsk.

Fig. 58.

O. menthaefolium Hochst. ex Benth.

Perennial herb; stems villous. Leaves petiolate, crenate, ovate to elliptic or oblong, obtuse at the apex, sparsely villous on both surfaces. Flowers pale-blue, in 8-flowered whorls forming hispid terminal racemes. Filaments of the upper stamens with a tooth near the base.

*Northern and Central Sudan.***O. suave** Willd.

Much-branched erect perennial herb or undershrub; stems pubescent. Leaves petiolate, crenate, 2-4 in. long, pubescent above, densely so beneath. Flowers white, small, in dense copiously paniced racemes finally 6-9 in. long. Filaments of the upper stamens with a tooth at the base.

*Fung District. Equatoria.***O. dichotomum** Hochst. ex Benth.

Erect annual herb similar to *O. basilicum*; stems erect, much branched, slightly pubescent. Leaves petiolate, subentire, oblong-lanceolate, 1-1½ in. long, nearly glabrous. Flowers in many-flowered whorls forming long lax racemes. Filaments of upper stamens without either a tooth or tuft of hairs at the base.

Kordofan. Blue Nile Province: Jebel Arashkol.

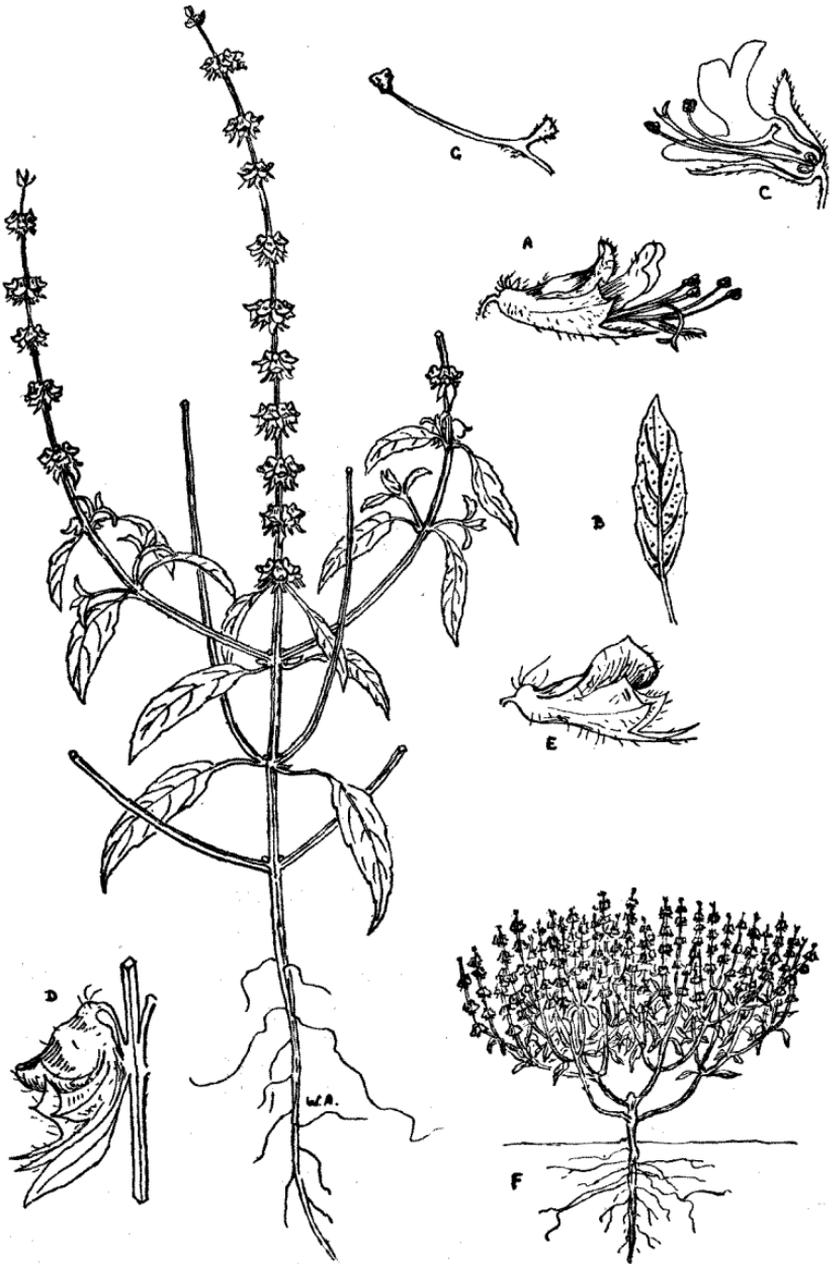


Fig. 57—*OCIMUM BASILICUM* L.

A, flower. B, back of leaf showing glands. C, longitudinal section of flower. D, calyx and bract. E, calyx. F, habit. G, one of upper pair of stamens.



Fig. 58—OCIMUM HADIENSE Forsk.

O. staminosum Bak.

Undershrub; branches covered with short spreading white hairs. Leaves petiolate, subentire or obscurely crenate, $1\frac{1}{2}$ -2 in. long, pubescent on both surfaces. Flowers pale-mauve, in few-flowered whorls in long lax racemes. Filaments of the upper stamens without either a tooth or tuft of hairs at the base.

Red Sea Hills.

22. **ORTHOSIPHON** Benth.**Orthosiphon bartsioides** Bak.

Perennial herb; stems long, slender, erect, branched, slightly pubescent. Leaves sessile, crenate, oblong-lanceolate, the lower ones $1\frac{1}{2}$ -2 in. long, pubescent on both surfaces. Flowers in 2-flowered whorls forming long lax racemes. Calyx pubescent, finally $\frac{1}{4}$ in. long.

Equatoria.

O. roseus Briq.

Herb; stems slender, erect, much branched, slightly pubescent upwards. Leaves shortly petiolate, crenate, ovate, acute at the apex, the upper ones about 1 in. long, slightly pubescent. Flowers in many few-flowered whorls forming lax terminal racemes. Calyx $\frac{1}{2}$ in. long.

Equatoria.

O. pallidus Royle ex Benth.

Perennial herb, much branched from the base; stems short, densely pubescent. Leaves shortly petiolate, crenate, ovate, obtuse at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, pubescent on both surfaces. Flowers in few-flowered whorls forming lax terminal racemes. Calyx $\frac{1}{2}$ in. long.

Red Sea Hills.

O. schimperi Benth.

Perennial herb; stems erect or decumbent, simple or branched, densely hairy upwards. Leaves petiolate, crenate, ovate, abruptly narrowed to the base, 1-3 in. long, sparsely pubescent on both surfaces. Flowers in many-flowered lax or dense racemes. Calyx, finally $\frac{1}{2}$ in. long.

Equatoria.

O. australis Vatke.

Herb; stems much branched, slightly pubescent towards the top. Leaves petiolate, crenate or dentate, ovate, obtuse at the apex, almost truncate at the base, up to $1\frac{3}{4}$ in. long, 1 in. broad, glabrous or nearly so. Flowers in 6-flowered whorls forming slender simple racemes. Calyx $\frac{1}{2}$ in. long in fruit.

Equatoria.

23. **OTOSTEGIA** Benth.**Otostegia fruticosa** (Forsk.) Briq.

Fig. 59.

O. scariosa Benth.; *O. repanda* Benth.

Shrub; branches more or less densely pubescent. Leaves petiolate, crenate, ovate, cuneate to truncate or cordate at the base, 1-2 in. long, pubescent above, densely pubescent beneath. Flowers cream, in numerous many-flowered whorls subtended by well-developed leaves. Calyx-tube pubescent, about $\frac{1}{2}$ in. long.

Red Sea District. Darfur: Jebel Marra. Fung District.

O. tomentosa A. Rich.

Shrub; branchlets woody, virgate, pubescent. Leaves sessile, thick, crenate, oblong, obtuse at the apex, very small, white-tomentose beneath with much-raised nerves. Flowers few in a whorl, sessile.

Red Sea Hills: Erkowit.



Fig. 59—*OTOSTEGIA FRUTICOSA* (Forsk.) Briq.
A, calyx. B, corolla, with stamens and style.

24. *PLATOSTOMA* Beauv.

Platostoma africanum Beauv.

Erect annual herb; stem much-branched, slender, pubescent, 1-2 ft. high. Leaves petiolate, crenate, membranous, ovate, $\frac{1}{2}$ -2 in. long. Flowers pale-lilac, in 10-flowered whorls forming moderately dense racemes 3-6 in. long.

Equatoria.

25. **PLECTRANTHUS** L'Hérit.**Plectranthus cylindraceus** Hochst. ex Benth.

Shrubby perennial herb; stems shortly pubescent above. Leaves shortly petiolate, crenate, oblong, cuneate at the base, pubescent on both surfaces. Flowers white, in whorls forming racemose inflorescences dense in the upper half and 3-5 in. long. Calyx-teeth subequal.

Red Sea Hills: Erkowit; Karora.

P. defoliatus Hochst. ex Benth.

Shrub up to 12 ft. high; branchlets densely pubescent. Leaves crenate or dentate, ovate, 3 in. long, puberulous above, densely pubescent beneath. Flowers dark-blue, in irregular cymes forming long lax racemose panicles, the branches several in a whorl and leafless. Calyx-teeth subequal. Lower lip of corolla as long as the tube.

Equatoria: Imatong Mountains, near Itobol camp.

P. ramosissimus Hook. f.

Erect much-branched herb 4-10 ft. high; stems pubescent. Leaves petiolate, crenate, ovate or narrowly ovate, 1-1½ in. long, pubescent. Flowers white, faintly marked with purple, ¼ in. long, in a lax panicle terminating each branch with copiously compound branchlets each subtended at the base by a reduced leaf. Calyx ½ in. long, densely pubescent.

Equatoria: Imatong Mountains, Ibahin, 6500 ft.

26. **PYGNOSTACHYS** Hook.**Pycnostachys niamniamensis** Gürke.

P. petherickii Bak.

Herb; stems erect, more or less pubescent. Leaves sessile or subsessile, crenate or serrate, oblong-lanceolate, 2-4 in. long, 1-1½ in. broad, glabrous or pubescent on both surfaces. Flowers in very dense spikes finally 3-4 in. long and 1½ in. in diameter.

Equatoria.

P. schweinfurthii Briq.

Erect branched perennial herb; stems pale, about 2 ft. high, pubescent towards the top. Leaves in distant pairs, spreading, sessile or subsessile, serrate, linear, the largest ones 3-4 in. long and ¼ in. broad at the middle, obscurely pubescent beneath. Flowers pale-blue, in very dense spikes finally 1½-2 in. long and ¾-1 in. in diameter.

Equatoria.

P. meyeri Gürke.

Shrubby herb up to 8 ft. high; stems branched, minutely puberulous above. Leaves petiolate, serrate, elliptic-oblong, acuminate at the apex, narrowed at the base into the petiole, up to 7 in. long and $2\frac{1}{2}$ in. broad, sparingly pubescent above, minutely puberulous on the nerves beneath. Flowers blue, in spikes $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long.

Equatoria: Imatong Mountains, Itobol, 6000 ft.

27. **SALVIA** L.**Salvia aegyptiaca** L.

Canescent much-branched undershrub; branches stiff. Leaves crenate, the upper ones sessile, the lower ones tapering to a short petiole, oblong-linear to linear, up to $\frac{1}{2}$ in. long, the margin turned in, more or less pubescent. Flowers pale-mauve, in 2-4-flowered whorls.

Red Sea District.

28. **SCUTELLARIA** L.**Scutellaria schweinfurthii** Briq.

Perennial herb, much branched at the crown of the rootstock; stems slender, erect, simple, about 1 ft. high, pubescent. Leaves entire, subsessile, lanceolate, 1-2 in. long. Flowers magenta-crimson, about $\frac{1}{3}$ - $\frac{1}{2}$ in. long, in 2-flowered whorls forming long lax racemes; bracts small.

Equatoria.

S. paucifolia Bak.

Perennial herb, much branched at the crown of the rootstock; stems erect, more or less pubescent. Leaves very few and very small, very shortly petiolate, crenate, ovate, pubescent. Flowers purple, in 2-flowered whorls forming racemose inflorescences; bracts very small. Corolla nearly $\frac{3}{4}$ in. long.

Equatoria: near Laboni Forest.

S. peregrina L.

Perennial herb; stems slender, branched, erect, more or less pubescent. Leaves petiolate, crenate, ovate, obtuse at the apex, the lower ones 1- $1\frac{1}{2}$ in. long. Flowers violet, nearly $\frac{1}{2}$ in. long, in long lax racemose inflorescences; bracts foliaceous, petiolate, oblong, entire.

Fung District.

29. **TEUCRIUM L.****Teucrium** sp.

T. nummularifolium (non Bak.) Broun & Massey.

Perennial much-branched herb; branchlets densely white-villous. Leaves subsessile or very shortly petiolate, crenate-serrate, ovate or the upper ones oblanceolate, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, softly and densely white-villous above and beneath. Flowers purple, shortly pedicellate in the axils of the leaves.

Red Sea Hills: Erkowit; Karora Hills.

30. **TINNEA** Kotschy & Peyr.**Tinnea aethiopica** Kotschy & Peyr.

Much-branched shrub 3-5 ft. high; branchlets woody, shortly but densely hairy above. Leaves shortly petiolate, usually entire, oblong to elliptic, cuneate at the base, the upper ones 1 in. or less long, the lower ones $1\frac{1}{2}$ -2 in. long, glabrous or pubescent beneath. Flowers chocolate-coloured or dark-purple, about $\frac{1}{2}$ in. long, in usually 2-flowered laxly dispersed whorls; bracts oblong, foliaceous, about as long as the flowers.

Equatoria.

MONOCOTYLEDONES

139. **BUTOMACEAE**

Fresh-water aquatic or marsh herbs, usually with milky juice. Leaves simple, often all radical. Flowers hermaphrodite, actinomorphic, solitary or in bracteate umbels. Sepals 3, free, imbricate, persistent. Petals 3, free, imbricate. Stamens 9 or more, rarely 6 or fewer, hypogynous; anthers basifixed, opening laterally. Carpels 3 or more, free, in a single whorl; ovules numerous, scattered on reticulately branched parietal placentas. Fruiting-carpels dehiscent by the inner suture.

1. **TENAGOCHARIS** Hochst.**Tenagocharis latifolia** (D. Don) Buchen.

Butomopsis lanceolata (Roxb.) Kunth.

Annual marsh herb. Leaves all radical, long-petiolate, oblanceolate, shortly and subobtusely acuminate at the apex, gradually narrowed to the base, about 4 in. long, $1\frac{1}{2}$ in. broad, glabrous, with 2 pairs of longitudinal lateral nerves. Flowers in about 3-8-flowered long-pedunculate umbels; pedicels up to $4\frac{1}{2}$ in. long in fruit. Stamens usually 9. Carpels 6, overtopping the calyx in fruit.

Central Sudan.

140. *HYDROCHARITACEAE*

Fresh-water or marine aquatic herbs, partly or wholly submerged, sometimes floating. Leaves simple, radical or cauline, alternate, opposite or verticillate. Flowers hermaphrodite or unisexual, actinomorphic, solitary or grouped in a tubular spathe or between 2 opposite bracts. Sepals 3, free, valvate. Petals 3, free, or absent. Stamens 2-3 or more. Ovary inferior, 1-locular, with parietal placentas sometimes protruding nearly to the middle of the ovary; ovules numerous. Fruit rupturing irregularly.

A. Fresh-water plants:

B. Stems elongated, with alternate or subopposite leaves; spathes sessile in the axils of the leaves:

(a) Stamens 3; leaves linear LAGAROSIPHON. 2.

(aa) Stamens 2; leaves linear-lanceolate ... NECHAMANDRA. 3.

BB. Stems very short; leaves radical; spathes pedunculate:

(b) Petals absent or rudimentary; leaves linear VALLISNERIA. 6.

(bb) Petals larger than the sepals; leaves not linear OTTELIA. 4.

AA. Marine plants:

(c) Stamens 6 or more; styles 2-fid; leaves linear THALASSIA. 5.

(cc) Stamens 3; styles entire; leaves petiolate, small, paired HALOPHILA. 1.

1. **HALOPHILA** Thou.**Halophila ovalis** (R. Br.) Hook. f.

H. ovata Gaudich.

Small marine herb growing just above low-water mark; rhizome creeping. Leaves 2 from each node, entire, elliptic-oblong, 1 in. long, up to $\frac{1}{2}$ in. broad, glabrous, flat; petiole $\frac{3}{4}$ -1 in. long. Spathes small, sessile. Fruit subglobose, included in the spathe, the beak exerted.

Red Sea District: coast.

H. stipulacea (Forsk.) Aschers.

Marine herb, with a creeping rhizome, growing below low-water mark. Leaves 2 from each node, minutely denticulate, linear-oblong, 2 in. long, $\frac{1}{4}$ in. broad, pubescent, puckered. Scale-leaves white, 2 from each node, one sheathing the internode, the other the bases of the leaves.

Red Sea District: coast.

2. **LAGAROSIPHON** Harv.**Lagarosiphon schweinfurthii** Casp.

Aquatic herb. Leaves alternate, linear, acute at the apex, about $\frac{1}{2}$ in. long, with 50-60 teeth on each margin. Spathes axillary, sessile.

Equatoria.

L. cordofanus (Hochst.) Casp.

Aquatic herb. Leaves alternate or occasionally subopposite, linear, attenuate to a very acute point at the apex, $\frac{1}{2}$ -1 in. long, with 34-44 teeth on each margin. Spathes axillary, sessile.

Blue Nile Province: Jebel Arashkol.

3. NECHAMANDRA Planch.**Nechamandra alternifolia** (Roxb.) Thw.

Aquatic herb; stems thread-like. Leaves alternate, linear-lanceolate, acute at the apex, 3-4 in. long, often twisted. Male spathes at length 2-valved; flowers numerous; stamens 2. Female spathes 1-flowered.

White Nile River, near Kosti.

4. OTTELIA Pers.**Ottelia alismoides** (L.) Pers.

Aquatic herb. Leaves thin, with a long triquetrous petiole, usually broadly cordate, obtuse at the apex, 4-6 or more in. broad, 7-11-nerved. Flowers white, hermaphrodite; spathe with several longitudinal wings.

Central Sudan.

O. ulvifolia (Planch.) Walp.

Fig. 60.

O. lancifolia A. Rich.; *Boottia abyssinica* Ridl.

Aquatic herb. Leaves very thin, elliptic-lanceolate to oblanceolate, acute to subacute at the apex, gradually narrowed at the base into a petiole, up to about 12 in. long and $2\frac{1}{2}$ in. broad but often much smaller, glabrous. Flowers yellow or white, hermaphrodite; spathe compressed, narrowly oblong-elliptic, 2-winged, $\frac{3}{4}$ - $2\frac{1}{4}$ in. long, usually 1-flowered. Fruit about as long as and enclosed in the somewhat expanded spathe.

Central and Southern Sudan.

O. brachyphylla (Gürke) Dandy.

Boottia abyssinica (non Ridl.) Broun & Massey p.p.

Aquatic herb. Leaves thin, lanceolate, obtuse at the apex, narrowed into a petiole not clearly differentiated from the lamina. Flowers dioecious; scapes up to 8 in. long; spathe 2-winged, up to 2 in. long, smooth.

Equatoria.

O. scabra Bak.

Boottia scabra (Bak.) Ridl.

Aquatic herb. Leaves oblanceolate, acute at the apex, up to $1\frac{1}{2}$ -2 ft. long and $2\frac{1}{2}$ in. broad; petiole 12 in. long, expanded at the base into an amplexicaul sheath $1\frac{1}{4}$ in. broad. Flowers white, hermaphrodite; scapes $2\frac{1}{2}$ ft. long, rough; spathe unwinged, rugose, 3 in. long, 1 in. wide, 1-flowered.

Central and Southern Sudan: White Nile River.



Fig. 60—*OTTELIA ULVIFOLIA* (Planch.) Walp.
 A, spathe enclosing fruit. B, cross-section of spathe and fruit.

5. **THALASSIA** Banks ex König**Thalassia hemprichii** (Ehrenb.) Aschers.

Submerged marine herb; rhizome long-creeping with numerous annular scars. Leaves clustered on short shoots at intervals along the rhizome, linear, obtuse at the apex, 6 in. long, about $\frac{1}{4}$ in. broad. Flowers dioecious, solitary: male flower on a long pedicel; female flower at length stipitate; spathe composed of 2 united bracts. Petals absent.

Red Sea District: coast.

6. **VALLISNERIA** L.**Vallisneria aethiopica** Fenzl.

V. spiralis (non L.) Broun & Massey.

Submerged grass-like plant. Leaves linear, obtuse at the apex, 2-16 in. long. Male scapes axillary, 1-2 in. long; spathe ovate, compressed; male flowers very numerous in the spathe, minute, very shortly pedicellate. Female scapes very long, becoming spirally coiled; spathe tubular, nearly as long as the ovary; female flower solitary in the spathe. Capsule 2-4 in. long.

Central and Southern Sudan.

141. **ALISMATACEAE**

Perennial or annual aquatic or marsh herbs. Leaves simple, usually all radical, with elongated petioles sheathing at the base. Flowers hermaphrodite or unisexual, actinomorphic, whorled in umbels, racemes or panicles, rarely solitary. Sepals 3, free, imbricate, persistent. Petals 3, free, imbricate, deciduous, rarely absent. Stamens 3-6 or more, hypogynous. Carpels numerous or rarely 6 or 3, free, sometimes in 1 whorl; ovules 1 or more, basal. Fruiting-carpels 1-seeded and indehiscent, or rarely dehiscent at the inner suture.

- A. Flowers solitary (i.e. in 1-flowered umbels), hermaphrodite; fruiting-carpels strongly compressed, wing-margined, prominently beaked RANALISMA. 6.
- AA. Flowers verticillate in umbels, racemes, panicles or spike-like inflorescences:
 - B. Flowers subsessile in spike-like inflorescences, monoecious; stamens 3 WIESNERIA. 7.
 - BB. Flowers pedicellate; stamens 6 or more:
 - C. Flowers dioecious; petals smaller than the sepals BURNATIA. 2.
 - CC. Flowers hermaphrodite or polygamous; petals larger than the sepals:
 - (a) Flowers hermaphrodite; leaves cordate or subcordate at the base; carpels in a single whorl:
 - (b) Fruiting-carpels strongly compressed ALISMA. 1.
 - (bb) Fruiting-carpels turgid or only slightly compressed CALDESIA. 3.

- (aa) Flowers polygamous; leaves sagittate at the base; carpels not in a single whorl:
- (c) Fruiting-carpels inflated, obovoid LIMNOPHYTON. 4.
- (cc) Fruiting-carpels compressed ... LOPHOTOCARPUS. 5.

1. ALISMA L.

Alisma plantago-aquatica L.

Water-plantain.

Perennial aquatic herb; rhizome tuberous. Leaves all radical, 3-7-nerved, ovate, subcordate at the base, 1½-8 in. long, ½-4½ in. broad. Flowers pink, verticillate in panicles; scapes solitary or many, erect or curved, 1-2 ft. high. Fruiting-carpels strongly compressed, dorsally 2-ribbed.

Kordofan: Rahad.

2. BURNATIA M. Mich.

Burnatia enneandra M. Mich.

Slender aquatic herb 3-4 ft. high; rhizome ovoid-globose; stem and leaves secreting white juice. Leaves all radical, long-petiolate, oblong-lanceolate, acute at each end, 4-6½ in. long, ¾-1½ in. broad, glabrous. Flowers greenish-white, very small: male flowers in a much-branched panicle longer than the leaves; female flowers in a much smaller and more compact panicle than the male. Fruiting-carpels about 12, crowded.

Central and Southern Sudan.

3. CALDESIA Parl.

Caldesia reniformis (D. Don) Makino.

Aquatic herb, with a very short rhizome. Leaves all radical, long-petiolate, ovate-orbicular or suborbicular, deeply cordate at the base, 2½-3 in. long, usually about 2½ in. broad, glabrous. Flowers white, small, 3-4 in a whorl in large lax pyramidal panicles. Fruiting-carpels ribbed, sharply beaked.

Equatoria.

4. LIMNOPHYTON Miq.

Limnophyton obtusifolium (L.) Miq.

Fig. 61.

Aquatic herb; rhizome short. Leaves all radical, long-petiolate, often acuminate at the apex, widely sagittate at the base with the basal lobes sometimes longer than the upper part, up to 12 in. long and 8 in. broad, with numerous parallel nerves radiating from the base. Flowers white, polygamous, verticillate in lax panicles; scape 1½-3 ft. long. Carpels about 20. Fruiting-carpels obovoid, about ⅙ in. long, wrinkled when dry.

Central and Southern Sudan.

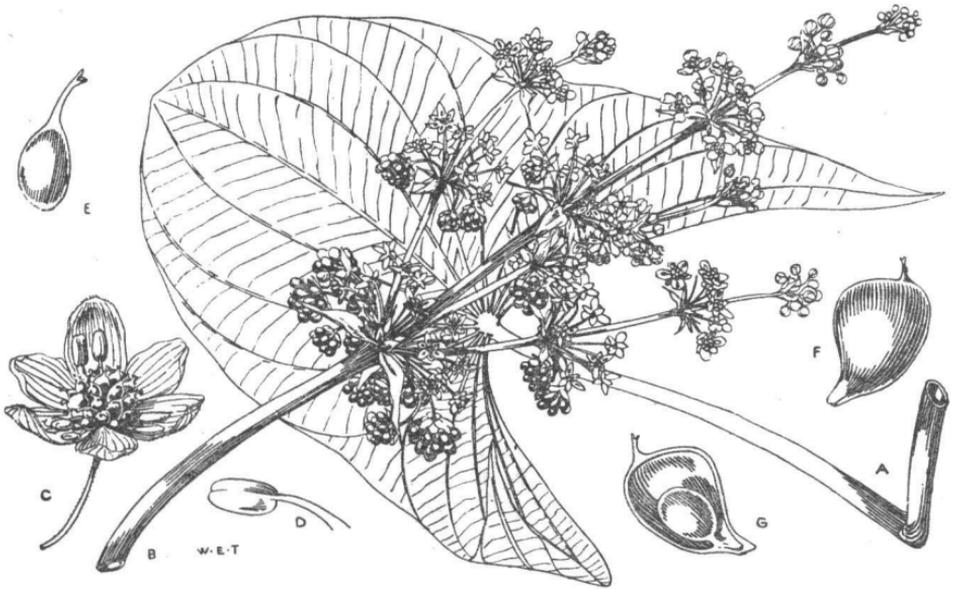


Fig. 61—*LIMNOPHYTON OBTUSIFOLIUM* (L.) Miq.

A, leaf. B, inflorescence. C, flower. D, anther. E, carpel. F, fruiting-carpel. G, vertical section of fruiting-carpel.

5. *LOPHOTOCARPUS* Th. Dur.

Lophotocarpus guayanensis (Kunth) Dur. & Schinz.

Aquatic herb; rhizome small. Leaves all radical, long-petiolate, ovate, deeply sagittate at the base, 2-3½ in. long, up to 3¼ in. broad. Flowers polygamous, few in a whorl in racemose inflorescences. Fruiting-carpels compressed, with a rugose margin.

Kordofan: *Taiara*.

6. *RANALISMA* Stapf

Ranalisma humile (Kunth) Hutch.

Fig. 62.

Echinodorus humilis (Kunth) Buchen.

Small marsh herb. Leaves all radical, long-petiolate, ovate or oblong-elliptic, subacute at the apex, rounded at the base, about 1½ in. long, ½ in. broad, glabrous. Flowers hermaphrodite, solitary on fairly long pedicels. Carpels numerous in a subglobose head. Fruiting-carpels compressed, long-beaked with the persistent style.

Central Sudan: banks of the *White Nile*.



Fig. 62—*RANALISMA HUMILE* (Kunth) Hutch.

A and B, whole plants in fruit. C, flower. D, stamen. E, fruit. F, mature carpel. G, longitudinal section of carpel.

7. **WIESNERIA** M. Mich.**Wiesneria schweinfurthii** Hook. f.

Slender aquatic herb. Leaves all radical, long-petiolate, elongate-linear-oblongate, subobtusate at the apex, $3\frac{1}{2}$ - $4\frac{1}{2}$ in. long, 2 - $2\frac{1}{2}$ in. broad; petiole septate. Flowers monoecious, in spike-like inflorescences, the female flowers in whorls below, the male flowers above. Fruiting-carpels 3-6, 3-ribbed on the back, beaked, muricate on the margin.

Equatoria.

142. **APONOGETONACEAE**

Fresh-water aquatic herbs; rhizome tuberous. Leaves simple, all radical, submerged or with a floating lamina. Flowers hermaphrodite or rarely unisexual, actinomorphic or zygomorphic, in simple or branched spatheate spikes on long peduncles; spathe deciduous. Perianth-segments 1-3 or absent, usually petaloid, equal or unequal, usually persistent. Stamens 6 or more, free, hypogynous. Carpels 3-6, free; ovules 2 or more, ascending. Fruiting-carpels dehiscent at the inner suture.

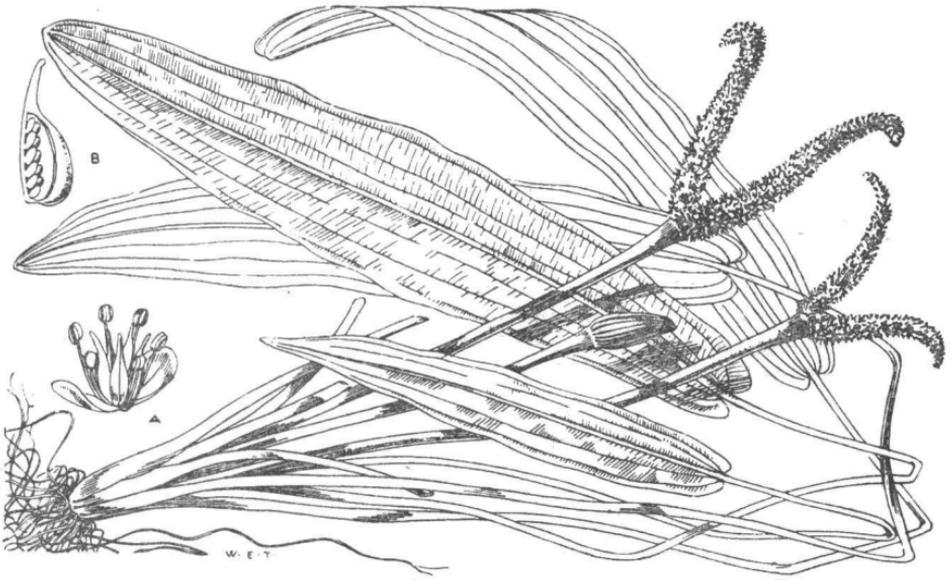


Fig. 63—**APONOGETON SUBCONJUGATUS** Schumach.

A, flower. B, vertical section of carpel.

1. **APONOGETON** L. f.**Aponogeton subconjugatus** Schumach.

Fig. 63.

Aquatic herb. Leaves long-petiolate, oblong, obtuse at the apex, cordate at the base, $6\frac{1}{2}$ -12 in. long, $1\frac{1}{4}$ - $1\frac{1}{2}$ in. broad, with a broad midrib and 3 parallel longitudinal nerves on each side and

numerous closely parallel transverse veins between. Spikes long-pedunculate, 2-branched, not secund, the branches about $1\frac{1}{4}$ in. long in flower and about $2\frac{1}{2}$ in. long in fruit. Fruiting-carpels ovoid-ellipsoid, beaked.

Upper Nile: Bor.

A. vallisnerioides Bak.

Aquatic herb. Leaves sessile, linear, up to 6 in. long, with no distinct midrib but with several distinct longitudinal parallel nerves. Flowers white or pale-violet; spikes unbranched, secund, about $\frac{3}{4}$ in. long, on very slender peduncles.

Equatoria.

143. POTAMOGETONACEAE

Fresh-water aquatic herbs. Leaves simple, alternate or opposite, all submerged or the upper ones with a coriaceous floating lamina, sheathing at the base, the sheath often free and stipule-like. Flowers hermaphrodite, small, actinomorphic, in pedunculate axillary spikes; bracts absent. Perianth composed of 4 free rounded shortly clawed valvate segments. Stamens 4, inserted on the claws of the perianth-segments; anthers extrorse, 2-locular, sessile. Carpels 4 or sometimes fewer, free; stigma sessile or on a short style; ovules solitary in each carpel, adaxial. Fruiting-carpels 1-seeded, indehiscent.

1. POTAMOGETON L.

Potamogeton nodosus Poir.

Leaves (in mature plants) all or mostly floating (the lower ones submerged but often disappearing early), all with a more or less elongated petiole; lamina of floating leaves elliptic to elliptic-oblong, cuneate to rounded at the base, 2-3 or more in. long; sheath free from the leaf. Fruiting-carpels about $\frac{7}{8}$ in. long, short-beaked.

Blue Nile Province: Gezira canals.

P. schweinfurthii A. Benn.

P. lucens (non L.) Broun & Massey.

Leaves all or mostly submerged (the upper ones sometimes floating); submerged leaves subsessile or with a more or less elongated petiole, linear to lanceolate or narrowly elliptic-oblong, $2\frac{1}{2}$ -3 or more in. long; floating leaves (if present) with a more or less elongated petiole, lanceolate to oblong or narrowly elliptic-oblong, cuneate or rounded at the base; sheath free from the leaf. Fruiting-carpels about $\frac{1}{2}$ in. long, short-beaked.

Southern Sudan.

P. perfoliatus L.

Perfoliate Pondweed.

Leaves all submerged, sessile, amplexicaul, suborbicular or ovate to lanceolate, rounded or obtuse at the apex, 1-1½ or more in. long; sheath free from the leaf, evanescent. Spikes ½-¾ in. long. Fruiting-carpels short-beaked.

Northern Sudan: near Faris. Blue Nile Province: Gezira canals.

P. octandrus Poir.*P. javanicus Hassk.*

Plant with or without coriaceous floating leaves; stems branched, thread-like. Submerged leaves entire, sessile, narrowly linear, with a well-marked lacunar system bordering the midrib and usually extending sideways to the lateral nerves; floating leaves lanceolate, long-petiolate; stipular sheath free from the leaf. Spikes varying from ¼-¾ in. long. Carpels normally 4 (but sometimes reduced to 3 or 2) in each flower, short-beaked in fruit.

Central and Southern Sudan.

P. pusillus L.

Leaves all submerged, entire, sessile, linear, up to about 3 in. long, ½ in. broad, 3-5-nerved, without a well-marked lacunar system bordering the midrib (except sometimes in the uppermost or involucreal leaves); sheath free from the leaf, closed and tubular at least when young. Fruiting carpels ⅙-⅓ in. long, short-beaked.

Darfur: Jebel Marra.

P. crispus L.

Curled Pondweed.

Leaves all submerged, usually more or less crisped, serrulate, sessile, 3-5-nerved, narrowly oblong to linear, up to ¾ in. broad; sheath free or almost free from the leaf, forming an independent stipular sheath. Spikes with few or comparatively few flowers. Fruiting-carpels long-beaked (the beak from half to wholly as long as the body of the carpel), with a more or less prominent dorsal tooth near the base.

Northern and Central Sudan.

P. pectinatus L.

Fennel-leaved Pondweed.

Stems thread-like. Leaves all submerged, entire, narrowly linear to setaceous, acute or mucronate at the apex; sheath adnate to the lower part of the leaf, forming a basal leaf-sheath. Peduncles very slender; spikes often interrupted, the upper flowers usually close together. Fruiting-carpels large, olive or green, obliquely obovoid.

Blue Nile Province: Gezira canals.

144. ZANNICHELLIACEAE

Submerged aquatic herbs of fresh, brackish or salt water, with slender creeping rhizomes. Leaves simple, alternate or opposite or crowded on short shoots, linear, sheathing at the base, the sheath sometimes free and stipule-like. Flowers minute, monoecious or dioecious, axillary, solitary or in cymes. Perianth absent or cupular or of 3 small free segments. Stamens 1-3, usually connate; anthers 1-4-locular; pollen globose or thread-like. Carpels 1-9, free; style simple or 2-4-fid; ovules solitary in each carpel, pendulous. Fruiting-carpels sessile or stipitate, 1-seeded, indehiscent, sometimes viviparous.

- A. Pollen sphaeroid; plants of fresh or brackish water; perianth present and cupular in the female flowers, absent in the male flowers; stamen 1 ZANNICHELLIA. 4.
- AA. Pollen thread-like; marine plants; perianth absent; stamens 2, united:
- B. Style simple; one anther attached higher than the other DIPLANTHERA. 2.
- BB. Style 2-4-fid; anthers attached at the same height:
- (a) Leaves terete, grooved; flowers cymose SYRINGODIUM. 3.
- (aa) Leaves flat, not terete; flowers solitary ... CYMODOCEA. 1.

1. CYMODOCEA König

Cymodocea ciliata (Forsk.) Ehrenb. ex Aschers.

Submerged marine herb; stems 3-12 in. long, woody, covered with closed annular scars. Leaves linear-falcate, 3-6 in. long, rounded and ciliate-serrulate at the apex.

Red Sea District: coast.

C. serrulata (R. Br.) Aschers. & Magnus.

Submerged marine herb; stems long, creeping; annular scars open. Leaves nearly straight, linear, 4-6 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad, ciliate-serrulate at the apex.

Red Sea District: coast.

C. rotundata Aschers. & Schweinf.

Submerged marine herb. Leaves narrowly linear, 9-13-nerved, $\frac{1}{8}$ in. or less broad, subentire.

Red Sea District: coast.

2. DIPLANTHERA Thou.

Diplanthera uninervis (Forsk.) Aschers.

Submerged marine herb; stems long, creeping. Leaves 3-nerved, linear, nearly straight, truncate and more or less 3-toothed at the apex, 5-7 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad.

Red Sea District: coast.

3. SYRINGODIUM Kütz.

Syringodium isoetifolium (Aschers.) Dandy.*Cymodocea isoetifolia* Aschers.

Submerged marine herb; stems short. Leaves terete, grooved, 3-5 in. long. Flowers in falcate cymes.

Red Sea District: coast.

4. ZANNICHELLIA L.

Zannichellia palustris L.

Horned Pondweed.

Submerged aquatic herb. Leaves opposite, narrowly linear, 1-2 in. long, with a free stipule-like sheath. Flowers small, in pairs or solitary, axillary, the female ones with a membranous translucent cupular perianth. Fruiting-carpels usually 4, falcate, sessile or stipitate.

Blue Nile Province: Gezira canals.

145. NAJADACEAE

Submerged fresh-water aquatic herbs, with elongated stems. Leaves small, opposite or in threes, sessile, with a sheathing base and linear entire or toothed lamina. Flowers monoecious or rarely dioecious, very small, axillary, ebracteate or with a spathaceous bract. Male flowers with a spathaceous perianth and 1 stamen; anther sessile, 1-4-locular. Female flowers without a perianth; ovary 1-locular; style 2-5-fid; ovule solitary, erect. Fruit usually embraced by the leaf-sheath, 1-seeded, indehiscent.

1. NAJAS L.

Najas graminea Del.

Aquatic herb; stems elongated, rooting at the lower nodes, from a few inches to 2 ft. long. Leaves linear, spreading-recurved, with 36-40 teeth on each margin; sheath elongated, with pointed lanceolate auricles and 8-10 teeth on each margin. Flowers without a spathe. Fruit narrow-oblong or ellipsoid-oblong, tapering at the apex.

*Blue Nile Province: near Jebel Arashkol. Equatoria.***N. schweinfurthii** Magnus.

Aquatic herb. Leaves thin, slender, tapering; marginal teeth about 12 on each side, ending in a brown spine; sheath-auricles with 3-4 erect teeth. Male flowers shortly pedicellate; spathe oblong; anther 1-locular: spathe of female flower ellipsoid-oblong, produced into a neck around the long style.

Equatoria.

N. pectinata (Parl.) Magnus.*N. horrida* A. Braun ex Magnus.

Aquatic herb; stems with numerous short lateral branches. Leaves falcate, coarsely toothed, ending in a spine; sheath-auricles broad, truncate, with 4-6 minute teeth. Male flowers with a spathe; anther 4-locular: female flowers without a spathe.

Central and Southern Sudan.

146. **COMMELINACEAE**

Perennial or annual herbs. Leaves alternate, simple, with a membranous often nervose closed sheath. Flowers actinomorphic or zygomorphic, hermaphrodite, in axillary clusters or in terminal cymes or panicles often subtended by spathaceous bracts. Sepals 3, free. Petals 3, free or sometimes united below into a tube. Stamens 6 or fewer, hypogynous; filaments sometimes with moniliform hairs; anthers basifixed, opening by slits lengthwise or rarely by pores. Ovary superior. 3- (rarely 2-) locular; style terminal, simple; ovules 1 to few in each loculus, axile. Fruit a capsule or berry; seeds usually crowded with the contiguous faces flat, usually muricate, ridged or reticulate.

- A. Inflorescences not enclosed in nor subtended by spathaceous bracts:
- B. Fruit dehiscent:
- (a) Fertile stamens 5-6; capsule 2-locular; seeds solitary in each loculus, ribbed **FLOSCOPA**. 4.
- (aa) Fertile stamens 2-3:
- (b) Capsule 2-locular with a small dorsal loculus with 1 (or no) seed sometimes added; median petal smaller than the 2 lateral ones **ANEILEMA**. 1.
- (bb) Capsule subequally 3-locular; petals subequal **MURDANNIA**. 5.
- BB. Fruit indehiscent:
- (c) Leaf-margins glabrous or nearly so; fruit crustaceous, shining, blue or blue-black **POLLIA**. 7.
- (cc) Leaf-margins silky-hairy; fruit fleshy **PALISOTA**. 6.
- AA. Inflorescences subtended by or enclosed in spathaceous bracts:
- (d) Fertile stamens 5-6; bracts numerous and conspicuous, the outermost usually larger than the others .. **CYANOTIS**. 3.
- (dd) Fertile stamens 2-3 **COMMELINA**. 2.

1. **ANEILEMA** R. Br.**Anelema beniniense** (Beauv.) Kunth.

Herb; stems trailing, rooting near the base, 1-2 ft. long, the axillary shoots sometimes boring through the bases of the leaf-sheaths. Leaves ovate, elliptic or oblong, acuminate at the apex, very slightly hairy, 2-5 in. long, the upper leaves much less narrowed at the base than the lower ones. Flowers blue or whitish, very small, in usually 1 dense terminal pedunculate nearly glabrous panicle 2 in. long and 1½ in. broad, the cyme-peduncles often 100

or more, spreading at right angles. Capsule ellipsoid without angles at the top, 2-locular, $\frac{1}{4}$ in. long, $\frac{1}{2}$ in. broad, shining, normally 5-7-seeded.

Equatoria.

A. lanceolatum Benth.

A. schweinfurthii C. B. Clarke.

Herb up to 15 in. high; roots long, thick, pubescent; stems decumbent at the base. Leaves broadly sheathing, linear-lanceolate, up to 6 in. long, $\frac{1}{4}$ in. broad. Flowers white or pale-violet, in terminal pedunculate minutely pubescent dense panicles up to $1\frac{1}{4}$ in. long and 1 in. broad. Capsule 2-locular, ellipsoid without angles at the top.

Darfur: Jebel Marra, Sunni. Equatoria.

Var. **evolutus** C. B. Clarke.

Leaves linear or scarcely linear-lanceolate, up to 10 in. long, $\frac{1}{2}$ in. broad, very hairy or with sparse long hairs. Panicle 4 in. long, 2 in. broad at the base, 1 in. broad at the top.

Equatoria.

A. spekei C. B. Clarke.

A. pedunculatum (non C. B. Clarke) Broun & Massey.

Herb; stems often branching, 15-24 in. high, decumbent at the base, rooting at the nodes. Leaves rather broadly lanceolate, 4 in. long, $\frac{3}{4}$ -1 in. broad. Flowers blue, in dense terminal pedunculate sparingly pubescent panicles 2 in. long and $\frac{3}{4}$ in. broad. Capsule 2-locular, rounded on the shoulders, $\frac{1}{2}$ in. long, 4-seeded.

Southern Sudan.

A. tacazezanum Hochst. ex A. Rich.

Herb; stems weak, decumbent at the base and there sometimes branched, often rooting at the lower nodes, 1-2 ft. long. Leaves elliptic, acute at the apex, contracted at the base, 3 in. long, 1 in. broad. Flowers probably yellow, in very lax obscurely pubescent terminal pedunculate inflorescences $1\frac{1}{2}$ in. long and $1\frac{1}{2}$ in. broad. Capsule usually 2-locular, truncate with the two upper angles acute; seeds 1-3 in each loculus.

Red Sea District: Khor Gwab.

2. COMMELINA L.

- A. Ovules 2 in each ventral loculus of the ovary, 1 or 0 in the dorsal loculus:
- B. Capsule 3-locular, 2-valved:
- C. Dorsal valve deciduous with the included seed, but usually finally dehiscing; seeds normally 5 to the capsule:
- D. Spathe simply folded, the margins being free or only slightly connate at the very base:

C. diffusa Burm. f.*C. nudiflora* L. p.p.

Hairy or almost glabrous herb; stems 1-2 ft. long, diffuse, decumbent at the base, often rooting at the nodes. Leaves sessile or subsessile, ovate-oblong, acute at the apex, 1-3 in. long. Cymes in each spathe usually 2, 1-3-flowered with very thin pedicels. Petals blue or white, equal.

*Central and Southern Sudan.***C. subulata** Roth.

Nearly glabrous annual herb; stems 6-15 in. long, weak, branched. Leaves linear, 2 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad. Spathes scattered, solitary on peduncles hardly exerted from the leaf-sheaths, $\frac{1}{2}$ in. long, ovate. Flowers blue, small.

*Kordofan. Kassala: Gallabat.***C. benghalensis** L.

Diffuse more or less hairy annual herb, rooting at the base, 1-2½ ft. long, much branched. Leaves ovate-elliptic, shortly triangular or subobtusate at the apex, suddenly narrowed at the base into a quasi-petiole, 1-3½ in. long. Spathes on peduncles hardly exerted from the leaf-sheaths, often a few near together near the tips of the branches, $\frac{1}{2}$ - $\frac{2}{3}$ in. long and broad. Flowers blue. Capsule $\frac{1}{2}$ in. long; seeds rough or wrinkled.

*Red Sea District. Central and Southern Sudan.***C. forskalaei** Vahl.

Fig. 64.

Glabrous, grey-puberulous or pubescent herb, stems 8-24 in. long, much branched, weak, rooting at the lower nodes. Leaves oblong or scarcely elliptic, usually obtuse but never acuminate at the apex, up to 2 in. long, $\frac{2}{3}$ in. broad, the margin often wavy and thickened. Peduncles scattered, exerted $\frac{1}{8}$ - $\frac{1}{2}$ in. from the leaf-sheaths; spathes $\frac{1}{2}$ - $\frac{2}{3}$ in. long. Flowers blue.

*Widespread.***C. amplexicaulis** Hassk.

Very sparingly hairy herb; stems up to 12 in. long, weak; internodes up to 2 in. long. Leaves elliptic, triangular and subobtusate at the apex, up to 1½ in. long and $\frac{2}{3}$ in. broad but usually smaller. Peduncles few, near the ends of the branches, scarcely $\frac{1}{2}$ in. longer than the leaf-sheaths; spathes $\frac{1}{2}$ in. long, ovate, not acuminate at the apex.

Fung District.



Fig. 64—*COMMELINA FORSKALAEI* Vahl.

B, stamens and staminodes.



Fig. 65—*COMMELINA AFRICANA* L.
A, pistil. B, stamen and staminodes.

***C. africana* L.**

Fig. 65.

C. krebsiana Kunth.

Nearly glabrous herb; stems rambling, much branched, almost woody at the base. Leaves nearly sessile, oblong, usually obtuse at the base, 3 in. long, $\frac{1}{2}$ in. broad, or much smaller, glabrous or pubescent, often with rusty hairs at the mouth of the sheath. Spathes scattered, on peduncles exserted $\frac{1}{8}$ - $\frac{1}{2}$ in. Flowers yellow. Capsule nearly always 1-seeded.

Red Sea Hills: Erkowit. Southern Sudan.

***C. involucrosa* A. Rich.**

Large herb. Leaves sheathing at the base, sessile, lanceolate, acute at the apex, up to 5 in. long, 1 in. broad, pubescent and ciliate when young. Spathes long-pedunculate, ciliate on the margin.

Red Sea District: Khor Tamanib.



Fig. 66—COMMELINA KOTSCHYI Hassk.

A, inflorescence with half spathe removed. B, staminodes. C, anthers. D, fruit developing in spathe (half spathe removed). E, fruit. F, transverse section of fruit. G, longitudinal section of fruit. H, seeds.

C. kotschy Hassk.

Fig. 66.

Nearly glabrous herb. Leaves sessile, very little narrowed at the base, $2\frac{1}{4}$ in. long, $\frac{2}{3}$ in. broad, the margin often crenulate. Spathes 2 (or 3-1) near the ends of the branches, exerted scarcely $\frac{1}{4}$ in. from the leaf-sheaths, very broadly ovate, obtuse or with a very short point. Petals blue. Capsule more than $\frac{1}{4}$ in. long, quadrate-oblong.

Central and Southern Sudan.

C. imberbis Ehrenb. ex Hassk.

Nearly glabrous herb; stems 1-2 ft. high, suberect at the base, with internodes 2-3 in. long. Leaves from ovate-lanceolate to narrow-lanceolate, 3-6 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, the upper ones sessile and dilated (often rounded or auricled) at the base. Peduncles few, scattered, exserted $\frac{1}{2}$ -1 $\frac{1}{2}$ in. from the leaf-sheaths; spathes very broadly ovate, triangular-acute at the apex, nearly glabrous. Flowers blue. Capsule $\frac{1}{4}$ - $\frac{1}{2}$ in. long.

Central and Southern Sudan.

C. latifolia Hochst. ex A. Rich.

Slightly hairy herb; stems 15-30 in. long, rather weak, with long internodes, decumbent and rooting at the base. Leaves sessile, oblong-lanceolate, dilated at the base; upper leaves often cordate, auriculate or nearly sagittate at the base. Peduncles solitary, exserted $\frac{1}{2}$ -1 in. from the leaf-sheaths; spathes about $\frac{3}{4}$ in. long, with a short acute point but not acuminate at the apex, very thinly hispid, slenderly striate. Petals blue. Capsule 4-seeded.

Kordofan. Blue Nile Province. Equatoria.

C. capitata Benth.

Nearly glabrous straggling herb up to 2 ft. high. Leaves varying from broadly oblong-lanceolate to lanceolate, unequal-sided at the base, up to 5 in. long, 1-1 $\frac{3}{4}$ in. broad. Spathes 3-8 together in quasi-terminal heads, $\frac{3}{4}$ -1 in. long, the margins densely ciliate with rufous hairs or nearly glabrous. Flowers yellow. Capsule 4-seeded; seeds cylindrical, deeply pitted.

Equatoria.

C. bracteosa Hassk.

Sparingly hairy herb; stems 8-15 in. long, branched. Leaves elliptic, acuminate at the apex, narrowed at both ends, up to 3 $\frac{1}{2}$ in. long, 1 in. broad. Peduncles 1 (or 2) at the ends of the branches, exserted 0- $\frac{1}{4}$ in. from the leaf-sheaths; spathes $\frac{3}{4}$ in. long, 1 in. broad, obtusely triangular at the tip, slightly white-hispid. Capsule $\frac{1}{2}$ in. long, papery, 3-seeded; seeds $\frac{1}{10}$ in. long, subglobose, flattened.

Southern Sudan.

C. aethiopica C. B. Clarke.

Nearly glabrous herb; stems 8-14 in. long, tufted, thick at the base. Leaves broadly oblong-lanceolate, narrowed at the base into a very short quasi-petiole, 3 $\frac{1}{2}$ in. long, $\frac{3}{4}$ -1 in. broad. Spathes acute but hardly acuminate at the apex, $\frac{3}{4}$ in. long, 1 in. broad, sparsely white-hispid. Flowers deep-blue. Capsule $\frac{1}{2}$ in. long, 2-seeded; seed smooth.

Southern Sudan.



Fig. 67—CYANOTIS HIRSUTA C. A. Mey.
A, open fruit. B, stamen and pistil. C, beaded hair.

3. **CYANOTIS** D. Don**Cyanotis caespitosa** Kotschy & Peyr.

Perennial herb; stems covered at the base with the persistent very hairy leaf-bases. Leaves radical, lanceolate, acute at the apex, up to 8 in. long, $1\frac{1}{2}$ in. broad, glabrous and finely pitted above, pilose beneath. Flowering stem 8-12 in. long with 2-6 heads of blue or red flowers; flower-heads hardly $\frac{1}{2}$ in. long, of 1 or few cymes, usually very oblique; outermost bracts $\frac{1}{2}$ -1 in. long, lanceolate.

Equatoria.

C. longifolia Benth.

C. djurensis C. B. Clarke.

Herb; young parts villous and with white wool, but later becoming almost glabrous; sterile central stem short, its leaves linear and attaining 10 in. long and $\frac{1}{2}$ in. broad; lateral flowering stems rather robust, 12-20 in. long with 2 or 3 heads of pale-blue flowers and 0-2 leaves up to 6 in. long (besides the outermost bracts of the heads). Flower-heads of several clustered cymes, $\frac{1}{2}$ -1 $\frac{1}{4}$ in. broad; outermost bracts linear, 2-3 in. long.

Darfur. Southern Sudan.

C. hirsuta C. A. Mey.

Fig. 67.

Softly shaggy or nearly glabrous herb arising from a bulb $\frac{1}{2}$ in. in diameter; stem 3-15 in. long, often branched, with many flower-heads. Leaves oblong-lanceolate, up to 4 in. long, $\frac{1}{2}$ in. broad. Inflorescences 6-15 on one stem, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, of 1 or several clustered cymes.

Red Sea Hills: Erkowit; Karora. Equatoria: Imatong Mountains, Mount Kineti.

C. lanata Benth.

White-woolly herb, the indumentum at length wearing off. Leaves linear, up to $7\frac{1}{2}$ in. long, the tubular sheath about $\frac{3}{4}$ in. long. Flowers light-blue, pink or white, in 1-4 clustered cymes $\frac{1}{2}$ - $\frac{2}{3}$ in. in diameter in often numerous axillary and pedunculate scattered inflorescences; outermost bracts usually $\frac{1}{2}$ -1 in. long.

Kassala: Gallabat. Equatoria.

4. **FLOSCOPA** Lour.**Floscopa flavida** C. B. Clarke.

Fig. 68.

Small weak annual bog plant; stems $1\frac{1}{2}$ -5 in. long, frequently branched from the base. Leaves sessile, lanceolate, $2\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad. Flowers yellow, in a few non-leafy cymes forming slender terminal panicles. Calyx pubescent, purple.

Equatoria.

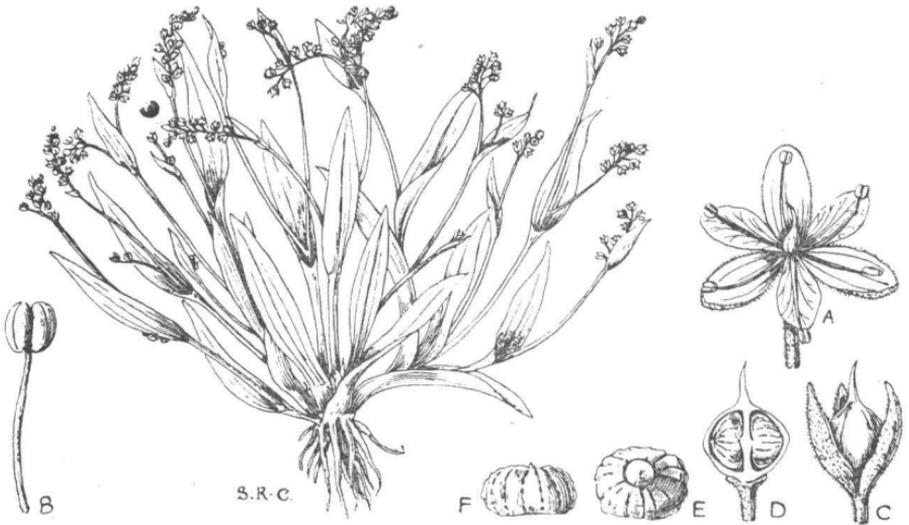


Fig. 68—*FLOSCOPA FLAVIDA* C. B. Clarke.

A, open flower. B, stamen. C, fruit. D, vertical section of fruit.
E, F, seeds from top and side respectively.

***F. rivularis* (A. Rich.) C. B. Clarke.**

Semi-erect marsh herb up to 3 ft. high. Leaves lanceolate to linear-lanceolate, subacute at the apex, $2\frac{1}{2}$ -4 in. long, up to $\frac{3}{4}$ in. broad, glabrous. Flowers pink or blue, small, in rather dense terminal clusters, pilose with rather long jointed hairs. Capsule $\frac{1}{16}$ - $\frac{1}{8}$ in. long.

Southern Sudan.

***F. schweinfurthii* C. B. Clarke.**

Thinly hairy annual herb; stems 6-8 in. high, erect, repeatedly branched from the base. Leaves sessile, ovate-lanceolate, 2 in. long, $\frac{3}{4}$ in. broad. Flowers in more or less leafy terminal panicles 1- $2\frac{1}{2}$ in. in diameter; cymes often 1- $1\frac{1}{2}$ in. long, villous and dense with flowers; pedicels up to $\frac{1}{8}$ in. long. Capsule $\frac{1}{16}$ in. long; seeds radiately ribbed.

Equatoria.

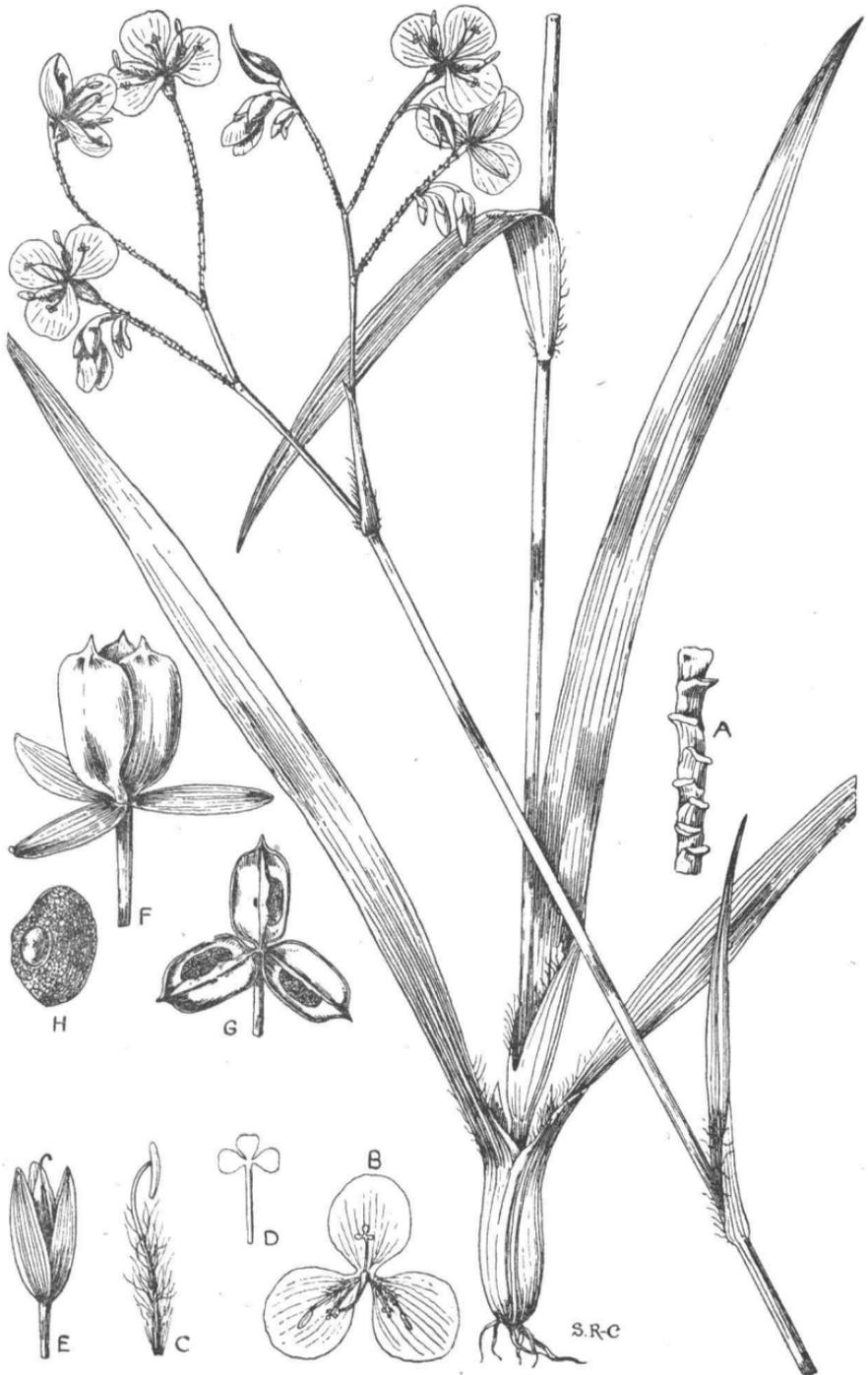


Fig. 69—MURDANNIA SIMPLEX (Vahl) Brenan.

A, portion of rhachis of inflorescence showing scars of fallen pedicels. B, open flower. C, stamen. D, staminode. E, young fruit. F, ripe fruit. G, open fruit. H, seed.

5. **MURDANNIA** Royle**Murdannia simplex** (Vahl) Brenan.

Fig. 69.

Ancilema sinicum Ker-Gawl.

Nearly glabrous herb; roots occasionally bearing tubers; stems 1-3 ft. long, sparingly leafy. Leaves linear, 8-18 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Panicle-branches elongated, slender; bracts $\frac{1}{2}$ -2 in. long, linear-lanceolate; cymes usually thin, loose, but sometimes dense with numerous flowers; lower flowers of cyme often sterile and falling early, so that the top of the cyme-peduncle appears knotted. Petals $\frac{1}{4}$ or more in. long, blue or sometimes dull-purple. Capsule subequally 3-locular; loculi 2-seeded.

*Southern Sudan.*6. **PALISOTA** Reichb. ex Endl.**Palisota schweinfurthii** C. B. Clarke.

Stout herb; young parts shaggy with rusty or greyish hairs; stems 3-7 ft. long, $\frac{1}{4}$ in. in diameter, with internodes 2-4 or more in. long and 2 or 3 leaves apparently whorled at the nodes. Leaves elliptic, acuminate at both ends, up to 26 in. long, 8 in. broad, more or less glabrous but densely hairy on the margin. Inflorescences very dense, cylindric, 4-7 in. long, 1-1 $\frac{1}{2}$ in. broad, sometimes 2 or 3 together. Fruit scarlet, succulent, $\frac{1}{2}$ in. in diameter, 5-seeded.

*Equatoria.*7. **POLLIA** Thunb.**Pollia condensata** C. B. Clarke.

Stout forest herb 4-6 ft. high; stems glabrous. Leaves sheathing and embracing the stem at the base, elongate-obovate-elliptic, acuminate at the apex, tapered at the base into a quasi-petiole, up to 12 in. long, 3 $\frac{1}{2}$ in. broad, glabrous. Flowers white or rose, in 20-40-flowered dense panicles 1 $\frac{1}{2}$ in. long and 1 $\frac{1}{4}$ in. broad; bracts $\frac{1}{4}$ - $\frac{1}{2}$ in. long, ovate, conspicuous on the young panicle, disappearing in fruit. Stamens 3, fertile. Fruit dark-blue or deep-pink, shining.

*Equatoria.*147. **XYRIDACEAE**

Perennial or annual herbs. Leaves usually radical, tufted, linear, terete or thread-like, sheathing at the base. Flowers hermaphrodite, slightly zygomorphic, arranged in pedunculate terminal globose to cylindric heads; bracts imbricate, leathery or rigid, the lower sometimes forming an involucre. Sepals 3 or rarely 2, the lateral 2 exterior, boat-shaped, keeled, glumaceous; the third interior, membranous, forming a hood over the corolla and pushed aside as the latter develops. Corolla gamopetalous, with a short or long tube and 3 equal spreading lobes. Stamens 3, opposite the corolla-lobes, with or without 3 alternating

staminodes; anthers 2-locular, opening by slits. Ovary superior, 1-locular with 3 parietal placentas, or imperfectly 3-locular at the base; style simple or 3-lobed; ovules few to numerous. Fruit a capsule enclosed in the persistent corolla-tube.

1. XYRIS L.

Xyris sp.

Herb 2 in. high. Flowers yellow.

Equatoria: *Imatong Mountains, damp rock at Kimisu, 6800 ft.*

148. ERIOCAULACEAE

Perennial or rarely annual herbs, usually with crowded narrow leaves. Flowers numerous in bracteate heads, actinomorphic, small, unisexual, the males often mixed with the females or the males in the middle and the females around, very rarely the sexes in separate heads. Sepals 2-3, scarious or membranous, free or rarely partially connate. Petals 2-3, free or connate or rarely absent. Stamens as many as or double the number of the sepals; anthers 1-2-locular, opening lengthwise. Ovary superior, 2-3-locular; style lobed; ovules solitary and pendulous in each loculus. Fruit a membranous loculicidal capsule.

1. ERIOCAULON L.

Eriocaulon afzelianum Wikstr. ex Koern.

Herb. Leaves linear, 1-2 in. long. Flower-heads on long slender peduncles up to 12 in. long; flowering bracts very shortly pubescent on the outside with a conspicuous acute triangular tip.

Equatoria.

E. bongense Engler & Ruhl.

Stemless herb. Leaves radical, linear, 1½-3 in. long, erect or ascending, glabrous. Flowers white, in subglobose heads ½-¾ in. in diameter on peduncles 5-16 to a plant and 3-12 (usually more than 6) in. long; flowering bracts glabrous; involueral bracts pale-brown or straw-coloured, acutely pointed at the apex.

Equatoria.

E. bifistulosum Heurck & Muell.

Almost submerged aquatic herb. Leaves thread-like, 1-3½ in. long, 1-nerved, glabrous. Flowers in very small compact heads on numerous glabrous peduncles 1½-5 in. long; bracts black or blackish, glabrous.

Equatoria.

E. elegantulum Engler.

Stemless herb. Leaves 4-10, radical, linear, ¾-3 in. long, glabrous. Flowers whitish, in globose monoecious heads ½ in. in diameter on acutely 3-4-angled peduncles 1-8½ in. long; flowering bracts dark-brownish, densely covered with short white hairs on the apical part.

Equatoria.

149. *MUSACEAE*

Large herbs; stem surrounded by the imbricate bases of the petioles, erect. Leaves spirally arranged, very large, with a thick midrib and numerous pinnately parallel nerves. Flowers usually unisexual, clustered and subtended by large green spathaceous bracts, the male flowers within the upper bracts, the female within the lower. Calyx elongated, at first narrowly tubular, soon splitting on one side, 3-toothed at the apex. Median petal free; lateral 2 petals adnate to the calyx. Stamens 5 perfect, with a rudimentary sixth; filaments thread-like; anthers 2-locular, the loculi parallel and contiguous. Ovary inferior, 3-locular; style thread-like, with a lobulate stigma; ovules numerous, axile. Fruit fleshy, indehiscent, 3-locular.

Bananas, *Musa sapientum* L. (*M. paradisiaca* subsp. *sapientum* (L.) K. Schum.), are cultivated in the Sudan.

1. **ENSETE** Horan.

Ensete ventricosum (Welw.) Cheesman.

Musa ensete J. F. Gmel.; *M. schweinfurthii* Schum. & Warb.

Plant reaching 30-40 ft. high; stem with the basal part swollen all round, and a plume of leaves up to 20 ft. long and 3 ft. broad. Flowers in terminal spicate panicles; bracts ovate-lanceolate, about 12 in. long, 4 in. broad. Anthers about 1 in. long. Fruit 3-3½ in. long, about 1¼ in. thick at the top, contracted and about ½ in. broad at the base; seeds black.

Equatoria.

150. *ZINGIBERACEAE*

Perennial herbs, usually aromatic, with horizontal tuberous rhizomes; stems sometimes very short, leafy or bearing only flowers. Leaves simple, alternate, with an open or closed sheath, sessile or stalked on the sheath, the lamina usually large with numerous closely parallel nerves diverging obliquely from the midrib. Flowers hermaphrodite, zygomorphic, solitary or in a distinct inflorescence accompanying or separate from the leaves. Calyx tubular, 3-lobed or split on one side. Corolla tubular, 3-lobed, the median segment usually the largest. Stamen 1, with a 2-locular anther, accompanied by 1-3 petaloid staminodes of which the median one forms a lip. Ovary inferior, 2-3-locular with axile placentas, or 1-locular with parietal or rarely basal placentas; style sometimes enveloped in a groove of the fertile stamen; ovules usually numerous. Fruit fleshy and indehiscent or capsular; seeds usually arillate.

A. Lateral staminodes rudimentary or suppressed:

B. Filament and connective of stamen not petaloid:

- (a) Flowers capitate or spicate, always borne separately from the leafy stems **AFRAMOMUM**. 1.
 (aa) Flowers paniculate, usually on the leafy stems
RENEALMIA. 4.

- BB. Filament and connective petaloid, bearing the anther in the middle **COSTUS**. 2.
 AA. Lateral staminodes large and petaloid, forming with the lip the conspicuous part of the flower **KAEMPFERIA**. 3.

1. **AFRAMOMUM** K. Schum.

Aframomum luteoalbum (K. Schum.) K. Schum.

Amomum luteoalbum K. Schum.

Rootstock stout. Leaves elliptic, tapered to the apex, up to 6½ or more in. long, hairy on the nerves beneath. Inflorescence simple, club-shaped, on a peduncle 6 in. long, or branched on a stem more than 1 ft. long. Corolla-lobes 1 in. or more long. Lip white with a yellow middle, obovate-cuneate, 1½ in. broad.

Equatoria.

A. sanguineum (K. Schum.) K. Schum.

Amomum sanguineum K. Schum.; *A. giganteum* (non Oliv. & Hanb.) Broun & Massey.

Rootstock stout, wide-creeping; leafy stem 15 ft. high. Leaves oblong-lanceolate, 1-1½ ft. long, 4-5 in. broad at the middle, pubescent beneath, nearly or quite sessile on the sheath. Inflorescence globose on a simple peduncle nearly 1 ft. long which is hidden by the large brown scarious imbricate bracts, or compound on a long stem. Corolla-lobes bright-red, the dorsal one up to 2 in. long. Lip pale-yellow, oblong, 1½ in. long.

Equatoria.

A. polyanthum (K. Schum.) K. Schum.

Amomum polyanthum K. Schum.

Leafy stems tall. Leaves distinctly petioled on the sheath, oblong-lanceolate, acuminate at the apex, rounded to the base, densely softly pilose beneath. Flowers several in a globose head on a peduncle ½-1 ft. long with large oblong obtuse scarious imbricate bracts. Lip oblong, purplish-yellow, 1 in. long.

Equatoria.

2. **COSTUS** L.

Costus afer Ker-Gawl.

Terrestrial herb; leafy stems erect, reaching a length of 10-12 ft. Leaves very variable in size, oblong or oblong-lanceolate, acuminate at the apex, rounded at the base to a short broad petiole, 3-9 in. long, 1-3 in. broad at the middle, glabrous or softly pubescent beneath. Flowers in globose spikes 1-3 in. long and 1½-2 in. in diameter usually sessile at the ends of the leafy stems; outer bracts ¾-1 in. long and broad. Lip white or red, with a yellow centre, 1½ in. long and broad.

Equatoria.

C. pterometra K. Schum.

Robust perennial herb. Leaves oblong-lanceolate, attenuate-acuminate at the apex, cuneate at the base, 12-14 in. long, $3\frac{1}{4}$ -4 in. broad, glabrous. Flowers white, in ellipsoid spikes $3\frac{1}{4}$ in. long and 2 in. in diameter terminating the leafy stems; bracts elliptic, 1 in. long.

Equatoria.

C. trachyphyllus K. Schum.

Herb; leafy stems long, moderately stout. Leaves oblanceolate, acute to acuminate at the apex, cuneate at the base, up to 14 in. long and $4\frac{1}{2}$ in. broad, pubescent beneath at least on the midrib. Flowers in many-flowered oblong terminal spikes up to 3 in. long and 2 in. in diameter borne on bracteate peduncles distinct from the leafy stems; outer bracts orbicular, glabrous, $1\frac{1}{2}$ in. broad. Lip obovate, white or tinged with rose-red, with a yellow streak.

Equatoria.

C. spectabilis (Fenzl) K. Schum.

Fig. 70.

Cadalvena spectabilis Fenzl.

Herb. Leaves usually 4 in a spiral rosette, obovate, cuneate at the base, much imbricated, 2-8 in. long and broad, membranous, glabrous. Flowers few, on short pedicels from the centre of the rosette, contemporary with the leaves. Corolla-lobes lanceolate, $1\frac{1}{2}$ -2 in. long. Lip pale-yellow, obovate, cuneate at the base, 3 in. long, $1\frac{1}{2}$ -2 in. broad.

Central and Southern Sudan.

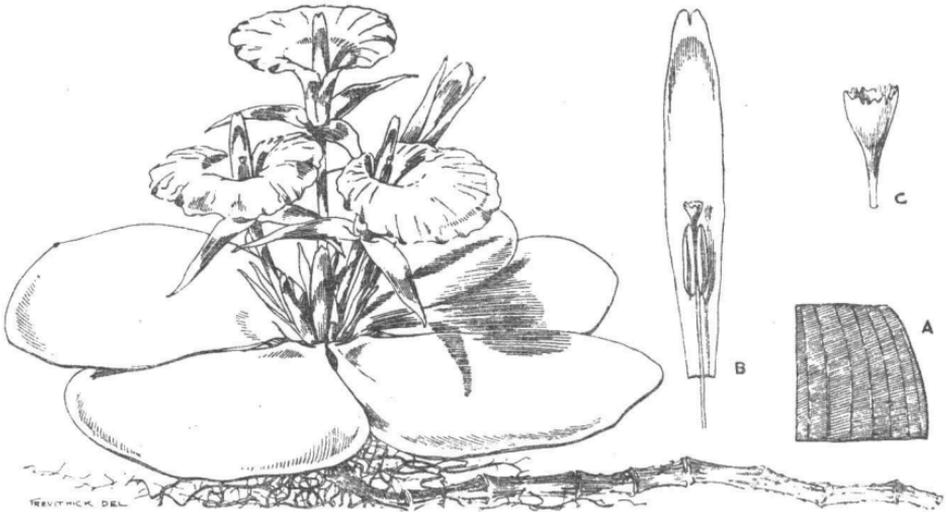


Fig. 70—*COSTUS SPECTABILIS* (Fenzl) K. Schum.

Whole plant showing habit (rootstock erect in nature). A, part of leaf showing venation. B, stamen with petaloid connective and style. C, stigma.

3. **KAEMPFERIA** L.**Kaempferia aethiopica** (Schweinf.) Solms.

Perennial herb up to 1 ft. high, with tuberous roots, the flowers often appearing before the leaves and often mistaken for ground orchids; leafy stems arising separately from the rhizome. Basal leaves reduced to sheaths; upper leaves oblanceolate, very acute at the apex, up to 16 in. long, $1\frac{3}{4}$ in. broad, attenuated at the base. Flowers usually solitary on short slender radical peduncles with 1-2 large membranous sheathing bracts. Corolla-tube about $1\frac{1}{2}$ in. long; lobes lanceolate, $1\frac{1}{2}$ in. long. Staminodes more than twice as long as the corolla-lobes, usually bright-purple with a yellow throat, rarely all pale-yellow.

Central and Southern Sudan.

K. rosea Schweinf. ex K. Schum.

Herb. Leaves about 4, with long channelled petioles, elliptic to oblong, acute at the apex, up to 12 in. long, $4\frac{1}{2}$ in. broad, glabrous. Flowers many, racemose at the apex of a long slender peduncle, contemporary with the leaves. Calyx funnel-shaped, about $\frac{1}{2}$ in. long. Staminodes light- or dark-pink with 2 dark spots at the throat, rarely white or yellow, about $1\frac{1}{2}$ in. long.

Darfur: Kulme. Southern Sudan.

K. macrosiphon Bak.

Herb. Leaves with short petioles, contemporary with the flowers, elliptic-oblong, acuminate at the apex, 4-6 in. long, up to $3\frac{3}{4}$ in. broad, glabrous. Flowers many on a short peduncle. Calyx cylindrical, $1\frac{1}{2}$ in. long, distinctly toothed. Staminodes pale-violet with yellow centre or blue and white, slightly longer than the corolla-lobes.

Equatoria: Azza Forest; Laboni Forest.

4. **RENEALMIA** L. f.**Renealmia** sp.

Herb in swamp with *Raphia* palms. Leaves oblong, cuneate at the base, up to 22 in. long, 5 in. broad. Fruit eventually black.

Equatoria: Lotti Forest.

151. **MARANTACEAE**

Perennial herbs, usually in moist or swampy forest. Leaves simple, alternate, in 2 rows, differentiated into an open sheath, stalk and lamina, the stalk often winged but terete and cushion-shaped towards the apex, the lamina sometimes with one straight and one curved side and with numerous closely parallel nerves diverging obliquely from the midrib. Flowers hermaphrodite, asymmetric, in terminal bracteate spikes or panicles, or the inflorescences arising from the rhizome. Sepals 3, free. Petals 3, more or less united into a tube. Stamen 1, with

one loculus fertile and the other transformed into a petaloid appendage; staminodes 2-4. Ovary inferior, 1- or 3-locular; style stout, often dilated at the apex; ovules solitary in each loculus, erect. Fruit fleshy or a capsule or nut; seeds often with an aril.

Species of *Canna* L., in the related family *Cannaceae*, are cultivated in the Sudan.

- A. Ovary 3-locular:
 - B. Leaves more or less equal-sided (sides equally rounded):
 - (a) Pairs of flowers furnished with small thickened glandular bracteoles:
 - (b) Ovary and fruit smooth; inflorescence borne on the stem, branched:
 - (c) Fruit dehiscent; seeds with an aril MEGAPHRYNIUM. 3.
 - (cc) Fruit indehiscent; seeds without an aril SARCOPHRYNIUM. 4.
 - (bb) Ovary and fruit muricate TRACHYPHRYNIUM. 6.
 - (aa) Pairs of flowers without bracteoles; flower-pairs 2 or more together; sepals equal ATAENIDIA. 1.
 - BB. Leaves with one nearly straight side and one rounded side MARANTOCHLOA. 2.
- AA. Ovary 1-locular; leaves equal-sided; flowers laxly paniculate; fruit 1-seeded, the seed filling the cavity THALIA. 5.

1. **ATAENIDIA** Gagnep.

Ataenidia conferta (Benth.) Milne-Redh.

Herb 4-5 ft. high. Leaves oblong, cuspidate at the apex, rounded at the base, 6-12 in. long, 2½-4½ in. broad. Flowers pink, several to each bract, crowded in deflexed subsessile axillary spikes 1½ in. long; bracts pink to red.

Equatoria.

2. **MARANTOCHLOA** Brongn. ex Gris

Marantochloa purpurea (Ridl.) Milne-Redh.

Clinogyne cuspidata K. Schum. ex Broun & Massey.

Herb; stems branched and leafy, up to 12 ft. high. Leaves oblong, cuspidate at the apex, up to 15 in. long, 6 in. broad, pinnately streaked with white, with a sheathing petiole. Flowers pink and white, in pairs, one on a longer pedicel, in copious panicles; bracts red. Fruit opaque-red.

Equatoria.

M. mannii (Benth.) Milne-Redh.

Herb 5-6 ft. high. Leaves long-petiolate, oblong, cuspidate at the apex, rounded at the base, 9-15 in. long, 4-7 in. broad, glabrous. Flowers in small shortly pedunculate panicles with red bracts.

Equatoria.

M. leucantha (K. Schum.) Milne-Redh.*Clinogyne ugandensis* (K. Schum.) K. Schum.

Herb; stems moderately stout, 5-6 ft. high. Leaves oblong to ovate, up to 7½ in. long, 5 in. broad; cusp eccentric; nodes and sheaths glabrous, the latter 4-5 in. long. Flowers ¼ in. long, in panicles with branches 6 in. long. Fruit bright-scarlet, globose.
Equatoria.

3. **MEGAPHRYNIUM** Milne-Redh.**Megaphrynum macrostachyum** (Benth.) Milne-Redh.

Herb up to 15 ft. high. Leaves ovate-elliptic, shortly acuminate at the apex, rounded at the base, up to 26 in. long, 17 in. broad, with very numerous parallel lateral nerves. Flowers pinkish, paniculate on a glabrous or minutely puberulous axis; bracts ¼ in. long, deciduous. Sepals oblanceolate, narrowed to the base. Staminodes short, more or less subulate or linear. Fruit bright-red, depressed, 1 in. in diameter; seeds black.

*Equatoria.*4. **SARCOPHRYNIUM** K. Schum.**Sarcophrynum schweinfurthianum** (Kuntze) Milne-Redh.

Rhizomatous herb 3-6 ft. high. Leaves long-petiolate, elongate-lanceolate, shortly acuminate at the apex, rounded to acute at the base, 10-20 in. long, glabrous. Flowers white with a purple patch, in ample panicles 8 in. long. Staminodes petaloid, obovate, unguiculate. Fruit bright-red.

*Equatoria.*5. **THALIA** L.**Thalia welwitschii** Ridl.

Fig. 71.

T. geniculata (non L.) Broun & Massey.

Straggling herb 6-8 ft. high, in swampy places. Leaves ovate-lanceolate, gradually and shortly acuminate at the apex, rounded or subcordate at the base, 6-16 in. long, 3¼-8 in. broad, with numerous closely parallel lateral nerves and a cartilaginous margin. Flowers purple, opening only in the early morning, in lax panicles with slender branches; bracts 2-flowered, deciduous, lanceolate, boat-shaped, ¼-¾ in. long.

*Southern Sudan.*6. **TRACHYPHRYNIUM** Benth.**Trachyprynum braunianum** (K. Schum.) Bak.

Tall woody herb with bamboo-like shoots; branches climbing or straggling. Leaves oblong, cuspidate at the apex, rounded at the base, 3-6 in. long, 1½-3 in. broad; sheath 2-4 in. long, glabrous. Flowers whitish, 1 in. long, in simple inflorescences spreading from the ends of the branches; rhachis pubescent, flexuous. Capsule subglobose, densely muricate, ¼ in. in diameter; seeds brown, subglobose, ¼ in. in diameter, with a large basal aril.

Equatoria.

Fig. 71—*Thalia welwitschii* Ridl.

A, flower. B, androecium. C, style. D, fruit with part of pericarp removed.
E, seed. F, cross-section of seed.

152. LILIACEAE

Herbs, usually perennial, or rarely soft-wooded shrubs; roots from a rhizome, corm or bulb, or tuberous; stems erect or climbing. Leaves alternate, opposite or verticillate, simple, sometimes reduced to scales. Flowers actinomorphic or zygomorphic, hermaphrodite or rarely unisexual, sometimes large and showy, never in umbels. Perianth usually petaloid; segments usually 6, in 2 similar whorls, free or united into a tube. Stamens usually 6, hypogynous; filaments usually free; anthers 2-locular, usually opening by slits lengthwise. Ovary superior, usually 3-locular with axile placentas, or rarely 1-locular with parietal placentas; style entire or divided, or rarely styles free; ovules usually numerous. Fruit a capsule or berry.

- A. Leaves not reduced to scales; branches not modified into flat or acicular leaf-like structures (cladodes):
- B. Stems erect; leaves not tendril-like at the apex:
- C. Rootstock a rhizome or tuber (never a bulb); roots fibrous or sometimes thick and tuberous:
- D. Leaves not fleshy, or if so then not prickly on the margin:
- E. Rootstock not thick and bulb-like, but sometimes the roots ending in tubers; seeds glabrous; pedicels not much elongated:
- F. Fruit globose or shallowly lobed; seeds not flat:
- (a) Filaments flattened and expanded at the base and encircling the ovary; perianth articulated at the base and leaving a small membranous cup ASPHODELUS. 5.
- (aa) Filaments not flattened at the base:
- (b) Perianth-segments free to the base:
- (c) Anthers basifixed or nearly so, not versatile:
- (d) Filaments short and thick DEBESIA. 8.
- (dd) Filaments more or less thread-like ANTHERICUM. 3.
- (cc) Anthers dorsifixed, more or less versatile BULBINE. 6.
- (bb) Perianth-segments united into a cylindric or funnel-shaped tube KNIPHOFIA. 13.
- FF. Fruit deeply lobed; seeds compressed CHLOROPHYTUM. 7.
- EE. Rootstock a bulb-like tuber; seeds villous; flowers on long pedicels ERIOSPERMUM. 11.
- DD. Leaves fleshy, sharply toothed on the margin ... ALOE. 2.
- CC. Rootstock a bulb:
- G. Perianth-segments free to the base:
- (e) Capsule more or less deeply lobed; seeds compressed URGINEA. 16.
- (ee) Capsule shallowly lobed; seeds not compressed:
- (f) Upper flowers abortive; raceme spike-like DRIMIOPSIS. 10.
- (ff) Upper flowers not abortive:

- (g) Stamens hypogynous; perianth-segments white or yellow with a green or dark keel:
- (h) Stamens shorter than the perianth; seeds obovoid or subglobose (neither compressed nor angular)
ORNITHOGALUM. 14.
- (lh) Stamens as long as the inner perianth; seeds compressed ALBUCA. 1.
- (gg) Stamens perigynous; perianth-segments blue, mauve or green SCILLA. 15.
- GG. Perianth-segments united at the base, tailed-acuminate
DIPCADI. 9.
- BB. Stems more or less climbing or forming long runners; leaves often tendril-like at the apex; style spreading at a right-angle from the top of the ovary GLORIOSA. 12.
- AA. Leaves much reduced and scale-like, their function fulfilled by flat or acicular leaf-like structures (cladodes); fruit a berry; flowers very small; rootstock a rhizome ... ASPARAGUS. 4.

1. ALBUCA L.

Albuca tayloriana Rendle.

Herb; bulb ovoid, $\frac{3}{4}$ in. in diameter. Leaves narrowly linear. Flowers in a lax 10-12-flowered raceme 4-5 in. long on a peduncle nearly 2 ft. long. Perianth $\frac{1}{2}$ in. long; segments white, keeled with green.

Equatoria.

A. wakefieldii Bak.

Herb; bulb ovoid, $1\frac{1}{2}$ in. in diameter. Leaves erect, linear, 1- $1\frac{1}{2}$ ft. long, 1 in. broad towards the base. Flowers in a 10-12-flowered very lax raceme on a peduncle longer than the leaves. Perianth about 1 in. long; segments white, keeled with green.

Red Sea Hills. Equatoria.

A. abyssinica Jacq.

Herb; bulb globose, 1-2 in. in diameter. Leaves 6-8, erect, linear, 2-3 ft. long, $\frac{1}{4}$ -1 in. broad towards the base. Flowers in a moderately dense cylindrical raceme $\frac{1}{2}$ -1 ft. long on a peduncle $1\frac{1}{2}$ -3 ft. long. Perianth $\frac{3}{4}$ in. long; segments bright-yellow with a broad green or red-brown keel.

Red Sea Hills: Erkowit. Fung District. Equatoria.

A. nigritana (Bak.) Troupin.

Urginea nigritana Bak.; *A. schweinfurthii* Engler.

Herb; bulb ovoid, 1 in. in diameter. Leaves linear, 1- $2\frac{1}{2}$ ft. long, $\frac{1}{3}$ in. broad. Flowers in a 20-30-flowered raceme over 1 ft. long on a peduncle longer than the leaves. Perianth about $\frac{3}{4}$ -1 in. long; segments pale-yellow with a broad red-brown keel.

Equatoria.

A. stuedneri Schweinf. & Engler.

Herb; bulb above 1 in. in diameter. Leaves linear, 6-10 in. long, $\frac{3}{8}$ - $\frac{1}{2}$ in. broad towards the base. Flowers in a 8-10-flowered lax raceme on a peduncle 1 or more ft. long. Capsule oblong, $\frac{1}{2}$ in. long.

Kassala: Gallabat.

A. purpurascens Engler.

Herb; bulb globose, 2 $\frac{1}{2}$ -3 in. in diameter. Leaves linear, 1-1 $\frac{1}{2}$ ft. long. Flowers in a 10-15-flowered raceme 6-8 in. long on a peduncle rather longer than the leaves. Perianth $\frac{1}{3}$ - $\frac{1}{2}$ in. long; segments with a broad purplish keel. Capsule ovoid, $\frac{1}{4}$ - $\frac{1}{2}$ in. long.

Equatoria.

2. ALOE L.

Aloe crassipes Bak.

Leaves sword-shaped, with large distant deltoid rather hooked teeth, 12 in. long, less than 1 in. broad towards the base. Flowers in cylindric moderately dense racemes 6 in. long with 2 short branches at the base. Perianth 1 $\frac{1}{4}$ in. long.

North-eastern Sudan: Kishi, between Suakin and Berber.

A. schweinfurthii Bak.

Leaves sword-shaped, narrowed gradually to a long point, 1-1 $\frac{1}{2}$ ft. long, 2 in. broad towards the base; marginal teeth close, large, deltoid, tipped with brown. Flowers in moderately dense cylindric racemes, the end one 6-9 in. long. Perianth pale-red, about 1 in. long.

Equatoria.

A. eru A. Berger.

Fig. 72.

A. abyssinica (non Lam.) Broun & Massey.

Stem 16-20 in. long. Leaves densely rosulate, usually reddish, sword-shaped, 16-24 in. long, 1 $\frac{1}{2}$ -2 $\frac{3}{4}$ in. broad towards the base; marginal teeth large, deltoid, tipped with brown. Flowers reddish-yellow or red, in rather dense oblong racemes 3 $\frac{1}{4}$ -6 in. long. Perianth $\frac{3}{8}$ - $\frac{1}{2}$ in. long.

Red Sea Hills.

3. ANTHERICUM L.

Anthericum monophyllum Bak.

Rootstock a globose tuber crowned with many fine bristles; stem slender, angled, pubescent, $\frac{1}{2}$ in. long, with a sheath at the base and a single lanceolate glabrous coriaceous leaf 6-9 in. long, with a clasping base from the middle. Flowers in a simple moderately dense raceme 1-3 in. long; rhachis pubescent. Perianth $\frac{1}{4}$ - $\frac{1}{2}$ in. long; segments linear-oblong, with a 3-nerved brown keel

Equatoria.



Fig. 72—ALOE ERU A. Berger.

A. nubicum Bak.

Rootstock tuberous, crowned with copious bristles. Leaves linear, membranous, 6 in. long, $\frac{1}{2}$ in. broad near the base, tapering to the apex. Flowers in very lax simple or forked racemes 6 in. long on slender terete peduncles 6-8 in. long bearing 2-3 reduced leaves. Perianth $\frac{1}{2}$ in. long; segments oblanceolate, white with a 3-nerved brown keel.

Equatoria.

A. subpetiolatum Bak.

A. triphyllum Bak.

Root-fibres wiry, not bearing tubers; old leaves splitting up into fibres. Leaves 4-6 to a stem, subpetiolate, thin, linear, 1 ft. long, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad, glabrous. Flowers in simple lax racemes 2-4 in. long. Perianth $\frac{1}{3}$ in. long; segments laxly 3-nerved on the keel.

Equatoria.

A. uyuiense Rendle.

A. triflorum (non Ait.) Broun & Massey.

Root-fibres slender; neck crowned with short bristles. Leaves 5 to a stem, linear, up to 22 in. long, $\frac{1}{3}$ in. broad, glabrous. Flowers in a simple raceme 4 in. long on a naked peduncle shorter than the leaves and flattened upwards. Perianth $\frac{1}{2}$ - $\frac{5}{8}$ in. long.

Kordofan. Southern Sudan.

A. superpositum Bak.

Leaves 3-4 to a stem, sessile, subcoriaceous, oblong, acute at the apex, 3-6 in. long, 1-1 $\frac{1}{2}$ in. broad at the middle, glabrous. Flowers in 1-3 lax racemes 2-3 in. long; peduncle 2-2 $\frac{1}{2}$ ft. long, stiffly erect. Perianth $\frac{1}{8}$ in. long; segments linear, with a green keel. Capsule subglobose, $\frac{1}{8}$ in. in diameter.

Equatoria.

4. **ASPARAGUS** L.**Asparagus flagellaris** (Kunth) Bak.

A. pauli-guilelmi Solms.

Much-branched erect undershrub 4-5 ft. high; main stems woody; branchlets long, slender, glabrous or pubescent. Scale-leaves of the main stem and branchlets with a sharp hooked woody spur. Cladodes 1-5 in a cluster, subulate, very slender, $\frac{1}{8}$ - $\frac{1}{4}$ in. long. Flowers solitary or in pairs, axillary. Perianth $\frac{1}{16}$ - $\frac{1}{12}$ in. long.

Central and Southern Sudan.

A. mitis A. Rich.

A. africanus (non Lam.) Broun & Massey p.p.

Much-branched climbing shrub; main stems woody; branches copiously pinnate; branchlets short, finely ribbed and scaberulous. Scale-leaves produced into a deflexed sharp flattened spine. Cladodes 6-15 in a cluster, subulate, not very slender, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Flowers several together in axillary clusters. Perianth $\frac{1}{8}$ in. long.
Central and Southern Sudan.

A. scaberulus A. Rich.

A. asiaticus (non L.) Broun & Massey p.p.; *A. africanus* (non Lam.) Broun & Massey p.p.

Similar to *A. mitis* but the scale-leaves produced into stronger recurved more hook-like spines.

Red Sea District.

A. abyssinicus Hochst. ex A. Rich.

A. schweinfurthii Bak.; *A. asiaticus* (non L.) Broun & Massey p.p.; *A. africanus* (non Lam.) Broun & Massey p.p.

Much-branched tall glabrous shrub; main stems terete, woody; branchlets straight, virgate, smooth and glabrous. Scale-leaves produced at the base into a sharp more or less spreading spine. Cladodes 3 or more in a cluster, subulate, ascending, $\frac{1}{4}$ - $1\frac{1}{4}$ in. long. Flowers 2-several together in axillary clusters. Perianth $\frac{1}{12}$ - $\frac{1}{8}$ in. long.

Central and Southern Sudan.

A. racemosus Willd.

Fig. 73.

Climbing shrub; branches terete, woody, glabrous; branchlets copious, spreading. Scale-leaves produced at the base into a sharp spur. Cladodes 2-6 in a cluster, subulate or slightly flattened, $\frac{1}{2}$ - $\frac{2}{3}$ in. long. Flowers in solitary or clustered lax racemes 1-2 in. long. Perianth white, $\frac{1}{12}$ - $\frac{1}{8}$ in. long.

Central and Southern Sudan.

5. **ASPHODELUS** L.**Asphodelus tenuifolius** Cav.

A. fistulosus var. *tenuifolius* (Cav.) Bak.

Annual herb. Leaves many in a dense basal rosette, subulate, erect, tubular, tapering to the apex, 6-9 in. long. Flowers white, in lax racemes forming a much-branched panicle. Perianth $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Capsule globose, $\frac{1}{8}$ in. in diameter.

North-eastern Sudan.

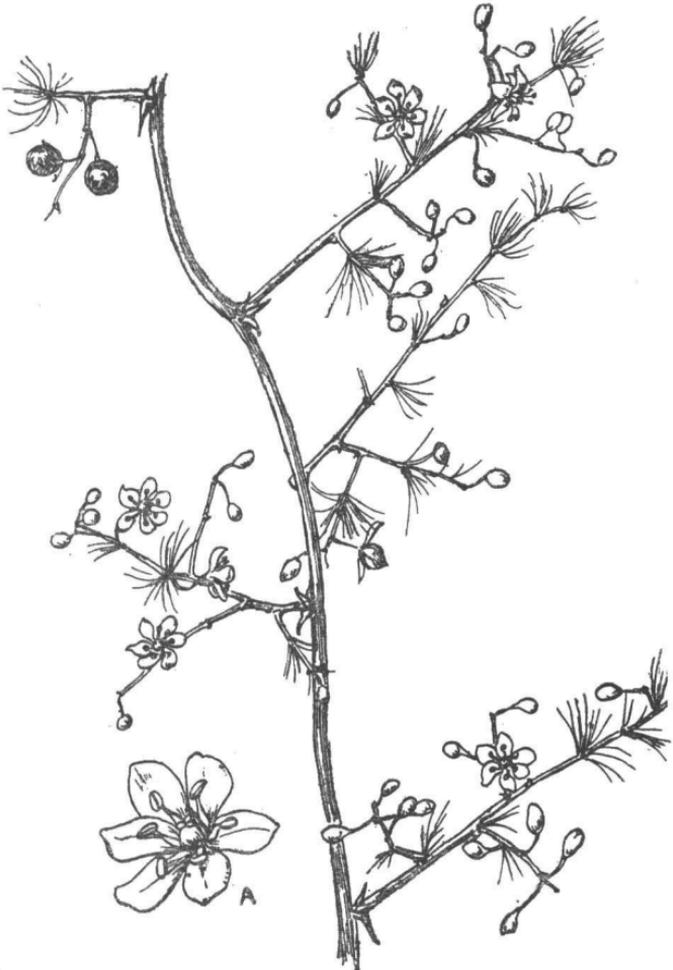


Fig. 73—*ASPARAGUS RACEMOSUS* Willd.

A, flower.

6. **BULBINE** Willd.**Bulbine asphodeloides** (L.) J. A. & J. H. Schult.

Rootstock a small globose tuber, with a dense tuft of slender root-fibres. Leaves 10-20 in a dense basal rosette, erect, subulate, $\frac{1}{2}$ - $1\frac{1}{2}$ ft. long. Flowers bright-yellow, $\frac{1}{3}$ in. long, in racemes 3-6 in. long and very dense upwards on peduncles shorter than the leaves. Capsule obovoid-trigonous, $\frac{1}{4}$ - $\frac{1}{3}$ in. long.

Fung District. Equatoria.

7. **CHLOROPHYTUM** Ker-Gawl.

A. Leaves thin:

B. Leaves distinctly petiolate:

(a) Leaves lanceolate, narrowed to the base, 12-18 in. long
C. macrophyllum.

(aa) Leaves oblong-lanceolate, cordate at the base, 4-6 in. long
C. cordatum.

BB. Leaves not distinctly petiolate:

C. Leaves 3-4, superposed, ciliate on the margin
C. blepharophyllum.

CC. Leaves basal, not ciliate:

D. Peduncle less than 6 in. long:

(b) Perianth $\frac{1}{8}$ in. long *C. pusillum.*

(bb) Perianth $\frac{1}{4}$ in. long *C. schweinfurthii.*

DD. Peduncle more than 6 in. long:

(c) Perianth $\frac{1}{8}$ in. long; leaves $1\frac{1}{2}$ -2 in. broad
C. gallabatense.

(cc) Perianth $\frac{1}{3}$ - $\frac{1}{2}$ in. long; leaves $\frac{2}{3}$ in. broad
C. andongense.

AA. Leaves firm, linear or lanceolate, very closely nerved:

E. Perianth $\frac{1}{2}$ - $\frac{3}{4}$ in. long; root-fibres bearing tubers
C. tuberosum.

EF. Perianth $\frac{1}{8}$ - $\frac{1}{2}$ in. long:F. Leaves ciliate on the margin; perianth $\frac{1}{4}$ - $\frac{1}{2}$ in. long:

(d) Leaves 12-15 in. long; flowers racemose ... *C. longifolium.*

(dd) Leaves 2-2 $\frac{1}{2}$ ft. long; flowers subspicate *C. aureum.*

FF. Leaves not ciliate; perianth $\frac{1}{8}$ in. long:

(e) Leaves 4-6 in. long, $\frac{1}{4}$ in. broad *C. micranthum.*

(ee) Leaves 12 in. long, $\frac{1}{4}$ - $\frac{1}{3}$ in. broad *C. polystachys.*

Chlorophytum macrophyllum (A. Rich.) Aschers. ex Bak.

Herb; root-fibres long, slender, not bearing tubers. Leaves 4-5 to a stem, membranous, lanceolate, narrowed to the base and apex, 1-1 $\frac{1}{2}$ ft. long, 2-3 in. broad at the middle, glabrous. Flowers in dense simple or branched racemes finally 6-8 in. long on naked or bracteate peduncles 6-12 in. long. Perianth $\frac{1}{8}$ in. long.

Kassala: Gallabat. Equatoria.

C. cordatum Engler.

Herb; root-fibres long. Leaves oblong-lanceolate, acuminate at the apex, cordate at the base, 4-6 in. long, $1\frac{1}{2}$ -2 in. broad in the lower part. Flowers on a branched peduncle 16 in. long, the branches $\frac{3}{4}$ - $3\frac{1}{4}$ in. long. Perianth $\frac{1}{2}$ in. long.

Equatoria.

C. blepharophyllum Schweinf. ex Bak.

C. ciliatum Bak.

Herb; root-fibres long, slender; rootstock crowned with a dense mass of bristles. Leaves about 4, sheathing the base of the stem, the lowest small; the others lanceolate or oblong-lanceolate, narrowed to the base, up to 20 in. long, $\frac{1}{2}$ - $1\frac{1}{4}$ in. broad at the middle, ciliate on the margin. Flowers in a dense simple or forked raceme 2-3 in. long on a slender peduncle shorter than the leaves. Perianth dark-purple or brown, $\frac{1}{2}$ in. long.

Kassala: Gallabat, Equatoria.

C. pusillum Schweinf. ex Bak.

Dwarf herb; rootstock an oblong tuber, bearing many slender fibres. Leaves about 4 to a tuft, sessile, oblong-elliptic, spreading, 4-5 in. long, 2- $2\frac{1}{2}$ in. broad, crisped at the margin, glabrous. Flowers in a dense simple raceme 1-2 in. long sessile in the centre of the rosette of leaves. Perianth white.

Equatoria.

C. schweinfurthii Bak.

C. breviscapum (non Dalz.) Broun & Massey.

Root-fibres many, long, slender. Leaves 5-6 to a stem, oblong-lanceolate, narrowed to the base, 12-15 in. long, 2 in. broad at the middle. Flowers in a dense oblong simple or branched raceme 2-3 in. long on a peduncle 2-3 in. long.

Southern Sudan.

C. gallabatense Schweinf. ex Bak.

Herb; rootstock horizontal; root-fibres dense, long, slender. Leaves 6-8 to a stem, lanceolate, gradually narrowed to the base, 1- $1\frac{1}{2}$ ft. long, $1\frac{1}{2}$ -2 in. broad, glabrous. Flowers in many slender racemes, the end one 6-9 in. long, forming a panicle on a slender peduncle 1 ft. long. Capsule $\frac{1}{2}$ in. in diameter.

Kassala: Gallabat. Equatoria.

C. andongense Bak.

Herb; root-fibres many, long, fleshy, some bearing tubers. Leaves about 6 to a tuft, oblong-lanceolate, 1- $1\frac{1}{2}$ ft. long, $\frac{3}{4}$ in. broad, pale and rather crisped at the edge. Flowers in many racemes forming a lax panicle 1-2 ft. long. Perianth $\frac{1}{2}$ - $\frac{1}{2}$ in. long.

Southern Sudan.

C. tuberosum (Roxb.) Bak.

Herb; root-fibres very dense, bearing large tubers at the end. Leaves 6-10 to a stem, lanceolate, 6-12 in. long, $\frac{1}{4}$ -1 in. broad. Flowers in a dense usually simple raceme 2-4 in. long on a peduncle shorter than the leaves. Perianth white, $\frac{1}{2}$ - $\frac{3}{4}$ in. long.

Central and Southern Sudan.

C. longifolium (A. Rich.) Schweinf.

Herb; rootstock horizontal, crowned with copious bristles; root-fibres many, long, not bearing tubers. Leaves about 6 to a stem, sessile, linear, 12-15 in. long, $\frac{3}{4}$ -1 in. broad, very closely ribbed, ciliate on the margin. Flowers in simple racemes 3-9 in. long. Perianth white, $\frac{1}{2}$ in. long. Capsule deeply emarginate, $\frac{1}{4}$ - $\frac{1}{2}$ in. long.

Kassala: Gallabat.

C. aureum Engler.

Dasystachys aurea (Engler) Bak.

Herb. Leaves 5-6 to a stem, erect, linear, gradually narrowed to the acuminate apex and sheathing base, 2-2 $\frac{1}{2}$ ft. long, 1 in. broad, glabrous but obscurely ciliate on the margin. Flowers in subspicate cylindrical raceme 6-12 in. long on an erect stiff peduncle 3 ft. long; flowers covered in the early stage with golden pubescence. Perianth $\frac{1}{4}$ in. long; segments oblong, white with a red-brown keel.

Equatoria.

C. micranthum Bak.

Herb; root-fibres wiry, not bearing tubers; rootstock crowned with a dense ring of fibres. Leaves linear, 4-6 in. long, $\frac{1}{4}$ in. broad, glabrous. Flowers in lax simple or deeply forked racemes 6-8 in. long. Perianth greenish-white, $\frac{1}{2}$ in. long. Capsule $\frac{1}{2}$ in. in diameter.

Equatoria.

C. polystachys Bak.

Herb; root-fibres cylindric, fleshy; rootstock crowned with a few bristles. Leaves about 6 to a stem, linear, not narrowed to the base, 12 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, glabrous. Flowers in several lax paniced racemes. Perianth campanulate, $\frac{1}{2}$ in. long, the segments green.

Equatoria.

8. **DEBESIA** Kuntze**Debesia** sp.

Herb. Leaves narrow-lanceolate, acute at the apex, gradually narrowed to the base, 13 in. long, $\frac{1}{4}$ in. broad. Flowers slightly pinkish-white, racemose.

Equatoria: Yei.

9. **DIPCADI** Medic.**Dipcadi unifolium** Bak.

Herb; bulb globose, $\frac{1}{3}$ - $\frac{1}{2}$ in. in diameter. Leaf single, linear, 6-7 in. long, clasping the base of the peduncle for some distance. Flowers in a laxly 3-6-flowered raceme on a slender peduncle rather shorter than the leaf. Perianth green.

Kassala: Gallabat. Blue Nile Province.

D. fesoghense (Solms) Bak.

Leaves 2, narrowly linear, 6-8 in. long, $\frac{1}{2}$ in. broad. Flowers in a lax many-flowered raceme. Perianth green.

Fung District.

D. filifolium Bak.

Herb; bulb globose, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter. Leaves 2, subterete, firm, nearly 1 ft. long, glabrous. Flowers in a very lax 3-10-flowered raceme on a slender peduncle 1 or more ft. long. Perianth tawny-green. Capsule $\frac{1}{2}$ in. in diameter, shortly stipitate.

Southern Sudan.

D. tacazzeanum (Hochst.) Bak.

Herb; bulb globose, 1 in. in diameter. Leaves 2-3, linear, flat, 3-4 in. long, glabrous. Flowers in a lax 6-12-flowered raceme on a slender peduncle 6-9 in. long. Perianth green. Capsule subglobose, sessile.

Equatoria.

D. lanceolatum Bak.

Herb. Leaves 4-5, lanceolate, acute at the apex, 3-4 in. long, $\frac{1}{4}$ - $\frac{1}{3}$ in. broad, glabrous. Flowers in a very lax raceme 6-12 in. long on a moderately stout peduncle 8-18 in. long. Perianth green.

Equatoria.

10. **DRIMIOPSIS** Lindl. & Paxt.**Drimiopsis barteri** Bak.

Herb; bulb globose, 1 in. in diameter. Leaves oblanceolate, not distinctly petiolate but gradually narrowed to a clasping base, 6-8 in. long, 1 in. broad. Flowers in a dense subspicate raceme $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long on a peduncle 6-8 in. long; upper flowers abortive. Perianth $\frac{1}{2}$ in. long.

Equatoria.

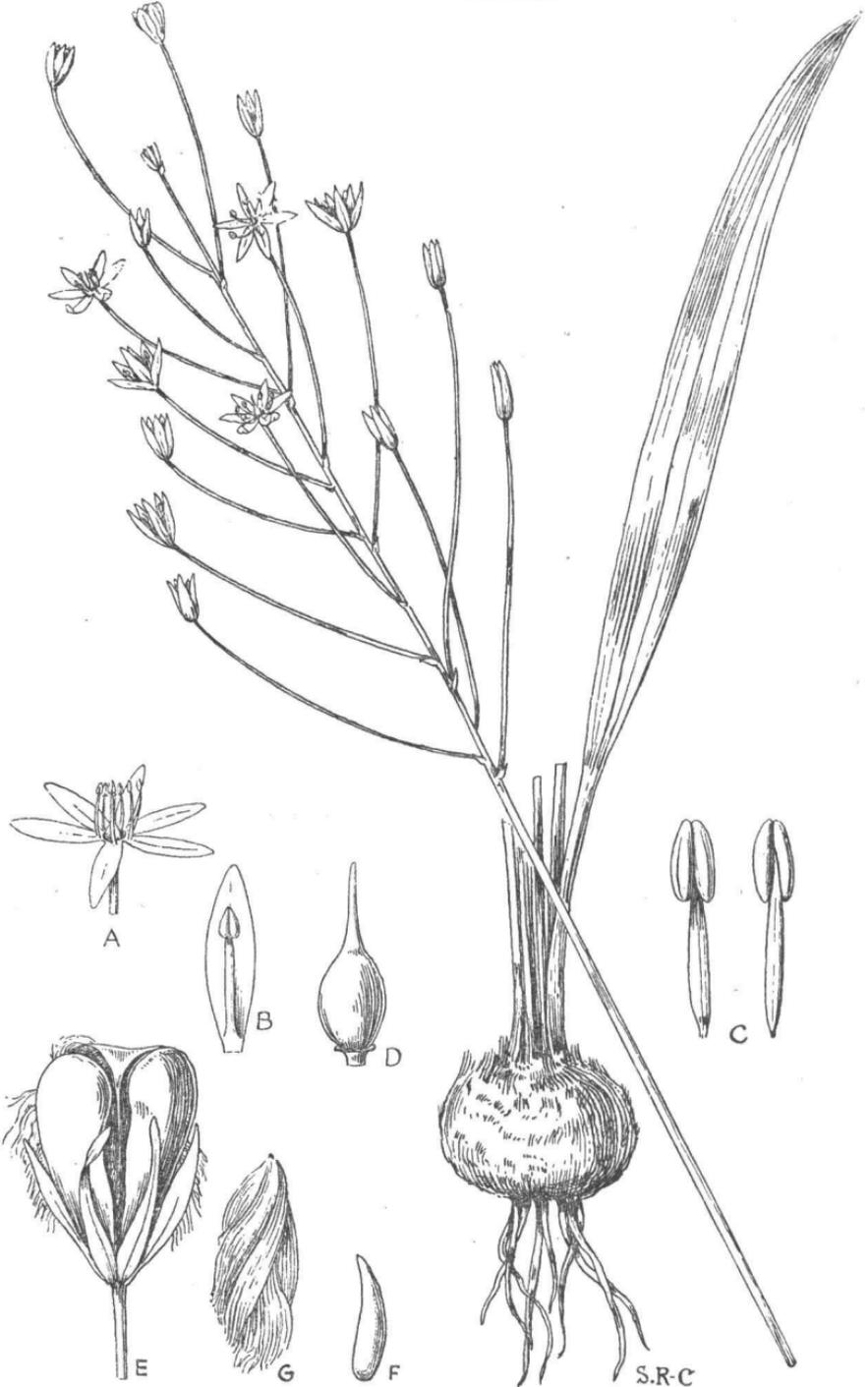


Fig. 74—ERIOSPERMUM ABYSSINICUM Bak.

A, flower. B, perianth-segment and stamen. C, stamens. D, pistil. E, opened capsule showing seeds. F, seed with hairy covering removed. G, seed with hairy covering.

11. **ERIOSPERMUM** Jacq.**Eriospermum abyssinicum** Bak.

Fig. 74.

Herb; tuber bulb-like or somewhat irregular in shape, crowned by the remains of the leaf-bases. Leaves 2 or 3, long-petiolate, linear-lanceolate, acute at each end, about 6 in. long, $\frac{1}{4}$ in. broad, markedly nerved, glabrous. Flowers in a lax raceme 6-8 in. long on a wiry peduncle 3-6 in. long; pedicels 2-3 in. long. Perianth $\frac{1}{4}$ in. long; segments white with a pale-brown keel.

Kassala: Gallabat. Equatoria.

12. **GLORIOSA** L.**Gloriosa simplex** L.

Fig. 75.

G. virescens Lindl. ex Sims.

Herb; stems erect or climbing. Leaves opposite or alternate, ovate-lanceolate, long-acuminate at the apex which is more or less tendril-like, 5-6 in. long. Flowers greenish, turning yellow and red or pink, on long pedicels forming a lax terminal corymb. Perianth-segments with straight or somewhat wavy margins, broadly oblanceolate or almost obovate-oblanceolate.

Red Sea Hills. Central and Southern Sudan.

13. **KNIPHOFIA** Moench**Kniphofia comosa** Hochst.

Herb; rootstock thick and short with copious cylindric root-fibres. Leaves numerous, linear, acutely keeled, 1½-2 ft. long, $\frac{1}{2}$ in. broad towards the base, smooth on the margin. Flowers bright-yellow, funnel-shaped, $\frac{1}{2}$ in. long, in very dense oblong racemes 3-4 in. long when in flower on moderately stout peduncles as long as the leaves. Capsule $\frac{1}{8}$ in. in diameter.

Kassala: Gallabat.

K. nubigena Mildbr.

Leaves up to 18 in. long, hardly keeled. Flowers in dense spiciform racemes 2-2½ in. long on peduncles 10-14 in. long.

Red Sea Hills: Erkowit.

14. **ORNITHOGALUM** L.**Ornithogalum eckloni** Schlecht.

Herb; bulb globose, 1-2 in. in diameter. Leaves 4-6, linear, erect, 1-2 ft. long, $\frac{1}{2}$ -¾ in. broad towards the base. Flowers in a dense or moderately dense raceme 3-4 in. long on a moderately stout peduncle 1½-2 ft. long. Perianth $\frac{1}{2}$ in. long; segments oblong, white with a distinct green keel.

Equatoria.



Fig. 75—GLORIOSA SIMPLEX L.

S. maesta Bak.

Herb; bulb ovoid, 1-1½ in. in diameter. Leaves 5-6, erect, lanceolate, sessile, 4-6 in. long, ½-¾ in. broad, with a few purple spots. Flowers green, ⅓ in. long, in dense racemes 1-2 in. long on peduncles (usually 2-3 to a bulb) 4-5 in. long.

Southern Sudan.

S. chlorantha Bak.

Herb; bulb globose, 1½ in. in diameter. Leaves 3, erect, oblong or oblong-lanceolate, acute at the apex, 6 in. long, 1-2 in. broad, narrowed gradually to an entirely clasping petiole. Flowers green, ½ in. long, in a moderately dense cylindrical raceme 3-5 in. long on a peduncle 4 in. long.

Equatoria.

S. engleri Dur. & Schinz.

S. modesta Bak.

Herb; bulb ovoid, 1-1½ in. in diameter. Leaves 2, oblong or lanceolate, acute or obtuse at the apex, 2-6 in. long, ½-1 in. broad. Flowers greenish, campanulate, ⅓ in. long, in a lax cylindrical raceme 2-3 in. long on a peduncle 2-6 in. long.

Equatoria.

S. lilacina (Fenzl) Bak.

Herb; bulb ovoid, 1½ in. in diameter. Leaves 6-8, thin, sub-erect, oblong-lanceolate, 3-4 in. long, 1-1½ in. broad, narrowed gradually into a channelled petiole as long as the lamina. Flowers pale-purple, in a lax cylindrical raceme 3-5 in. long on a peduncle 4-6 in. long.

Central and Southern Sudan.

16. **URGINEA** Steinh.**Urginea altissima** (L. f.) Bak.

Fig. 76.

U. micrantha (A. Rich.) Solms.

Herb; bulb very large. Leaves linear, developed after the flowers. Flowers in moderately dense cylindrical racemes 1-1½ ft. long on peduncles 1-2 ft. long; bracts minute; pedicels rigid, articulated at the apex, the lower ones ¾-1 in. long. Perianth ½ in. long; segments oblong, with a 1-nerved brown keel.

Central and Southern Sudan.

U. indica (Roxb.) Kunth.

Herb; bulb globose, 2-3 in. in diameter. Leaves developed after the flowers, linear, 6-12 in. long. Flowers whitish, ¼-½ in. long, in very lax racemes 6-12 in. long on fragile slender peduncles 1-2 ft. long; bracts minute, deltoid; pedicels ascending, the lower ones finally 1-2 in. long. Perianth ¼-½ in. long; segments with a 2-3-nerved brownish-green keel.

Central and Southern Sudan.

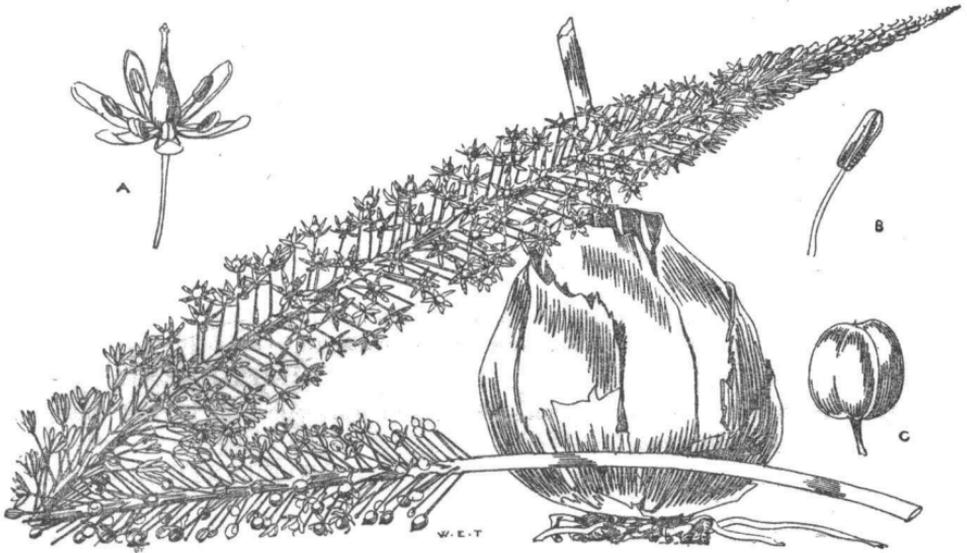


Fig. 76—*URGINEA ALTISSIMA* (L. f.) Bak.

A, flower. B, stamen. C, fruit.

***U. petitiانا* (A. Rich.) Solms.**

Herb; bulb subglobose, 1-1½ in. in diameter. Leaves linear, glabrous, developed after the flowers. Flowers in cylindric racemes dense in the upper half and 6 in. long on moderately stout stiffly erect peduncles 2 ft. long; bracts linear-subulate, not spurred, ¼-½ in. long; pedicels very short. Perianth ½-⅝ in. long; segments white, with a 2-3-nerved greenish-brown keel.

Kassala: Gallabat.

***U. grandiflora* Bak.**

Herb; bulb elongate-ovate, 1-1½ in. in diameter. Leaves 3-4, lanceolate, 5-6 in. long, ¼-¾ in. broad towards the base, glabrous except the densely and softly white-ciliate margin. Flowers in 6-8-flowered racemes on peduncles 6 in. long; bracts linear, persistent, ¼-½ in. long; pedicels ½-⅝ in. long. Perianth about ¾ in. long; segments whitish with a broad many-nerved green keel.

Red Sea Hills: Khor Tamanib.

153. PONTEDERIACEAE

Aquatic erect or floating herbs. Leaves alternate, simple, with a floating or submerged lamina, sheathing at the base. Flowers hermaphrodite, actinomorphic, solitary or in racemes or panicles subtended by spathe-like leaf-sheaths; bracts minute or absent. Perianth petaloid; segments 6, in 2 whorls, free or united into a tube. Stamens 6 or 3, or rarely 1; filaments free; anthers 2-locular, opening lengthwise by slits or by pores. Ovary superior, 3-locular with axile placentas or 1-locular with parietal placentas; style entire or shortly lobed; ovules numerous to solitary and then pendulous. Fruit a capsule or indehiscent; seeds ribbed.

A. Stamens 6 in the normal flowers:

(a) Perianth-segments free to the base; leaves all alike
MONOCHORIA. 3.

(aa) Perianth-segments partially united into a tube; submerged
leaves linear; floating leaves ovate to ovate-orbicular
EICHHORNIA. 1.

AA. Stamens 3 in the normal flowers or sometimes 1 in the non-
opening self-fertilized flowers; leaves all alike
HETERANTHERA. 2.

1. EICHHORNIA Kunth

Eichhornia diversifolia (Vahl) Urb.

Fig. 77.

E. natans (Beauv.) Solms.

Aquatic herb. Submerged leaves linear, $1\frac{1}{4}$ - $2\frac{1}{4}$ in. long; floating leaves long-petiolate, ovate to ovate-orbicular, cordate at the base, $\frac{1}{2}$ -1 in. long, minutely pustulate on the upper surface, with very numerous and close nerves beneath. Flowers blue, solitary. Perianth 6-lobed.

Equatoria.

2. HETERANTHERA Ruiz & Pav.

Heteranthera callifolia Reichb. ex Kunth.

H. kotschyana Fenzl ex Solms.

Aquatic herb. Leaves long-petiolate, ovate, obtuse at the apex, deeply cordate at the base, 2- $2\frac{3}{4}$ in. long, $1\frac{1}{4}$ -2 in. broad, thin, with numerous slender nerves ascending from the base; petiole hollow, sheathing at the base and embracing the capsules. Flowers white, spicate, few. Perianth-tube about $\frac{1}{2}$ in. long; lobes 6, oblong, about $\frac{1}{2}$ in. long, nervose.

Kordofan. Blue Nile Province: Jebel Arashkol. Equatoria.



Fig. 77—*EICHHORNIA DIVERSIFOLIA* (Vahl) Urb.

A, base of floating leaf. B, C, stamens. D, pistil. E, stigma. F, leaf-sheath.
G, cross-section of ovary. H, seed.

3. **MONOCHORIA** C. Presl**Monochoria africana** (Solms) N. E. Br.

Aquatic herb 1½-2 ft. high; rhizome absent. Leaves and flower-stems all radical with a dense tuft of fibrous roots at their base. Leaves ovate, acuminate at the apex, slightly cordate at the base, 3-4½ in. long, 2-3 in. broad; petiole long. Flowers violet, about ½ in. long, numerous, rather crowded in spikes 2½-4 in. long with rather stout peduncles 1½-2½ in. long, on stout flowering stems 11-14 in. long with a leaf or tubular leaf-sheath at their summit enclosing a membranous spathe or bract about ¾ in. long which is abruptly terminated by a thread-like point.

Equatoria.

154. **SMILACACEAE**

Climbing or straggling often rhizomatous shrubs, often with tendril-bearing petioles and prickly stems and branches. Leaves alternate or opposite, simple, 3-5-nerved, reticulately veined between the nerves. Flowers dioecious, small, arranged in axillary umbels, racemes or spikes. Perianth-segments 6, free or rarely united. Stamens 6; filaments free or united; anthers apparently 1-locular by the confluence of the loculi, introrse. Ovary superior, 3-locular; ovules 1-2 in each loculus, pendulous. Fruit a berry.

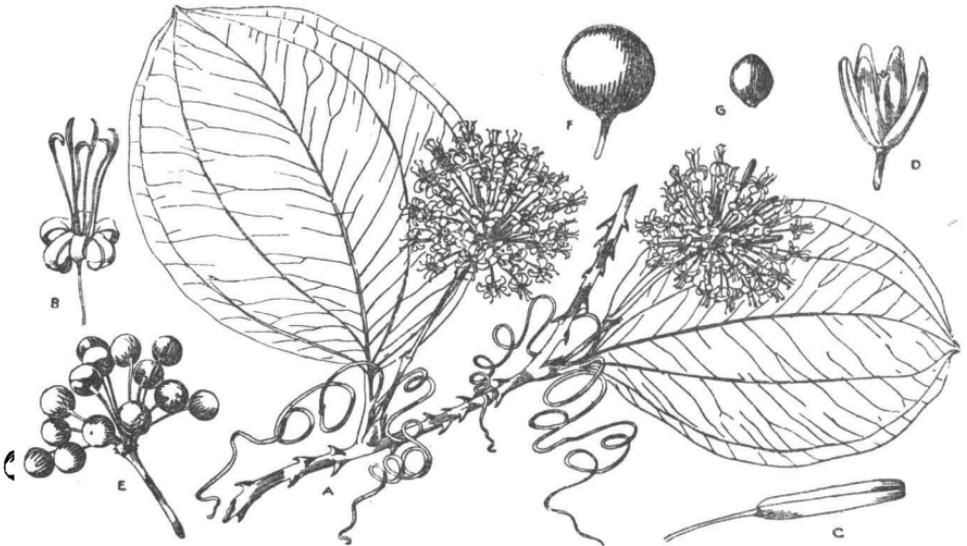


Fig. 78—*SMILAX KRAUSSIANA* Meisn.

A, flowering shoot. B, male flower. C, anther. D, female flower.
E, infructescence. F, fruit. G, seed.

1. SMILAX L.

Smilax kraussiana Meisn.

Fig. 78.

Climbing shrub; branchlets prickly. Leaves alternate, ovate-elliptic to broadly elliptic, abruptly and very shortly acuminate at the apex, up to 6 in. long, 4 in. broad, glabrous, prominently 3-5-nerved from the base, the larger leaves widely subcordate. Flowers yellowish-green, dioecious, in shortly pedunculate many-flowered axillary umbels; peduncle bracteate at the base. Fruit subglobose, nearly $\frac{1}{4}$ in. long.

Equatoria.

155. ARACEAE

Herbs, rarely woody and climbing, with watery or milky juice; rhizome tuberous or elongated. Leaves solitary or few, sometimes appearing after the flowers, if cauline then alternate and distichous or spirally arranged, entire or variously divided, often hastate or sagittate with a membranous sheath at the base. Flowers small, arranged on a spadix enclosed in a spathe, unisexual, monoecious (the male flowers above, the female below) or rarely dioecious. Perianth present, small, or more usually absent. Stamens hypogynous, 2-4-8; anthers free or united. Ovary superior or immersed, 1-many-locular; ovules parietal, axile, basal or apical. Fruit a berry, or coriaceous and rupturing, 1-many-seeded.

Alocasia macrorrhiza (L.) Schott is cultivated in Equatoria by the Azande for its edible rootstock.

A. Terrestrial or epiphytic herbs or climbers:

B. Perianth present; male flowers covering the upper part of the spadix STYLOCHITON. 8.

BB. Perianth absent:

C. Herbs without distinct stems:

D. Spadix without a terminal appendix ANCHOMANES. 2.

DD. Spadix with a terminal appendix destitute of flowers:

(a) Leaves and flowers produced together:

(b) Ovules parietal; leaves simple, peltate COLOCASIA. 4.

(bb) Ovules basal; leaves compound, digitate ARISAEMA. 3.

(aa) Leaves and flowers produced at different times:

(c) Leaves 3-branched at the apex of the petiole; branches dichotomously divided, pinnatifid; spadix without neuter organs above the female flowers AMORPHOPHALLUS. 1.

(cc) Leaves pedate; spadix with neuter organs above the female flowers SAUROMATUM. 7.

CC. Stems well developed and climbing CULCASIA. 5.

- AA. Aquatic floating herbs with a tuft of fibrous roots and a rosette of flabellately nerved leaves; flowers without a perianth, the female part of the spadix adnate to the spathe
PISTIA. 6.

1. **AMORPHOPHALLUS** Bl. ex Decne.

Amorphophallus abyssinicus (A. Rich.) N. E. Br.

A. schweinfurthii (Engler) N. E. Br.

Herb; tuber 2-2½ in. in diameter, flattened. Leaf about 2½ ft. in diameter, glabrous; petiole 1-1¼ or more ft. long. Spathe erect, glabrous; tube dark-purple with a pale zone around the mouth, 2 in. long, 1 in. in diameter at the apex; limb erect, dark-purple, 4-4½ in. long. Spadix much shorter than the spathe, sessile; appendix dark-purple, about 1½ in. long, ½ in. in diameter.

Fung District. Southern Sudan.

A. maculatus N. E. Br.

Herb. Leaf about 2½ ft. in diameter; petiole about 2½ ft. long, light-green with elliptic olive-green spots. Spathe erect; tube green, spotted with dark-grey outside, 4-5 in. long, densely hairy at the base inside; limb green, suffused and veined with deep-red, about 8 in. long, 6 in. broad, glabrous. Spadix very shortly stipitate, twice as long as the spathe; appendix dark-violet, 15-16 in. long, ¾ in. in diameter.

Equatoria.

2. **ANCHOMANES** Schott

Anchomanes difformis (Bl.) Engler.

A. dubius Schott.

Herb. Leaf solitary, pinnati-tripartite; segments more or less oblong-lanceolate, gradually acuminate at the apex, the upper ones usually decurrent on the rhachis, thin and glabrous; petiole and rhachis with scattered short prickles. Peduncle with scattered sharp prickles. Spathe 8-12 or more in. long. Spadix shorter than the spathe, slender, the male portion much longer than the female. Ovary and fruit smooth.

Equatoria.

3. **ARISAEMA** Mart.

Arisaema sp.

Herb from a corm-like tuber. Leaves 1-2, long-petiolate, digitate with about 7 oblanceolate acuminate leaflets up to 6 in. long and 1¾ in. broad; petiole long-sheathing. Peduncle shorter than the leaves. Spathe pale-green, lined with white, purplish outside, about 5-6 in. long, tapering to a long filiform apex. Spadix with a pale-green appendix.

Equatoria: Didinga Mountains, Mount Lotuke, 8000 ft.

4. **COLOCASIA** Schott**Colocasia esculenta** (L.) Schott.*C. antiquorum* Schott.

Herb, rootstock tuberous. Leaves all radical, peltate, more or less ovate, cordate-sagittate at the base, $\frac{1}{2}$ -2 ft. long, thin, glabrous; lateral nerves about 6-8 pairs, radiating from the base. Spathe usually 6-17 in. long; tube green; limb apricot-yellow, 2-5 times as long as the tube. Spadix much shorter than the spathe. Berries enclosed in the persistent tube of the spathe.

Central and Southern Sudan. Introduced and cultivated but now semi-naturalized.

5. **CULCASIA** Beauv.**Culcasia scandens** Beauv.

Fig. 79.

Herb, climbing and epiphytic on trees. Leaves more or less oblique, elliptic or oblong-elliptic, abruptly acuminate at the apex, shortly and broadly cuneate at the base, $4\frac{1}{2}$ -10 in. long, $2\frac{1}{4}$ -4 in. broad, with several more prominent lateral nerves looped near the margin. Spathe pale-green, dorsally cuspidate near the apex, $1\frac{1}{2}$ -2 in. long, a little shorter than the white or purplish spadix. Fruit red.

*Equatoria.*6. **PISTIA** L.**Pistia stratiotes** L.

Water-lettuce.

Floating freshwater herb. Leaves sessile in a rosette, oblong-spathulate, rounded or truncate or widely emarginate at the apex, up to about 5 in. long and 2 in. broad but sometimes much larger, softly puberulous or tomentellous on both surfaces, tomentose towards the base. Spathes axillary, shortly pedunculate, up to $\frac{1}{2}$ in. long, tubular below, villous outside and with a broad white ciliate margin. Spadix shorter than the spathe. Male flowers 3-8 in a stipitate whorl, each flower composed of 2 connate 2-locular anthers. Female flower solitary; ovary 1-locular, with a capitate stigma.

Central and Southern Sudan: in rivers.

7. **SAUROMATUM** Schott**Sauromatum venosum** (Ait.) Kunth.*S. nubicum* Schott.

Herb; rhizome depressed-globose. Leaf solitary, pedatisect; segments 7, broadly lanceolate, acuminate at the apex, the middle segment about 9 in. long and 4 in. broad, glabrous; petiole $1-1\frac{1}{2}$ ft. long, glabrous. Peduncle 2-6 in. long. Spathe-tube blackish-purple at the base within, about 2 in. long; limb spotted with dark-purple, 8-10 in. long. Spadix 8-9 in. long, the male and female parts distant about $1\frac{1}{2}$ in.; appendix purple-brown, 7-8 in. long.

Fung District. Equatoria.

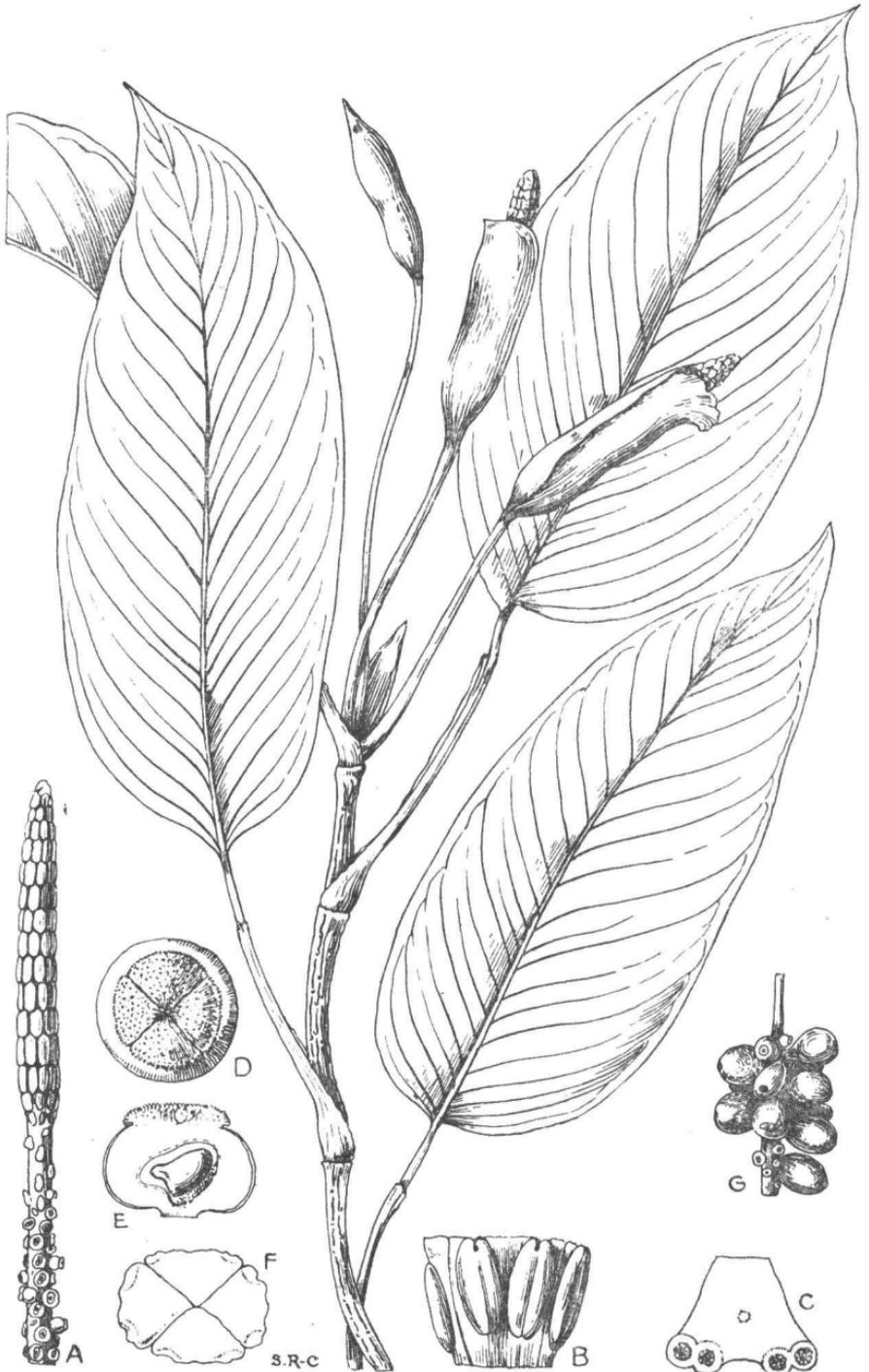


Fig. 79—*CULCASIA SCANDENS* Beauv.

A, spadix. B, male flower. C, section of same. D, female flower from above. E, vertical section of same. F, neuter flower from above. G, fruits.

8. **STYLOCHITON** Lepr.**Stylochiton kerensis** N. E. Br.

Herb; rhizome thick and fleshy. Leaves appearing after the flowers, sagittate, glabrous; petiole $2\frac{1}{2}$ -6 in. long, sheathing for about half its length. Peduncle $\frac{1}{4}$ - $\frac{1}{2}$ in. long, together with the base of the spathe enclosed in 3-4 sheaths. Spathe-tube subterranean, 1- $1\frac{1}{2}$ in. long; limb about $\frac{1}{2}$ in. long, hood-shaped. Male flowers shortly distant from the female flowers. Female flowers 5 in a single whorl, very oblique, connate, the ovary adnate to the perianth.

Kordofan.

S. lancifolius Kotschy & Peyr.

Herb. Leaves appearing after the flowers, elliptic-oblong or lanceolate-elliptic, rounded or obtuse at the base, 3-4 in. long, 1- $1\frac{1}{2}$ in. broad; petiole $2\frac{1}{4}$ -4 in. long, the sheathing portion subterranean. Peduncle $\frac{1}{2}$ - $\frac{3}{4}$ in. long, enclosed by several membranous ovate sheaths about 1 in. long. Spathe-tube subterranean, about $\frac{3}{4}$ in. long; limb green, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, with a very oblique mouth. Male flowers shortly distant from the female flowers. Female flowers 5 in a single whorl, erect, free; ovary free within the perianth.

Equatoria.

156. **LEMNACEAE**

Small to minute floating or submerged herbs (Duckweeds) reduced to thallus-like "fronds", without roots or with roots simple and thread-like. Flowers naked or at first enclosed in a membranous spathe. Perianth absent. Stamens 1-2; anthers 1-2-locular. Ovary sessile, 1-locular, with a basal placenta; style and stigma simple; ovules 1-several. Fruit indehiscent or opening transversely.

- A. Fronds with 1 or more roots; flower enclosed in a spathe seated in a cavity at the margin of the frond **LEMNA.** 1.
 AA. Fronds rootless; flowers without a spathe, seated in 1 or 2 cavities in the upper surface of the frond **WOLFFIA.** 2.

1. **LEMNA** L.**Lemna polyrhiza** L.

Great Duckweed.

Fronds elliptic, suborbicular or somewhat obovate, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, bright-green above, purple beneath; roots several in a cluster on the lower surface of each frond towards the basal end.

Equatoria.

L. perpusilla Torr.

L. paucicostata Hegelm. ex Engelm.

Fronds oblong or elliptic, $\frac{1}{4}$ - $\frac{1}{2}$ in. long; root solitary from the lower surface of each frond; root-sheath winged on each side; root-cap acute.

Central and Southern Sudan.

L. aequinoctialis Welw.

Fronds elliptic or elliptic-obovate, $\frac{1}{4}$ - $\frac{1}{8}$ in. long, obtusely keeled longitudinally on the upper surface; root solitary from near the basal end of the lower surface of each frond.

Equatoria.

2. **WOLFFIA** Hork. ex Schleid.**Wolffia hyalina** (Del.) Hegelm.

W. delilii Schleid.

Fronds elliptic or elliptic-oblong, $\frac{1}{2}$ in. long, producing from the lower edge of the cavity from which the young frond emerges a broad flat linear colourless process about $\frac{1}{2}$ in. long. Flower seated in a cavity in the upper surface of the frond.

Darfur: Jebel Barkin. Kordofan: Bara.

W. welwitschii Hegelm.

Fronds small, oblong, broadly or subtruncately rounded at the ends, $\frac{1}{8}$ - $\frac{1}{4}$ in. long. Flowers in 2 cavities on the upper surface of the frond, very minute.

Equatoria.

157. **TYPHACEAE**

Aquatic or marsh herbs, with a creeping rhizome, often tall; stems simple, submerged at the base. Leaves alternate, simple, usually radical, linear or strap-shaped, rather thick and spongy. Flowers small, unisexual, wind-pollinated, very numerous, densely crowded in a terminal spike, the male above, the female below, the two sexes contiguous or distant; slender bracteoles often present among the flowers. Perianth of very slender jointed hairs. Male flowers: stamens 2-5; filaments variously connate; anthers linear, basifixed. Female flowers: ovary superior, 1-locular, stipitate; style elongated, slender; ovule solitary, pendulous. Fruit dry, at length splitting.

1. **TYPHA** L.**Typha angustata** Bory & Chaub.

Herb 5-9 ft. high. Male and female parts of spike subequal or the male longer, $\frac{1}{2}$ -1 in. distant, very rarely contiguous; bracteoles of the female flowers lanceolate- or elliptic-spathulate, much longer than the hairs.

Widespread.

T. angustifolia L.

Lesser Reed-mace.

Herb 5-6 ft. high. Leaves linear, about $\frac{1}{2}$ in. broad. Male part of spike usually longer than the female, 5-10 in. long, $\frac{1}{4}$ - $1\frac{1}{2}$ in. distant; bracteoles of the female flowers rhomboid-, obcordate-, obovate- or orbicular-spathulate, about as long as the hairs.

Red Sea Hills.

T. australis Schumach.

Herb 5-6 ft. high. Leaves linear or strap-shaped, up to $\frac{1}{2}$ in. broad. Male and female parts of spike subequal, up to 12 in. long, contiguous or $\frac{1}{4}$ -1 in. distant; bracteoles of the female flowers lanceolate-spathulate or rarely fusiform-club-shaped, acute or acuminate at the apex, about as long as or slightly longer than the hairs.

Southern Sudan.

158. AMARYLLIDACEAE

Herbs, with a tunicated bulbous rootstock or rarely a corm or rhizome. Leaves alternate, simple, usually radical, with parallel nerves and transverse secondary veins. Flowers showy, solitary to many in an umbel at the top of the scape, subtended by an involucre of one or more usually membranous bracts. Perianth petaloid; segments 6, free or united. Stamens usually 6, hypogynous or epigynous or inserted on the perianth-tube; filaments free or united, often expanded and sometimes forming a false corona; anthers 2-locular, basifixed or versatile. Ovary superior or inferior, 3-locular, with usually axile placentas; style slender; ovules numerous or few. Fruit a capsule or berry; seeds sometimes winged.

Allium cepa L., Onion, and *A. ascalonicum* L., Shallot, are cultivated in the Sudan.

A. Ovary superior; perianth-segments free; corona absent

ALLIUM. 1.

AA. Ovary inferior; perianth-segments more or less united into a tube:

B. Corona absent:

(a) Ovules numerous; flowers in a 1-many-flowered umbel, usually large:

(b) Ovules closely sessile or immersed in the placentas:

(c) Leaves distichous, biflabellately arranged, arching or spreading on the ground, growing out again at the beginning of a new growth-period

AMMOCHARIS. 2.

(cc) Leaves not biflabellately arranged, usually lasting through only one growth-period

CRINUM. 4.

(bb) Ovules not immersed in the placentas; seeds winged

CYRTANTHUS. 5.

(aa) Ovules few, 2 in each locus; flowers red, in a dense many-flowered umbel:

(d) Fruit capsular, turbinate

BOOPHON. 3.

(dd) Fruit baccate, globose

HAEMANTHUS. 6.

- BB. Corona present, formed by the connate expanded petaloid filaments; flowers white PANCRATIUM. 7.

1. ALLIUM L.

Allium alibile A. Rich.

Herb; bulb white, globose, up to 1 in. in diameter. Flowers pale-rose, campanulate, in a dense many-flowered umbel on a peduncle 18 in. long; spathe short, scarious; pedicels subtended by short scales. Filaments of the inner stamens 3-cuspidate.

Darfur.

A. spathaceum Steud. ex A. Rich.

Herb; bulb globose, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter. Leaves 1-2, thin, narrowly linear, sometimes as long as the peduncle. Flowers white, each perianth-segment with a distinct brown keel, in a 10-15-flowered umbel on a slender fragile peduncle 4-9 in. long. Filaments uniform, subulate.

Red Sea Hills: Erkowit.

2. AMMOCHARIS Herbert

Ammocharis tinneana (Kotschy & Peyr.) Milne-Redh. & Schweick.

Crinum tinneanum Kotschy & Peyr.; *C. ammocharoides* Bak.

Herb; bulb ovoid, up to $4\frac{3}{4}$ in. in diameter. Leaves up to 13 but often fewer, biflabbately spreading, strap-shaped, often falcate, $2\frac{1}{4}$ -13 in. long, $\frac{1}{5}$ - $2\frac{1}{2}$ in. broad, glabrous. Flowers in a 4-30-flowered umbel on a scape $1\frac{1}{2}$ -9 in. long. Perianth delicate-pink to carmine or dull-purplish-red, each lobe usually with a white median line on the inner surface.

Kordofan. Equatoria.

3. BOOPHONE Herbert

Boophone disticha (L.f.) Herbert.

Herb; bulb subglobose, 4-9 in. in diameter. Leaves 8-16, distichous, sword-shaped, up to $1\frac{1}{2}$ ft. long, glabrous. Flowers numerous in a dense umbel up to 1 ft. in diameter on a stout peduncle up to 1 ft. long; pedicels $1\frac{1}{2}$ -4 in. long. Perianth deep-crimson; tube $\frac{1}{4}$ - $\frac{1}{2}$ in. long; lobes linear, $\frac{3}{4}$ -1 in. long.

Equatoria: Sudan-Uganda boundary, Urungo Hill, 3700 ft.

4. CRINUM L.

Crinum jagus (Thompson) Dandy.

C. giganteum Andr.

Herb; bulb globose, 5-6 in. in diameter. Leaves 12 or more to a bulb, lanceolate, laxly veined, 2-3 ft. long, 3-4 in. broad, narrowed to the apex and the base. Flowers white, in a generally 4-6-flowered or rarely 8-12-flowered umbel on a stout compressed peduncle 2-3 ft. long. Perianth-tube slender, curved, 5-7 in. long; lobes oblong, 3-4 in. long, much imbricated.

Southern Sudan.

C. ornatum (L.f.) Bury.*C. scabrum* Herbert.

Herb; bulb globose, 5-6 in. in diameter. Leaves 12 or more to a bulb, sword-shaped, 2-3 ft. long, up to 2 in. broad, tapering gradually to a point, scabrous on the margin. Flowers 4-8 in an umbel on a moderately stout peduncle 1-2 ft. long. Perianth-tube greenish, 4-5 in. long; lobes white with a distinct red keel, 2½-3 in. long, 1 in. broad.

*Central and Southern Sudan.***C. abyssinicum** Hochst. ex A. Rich.

Herb; bulb ovoid, 3 in. in diameter. Leaves about 6 to a bulb, linear, 1-1½ ft. long, ¾-1 in. broad, denticulate on the margin. Flowers 4-6 in an umbel on a moderately stout peduncle 1-2 ft. long. Perianth-tube slender, 1½-2 in. long; lobes white without a red keel, oblong, 2-3 in. long, ½-¾ in. broad.

*Fung District.***C. pauciflorum** Bak.

Herb; bulb globose, 2-3 in. in diameter. Leaves 6-8 to a bulb, stiffly erect, narrowly linear, 1-1½ ft. long, ¼ in. broad, smooth on the margin. Flowers 1-2 in an umbel on a slender peduncle 6-8 in. long. Perianth-tube curved, 4-5 in. long; lobes white with a distinct red keel, 3 in. long, 1 in. broad.

*Equatoria.***C. purpurascens** Herbert.

Herb; bulb ovoid, stoloniferous, 2 in. in diameter. Leaves many to a bulb, suberect, wavy, strap-shaped, 1½-3 in. long, 1½ in. broad. Flowers 4-6, subsessile in an umbel on a slender peduncle shorter than the leaves. Perianth-tube slender, tinged with purple, 5-6 in. long; lobes lanceolate, 2½-3 in. long. Filaments purple; anthers black or violet.

*Equatoria.*5. **CYRTANTHUS** L. f.**Cyrtanthus** sp.

Herb; bulb white. Leaves absent at flowering time. Bracts mauve. Perianth salmon-pink, white-edged.

*Equatoria: Imatong Mountains, Ras Logoforok.*6. **HAEMANTHUS** L.**Haemanthus multiflorus** Martyn.*H. filiflorus* Hiern ex Bak.; *H. lynesii* Stapf.

Herb; bulb globose, 1½-3 in. in diameter; leafy stem about 12 in. long, bearing about 3-6 leaves with broad sheathing petioles. Leaves oblong to ovate-elliptic, up to 12 in. long, 2½-6 in. broad. Peduncle lateral, about 12 in. long, spotted; umbel very dense,

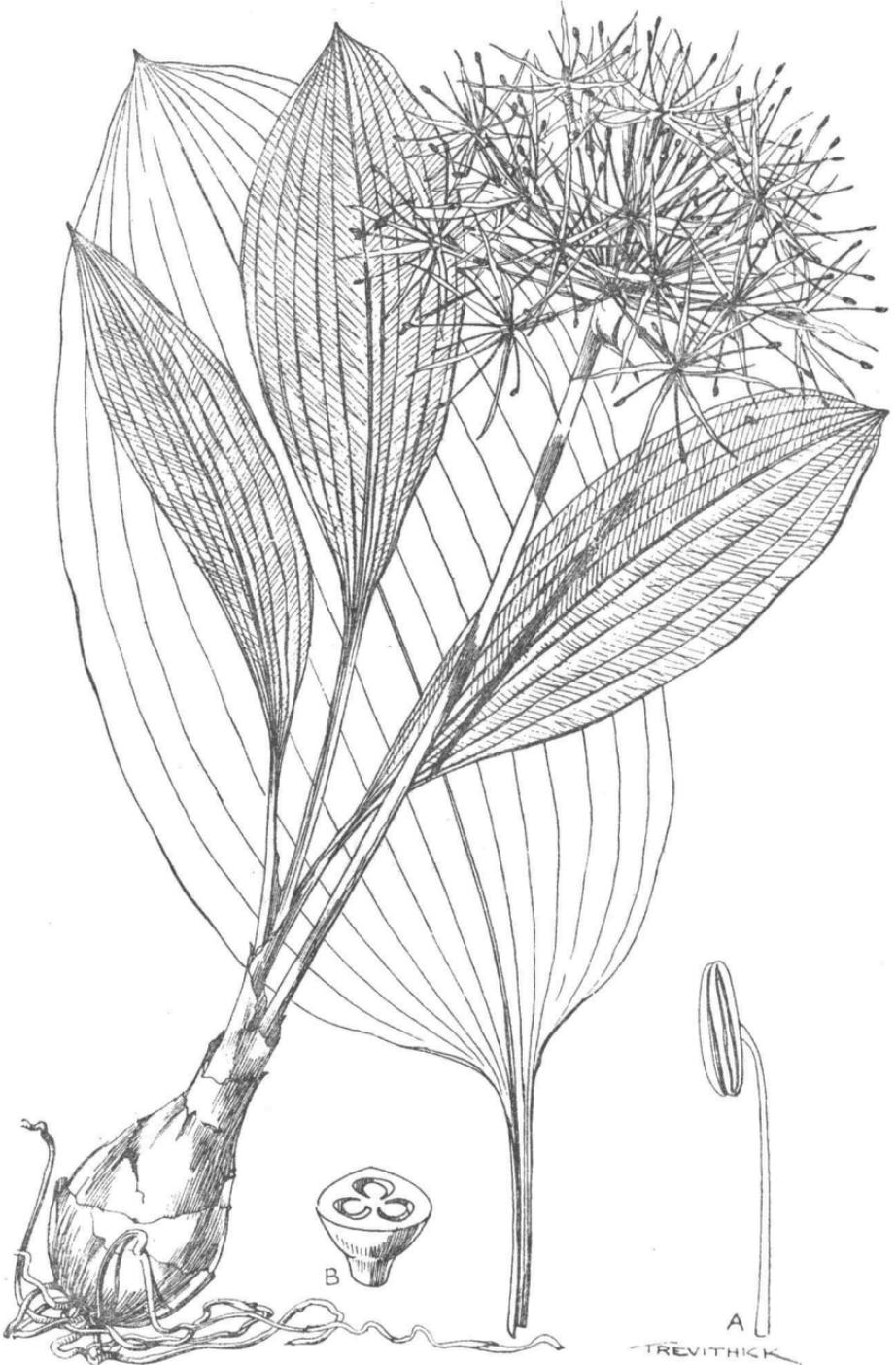


Fig. 80—HAEMANTHUS RUPESTRIS Bak.
A, stamen. B, transverse section of ovary.

5-6½ in. in diameter; pedicels 1-1½ in. long; spathe-valves oblong to lanceolate, reflexing, 2 in. long. Perianth bright-red, sometimes with yellow lobes; tube cylindric, ¼-½ in. long; lobes linear to subulate, 1-3-nerved, ½-1 in. long. Filaments bright-red.

Central and Southern Sudan.

H. rupestris Bak.

Fig. 80.

Herb; bulb small, globose. Leaves 2 from a short slender stem; petiole slender, 1½-2 in. long; lamina oblong, 6 in. long, 4 in. broad, rounded at the base. Peduncle slender, lateral, 3-9 in. long; umbel dense, globose, 3 in. in diameter; pedicels ½-¾ in. long; spathe-valves 4-5, linear-oblong, reddish, reflexing, 1-1½ in. long. Perianth bright-red; tube ¼ in. long; lobes linear, twice as long as the tube, 3-5-nerved.

Kordofan.

7. **PANCRATIUM** L.

Pancratium maximum Forsk.

Herb; bulb large, globose. Leaves 4-5 to a bulb, contemporary with the flowers, linear, 1 ft. long, 6 in. broad, glabrous, not crisped. Flower solitary on a short peduncle. Perianth-tube greenish, cylindric, 4 in. long; lobes white, lanceolate, 2½ in. long. Staminal corona 2 in. long, faintly lobed at the throat.

Red Sea District.

P. tortuosum Herbert.

Fig. 81.

Herb; bulb globose, 1½-2 in. in diameter, with a long cylindric neck. Leaves 6-12, linear, contemporary with the flowers, 6-12 in. long, moderately firm, conspicuously spirally twisted. Flowers 2-4 in an umbel on a very short peduncle. Perianth-tube 5-6 in. long; lobes linear, above 2 in. long. Staminal corona obconic, above 1 in. long, toothed between the short free ends of the filaments.

Red Sea District.

P. trianthum Herbert.

Herb; bulb globose, 1-2 in. in diameter, with a long cylindric neck. Leaves 6-8, linear, flaccid, 12 or more in. long, glabrous, not twisted. Flowers 1-3 in an umbel on a short slender peduncle. Perianth-tube slender, 6 in. long; lobes lanceolate, 2-3 in. long. Staminal corona 1 in. long, with 2-fid teeth between the short free ends of the filaments.

Central and Southern Sudan.



Fig. 81—PANCRATIUM TORTUOSUM Herbert.

159. IRIDACEAE

Perennial herbs, with a rhizome, corm or bulb. Leaves alternate, simple, often crowded at the base of the stem, usually linear, flattened at the sides, sheathing at the base. Flowers hermaphrodite, actinomorphic or zygomorphic, usually showy. Perianth petaloid, withering and persisting for some time; segments 6, in 2 rows, free or united, subequal or more or less dissimilar. Stamens 3, opposite the outer perianth-segments; anthers 2-locular, opening by slits. Ovary inferior, 3-locular with axile placentas, or 1-locular with parietal placentas; style 3-lobed, the lobes sometimes petaloid; ovules numerous. Fruit a loculicidal capsule.

- A. Style-branches petaloid; stamens opposite the style-branches; flowers Iris-like **MORAEA**. 5.
- AA. Style-branches not petaloid; stamens alternate with the style-branches:
- B. Peduncles winged; flowers in clusters **ARISTEA**. 1.
- BB. Peduncles not winged; flowers solitary in the spathes:
- (a) Flowers not spicate nor cymose; leaves thread-like **ROMULEA**. 6.
- (aa) Flowers spicate or cymose; leaves flat:
- (b) Style-branches 2-fid or 2-lobed; flowers cymose **LAPEYROUSIA**. 4.
- (bb) Style-branches entire:
- (c) Spathe-valves (at least the lower ones) $\frac{1}{2}$ or more in. long **GLADIOLUS**. 3.
- (cc) Spathe-valves $\frac{1}{8}$ in. long:
- (d) Perianth red-purple, the limb bilabiate with a hood-like upper lip **ZYGOTRITONIA**. 7.
- (dd) Perianth bright-orange, the limb with subequal lobes ... **CROCOSMIA**. 2.

1. **ARISTEA** Ait.**Aristea alata** Bak.

Herb. Leaves numerous in a distichous basal rosette, linear, rigid, 6-12 in. long, $\frac{1}{8}$ - $\frac{1}{3}$ in. broad. Peduncle flat, 2-winged, longer than the leaves, up to 1 $\frac{1}{2}$ ft. long; flower-clusters 1-2. Flowers blue.

Equatoria: *Imatong Mountains, Mount Kineti*, 10,000 ft.

2. **CROCOSMIA** Planch.**Crocosmia pauciflora** Milne-Redh.

Herb, with a long creeping fibrous-coated rhizome ending in a small corm; stem erect, simple, leafy, up to 2 ft. high. Leaves distichous, the lower ones reduced to sheaths, the upper ones with a sword-shaped lamina up to 1 ft. long and 1 $\frac{1}{2}$ in. broad. Inflorescence 4-6-flowered; outer spathe-valves $\frac{1}{8}$ in. long. Perianth bright-orange; tube curved downwards, $\frac{3}{4}$ in. long; lobes oblong-oblancoelate, $\frac{2}{3}$ - $\frac{5}{8}$ in. long.

Equatoria.



Fig. 82 -GLADIOLUS PSITTACINUS Hook.
A, B, anthers. C, style-branches.

3. **GLADIOLUS** L.**Gladiolus psittacinus** Hook.

Fig. 82.

G. martinianus A. Rich.

Herb 3-4 ft. high; flowering stems with well-developed leaves. Leaves up to about 18 in. long, $1\frac{1}{2}$ in. broad. Flowers pale-yellow to yellow-green or apricot and mottled with brown or carmine. hooded, in 6-9-flowered spikes 6-12 in. long; spathe-valves up to 2 in. long.

*Central and Southern Sudan.***G. unguiculatus** Bak.

Slender herb; flowering stems with very short closely appressed leaves. Flowers mauve-pink or white, usually numerous in the spike; spathe-valves up to $\frac{3}{4}$ in. long. Capsule about $\frac{3}{4}$ in. long, closely mottled with carmine.

*Equatoria.*4. **LAPEYROUSIA** Poirr.**Lapeyrousia abyssinica** (R. Br.) Bak.

Herb; corm ovoid, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter. Leaves 3-4, basal or the upper suprabasal, linear, moderately firm, 3-6 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, glabrous. Peduncle compressed, acutely angled in the lower part, usually branched from about the middle, 6-12 in. long including the inflorescence; flowers lilac, in lax 2-6-flowered cymes; outer spathe-valves oblong-lanceolate, greenish-brown, $\frac{1}{4}$ in. long. Perianth-tube cylindrical, as long as the spathe; lobes oblanceolate, $\frac{1}{2}$ in. long.

*Kassala: Gallabat.*5. **MORAEA** L.**Moraea schimperi** (Hochst.) P.-Sermolli.*M. diversifolia* Bak.

Herb; corm globose, 1 in. in diameter, with brown rigid outer tunics produced 2-3 in. above its neck. Leaf 1, rigid, basal, linear, $\frac{1}{4}$ in. broad. Peduncle simple, 6-12 in. long, with several rudimentary leaves; spathes 3 in. long, the valves acuminate; flowers lilac with bright-yellow triangular markings, $1\frac{1}{2}$ in. long, 2 or more in each spathe. Capsule oblong, $\frac{3}{4}$ in. long.

*Equatoria: Imatong Mountains, Kippia, 8800 ft.***M. carsoni** Bak.

Herb; corm globose, 1- $1\frac{1}{2}$ in. in diameter, with fibrous tunics produced above its neck. Leaf 1, rigid, from the middle of the stem, narrowly linear, $\frac{1}{4}$ in. broad. Flower-clusters 2-4; spathes $\frac{3}{4}$ - $1\frac{1}{2}$ in. long. Perianth lilac to deep-purple, white at the throat with lilac spots.

Equatoria: Didinga Mountains, Mount Lotuke, 6000-6700 ft.

6. **ROMULEA** Maratti**Romulea bulbocodium** (L.) Seb. & Mauri.

Bulbous herb. Leaves narrowly linear, thread-like, grooved on the upper surface, erect or recurved, nearly twice as long as the peduncle. Peduncle 4-12 in. long, 1-3-flowered; spathe-valves lanceolate, unequal, the upper hyaline. Perianth pale-violet to white, yellow towards the base, twice as long as the spathe.

Red Sea Hills: Erkowit.

7. **ZYGOTRITONIA** Mildbr.**Zygotritonia bongensis** (Pax) Mildbr.

Tritonia bongensis Pax.

Herb; corm globose, about 1 in. in diameter. Leaves 2, supra-basal, erect, sword-shaped, strongly ribbed, narrowed to the apex and base, 12 in. long, about $\frac{1}{2}$ in. broad. Peduncle 12 in. long including the simple spike, bearing 2-3 much-reduced leaves; flowers red-purple, in a lax spike 3-6 in. long; spathe-valves brownish, $\frac{1}{2}$ in. long. Perianth-tube nearly twice as long as the spathe; lobes unequal, unguiculate, forming a bilabiate limb.

Equatoria.

160. **DIOSCOREACEAE**

Usually climbers, with a tuberous rhizome or thick woody rootstock. Leaves alternate or opposite, simple or digitately compound, often cordate at the base and digitately nerved, with reticulate venation. Flowers small, actinomorphic, unisexual, spicate, racemose or paniculate. Perianth campanulate or spreading, 6-lobed; lobes in 2 rows. Stamens 6 or only 3 fertile; filaments free or shortly connate; anthers 2-locular. Ovary inferior, 3-locular; styles 3, free or connate; ovules 2 in each loculus, superposed on axile placentas. Fruit a 3-valved capsule or a berry; seeds often winged.

1. **DIOSCOREA** L.

- A. Leaves simple, entire or lobed:
 - B. Leaves all alternate:
 - C. Leaves glabrous *D. bulbifera*.
 - CC. Leaves hairy (at least beneath):
 - (a) Stems not winged; hairs on leaves stellate ... *D. hirtiflora*.
 - (aa) Main stems winged; hairs on leaves not stellate
D. preussii.
 - BB. Leaves (or most of them) opposite:
 - D. Leaves glabrous:
 - (b) Leaves suborbicular, sometimes irregularly lobed, abruptly and conspicuously cuspidate *D. sansibarensis*.
 - (bb) Leaves ovate to lanceolate, cordate or hastate at the base ...
D. abyssinica.

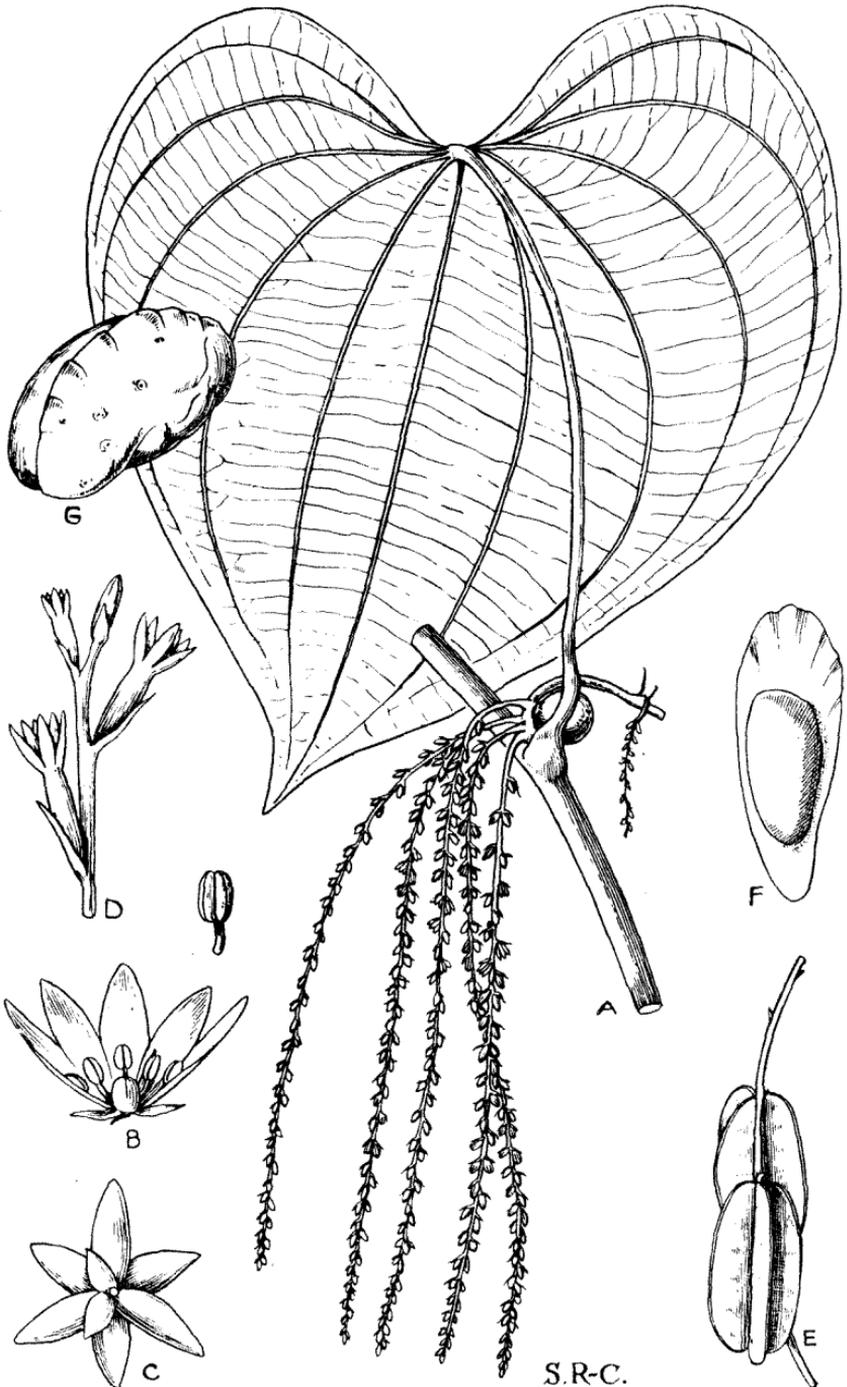


Fig. 83—DIOSCOREA BULBIFERA L.

A, male inflorescence and leaf. B, male flower with one perianth-segment removed. C, male flower from below. D, female flowers. E, fruits. F, seed. G, bulbil.

D. abyssinica Hochst. ex Kunth.*D. sagittifolia* Pax.

Herbaceous glabrous climber. Leaves opposite or sometimes alternate, ovate to lanceolate, acuminate-cuspidate at the apex, cordate or sagittate at the base, $2\frac{3}{4}$ - $4\frac{1}{2}$ in. long, 2- $3\frac{1}{2}$ in. broad. 5-9-nerved. Male spikes in axillary clusters of 2-6.

*Kassala: Gallabat. Equatoria.***D. schimperiana** Hochst. ex Kunth.

Densely pubescent herbaceous climber. Leaves usually opposite, suborbicular-ovate, acuminate at the apex, deeply cordate at the base, 5-nerved, $3\frac{1}{4}$ -8 in. long and broad, densely pubescent beneath. Male spikes long, lax. in clusters of 3-4, $2\frac{1}{2}$ -4 in. long; flowers densely pubescent.

*Fung District: Bunzaga. Equatoria.***D. dumetorum** (Kunth) Pax.

Herbaceous climber; stems robust, woody, canescent-tomentose, often prickly. Leaves 3-foliolate; leaflets obscurely petiolulate, usually more or less densely and persistently pubescent beneath, the terminal one obovate, cuspidate at the apex and 5-6 in. long; lateral leaflets very oblique; petiole often prickly. Male flowers in short axillary panicles with dense cylindric branches; female flowers in lax simple racemes.

*Kordofan. Kassala: Gallabat. Equatoria.***D. quartiniana** A. Rich.*D. beccariana* Martelli.

Herbaceous climber. Leaves 3-5-foliolate; leaflets very shortly petiolulate; terminal leaflet obovate-oblong, abruptly and shortly acuminate at the apex, $2\frac{1}{2}$ -4 in. long; lateral leaflets unequal-sided, apiculate at the apex, 1-3-nerved, puberulous beneath; petiole $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long. Male spikes in axillary clusters of 3-7, $\frac{1}{2}$ -2 in. long; female racemes simple, as long as or shorter than the leaves.

*Kassala: Gallabat.*Var. **phaseoloides** (Pax) Burkill.*D. phaseoloides* Pax.

Herbaceous climber. Leaves 3-foliolate; leaflets oblanceolate, more or less narrowed to the apex, more or less rounded at the base, the terminal one about $2\frac{1}{4}$ in. long and 1 in. broad with a distinct mucro, the lateral ones smaller and more or less oblique, pubescent on both surfaces. Male spikes in clusters of 3-10 in the axils of the large leaves, or the clusters produced from leafless nodes as long racemes up to 14 in. long.

Equatoria.

Var. **schweinfurthiana** (Pax) Burkill.

D. beccariana (non Martelli) Broun & Massey p.p.

Herbaceous climber. Leaves 5-foliolate; leaflets 5, shortly petiolulate, sparsely pubescent, spathulate-obovate or obovate, abruptly acuminate or sometimes retuse or minutely cut at the apex, the terminal one often $3\frac{1}{2}$ in. long and $1\frac{3}{4}$ in. broad, the lateral ones often $2\frac{1}{2}$ in. long. Female spikes up to 4 in. long.

Equatoria.

161. AGAVACEAE

Herbs, shrubs or trees; rootstock a rhizome; stem short or well developed. Leaves alternate, simple, usually crowded on or at the base of the stem, often thick and fleshy, entire or with prickly teeth on the margin. Flowers actinomorphic, hermaphrodite or unisexual, racemose to paniculate or subcapitate, sometimes in a very large panicle, bracteate. Perianth petaloid; segments 6, free or united. Stamens 6, inserted at the base of the perianth-segments or on the tube; filaments thread-like or thickened, free; anthers introrse, 2-locular, opening lengthwise. Ovary superior or inferior, 3-locular, with axile placentas; style slender; ovules numerous to solitary in each loculus. Fruit a capsule or berry.

- A. Stem and leaves usually not fibrous; trees or shrubs; fruit a berry; leaves flat DRACAENA. 1.
 AA. Stem and leaves often fibrous; stout herbs; fruit with a thin pericarp falling away from the berry-like seeds; leaves thick, sometimes terete SANSEVIERIA. 2.

1. DRACAENA Vand. ex L.

Dracaena ombet Kotschy & Peyr.

Fig. 84.

Tree; trunk 7-8 ft. high, twice forked; branchlets short, thick, spreading. Leaves densely rosulate, very thick and rigid, sword-shaped from a dilated base, $1\frac{1}{2}$ -2 ft. long, under 1 in. broad towards the base, rounded on the back in the lower half, keeled upwards. Panicles shortly pedunculate, very compound, above 1 ft. long; branchlets glabrous; pedicels many in a cluster, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, articulated at the middle.

Red Sea Hills.

D. steudneri Engler.

Shrub or tall tree. Leaves oblanceolate, up to 3 or more ft. long and 6 or more in. wide. Panicles ample, with spreading branches; flowers densely clustered; pedicels $\frac{1}{4}$ in. long. Perianth more than $\frac{1}{2}$ in. long; tube constricted above the ovary; lobes linear-oblong, tinged with red on the keel outside. Berry $\frac{1}{2}$ - $\frac{1}{4}$ in. in diameter.

Equatoria: Mount Loka, 4700 ft.; Imatong Mountains, 3200-5500 ft.



Fig. 84—*DRACAENA OMBET* Kotschy & Peyr.
A, flower. B, habit of tree.

D. laxissima Engler.

D. elliptica (non Thunb.) Broun & Massey.

Shrub. Leaves laxly disposed, shortly petiolate, oblong, acute at the apex, narrowed to the base, 6 in. long, 2 in. broad. Panicles very lax, 1 ft. long; branches slender; pedicels $\frac{1}{3}$ - $\frac{1}{2}$ in. long.

Equatoria.

2. **SANSEVIERIA** Thunb.**Sansevieria abyssinica** N. E. Br.

Rootstock creeping, $\frac{3}{4}$ or more in. in diameter. Leaves 1-2, apparently erect, firm or subrigid, lanceolate, acute at the apex, with a hardened apical point, 2 or more ft. long, 2 $\frac{1}{2}$ -3 in. broad, rough, tapering from the middle into a stout concave-channelled petiole $\frac{1}{3}$ - $\frac{1}{2}$ as long as the lamina, wavy along the hardened reddish-brown margin. Flowering stem 2 $\frac{1}{4}$ -2 $\frac{1}{2}$ ft. high, $\frac{1}{4}$ or more in. thick at the base, with 5-6 ovate-lanceolate acute or acuminate distant sheaths in the lower half and a spike-like raceme of flower-clusters in the upper half; flowers 4-5 in a cluster. Berries 1-3-seeded.

Central and Southern Sudan.

S. ehrenbergii Schweinf. ex Bak.

Stem up to 9 in. high, concealed by the leaf-bases. Leaves 5-9, crowded, 2-ranked, erect or more or less spread fanwise, faintly rough, 2 $\frac{1}{2}$ -6 ft. long, about 1 $\frac{1}{4}$ in. thick, laterally compressed with flattened sides, rounded on the back, tapering upwards, rather abruptly ending in a stout hard spine-like point $\frac{1}{4}$ - $\frac{1}{2}$ in. long, with a triangular channel as broad as the leaf all down the face, the margins of the channel acute and reddish-brown with a white membranous edge. Flower-stem up to 6 $\frac{1}{4}$ ft. high, paniculately branched in the upper portion; branches $\frac{1}{4}$ -1 $\frac{3}{4}$ ft. long; flowers 4-7 in a cluster.

Red Sea District: Wadi Ossir, south of Suakin.

S. nilotica Bak.

Stemless herb, with a creeping rootstock about $\frac{3}{4}$ in. in diameter. Leaves 2-3 to a growth, 3-4 ft. long, 1-2 $\frac{1}{4}$ in. broad, smooth, strap-shaped, with the sides for a foot or more of the central part quite parallel, narrowing at the apex into a soft green subulate point $\frac{1}{6}$ - $\frac{2}{3}$ in. long, gradually tapering in the basal part into a deeply concave-channelled petiole 1-2 ft. long, usually marked with very numerous closely placed irregular zigzag transverse narrow bars of dark and paler green; margin green. Flower-stem 1 $\frac{3}{4}$ -2 $\frac{1}{2}$ ft. high, of which 1-1 $\frac{1}{4}$ ft. consists of a lax raceme of irregularly scattered flower-clusters, and in the lower part are about 5 clasping sheaths; flowers 4-10 in the lower clusters, 2-3 in the upper clusters.

Fung District. Equatoria.

S. powellii N. E. Br.

Stem erect, 3-4 or more ft. high, 1 in. in diameter, cylindric, leafy throughout or naked. Leaves in 2 more or less spirally twisted ranks, spreading, slightly recurved, often curved on one side or slightly twisted, slightly rough, 1-2½ ft. long, ⅞-1½ in. broad and about ¼ in. thick, tapering to a hard pale-brown very acute spine-like point and with a concave channel down the face as broad as the leaf and bordered by an exceedingly narrow red-brown line edged with white. Panicle about 18 in. long with ascending spreading branches 4-6 in. long; flowers 4-6 in a cluster, rather dingy-greenish-white, marked with dull-brownish-purple slender lines outside.

Kassala: Abondob, Khor Ereirib.

162. PALMAE

Trees or tall climbers; stems stout or slender, sometimes very short, often covered by the persistent bases of the leaves; primary root soon disappearing and replaced by roots from the base of the stems. Leaves alternate, in a terminal cluster or in climbing species scattered, sometimes very large, simple (often fan-shaped) or pinnately compound, the segments or leaflets folded in bud, often prickly on the margin; rachis sometimes extended at the apex and bearing hooks. Flowers small, hermaphrodite or unisexual, actinomorphic, usually paniculate or spicate; spathes (bracts) various, leathery or membranous; bracteoles often connate below the flowers. Sepals 3, free or united, imbricate or open. Petals 3, free or united, usually valvate in the male and imbricate in the female flowers. Stamens usually 6, in two series, or rarely numerous or fewer. Ovary superior, 1-3-locular or rarely 4-7-locular, or carpels 3 and free or nearly so; ovules solitary, erect, pendulous or axile. Fruit a berry or drupe, or fruiting-carpels distinct; exocarp often fibrous, sometimes covered by reflexed scales.

The Oil-palm (*Elæis guineensis* Jacq.) is cultivated in the Sudan. The late Dr. J. G. Myers discovered this palm in Equatoria growing thickly north of R. Tori (lat. 4° 39' N., long. 30° 29' E.) as far as Khor Baradda (lat. 4° 44' N., long. 30° 45' E.) under conditions suggesting that it is perhaps indigenous to the Sudan.

A. Leaves pinnate:

B. Stems erect, not climbing:

- (a) Edges of leaf-segments folded in vernation ... **RAPHIA.** 7.
 (aa) Leaf-segments folded along the centre in vernation
PHOENIX. 6.

BB. Stems climbing:

- (b) Leaf-rachis prolonged into a tendril armed with hooks
ANCISTROPHYLLUM. 1.
 (bb) Leaf-rachis not so prolonged; inflorescences borne on slender
 leafless branches armed with prickles ... **CALAMUS.** 3.

AA. Leaves fan-shaped:

C. Endosperm homogeneous:

- (c) Male flowers many in pits on the spadix ... **BORASSUS.** 2.

- (cc) Male flowers solitary in pits on the spadix
 HYPHAENE. 4.
 CC. Endosperm mottled MEDEMIA. 5.

1. **ANCISTROPHYLLUM** (Mann & Wendl.) H. Wendl.

Ancistrophyllum secundiflorum (Beauv.) H. Wendl.

A. schweinfurthii Mann & Wendl. ex Broun & Massey.

Tall climber. Leaves pinnate; leaflets elongate-linear-lanceolate, about 10 in. long, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. broad, with numerous fine subulate teeth on the margin; rhachis produced into a stout triangular tendril bearing several pairs of sharply triangular spines thickened at the base, also prickly towards the base. Spadices with very numerous branches; bracts imbricate, pointed; flowers abruptly apiculate. Fruit red, broadly ellipsoid, sharply mucronate, about $\frac{3}{4}$ in. long, covered by about 12 rows of closely packed rhomboid-ovate shining reflexed scales.

Equatoria.

2. **BORASSUS** L.

Borassus aethiopum Mart.

B. flabellifer var. *aethiopum* (Mart.) Warb.

Tall usually unbranched tree up to 60-70 ft. high; stem thicker above the middle, the younger part clothed by the persistent bases of the leaves. Leaves fan-shaped, divided to about the middle; lobes linear-lanceolate, soon splitting at the apex, about 1 $\frac{1}{2}$ in. broad at the base; petiole flat above with jagged margins. Male spadices branched from the base; branches poker-like, up to 6 ft. long. Female spadices up to 9 ft. long. Fruit subglobose, enclosing 3 pyrenes; pyrenes compressed-ellipsoid, about 4 in. long, covered with fine fibres.

Central and Southern Sudan.

3. **CALAMUS** L.

Calamus deerratus Mann & Wendl.

C. barteri Becc. ex Drude.

Slender climber to the tops of forest trees; stems prickly. Leaves pinnate; leaflets elongate-linear-lanceolate, acutely acuminate at the apex, 12 in. long, 1 in. broad, with fine subulate teeth on the margin and often on the lower surface; rhachis armed with sharp recurved hooks. Spadices borne on slender leafless branches armed with numerous recurved hooks; branches of spadix short, about 2 in. long. Fruit oblong-ellipsoid, pointed, about $\frac{3}{4}$ in. long, with about 15 rows of triangular-ovate scales, the scales with fringed margins.

Equatoria.

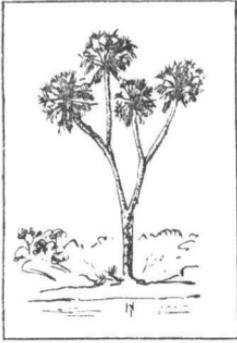


Fig. 85—HYPHAENE THEBAICA (L.) Mart.

A, male flower. B, female flower.

4. **HYPHAENE** Gaertn.

Fig. 85.

Hyphaene thebaica (L.) Mart.

Tree up to 50 ft. high; stem branching dichotomously. Leaves 20-30 in a terminal crown on each branch, fan-shaped; lobes linear-lanceolate; petiole with numerous upwardly curved hooks. Male spadices about 4 ft. long; spathe-bracts encircling the spadix pointed, emitting the branches, the latter with the stalk flattened next the axis. Branches of female spadices stouter, in the fruiting stage marked by densely tomentose cushions after the fall of the fruit. Fruit globose-quadrangular, about $2\frac{1}{2}$ in. long, 2 in. broad.

Northern and Central Sudan.

5. **MEDEMIA** Württemb. ex H. Wendl.**Medemia argun** (Mart.) Württemb. ex H. Wendl.

Tree; stem simple. Leaves fan-shaped; petiole unarmed. Male spadices slender, with reddish tomentose scales. Fruit dull-brown, ellipsoid, about 2 in. long, $1\frac{1}{2}$ in. in diameter, bitter, not edible; seed ellipsoid, $1\frac{1}{2}$ in. long, about 1 in. in diameter.

Northern Sudan: Nubian Desert.

M. abiadensis H. Wendl.

Similar to *M. argun* but the fruit bright-brown, $1\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. in diameter; seed about 1 in. long, rather less than 1 in. in diameter.

White Nile.

6. **PHOENIX** L.

Date-palm.

Phoenix dactylifera L.

Tree; stem tall, straight, cylindric, scaly in the younger parts with the remains of leaf-bases. Leaves pinnate, 10 or more ft. long, glaucous; leaflets lanceolate-linear, acuminate at the apex, somewhat 4-ranked, the middle ones the longest. Flowers dioecious, paniculate. Corolla twice as long as the calyx. Drupe fleshy, saccharine, ellipsoid, variously coloured, usually more than 1 in. long.

Northern Sudan. Cultivated.

P. reclinata Jacq.

Tree; stem 3-6 or more ft. high. Leaves pinnate, bright-green, 3-5 ft. long; leaflets rigid, lanceolate, acuminate and particularly the lower ones sharply pointed at the apex, the middle ones 12 in. long and 1 in. broad, the midrib with white floccose indumentum on the lower side. Flowers dioecious, arranged in close panicles of spikes at first enclosed in a rigid spathe; spikes very wavy.

Darfur: Jebel Marra. Southern Sudan.

7. **RAPHIA** Beauv.**Raphia monbuttorum** Drude.

Stemless or with a stem up to 5 ft. high. Leaves in a terminal crown, pinnate; leaflets irregularly arranged, up to $1\frac{1}{4}$ in. broad. Male flowers: calyx shortly campanulate, $\frac{1}{4}$ - $\frac{1}{3}$ as long as the corolla; corolla-lobes curved, narrowly lanceolate from a linear base, long-acuminate at the apex, $\frac{3}{4}$ -1 in. long. Female flowers scarcely half as long as the male flowers; calyx enclosing and its teeth overtopping the short corolla; staminodes absent.

Equatoria.

163. **PANDANACEAE**

Trees or shrubs; trunk and branches often with aerial roots. Leaves in 4 rows or spirally arranged and crowded to the tops of the shoots, simple, linear, sheathing at the base, keeled, usually spinulose on the margin and keel. Flowers dioecious, paniculate or densely crowded on spadices, the latter axillary and terminal, clustered or paniculate, enclosed at first by spathaceous sometimes coloured or leafy bracts. Perianth rudimentary or absent. Male flowers: stamens numerous; filaments free or connate; anthers erect, basifixed, 2-locular, the loculi sometimes again once divided. Female flowers: staminodes absent or small and hypogynous or adnate to the base of the ovary; ovary superior, 1-locular, free or confluent with adjacent ovaries into bundles with separate or united stigmas; style very short or absent; ovules solitary to many, basal or parietal. Fruit forming oblong or globose syncarps; mature carpels woody, drupaceous or baccate, pulpy inside; seeds minute.

1. **PANDANUS** L.**Pandanus** sp.

Leaves sword-like, sharply toothed, thick and leathery.

Equatoria: Khor Azza.

164. **HYPOXIDACEAE**

Herbs, with a tuberous rhizome or corm. Leaves alternate, simple, usually all radical, usually prominently nerved and often covered with long hairs. Flowers hermaphrodite, actinomorphic, solitary, spicate, racemose or subumbellate, usually white or yellow. Perianth petaloid; segments 6, equal, spreading, free or united below, the tube consolidated into a long beak above the ovary. Stamens 6 or rarely 3, inserted at the base of the perianth-segments; anthers 2-locular, opening lengthwise. Ovary inferior, 3-locular; style short, with 3 separate or connate stigmas; ovules numerous in 2 series on axile placentas or rarely few. Fruit a capsule opening by a circular slit or by vertical slits near the top, or indehiscent and fleshy; seeds small.

- A. Ovary immediately below the perianth-segments, the latter free to the base; fruit dehiscent by a circular slit around the middle or into valves **HYPOXIS**. 2.
- AA. Ovary far below the perianth-lobes which are separated from it by a long slender stipe-like tube; fruit indehiscent **CURCULIGO**. 1.

1. **CURCULIGO** Gaertn.

Curculigo pilosa (Schumach.) Engler.

Fig. 86.

C. gallabatensis Schweinf. ex Bak.

Herb. Leaves tufted, elongate-linear-lanceolate, very acute at the apex, up to 20 in. long and $1\frac{1}{4}$ in. broad, thinly pilose with weak hairs. Flowers with a star-shaped yellow perianth-limb, solitary or paired on short peduncles hidden in the leaf-sheaths. Perianth-lobes broadly lanceolate, $\frac{3}{4}$ in. long, thinly pilose. Stamens on filaments half as long as the anthers. Tube-like beak of the ovary linear, $2-3\frac{1}{4}$ in. long, pilose with weak hairs. Fruit oblong, sessile, crowned by the persistent tube of the perianth.

Kassala: Gallabat. Equatoria.

2. **HYPOXIS** L.

Hypoxis urceolata Nel.

Perennial herb, with a large cylindric corm. Leaves up to 2 ft. long, about $\frac{1}{2}$ in. broad, villous on the margin, broadly sheathing at the base, about 3-nerved on each side of the midrib. Flowers yellow, villous, in several-flowered racemes on peduncles as long as or shorter than the leaves; bracts linear-subulate, as long as the pedicels.

Equatoria: Imatong Mountains.

H. angustifolia Lam.

Herb; corm $1-1\frac{1}{2}$ in. in diameter, crowned with copious bristles. Leaves 6-20, lanceolate, erect or falcate, 6-12 in. long, $\frac{1}{2}$ -1 in. broad towards the base, more or less hairy especially beneath. Flowers yellow, in lax 4-8-flowered corymbs on peduncles often 3-4 to a corm and shorter than the leaves.

Equatoria.

H. multiflora Nel.

Densely pilose herb from a corm 3 in. in diameter and bright-yellow in section. Leaves coriaceous, 20-24-nerved, linear-lanceolate, acuminate at the apex, 8-10 or more in. long, about $1\frac{1}{4}$ in. broad, densely white- or grey-appressed-villous on both surfaces. Inflorescences about $9\frac{1}{2}$ in. long, 12-14-flowered, on peduncles $6-7\frac{1}{2}$ in. long. Flowers bright-yellow, subsessile.

Equatoria: Imatong Mountains.

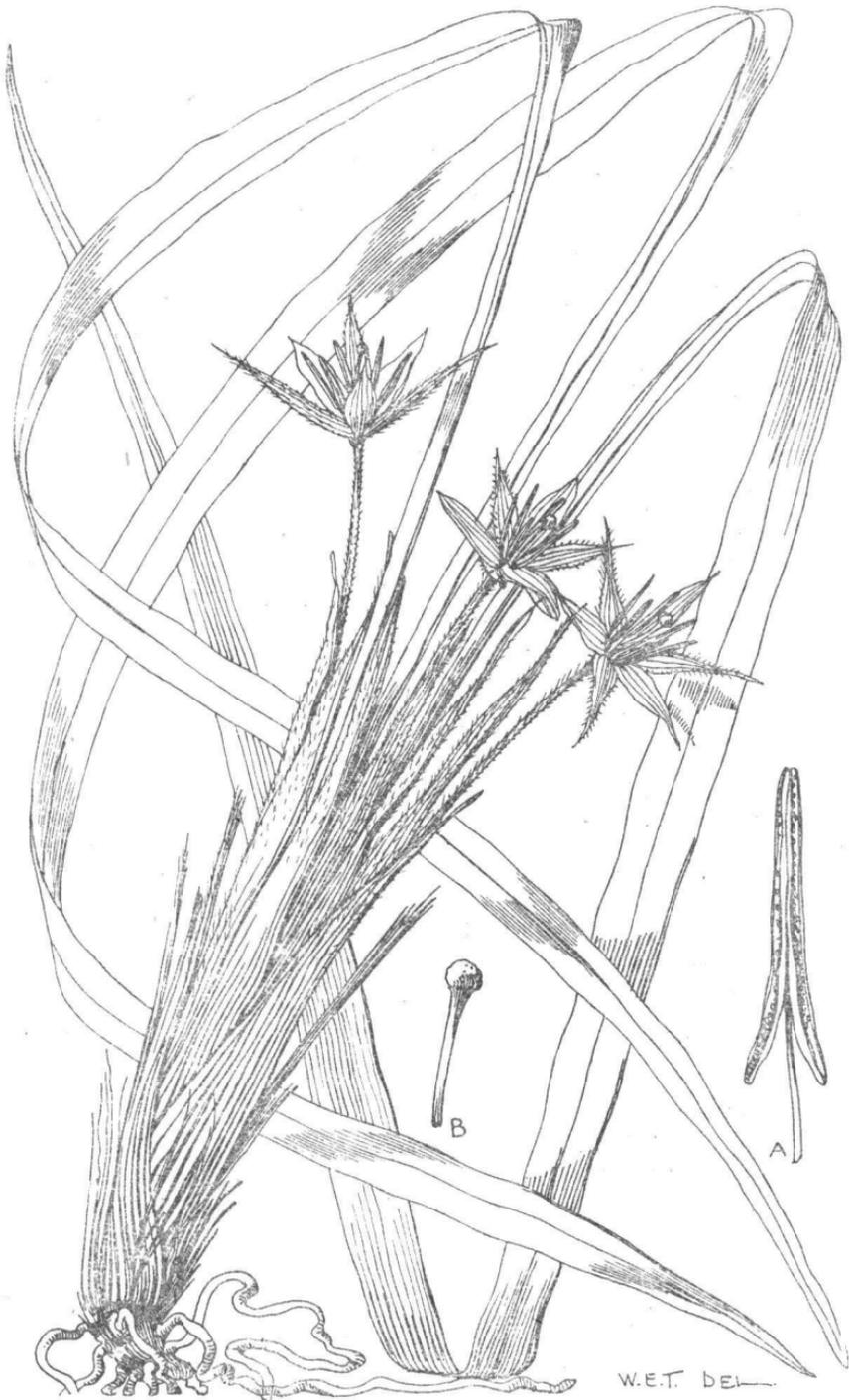


Fig. 86—*CURCULIGO PILOSA* (Schumach.) Engler.
A, stamen. B, stigma.

165. VELLOZIACEAE

Arborescent or shrubby plants; stem woody, fibrous, dichotomously branched, covered with the persistent bases of the fallen leaves. Leaves alternate, simple, crowded in tufts at the ends of the stem or branches, narrow, often sharply pointed. Flowers hermaphrodite, actinomorphic, white, yellow or blue, solitary, pedunculate. Perianth petaloid; segments equal, spreading, free or united at the base. Stamens 6, or numerous in 6 bundles of 2-6; anthers linear, basifixed, opening by longitudinal slits. Ovary inferior, 3-locular; style slender, with a capitate stigma or 3 short arms; ovules very numerous on axile stalked placentas. Fruit a dry or hard capsule, often flat or concave on the top, crowned with the scar of the perianth or 6-toothed, sometimes spiny, loculicidally dehiscent.

1. VELLOZIA Vand.

Vellozia sp.

Shrub, with tufts of grassy leaves from a fibrous tree-fern-like bent and twisted stem 4-5 in. in diameter.

Equatoria: on rocks at the summit of Mount Oro, Opari-Torit road; Itaba Hill, Lomolongori, Torit District, 4000 ft.

166. TACCACEAE

Perennial herbs, with a tuberous or creeping rhizome. Leaves all radical, large, entire or much divided. Flowers hermaphrodite, actinomorphic, umbellate; bracts forming an involucre, the inner ones often thread-like. Perianth petaloid, with a short tube and 6 lobes; lobes in 2 rows. Stamens 6, inserted on the perianth; filaments short; anthers 2-locular, opening lengthwise. Ovary inferior, 1-locular, with 3 parietal placentas; style short, with 3 stigmas often petaloid and reflexed over the style; ovules numerous. Fruit a berry or rarely opening by valves; seeds numerous.

1. TACCA J. R. & G. Forst.

Tacca leontopetaloides (L.) Kuntze.

T. pinnatifida J. R. & G. Forst.

Herb, with a large tuberous rootstock. Leaves large, erect, shining, 3-partite, each segment 2-forked, pinnatipartite, the lower lobes separated, the upper ones connected, sometimes one segment not 2-forked, glabrous; petiole 1-3 ft. long. Flowers green, many in an umbel surrounded by a whorl of foliaceous bracts, and with purplish thread-like inner bracts, on a naked peduncle as long as or longer than the petioles. Fruit ovoid-ellipsoid, about 1½ in. long; seeds ribbed.

Kassala: Gallabat. Southern Sudan.

167. ORCHIDACEAE

Perennial terrestrial or epiphytic sometimes saprophytic herbs, with a rhizome or tuberous roots or rootstock; stems frequently thickened at the base into pseudobulbs and bearing aerial assimilating roots. Leaves alternate and often distichous, frequently all radical, simple, sometimes all reduced to scales, often fleshy, sheathing at the base. Flowers bracteate, hermaphrodite or very rarely polygamous or monoecious, zygomorphic; inflorescence spicate, racemose or paniculate, or flowers solitary. Perianth composed of 6 petaloid segments in 2 whorls, or the outer whorl calyx-like and the inner corolla-like, or the outer rarely corolla-like and the inner minute, free or variously connate in each whorl; outer segments ("sepals") imbricate or subulate; median segment of each whorl generally different in size and colour from the lateral ones, especially the median "petal" (lip) which is often extremely complicated in structure; on account of the twisting of the ovary through 180° the lip is usually placed in an abaxial position; frequently the lip, or more rarely the median sepal, is prolonged into a sac or spur, sometimes very long. Stamens 2 or 1; anther or anthers 2-locular, introrse, opening by slits lengthwise; pollen granular or generally agglutinated into mealy, waxy or bony masses (pollinia); at one end the pollinium may be extended into a sterile portion (caudicle); the pollinia may be free in the anther-loculi or more or less loosely united. Ovary inferior, 1-locular with 3 parietal placentas or very rarely 3-locular with axile placentas, usually produced at the apex into a special structure (column); stigmas 3, fertile, or more frequently the lateral 2 fertile, the other sterile and transformed into a small outgrowth (rostellum) which lies between the anther and the stigmas; a portion of the rostellum is sometimes modified into a viscid disk or disks (viscidia) to which the pollinia are attached; ovules very numerous and minute. Fruit usually a capsule, usually opening laterally by 3 or 6 longitudinal slits; seeds very numerous, minute, often drawn out at each end or rarely winged.

- A. Anther attached to the column by its base, the loculi adnate to the column and persistent; pollinia granular, with caudicles and 2 (or rarely 1) viscidia; terrestrial herbs with erect annual leafy stems and terminal inflorescences:
- B. Lip with 1 or 2 distinct but sometimes rather short spurs:
- C. Spurs 2; lip at top of flower (flowers not resupinate); sepals and lateral petals similar, more or less united to one another and to the lip; column slender, somewhat curved; stigma superior, cushion-like, fleshy; anther pendulous ...
SATYRIUM. 18.
- CC. Spur 1:
- (a) Middle lobe of rostellum concave, frequently placed some way in front of the anther; lip entire or with a small tooth-like lobe on each side at the base; lateral petals entire or with a small lobe at the base, more or less falcate:

- (b) Stigmatic processes very long and partly adnate to the stalk of the lip BONATEA. 3.
- (bb) Stigmatic processes not adnate to the lip, usually short ...
PLATYCORYNE. 16.
- (aa) Middle lobe of rostellum usually flat or subulate, more or less appressed to the anther; other characters not associated as above HABENARIA. 12.
- BB. Lip sometimes concave at the base but with no distinct spur:
 - (c) Median sepal drawn out into an erect or pendulous spur; lip entire with short tooth-like lateral lobes; rostellum small, tooth-like DISA. 9.
 - (cc) Median sepal without a spur BRACHYCORYTHIS. 4.
- AA. Anther attached to the column by its apex (usually at the back of the column), either operculate (i.e. the anther can be lifted like a little cap, the pollinia usually being carried with it) or erect and persistent, the caudicle and viscidium being then at the top:
 - D. Pollinia granular or much divided into small masses attached to a common axis:
 - (d) No leaves at time of flowering; rhizome bearing tubers; leaves 1-few, very varied in shape; flowers small, in erect or pendulous racemes NERVILIA. 15.
 - (dd) Leafy plants usually with a slender creeping rhizome or fibrous rootstock; stems 3-6 ft. high, rigid, leafy; leaves folded several times, lanceolate or narrowly elliptic, the lamina 6-12 in. long; inflorescences axillary or terminal, paniculate; flowers 2-2 $\frac{3}{4}$ in. long; rostellum elongate ...
CORYMBORKIS. 7.
 - DD. Pollinia waxy, entire, 2 or 4 or 8, either free or adhering at one end by viscid outgrowths (the caudicles) or attached to 1 or 2 sticky gland-like structures (the viscidia); anther operculate:
 - E. Growth sympodial, consisting either of annual growths from a tuberous underground root or stem, or of a series of erect or creeping lateral shoots, the stem in each growth being often partly thickened to form a fleshy pseudobulb; inflorescences terminal on the year's growth, or axillary:
 - F. Anther 2-locular; pollinia free or joined together by a sticky appendage, neither attached to the rostellum nor possessing a distinct viscidium:
 - (e) Column usually short, produced downwards into a foot often nearly as long as itself; lip articulated on the column-foot and freely moving; inflorescences arising from the bases of the pseudobulbs; pseudobulbs well defined, bearing 1-2 (rarely 3) leaves at the apex
BULBOPHYLLUM. 5
 - (ee) Column not produced downwards into a foot; lip continuous with the base of the column; inflorescences

- terminal on the annual leafy outgrowths; pseudobulbs not well defined and often absent
MALAXIS. 13.
- FF. Anther incompletely 2-locular; pollinia attached by a stalk (stipes) to the viscidium (both stipes and viscidium are part of the rostellum) which comes away with them:
- G. Flowers resupinate (median sepal uppermost); usually terrestrial herbs, a few epiphytic:
- (f) Lip with a distinct spur or very concave sac at the base:
- (g) Pseudobulbs 1-leaved; leaves fleshy, folded lengthwise EULOPHIDIUM. 11.
- (gg) Pseudobulbs 2- or more-leaved or plant with a tuberous underground stem; leaves folded several times, very frequently not developed at time of flowering EULOPHIA. 10.
- (ff) Lip without a spur; epiphytic herbs; pseudobulbs tall, fusiform, many-leaved; inflorescences usually paniculate; sepals and lateral petals similar
ANSELLIA. 2.
- GG. Flowers not resupinate (lip uppermost); usually epiphytic herbs or on rocks; inflorescences terminal on the leafy shoots POLYSTACHYA. 17.
- EE. Growth monopodial, continued by a relatively slow-growing apical bud; no pseudobulbs; leaves when present more or less distichous, fleshy, folded lengthways, very frequently unequally bilobed at the apex; inflorescences always axillary; pollinia with stalk (stipes) and viscidium; epiphytic herbs:
- H. Leaves absent; roots very abundant, assimilating
MICROCOELIA. 14.
- HH. Leaves present:
- I. Lip with a small tooth-like or rim-like callus in the centre at the mouth of the spur; mouth of spur narrow; pollinia with separate stipes and common viscidium or each with its own stipes and viscidium
DIAPHANANTHE. 8.
- II. Lip without any tooth-like callus; pollinia on a single stipes and viscidium:
- J. Stems elongated, bearing leaves at more or less regular intervals usually for the greater part of their length:
- (h) Spur with a narrow mouth easily distinguishable from the limb of the lip, almost straight, not or only slightly thickened in the apical part; lip frequently 3-lobed, the side-lobes sometimes tooth-like, in most species with thickened auricles on each side of the mouth of the spur
TRIDACTYLE. 19.

(hh) Spur with a wide mouth, gradually merging into the limb of the lip, narrowest in the middle and swollen at the apex, abruptly recurved near the apex, about as long as the rest of the lip; lip usually distinctly 3-lobed; sepals and lateral petals acuminate CALYPTROCHILUM. 6.

JJ. Stems short, bearing all the leaves closely together; spur with a narrow mouth, easily distinguishable from the limb of the lip, usually much longer than the rest of the lip and not or scarcely thickened in the apical part; lip entire, somewhat broader than the other perianth-segments AERANGIS. 1.

1. AERANGIS Reichb. f.

Aerangis kotschyana (Reichb. f.) Schlechter.

Angraecum kotschyianum Reichb. f.

Epiphytic herb. Leaves 3-6, broadly oblanceolate, unequally bilobed at the apex, $3\frac{1}{4}$ - $9\frac{1}{4}$ in. long, $\frac{1}{2}$ - $2\frac{1}{2}$ in. broad. Flowers white, often tinged with pink, in up to 15-flowered inflorescences 6-24 in. long. Sepals and lateral petals $\frac{3}{4}$ - $1\frac{1}{2}$ in. long; lip $\frac{3}{4}$ - $1\frac{1}{4}$ in. long, much wider than the sepals in the middle; spur $2\frac{1}{4}$ - $8\frac{3}{4}$ in. long, spirally twisted.

Fung District: Fazoghli. Equatoria.

2. ANSELLIA Lindl.

Ansellia gigantea var. **nilotica** (Bak.) Summerh.

Epiphytic herb; pseudobulbs 1-2 ft. long, elongate. Leaves lanceolate or oblong-lanceolate, subacute at the apex, 6-15 in. long, 1- $1\frac{1}{2}$ in. broad. Flowers deep-yellow, spotted with brown, in branched or rarely simple racemose panicles 9-18 in. long; pedicels (with ovaries) $1\frac{1}{2}$ - $1\frac{3}{4}$ in. long. Lip 3-lobed, $\frac{3}{4}$ -1 in. long.

Equatoria.

3. BONATEA Willd.

Bonatea sudanensis Rolfe.

Herb. Stem-leaves sessile, elliptic-oblong, apiculate at the apex, $2\frac{3}{4}$ - $4\frac{3}{4}$ in. long, $1\frac{1}{2}$ - $1\frac{1}{2}$ in. broad. Racemes 5-flowered; bracts oblong-lanceolate, acuminate at the apex, $1\frac{1}{4}$ in. long; pedicels (with ovaries) $1\frac{1}{2}$ -2 in. long; flowers large. Lateral petals deeply 2-partite; posterior lobe linear, $\frac{3}{4}$ in. long; anterior lobe elongate-linear, $1\frac{1}{4}$ in. long. Lip $1\frac{1}{2}$ in. long, 3-partite; spur curved, cylindric, about 4 in. long.

Red Sea Hills: Erkowit.

4. **BRACHYCORYTHIS** Lindl.**Brachycorythis pubescens** Harv.*B. hispidula* (Rendle) Schlechter.

Densely leafy velvety herb 1-2 ft. high. Leaves lanceolate to ovate, acute or acuminate at the apex, $\frac{3}{4}$ -2 in. long, passing into sheaths below and into bracts above. Flowers purple, in a dense raceme 3-8 in. long. Median sepal elliptic-oblong, concave, $\frac{1}{4}$ in. long. Lateral petals obliquely semi-ovate-oblong, about $\frac{1}{4}$ in. long, pubescent. Lip about $\frac{1}{2}$ in. long, with a pair of rounded auricles at the gibbous or subsaccate base, constricted and bent above the base, cuneately dilated and 3-lobed above; lateral lobes rounded.

*Equatoria.***B. ovata** subsp. **schweinfurthii** (Reichb. f.) Summerh.*B. schweinfurthii* Reichb. f.; *B. grandis* var. *sudanensis* Braid.

Herb 2 $\frac{1}{2}$ -2 $\frac{3}{4}$ ft. high. Leaves about 40, strap-shaped, cuneate at the base, the lower ones 3-3 $\frac{1}{2}$ in. long. Flowers purple, in a dense inflorescence 6 in. long; bracts linear-lanceolate, about as long as the flowers.

*Equatoria.*5. **BULBOPHYLLUM** Thou.**Bulbophyllum cochleatum** Lindl.

Epiphytic herb; pseudobulbs $\frac{1}{2}$ in. apart on a creeping rhizome, elongate-linear, terete, 2-3 in. long, 2-leaved. Leaves sessile, oblong-linear, obtuse and retuse at the apex, 3-6 in. long, $\frac{1}{4}$ - $\frac{3}{4}$ in. broad. Peduncles suberect, 6-8 in. long; flowers small, in dense spikes 2 $\frac{1}{2}$ in. long; bracts distichous, broadly ovate, concave, imbricate, about $\frac{1}{4}$ in. long.

*Equatoria: Imatong Mountains, in forest, 6000-7000 ft.*6. **CALYPTROCHILUM** Kränzl.**Calyptrochilum christyanum** (Reichb. f.) Summerh.

Epiphytic herb. Leaves strap-shaped, close together, nearly 3 in. long, $\frac{3}{8}$ in. broad, with an unequal apex. Peduncles $\frac{1}{2}$ -1 in. long, 6-10-flowered; flowers $\frac{1}{2}$ - $\frac{3}{4}$ in. long, white, tinged with orange, the throat orange. Spur dull-orange.

*Equatoria.*7. **CORYMBORKIS** Thou.**Corymborkis welwitschii** (Reichb. f.) Kuntze.*Corymbis corymbosa* Ridl. p.p.

Herb. Leaves with a narrow sheathing base and a short petiole, elliptic-lanceolate, 6-12 in. long, 1 $\frac{1}{2}$ -3 $\frac{1}{2}$ in. broad, many-nerved. Flowers white or greenish, in up to 20-flowered inflorescences up to 2 $\frac{3}{4}$ in. long; bracts small. Perianth-segments 2-2 $\frac{3}{4}$ in. long, broadened near the apex. Column slender, 1 $\frac{3}{4}$ in. long, partially enveloped by the lip.

Equatoria.

8. **DIAPHANANTHE** Schlechter**Diaphanante fragrantissima** (Reichb. f.) Schlechter.

Epiphytic herb. Leaves falcate or sword-shaped, very coriaceous, oblique and very obscurely bilobed at the apex, 6-11 in. long, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. broad. Flowers white, tinged with green, opposite in many-flowered rather stout elongate racemes about 1 ft. long; bracts very shortly triangular, each pair confluent at the sides into a ring. Lip strongly apiculate, crenulate, about $\frac{1}{3}$ in. long; spur about $\frac{1}{2}$ in. long, the base slender, the apex suddenly and obliquely inflated. Column stout, $\frac{1}{4}$ in. long.

Equatoria.

9. **DISA** Berg.**Disa erubescens** Rendle.

Fig. 87.

Herb 1-3 ft. high; flowering stem clothed with coriaceous lanceolate appressed sheath-like leaves 1 $\frac{1}{2}$ -3 in. long, the basal sheaths spotted. Leaves of barren shoot linear, 12 or more in. long, $\frac{1}{3}$ - $\frac{5}{8}$ in. broad. Flowers salmon-pink, orange spotted with red at the throat, large, in a lax 3-10-flowered spike 3-6 in. long; bracts elliptic-ovate, shorter than the flowers, 1-1 $\frac{1}{4}$ in. long. Median sepal spatulate with a long narrow claw about 1 in. long; spur pendulous, about $\frac{1}{4}$ in. long. Anther erect.

Equatoria: Imatong Mountains, 6000-7000 ft.

D. schimperi N. E. Br.

Herb 2-2 $\frac{1}{2}$ ft. high, glabrous; flowering stem leafy at the top. Leaves of barren shoot strap-shaped, acute at the apex, 1 ft. long, $\frac{1}{2}$ -1 $\frac{1}{4}$ in. broad; leaves of flowering stem with a tubular sheath and an ascending or spreading lamina 1 $\frac{1}{2}$ -4 in. long and $\frac{1}{2}$ -1 in. broad, lanceolate or ovate-lanceolate. Flowers pink or carmine-red in a spike 6-8 in. long and about 1 in. thick. Median sepal not spatulate and without a claw. Lateral petals 2-lobed. Anther erect.

Equatoria: Imatong Mountains, mountain meadow above Lomuleng, 8700 ft.

D. deckenii Reichb. f.

Herb 7-15 in. high, glabrous. Lowest leaves ascending, strap-shaped, acute at the apex, 6-8 in. long, $\frac{1}{3}$ - $\frac{3}{4}$ in. broad; upper leaves gradually smaller, more or less spreading. Flowers pink, in a dense many-flowered spike 1-2 in. long. Median sepal not spatulate and without a claw. Lateral petals entire, lanceolate. Anther erect.

Equatoria: Imatong Mountains, summit of Mount Kineti, 10,400 ft.



Fig. 87.—*DISA ERUBESCENS* Rendle.

A, inflorescence. B, lower part of flowering stem and leaves. C, median sepal.
D, lateral sepal. E, lateral petal. F, lip.

D. hircicornis Reichb. f.

Herb about 2 ft. high, glabrous; flowering stem without radical leaves. Lowest 2-3 leaves reduced to sheaths; next 3-4 leaves strap-shaped, erect, coriaceous, the lowest 3-6 in. long; upper leaves gradually passing into the bracts at the top of the stem. Flowers deep-purple to madder-brown, small, in a moderately dense spike 4-5 in. long and about $\frac{3}{4}$ in. broad. Lateral petals entire. Anther horizontal.

Equatoria: Imatong Mountains, Mount Kineti, 10,200 ft.

10. **EULOPHIA** R. Br.

A. Leaves irregularly and shallowly toothed on the margin, stout ...
E. schimperiana.

AA. Leaves not as above:

B. Lateral petals less than $\frac{1}{2}$ in. long:

(a) Pedicels (with ovaries) up to $\frac{1}{8}$ in. long *E. warneckeana.*

(aa) Pedicels (with ovaries) $\frac{1}{8}$ - $\frac{1}{4}$ in. long:

(b) Flowers yellow; lateral petals orbicular, apiculate at the apex; sepals reflexed *E. schweinfurthii.*

(bb) Flowers greenish-brown; lateral petals ovate or ovate-oblong, subobtuse at the apex *E. pyrophila.*

BB. Lateral petals $\frac{1}{2}$ or more in. long:

C. Lateral petals narrow, lanceolate, oblong or elliptic:

D. Sepals spatulate or subspatulate, broadest near the apex; lateral petals yellow *E. lindleyana.*

DD. Sepals strap-shaped, lanceolate or elliptic-oblong:

E. Keels of lip crested:

(c) Flowers greenish-yellow, striped or blotched with pale-purple; spur broadly conical ... *E. flavopurpurea.*

(cc) Flowers rose or flesh-coloured with a purple lip; spur narrowly conical *E. cristata.*

EE. Keels of lip thickened or slender but not crested:

F. Spur less than $\frac{1}{4}$ in. long:

(d) Spur broadly saccate; flowers green and purple
E. alta.

(dd) Spur not broadly saccate:

(e) Flowers yellow; spur $\frac{1}{4}$ - $\frac{1}{2}$ in. long, oblong
E. shupangae.

(ee) Flowers not yellow; spur about $\frac{1}{8}$ in. long:

(f) Lip fiddle-shaped *E. livingstoniana.*

(ff) Lip 3-lobed:

(g) Flowers pinkish-mauve; pedicels (with ovaries) up to 1 in. long *E. montis-elgonis.*

(gg) Flowers white with purple crests and nerves on the lateral lobes of the lip; pedicels (with ovaries) about $\frac{1}{4}$ in. long
E. stachyodes.

FF. Spur $\frac{3}{4}$ -1 in. long; flowers pink to purple
E. quartiniana.

CC. Lateral petals broadly ovate-orbicular or orbicular-elliptic:

G. Flowers red, purple or pink:

(h). Bracts linear-lanceolate; racemes 4-8 in. long
E. cucullata.

(hh) Bracts ovate or ovate-oblong; racemes 12 or more in.
long:

(i) Lip 3-lobed, the lateral lobes broadly rounded
E. porphyroglossa.

(ii) Lip entire or obscurely 3-lobed *E. latilabris.*

GG. Flowers yellow:

(j) Lip about $\frac{1}{2}$ in. long; bracts setaceous ... *E. orthoplectra.*

(jj) Lip $\frac{3}{4}$ -1 in. long; bracts ovate-lanceolate ... *E. wakefieldi.*

***Eulophia schimperiana* A. Rich.**

E. baginsensis Reichb. f.

Herb; rhizome very stout; pseudobulbs narrowly conical. Leaves rigid, folded before expansion, sword-shaped, acute at the apex, 1-2 or more ft. long, 2 or more in. broad. Peduncles 3 ft. high, stout, paniculate above; branches many-flowered; bracts ovate-lanceolate, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Lateral petals spatulate, acute. Lip oblong, sub-3-lobed.

Equatoria: Mount Bagense on Sudan-Congo border.

***E. warneckeana* Kränzl.**

E. lutea Lindl., non Bl.

Herb 1-1 $\frac{1}{2}$ ft. high; stems with a subglobose corm-like base. Leaves linear, acute. Peduncles slender, 1-1 $\frac{1}{2}$ ft. high; flowers yellow, in lax racemes. Lip elliptic-oblong, 3-lobed, about $\frac{1}{4}$ in. long.

Equatoria.

***E. schweinfurthii* Kränzl.**

Herb about 2 ft. high. Peduncle very slender, with several sheaths; flowers yellow, in a lax few-flowered raceme. Sepals smaller than the lateral petals. Lip 3-lobed; spur stout, straight.

Equatoria.

***E. pyrophila* (Reichb. f.) Summerh.**

Lissochilus pyrophilus Reichb. f.

Herb, with a stout rhizome. Peduncles arising after bush fires, about 18 in. high, with several loose basal sheaths; flowers greenish-brown, small, in lax many-flowered racemes 6-10 in. long.

Equatoria.

E. lindleyana (Reichb. f.) Schlechter.*Lissochilus paludicola* Reichb. f.

Herb up to 4 ft. high, with a stout rhizome. Leaves linear-lanceolate, acute at the apex, 1½-2 ft. long, ½-¾ in. broad. Peduncles 2½-4 ft. high, with a few sheaths below; flowers in lax many-flowered racemes 9-10 in. long. Sepals mahogany-red, sharply reflexed, ½-¾ in. long. Lateral petals yellow, ½-¾ in. long.

*Equatoria.***E. flavopurpurea** (Reichb. f.) Rolfe.*Lissochilus millsoni* Rolfe.

Herb up to 2½ ft. high. Peduncles slender, 2¼ ft. high, with a few distinct sheaths below; flowers in few-flowered lax racemes up to 13 in. long. Sepals pale-green with very faint purple-green stripes on the back. Lateral petals pale-greenish-yellow, ¾-1 in. long. Lip strap-shaped, 3-fid, striped or blotched with pale-purple; spur broadly conical, obtuse, small, yellow at the apex.

*Equatoria.***E. cristata** (Afz.) Lindl. ex Steud.*Lissochilus purpuratus* Lindl.

Herb 3-4½ ft. high. Leaves elongate-linear, 1-1¾ ft. long, ¼-½ in. broad. Peduncles 3-4½ ft. high, with several short sheaths below; flowers rose or flesh-coloured with a purple lip, in many-flowered racemes 9-12 in. long. Lip 3-lobed, about 1 in. long; spur narrowly conical with an acute apex, about ½ in. long.

*Southern Sudan.***E. alta** (L.) Fawc. & Rendle.*E. woodfordii* (Sims) Rolfe.

Herb, with a tuberous rhizome. Leaves lanceolate or elongate-lanceolate, acute or acuminate at the apex, attenuate at the base into a sheathing petiole, 1-2½ ft. long, 1½-4 in. broad. Peduncles 1½-3 ft. high, with several long sheaths below; flowers green with a purple lip, in many-flowered racemes 6-15 in. long.

*Equatoria.***E. shupangae** (Reichb. f.) Kränzl.

Herb; rhizome tuberous. Leaves long-petiolate, elongate-lanceolate or linear-lanceolate, acute at the apex, 1-1½ ft. long, ¼-1¼ in. broad. Peduncles 2-5 ft. high, covered with long imbricate sheaths; flowers yellow with orange hairs on the disk of the lip, in many-flowered rather dense racemes 3-6 in. long.

Equatoria: Imatong Mountains.

E. livingstoniana (Reichb. f.) Schlechter.*Lissochilus mediocris* Rendle.

Tall herb, with a stout rhizome. Peduncles up to 2½ or more ft. high, with a few sheaths below; flowers with white or pale-purple sepals and lateral petals and a dark-purple lip, in lax racemes 4-10 in. long; bracts oblong- to linear-lanceolate. Sepals and lateral petals ½-1 in. long. Lip oblong-fiddle-shaped; spur narrowly conical, ¼-½ in. long.

Equatoria: *Laboni forest*.**E. montis-elgonis** Summerh.

Herb up to 3 ft. high. Leaves appearing with the flowers, narrowly lanceolate, produced at the base into a false petiole, about 2 ft. long, 1-1¼ in. broad. Flowers pinkish-mauve, in cylindric racemes 3¼-4¾ in. long and 1½-2 in. in diameter. Spur narrow, cylindric.

Equatoria: *Imatong Mountains*, 10,000 ft.**E. stachyodes** Reichb. f.

Herb. Leaves lanceolate, acuminate at the apex, 5-10 in. long, ¾-2 in. broad. Peduncles about 2 ft. high, with several oblong-lanceolate acute sheaths; flowers in many-flowered racemes 6-9 in. long.

Equatoria.**E. quartiniana** A. Rich.*E. guineensis* (non Lindl.) Broun & Massey.

Herb, with conical pseudobulbs ¾-1½ in. long. Leaves petiolate, lanceolate-oblong or obovate-oblong, acute or apiculate at the apex, 4-12 in. long, 2-5 in. broad. Peduncles 2-3 ft. high, with several sheaths below; flowers pink to purple, in many-flowered racemes 4-12 in. long. Sepals and lateral petals 1-1½ in. long, ¼-½ in. broad. Spur attenuate and slender from a conical base, ¾-1 in. long.

Fung District. Equatoria.**E. cucullata** (Afz.) Lindl. ex Steud.

Fig. 88.

Lissochilus arenarius Lindl.; *L. roscheri* Reichb. f.

Herb, with a stout flattened rhizome. Leaves linear or lanceolate-linear, acute at the apex, ½-½ in. broad. Peduncles 2-3½ ft. high, with several long sheaths below; flowers usually appearing before the leaves, purplish-pink with a yellow throat, in 6-10-flowered racemes 4-8 in. long; pedicels (with ovaries) ¾-1 in. long. Lateral petals ¾-1¼ in. long.

Equatoria.



Fig. 88—*EULOPHIA CUCULLATA* (Afz.) Lindl. ex Steud.
A, fruit. (The sepals should be sharply reflexed.)

E. porphyroglossa (Reichb. f.) Bolus.*Lissochilus porphyroglossus* Reichb. f.

Tall herb, often growing in swamps or on river banks. Leaves long-petiolate, elongate-lanceolate, acuminate at the apex, up to 3½ ft. long, 3¼ in. broad. Peduncles up to 10 ft. high; flowers purple or pale-lilac, in many-flowered racemes 12 or more in. long; bracts ovate or ovate-oblong, ¾-1¼ in. long; pedicels (with ovaries) 1-1½ in. long. Lateral petals suborbicular, about 1 in. long.

*Equatoria.***E. latilabris** Summerh.*Lissochilus schweinfurthii* Reichb. f.

Tall herb, often growing in swamps. Leaves elongate-lanceolate, acute at the apex, 1½ or more ft. long. Peduncles stout, up to 6 ft. high; flowers red to pinkish-purple, in many-flowered racemes 12 or more in. long; bracts ovate-oblong, about 1 in. long. Lateral petals suborbicular, about 1 in. long.

*Equatoria.***E. orthoplectra** (Reichb. f.) Summerh.*Lissochilus orthoplectrus* Reichb. f.

Herb. Peduncles about 2 ft. high, with a few distinct sheaths; flowers yellow, streaked with red, in lax many-flowered racemes; bracts setaceous, ½-¾ in. long. Lip 3-lobed; lateral lobes semi-ovate; spur conical, straight, under ¼ in. long.

*Equatoria.***E. wakefieldi** (Reichb. & Moore) Summerh.

Herb, with a stout rhizome. Leaves elongate-linear, acute or acuminate at the apex, 6-9 or more in. long. Peduncles 2¼-4 ft. high, with several sheaths below; flowers yellow, in lax racemes 6-11 in. long; bracts ovate-lanceolate, acuminate at the apex, ¼-½ in. long. Lip 3-lobed; spur conical, up to ¼ in. long.

*Southern Sudan.*11. **EULOPHIDIUM** Pfitz.**Eulophidium ledienii** (Stein) De Wild.

Herb; pseudobulbs ovoid, ¾-1¼ in. long. Leaves variously petiolate, oblong-oblong, acute at the apex, 6-16 in. long, 1-2¼ in. broad, greyish-green with transverse irregular bands of darker green spots or blotches. Peduncles 8-16 in. long, simple or with 1 or 2 short branches at the base; flowers greenish-white with pink blotches on the lip. Lateral petals ¼-½ in. long. Lip 3-lobed; spur much swollen, about ½ in. long.

Equatoria: Kagelu, floor of gallery-forest in dense shade.

12. **HABENARIA** Willd.

- A. Lateral petals entire *H. filicornis*.
- AA. Lateral petals 2-lobed or 2-partite:
- B. Spur less than 2 in. long:
- C. Leaves up to 3 in. long, lanceolate to ovate-lanceolate:
- (a) Spur inflated throughout; anterior petal-lobe longer than the posterior; bracts as long as or longer than the flowers; inflorescence 1-1½ in. broad; longest leaves in the middle of the plant *H. njamnjamica*.
- (aa) Spur not inflated; anterior petal-lobe equaling or shorter than the posterior; bracts shorter than the flowers; inflorescence ¾ in. broad; longest leaves towards the base of the plant *H. bongensium*.
- CC. Leaves usually more than 3 in. long, linear to linear-lanceolate:
- D. Plant more than 2 ft. high *H. huillensis*.
- DD. Plant up to 2 ft. high:
- (b) Spur about ½ in. long, twisted and much swollen towards the end; inflorescence more than 2 in. in diameter ...
H. schimperiana.
- (bb) Spur ¾ in. long, not twisted and only slightly swollen at the end; inflorescence less than 2 in. in diameter ...
H. hochstetteriana.
- BB. Spur 3-8 in. long:
- (c) Lateral petals and lip-segments broad and flat; stigmas about ¼ in. long, club-shaped *H. walleri*.
- (cc) Lateral petals and lip-segments thread-like; stigmas ½ in. long, capitate *H. cirrhata*.

Habenaria filicornis Lindl.

Herb 9-20 in. high. Leaves cauline, linear-oblong, subacute at the apex, 1½-4 in. long. Flowers green, in a lax raceme up to 6 in. long; bracts oblong-lanceolate, acute or acuminate at the apex, ¼-¾ in. long. Lateral petals lanceolate-oblong, about ¼ in. long. Lip 3-partite; spur slender, about ¾ in. long.

Equatoria: Imatong Mountains, Mount Kineti, 10,000 ft.

H. njamnjamica Kränzl.

Herb; tuber nearly round, about ½ in. in diameter; stem 20-22 in. long, scaly at the base; basal sheaths retuse, those above obtuse, the uppermost increasing to the leaves. Leaves oblong or lanceolate, up to 2½ in. long, about ¾ in. broad, sheathing. Flowers green, in a rather dense elongate raceme up to 6 in. long; bracts ovate or ovate-lanceolate, the lower about 1 in. long, ½ in. broad. Spur about ¼ in. long.

Equatoria.

H. bongensium Reichb. f.

Herb 1-1½ ft. high. Leaves cauline, ovate-lanceolate, acute at the apex, 1-2½ in. long, about ½ in. broad. Peduncle up to 18 in. high; flowers white, in a dense many-flowered raceme up to 6 in. long; bracts lanceolate, aristate, ½-¾ in. long. Lateral petals 2-partite. Spur about ½ in. long.

Equatoria.

H. huillensis Reichb. f.

Herb 2-4 ft. high. Leaves cauline, linear-lanceolate, acute at the apex, 3-12 in. long. Flowers greenish, in a many-flowered raceme 4-8 in. long; bracts ovate-lanceolate, acuminate at the apex, ½-1 in. long. Lateral petals 2-partite. Spur ¾-1 in. long, thread-like.

Equatoria: Kagelu station, in small swamp on western boundary.

H. schimperiana Hochst. ex A. Rich.

Herb. Leaves cauline, linear or oblong-linear, acute at the apex, 3-9 in. long. Flowers greenish with a white centre, in a lax raceme up to 7 in. long; bracts ovate-lanceolate, ½-¾ in. long; pedicels (with ovaries) ¾-1½ in. long. Lateral petals 2-partite. Lip 3-partite; lobes linear-thread-like, ½-¾ in. long; spur about ½ in. long.

Equatoria: Imatong Mountains, Ras Logoforok, 6440 ft.

H. hochstetteriana Kränzl. ex Engler.

Herb 10-20 in. high; rootstock tuberous. Leaves cauline, linear, 3-7 in. long, ¼-½ in. broad. Flowers pale-green, in a lax raceme up to 9 in. long; bracts ovate-lanceolate, acuminate at the apex, ½-¾ in. long; pedicels (with ovaries) ½-¾ in. long. Lateral petals 2-partite. Lip 3-partite; lobes ½ in. long; spur ¾ in. long, thread-like below.

Equatoria: Imatong Mountains, 5000-6000 ft.

H. walleri Reichb. f.

Rather stout herb up to 4 ft. high. Leaves cauline, elliptic, the lower ones up to 5 in. long and 1¼ in. broad, the upper ones reduced and oblong-linear. Flowers white, large, in a lax few-flowered raceme; bracts ovate or elliptic-ovate, 1¼-1¾ in. long. Lateral petals 2-partite; lobes about ½ in. long. Lip 3-lobed; lateral lobes about 1 in. long.

Equatoria.

H. cirrhata (Lindl.) Reichb. f.

Herb; tuber oblong, 2 in. long, about 1 in. broad; stem 2-3 $\frac{1}{4}$ in. high. Leaves 4-5, ovate or broadly elliptic to nearly orbicular, 2-8 in. long, 1-3 in. broad. Flowers white, scented like vanilla, in a few-flowered raceme; bracts oblong, acute at the apex, 1 $\frac{1}{2}$ -2 in. long. Lateral petals 2-partite; posterior lobe linear, 1 in. long; anterior lobe broader, thread-like, 3 $\frac{1}{4}$ -4 in. long. Spur 5-8 in. long, thread-like.

Kassala: Gallabat. Equatoria.

13. **MALAXIS** Soland. ex Sw.**Malaxis maclaudii** (Finet) Summerh.

Herb up to 8 in. high; stems 1 $\frac{1}{2}$ -2 in. long, 3-leaved. Leaves ovate, 1 $\frac{1}{2}$ -2 $\frac{3}{4}$ in. long, 1-2 in. broad. Flowers flesh- or wine-coloured, close together at the apex of the inflorescences, forming false umbels. Sepals and lateral petals $\frac{1}{2}$ - $\frac{3}{4}$ in. long.

Equatoria.

14. **MICROCOELIA** Lindl.**Microcoelia guyoniana** (Reichb. f.) Summerh.

Epiphytic leafless herb, with a very short stem and dense masses of roots, 6-12 in. long. Flowers white, in numerous slender racemes 2-4 in. long; bracts amplexicaul, obtuse or acute at the apex, $\frac{1}{4}$ in. long. Sepals and lateral petals about $\frac{1}{4}$ in. long. Spur $\frac{1}{2}$ - $\frac{3}{8}$ in. long.

Fung District.

15. **NERVILIA** Commers. ex Gaudich.**Nervilia kotschy** (Reichb. f.) Schlechter.

Herb up to 12 in. high from a small tuber. Leaves appearing after the flowers, broadly ovate to almost orbicular, up to 5 $\frac{1}{2}$ in. in diameter. Flowers greenish with a white lip nerved with violet-purple or pink, small, in lax racemes. Sepals strap-shaped.

Fung District. Equatoria: around Mrolo.

16. **PLATYCORYNE** Reichb. f.**Platycoryne crocea** (Schweinf.) Rolfe.

Slender herb 1-1 $\frac{1}{2}$ ft. high. Leaves cauline, lanceolate, acute or acuminate at the apex, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad, decreasing upwards. Flowers yellow or deep-orange, in a short or subcapitate 3-5-flowered raceme; bracts ovate-oblong, acuminate at the apex, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Sepals and lateral petals nearly $\frac{1}{4}$ in. long. Spur nearly $\frac{3}{4}$ in. long.

Equatoria.

17. **POLYSTACHYA** Hook.**Polystachya stricta** Rolfe.

Epiphytic herb; pseudobulbs tufted, oblong, $1\frac{1}{2}$ - $3\frac{1}{4}$ in. long, 2-leaved. Leaves coriaceous, oblong, $2\frac{3}{4}$ - $4\frac{3}{4}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad. Flowers greenish-yellow with a few faint purple streaks on the base and lateral lobes of the lip, in panicles $8\frac{3}{4}$ in. long, with puberulous branches about 1 in. long. Sepals and lateral petals about $\frac{3}{4}$ in. long.

Equatoria.

P. tessellata Lindl.

Epiphytic herb; stems leafy, 3-6 in. long, slightly swollen at the base. Leaves dark- or bronze-green, oblong or oblong-elliptic, obtuse or subobtuse at the apex, 4-9 in. long, $\frac{3}{4}$ - $2\frac{1}{4}$ in. broad. Peduncles 1- $1\frac{1}{2}$ in. high, many-flowered, with numerous lateral branches; flowers yellow, cream or pink; bracts up to $\frac{1}{4}$ in. long. Sepals and lateral petals about $\frac{1}{2}$ in. long. Capsule oblong, $\frac{1}{2}$ in. long.

Equatoria.

18. **SATYRIUM** Sw.**Satyrium coriophoroides** A. Rich.

Stout herb up to $2\frac{3}{4}$ ft. high; tuber ovoid-oblong, $1\frac{1}{4}$ - $1\frac{1}{2}$ in. long. Leaves cauline, numerous, oblong-lanceolate, sheathing at the base, 2-4 in. long, the 2 leaves on barren shoots at the base rather larger. Flowers white or red, in a rather dense inflorescence up to 6 in. long; bracts ovate-lanceolate, acute or acuminate at the apex, $\frac{1}{2}$ -1 in. long. Sepals and lateral petals about $\frac{1}{4}$ in. long.

Equatoria: Imatong Mountains, 6000-7000 ft.

S. fimbriatum Summerh.

Herb up to 18 in. high; tuber ovoid, about $\frac{1}{2}$ in. long. Leaves 2, radical, ovate or suborbicular, $1\frac{1}{4}$ - $2\frac{3}{4}$ in. long, 1- $2\frac{1}{2}$ in. broad. Peduncle erect, with lanceolate membranous sheaths; flowers rose-coloured or pale-pink, in a cylindric 5-16-flowered raceme $2\frac{1}{2}$ -4 in. long and about 1 in. in diameter. Sepals and lateral petals nearly $\frac{1}{2}$ in. long; margins of petals (and apex of lip) lacerate or fringed. Spurs cylindric, about $1\frac{1}{2}$ in. long.

Equatoria: Imatong Mountains, Mount Kineti, 10,200 ft.

19. **TRIDACTYLE** Schlechter**Tridactyle tridentata** (Harv.) Schlechter.

T. filifolia (Schlechter) Schlechter.

Epiphytic herb; stems terete, jointed, rugose. Leaves very few, linear-acicular, usually grooved, about 3 in. long. Flowers white or orange, very small, in very small racemes.

Equatoria: on rocks at Asugi, Yei River.

168. JUNCACEAE

Perennial or annual herbs. Leaves alternate, simple, usually in a basal tuft, linear or terete, sheathing at the base, or sometimes reduced to sheaths; sheath open or closed. Flowers hermaphrodite or unisexual, actinomorphic, usually very small. Perianth-segments 6 in 2 whorls, free, usually glumaceous. Stamens 6 or 3, free; anthers 2-locular, basifixed, opening lengthwise; pollen in tetrads. Ovary superior, 1- or 3-locular; style slender, 3-branched; ovules 3, basal, or numerous on axile or parietal placentas. Fruit a loculicidal capsule; seeds sometimes tailed.

1. JUNCUS L.

Juncus arabicus (Aschers. & Buchen.) Adamson.

Tufted perennial herb up to 3 ft. high; culms terete, pale-green, wiry, finely striate, 2-3 ft. high. Leaves few, basal, terete, dilated at the base into a pale-brown sheath. Panicles with contracted branches, sessile, terminal or pseudo-lateral, up to 6 in. long; bracts ovate-lanceolate; flowers about $\frac{1}{4}$ in. long. Capsule as long as the perianth, trigono-prismatic, mucronate and attenuate at the apex.

Northern Sudan: Jebel Uweinat; Halfa.

J. dregeanus Kunth.

Tufted perennial herb; culms 4-15 in. high. Leaves many, basal, flat or inrolled, up to 7 in. long. Inflorescences terminal, composed of 1-several dense many-flowered globose clusters; flowers $\frac{1}{2}$ in. long. Perianth-segments dark-brown.

Darfur: Jebel Marra, 7500-9000 ft.

169. CYPERACEAE

Perennial or rarely annual herbs, usually in damp or marshy habitats, often tufted or from a creeping rhizome; culms solid or rarely hollow, often 3-angled, usually simple below the inflorescence. Leaves alternate, simple, usually in a basal tuft or crowded on the lower part of the culms, with a closed or open sheath at the base and a usually narrow grass-like blade, or sometimes entirely reduced to sheaths; ligule rarely present. Flowers very small and inconspicuous, hermaphrodite, or unisexual and monoecious or very rarely dioecious, arranged in small spikes (spikelets) and each usually solitary within a bract (glume); bracts (glumes) distichously or spirally arranged; rarely the female spikelets reduced to 1 bract and 1 flower; spikelets variously umbellate, paniculate or spicately arranged, the whole inflorescence subtended by 1 or more usually leaf-like bracts. Perianth reduced to scales, bristles or hairs, or very rarely subpetaloid, often absent. Stamens hypogynous, 3 or fewer, very rarely more or numerous; filaments free; anthers basifixed, oblong or linear, 2-locular, opening lengthwise by slits. Ovary superior, 1-locular; style slender, with 2 or 3 branches or lobes; ovule solitary, erect from the base of the ovary. Fruit nut-like, indehiscent, usually 2- or 3-sided, sometimes enclosed in a bottle-shaped utricle; seed erect.

- A. Flowers hermaphrodite, with or without some unisexual flowers:
- B. Hypogynous scales or bristles present:
- C. Hypogynous scales united into one and embracing the flower; sheath of hypogynous scale (squamella) between the nut and the glume with an elongate flattened conic beak, holding the nut in a hollow or pocket near its base, longer than the glume ASCOLEPIS. 2.
- CC. Hypogynous scales or bristles not united into one:
- D. Hypogynous bristles (but no scales) present:
- (a) Style-base confluent with and passing gradually into the ovary or nut SCIRPUS. 13.
- (aa) Style-base often swollen and always abruptly contracted into the ovary or nut:
- (b) Empty lower glumes of the spikelet 1-2; culms ending in a solitary spikelet ELEOCHARIS. 8.
- (bb) Empty lower glumes of the spikelet 3; culms ending in panicles, corymbs or heads of spikelets RHYNCHOSPORA. 12.
- DD. Hypogynous scales present, either with or without bristles:
- (c) Hypogynous scales whorled, not anterior and posterior ... FUIRENA. 10.
- (cc) Hypogynous scales anterior and posterior LIPOCARPHA. 11.
- BB. Hypogynous scales or bristles absent:
- E. Glumes arranged in more than 2 rows (i.e. in more than one plane), rarely the lower glumes distichous:
- F. Style-base not passing gradually into the ovary or nut:
- (d) Style-base not persistent on the nut:
- (e) Lower glumes distichous; culms with 1-3-spikelets ABILDGAARDIA. 1.
- (ee) Lower glumes not distichous; culms with usually more than 3 spikelets FIMBRISTYLIS. 9.
- (dd) Style-base persistent on the nut:
- (f) Style-base minute, discoloured ... BULBOSTYLIS. 3.
- (ff) Style-base large ELEOCHARIS. 8.
- FF. Style-base passing gradually into the ovary or nut SCIRPUS. 13.
- EE. Glumes arranged entirely in 2 rows (i.e. in one plane) CYPERUS. 6.
- AA. Flowers all unisexual, the female without staminodes:
- G. Nut enclosed in a utricle, i.e. a bottle-shaped sheath CAREX. 4.
- GG. Nut not enclosed in a utricle:
- H. Nut surrounded at the base by numerous hairs or bristles ... COLEOCHLOA. 5.
- HH. Nut not surrounded at the base by hairs or bristles:
- (g) Inflorescence spiciform or paniculate SCLERIA. 14.
- (gg) Inflorescence of small axillary clusters .. DIPLACRUM. 7.

1. **ABILDGAARDIA** Vahl**Abildgaardia monostachya** (L.) Vahl.*Fimbristylis monostachya* (L.) Hassk.

Glabrous herb; culms tufted, 2-16 in. high, slender. Leaves $\frac{1}{2}$ the length of the culm, $\frac{1}{16}$ - $\frac{1}{10}$ in. broad. Spikelets 1 or rarely 2-3 on each culm, $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. broad, few- to many-flowered (in fruit up to 1 in. long), greenish-white or yellowish. Glumes ovate, mucronate, keeled, the lower ones distichous, the upper ones spirally arranged. Style 3-fid, hairy, deciduous in fruit together with the pyramidal style-base.

*Equatoria.*2. **ASCOLEPIS** Nees ex Steud.**Ascolepis capensis** (Kunth) Ridl.

Glabrous herb; culms 8-20 in. high, densely tufted, slender. Leaves $\frac{1}{2}$ - $\frac{3}{4}$ the length of the culm, $\frac{1}{12}$ - $\frac{1}{8}$ in. broad. Heads of spikelets white or straw-coloured, about $\frac{1}{2}$ in. in diameter; bracts 3, spreading, similar to the leaves, one longer than the others, from a short broad base, the lowest 1-4 in. long. Spikelets $\frac{1}{2}$ - $\frac{1}{2}$ in. long, ovoid, dense. Glumes obovate, triangular at the apex, about half as long as the hypogynous scales, the latter broadly long-acuminate from an elliptic base.

*Southern Sudan.***A. elata** Welw.*A. protea* var. *bellidiflora* (non Welw.) Broun & Massey.

Herb; culms 16-20 in. high, densely tufted, rather slender. Leaves rather numerous, almost thread-like, $\frac{1}{2}$ the length of the culm. Heads of spikelets $1\frac{1}{2}$ - $1\frac{1}{2}$ in. in diameter; leafy bracts 2 or 3. Hypogynous scales about 6 times as long as the subtending glumes giving the head the appearance of a double Daisy, about $\frac{1}{2}$ in. long, linear.

*Equatoria.*3. **BULBOSTYLIS** Kunth**Bulbostylis sphaerocarpa** (Boeck.) C. B. Clarke.

Tufted annual herb; culms 2-5 in. high, glabrous, bearing a solitary spikelet. Leaves thread-like, $\frac{2}{3}$ the length of the culm, usually minutely hairy. Spikelet $\frac{1}{4}$ in. long, developing a few nuts at the base, lanceolate and male above; bract $\frac{1}{2}$ in. long, setaceous; basal stemless spikelets often produced in addition.

Kassala: Gallabat.

B. filamentosa (Vahl) C. B. Clarke.

Herb; culms densely tufted, 8-20 in. high, slender, trigonous at the top, hairy. Leaves $\frac{3}{4}$ the length of the culm, setaceous; sheath hairy, often with long white hairs at the throat. Heads solitary, $\frac{1}{4}$ - $\frac{2}{3}$ in. in diameter, of 6-14 spikelets, chestnut-brown; bracts 3-2, setaceous, the lowest often overtopping the head. Spikelets $\frac{1}{2}$ in. long, 6-10-flowered. Glumes boat-shaped, ovate, pubescent.

Fung District. Equatoria.

B. atrosanguinea (Boeck.) C. B. Clarke.

Herb; culms densely tufted, 12 in. high, slender, triquetrous and minutely hairy at the top. Leaves nearly as long as the culm, setaceous, minutely hairy; sheath hairy, scarcely bearded in the throat. Heads solitary, $\frac{1}{4}$ - $\frac{2}{3}$ in. in diameter, of 4-12 spikelets, dark-chestnut; lowest bract setaceous, usually much overtopping the head. Spikelets $\frac{1}{2}$ in. long, 6-12-flowered. Glumes closely imbricate, ovate, keeled.

Equatoria: slopes of Mount Lotuke, about 6000 ft.

B. coleotricha (Hochst.) C. B. Clarke.

Herb; culms 4-16 in. high, densely tufted, very slender, minutely hairy at the top. Leaves about $\frac{1}{2}$ the length of the culm, setaceous; sheath hairy and with long white hairs in the throat. Umbels about 2 in. in diameter, compound or simple with numerous solitary usually pedicellate spikelets; bracts setaceous, often overtopping the umbel. Spikelets $\frac{1}{2}$ in. long, ovoid, brown. Glumes boat-shaped, ovate, pubescent; keel green, 1-3-nerved.

Kassala: Gallabat. Equatoria.

B. abortiva (Steud.) C. B. Clarke.

Herb; culms 6-24 in. high, very slender, densely tufted at the base, glabrous at the top. Leaves thread-like, about $\frac{1}{2}$ the length of the culm; sheath with a few white hairs in the throat. Umbels up to 4-6 in. in diameter, compound, with very numerous pedicellate spikelets; bracts setaceous, much shorter than the umbel, usually inconspicuous. Nut pallid, smooth or with faint transverse wavy lines.

Kassala: Gallabat. Equatoria.

B. pusilla (Hochst.) C. B. Clarke.

Herb; culms 1-5 in. high, densely tufted, glabrous at the top, with 1-9 spikelets. Leaves $\frac{1}{2}$ as long as the culm, setaceous; sheath with long white hairs in the throat. Nut very broadly obovoid, trigonous, truncate, black with strong horizontal glistening-white wavy lines.

Kordofan.

4. CAREX L.

Carex echinochloe Kunze.

Herb, glabrous except the densely and minutely hairy branches of the panicles; culms $1\frac{1}{2}$ -3 ft. high. Leaves up to 2 ft. long, about $\frac{1}{3}$ in. broad. Inflorescences 6-14 in. long, oblong; lower peduncles remote, carrying oblong loose partial panicles of 6-30 spikes; spikes (many of them) female at the base, male at the top, in fruit $\frac{1}{4}$ - $\frac{1}{3}$ in. long with about 5-8 utricles. Utricle (including the beak) $\frac{1}{10}$ in. long, broadly ellipsoid, trigonous, glabrous, with about 18 well-marked ribs; beak much shorter than the body of the utricule.

Equatoria: *Imatong Mountains, Mount Angargi, 6000-7000 ft.*

C. steudneri Boeck.

Herb up to $4\frac{1}{2}$ ft. high, glabrous except the minutely scabrous panicle-branches and utricles; rhizome stout; culms robust. Leaves about 2 ft. long, $\frac{1}{3}$ in. broad, stout. Inflorescences 11 in. long, about 2 in. broad; partial panicles narrowly oblong, erect, dense, chestnut- or deep-brown; bracts overtopping the inflorescence; spikes $\frac{3}{4}$ in. long, $\frac{1}{8}$ in. broad, female at the base, male at the top, in fruit with 6-8 utricles. Utricle exceeding $\frac{1}{2}$ in. long, linear-lanceolate, densely hispid; beak about $\frac{1}{2}$ the length of the utricule.

Equatoria: *Imatong Mountains, summit of Mount Kineti, 10,400 ft.*

C. thomasi Nelmes.

Herb; culms 4 or more ft. high. Leaves long, about $\frac{1}{3}$ in. broad, scabrous on the margin and nerves. Spikes dense, 2- $3\frac{1}{4}$ in. long, cylindric, unequally long-pedunculate; peduncles thread-like. Utricle about $\frac{1}{3}$ in. long, inflated, glabrous, about 10-12-nerved.

Equatoria: *Imatong Mountains, 8000 ft.*

C. mannii E. A. Bruce.

Herb, culms 2-3 ft. high, with about 9 scattered spikes. Leaves long, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad, rigid, purple at the base. Inflorescences narrowly paniculate, about 8 in. long; spikes about 2 in. long, dense, unequally pedunculate, the peduncles scabrous; rhachis scabrous. Glumes reddish-purple. Utricle narrowly ovoid, about $\frac{1}{2}$ in. long.

Equatoria: *Mount Lotuke, 8000 ft.*

C. chlorosaccus C. B. Clarke.

Nearly glabrous perennial herb; culms tufted, 1-2 ft. high. Leaves 6-15 in. long, $\frac{1}{2}$ in. broad. Inflorescences green, 4-14 in. long, 1-3 in. broad; lower peduncles remote, with oblong panicles of 8-20 spikes; bracts overtopping the inflorescence. Utricle (including the beak) $\frac{1}{2}$ in. long, narrowly ellipsoid, attenuate into a beak forming $\frac{2}{3}$ at least of the utricule; beak linear, smooth, with 2 short lanceolate teeth.

Equatoria: *Imatong Mountains, summit of Mount Kineti, 10,400 ft.*

5. **COLEOCHLOA** Gilly***Coleochloa schweinfurthiana*** (Boeck.) Nelmes.*Eriospora schweinfurthiana* (Boeck.) C. B. Clarke.

Herb; stems loosely tufted, developing from extravaginal shoots, 2-3 ft. high. Leaves $\frac{1}{8}$ - $\frac{1}{4}$ in. broad, with glabrous sheaths. Inflorescences composed of 5-7 fascicles of spikes; spikes mostly ellipsoid, $\frac{1}{4}$ - $\frac{3}{8}$ in. long. Spikelets $\frac{3}{16}$ - $\frac{1}{2}$ in. long. Glumes straw-coloured, often slightly tinged with reddish-brown. Nut surrounded by numerous hairs less than $\frac{1}{2}$ as long as itself.

*Equatoria.****C. glabra*** Nelmes.

Herb; stems densely tufted, developing from intravaginal shoots, 10-18 in. high. Leaves up to $\frac{1}{2}$ in. broad (when flattened out), with shortly subappressed-villous sheaths. Inflorescences composed of 2-3 fascicles of spikes; spikes obovoid, becoming obconical in fruit, $\frac{1}{8}$ - $\frac{1}{4}$ in. long. Spikelets $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Glumes bright-reddish or streaked and splashed with reddish, paler at the base. Nut surrounded by numerous bristles up to more than $\frac{1}{2}$ as long as itself.

*Equatoria.*6. **CYPERUS** L.

KEY TO GROUPS.

- A. Rhachilla (stalk) of the spikelets continuous, persistent:
 - B. Style 3-branched; nut 3-sided GROUP 1.
 - BB. Style 2-branched; nut lenticular-compressed or biconvex:
 - (a) Nut dorsally compressed GROUP 2.
 - (aa) Nut laterally compressed GROUP 3.
- AA. Rhachilla of the spikelets articulated, deciduous:
 - (b) Style 3-branched; nut 3-sided GROUP 4.
 - (bb) Style 2-branched; nut lenticular GROUP 5.

GROUP 1.

- A. Plant 8-15 ft. high; culms leafless; umbels large with numerous rays *C. papyrus*.
- AA. Plant less than 8 ft. high:
 - B. Culms transversely septate-nodose; leaves absent *C. articulatus*.
 - BB. Culms not transversely septate-nodose; leaves present or absent:
 - C. Spikelets digitate or clustered or rarely subsolitary, but not spicate:
 - D. Aquatic or swamp herbs; culms leafless; bracts 1-3:
 - (a) Culms $\frac{1}{2}$ in. in diameter at the top *C. nudicaulis*.
 - (aa) Culms $\frac{1}{2}$ - $\frac{1}{8}$ in. in diameter at the top *C. corymbetes*.
 - DD. Terrestrial herbs:
 - E. Inflorescences typically open, very rarely contracted into a head:

- F. Perennial herbs; rhizome short, woody:
- G. Culms rigid; leaves usually many:
- H. Inflorescences umbellate; glumes flat, not articulate at the base, wholly deciduous, acute or cuspidate-mucronate at the apex:
- (b) Spikelets compressed; glumes 3-5-nerved at the back; leaves absent
C. alternifolius subsp. *flabelliformis*.
- (bb) Spikelets more or less swollen; glumes generally many-nerved; leaves present:
- (c) Umbels dense with numerous red clusters; glumes oblong or oblong-ovate
C. derreilema.
- (cc) Umbels open with numerous very small green later brown-red clusters; glumes ovate
C. renschii.
- HH. Inflorescences capitate; glumes curved inwards, articulated (base saccate, persistent), obtuse or very shortly mucronate at the apex, minutely hairy on the margin and keel
C. mapunioides var. *major*.
- GG. Culms slender, not rigid; leaves few:
- (d) Culms always leafy; stamens 1 or 2; bracts generally longer than the inflorescence; glumes dark-brown; spikelets 6-14-flowered *C. fresenii*.
- (dd) Culms usually leafless; stamens 3 or rarely 2 or 1; bracts generally shorter than the inflorescence; glumes dusky-green or purplish-red; spikelets 10-40-flowered *C. haspan*.
- FF. Annual herbs:
- I. Leaves $\frac{1}{4}$ or more in. broad, not setaceous; spikelets oblong or oblong-lanceolate; nut obovoid or ellipsoid:
- (e) Glumes chestnut, very obtuse at the apex; spikelets many in dense heads; culms almost 3-winged *C. difformis*.
- (ee) Glumes not chestnut:
- (f) Glumes with a distinct curved mucro
C. reduncus.
- (ff) Glumes not distinctly mucronate:
- (g) Spikelets more than 5 in each cluster; culms 3-angled *C. submicrolepis*.
- (gg) Spikelets 1-5 in each cluster ... *C. tenuispica*.
- II. Leaves less than $\frac{1}{4}$ in. broad, setaceous; spikelets linear; nut obovoid-oblong or oblong:
- (h) Glumes tawny or rust-coloured, with a bristle-like mucro $\frac{2}{3}$ the length of the glume; leaves usually as long as the culm *C. cuspidatus*.

- (hh) Glumes orange or rust-coloured, with a short mucro; leaves $\frac{1}{3}$ - $\frac{1}{2}$ the length of the culm
C. amabilis.
- EE. Inflorescences typically contracted-capitate, very rarely (e.g. in *C. conglomeratus*) consisting of an umbel with few rays:
- J. Spikelets more or less swollen; glumes scarcely keeled at the apex *C. conglomeratus.*
- JJ. Spikelets more or less compressed; glumes keeled, boat-shaped:
- (i) Culms not densely tufted; flower-heads of 5-20 spikelets:
- (j) Spikelets usually less than $\frac{1}{3}$ in. long, in heads $\frac{1}{3}$ - $\frac{2}{3}$ in. in diameter; glumes laxly imbricate, 3-8-nerved; nut oblong *C. pulchellus.*
- (jj) Spikelets $\frac{1}{3}$ - $\frac{2}{3}$ in. long, in heads $\frac{1}{2}$ - $1\frac{1}{2}$ in. in diameter; glumes densely imbricate, many-nerved; nut obovoid *C. obtusiflorus.*
- (ii) Culms densely tufted, usually short; flower-heads dense, often of 100 spikelets; bracts long, dilated at the base *C. pygmaeus.*
- CC. Spikelets in elongated spikes:
- K. Rhachilla of the spikelets decurrent at the base with the margin of the glume, and at length conspicuously winged:
- L. Spikes cylindrical; spikelets numerous; wings of rhachilla often coloured:
- M. Spikelets suberect, linear, terete or subterete; rhachilla broadly winged; wings yellow, lanceolate, falling early *C. digitatus.*
- MM. Spikelets at length usually divergent, oblong-lanceolate, compressed; rhachilla narrowly winged; wings linear and persistent for a long time; nut ellipsoid or ovoid:
- N. Spikes (at least some of them) pedunculate; anthers linear:
- (k) Rays of umbel rigid; spikes dense, shortly pedunculate; spikelets dense all round:
- (l) Leaves $\frac{3}{4}$ - $1\frac{1}{2}$ in. broad; rays of umbel up to 10 in. long *C. immensus* var. *pethericki.*
- (ll) Leaves $\frac{1}{4}$ - $\frac{3}{4}$ in. broad; rays of umbel not more than $3\frac{1}{4}$ in. long *C. dives.*
- (kk) Rays of umbel not rigid; spikes lax, long-pedunculate; spikelets subdistichous ... *C. exaltatus.*
- NN. Spikes sessile, of many dense rows; anthers linear-oblong; connective produced, white
C. imbricatus.
- LL. Spikes broadly ovoid or turbinate; spikelets not numerous; wings of rhachilla white-glass-like, long-persistent:

- O. Rhizome horizontally creeping or putting out stolons; glumes more or less densely imbricate:
- P. Culms stout, leafless or with a sheath ending in a short lamina; spikelets linear
C. schimperianus.
- PP. Culms slender, leafy; spikelets linear or oblong-lanceolate:
- (m) Rhizome creeping; stolons becoming woody; glumes keeled, obscurely few-nerved:
- (n) Stolons bearing tubers *C. rotundus.*
- (nn) Stolons not bearing tubers:
- (o) Stolons robust; culms thickened at the base but never bulbous; rhizome nodose
C. longus var. *pallidus.*
- (oo) Stolons slender; culms bulbous at the base; glumes straw-coloured or spotted with purple or chestnut *C. maculatus.*
- (mm) Roots fibrous; stolons slender; glumes concave, scarcely keeled, conspicuously many-nerved:
- (p) Stolons terminated by a tuber *C. esculentus.*
- (pp) Stolons terminated by a bulb:
- (q) Bulbs $\frac{1}{2}$ - $\frac{1}{3}$ in. in diameter, the outer covering black *C. bulbosus.*
- (qq) Bulbs $\frac{1}{2}$ in. in diameter, the outer covering brown *C. microbolbos.*
- OO. Rhizome producing thin stolons or ascending short young growths:
- Q. Rhizome producing slender stolons; culms slender; spikes broadly ovoid:
- (r) Spikelets divergent at right-angles; glumes elliptic-lanceolate *C. gracilinox.*
- (rr) Spikelets suberect or arched-ascending; glumes ovate-elliptic or ovate ... *C. schweinfurthianus.*
- QQ. Rhizome producing short ascending young shoots; culms stout; spikes brush-like:
- (s) Spikelets generally divaricate, very slender
C. distans.
- (ss) Spikelets obliquely spreading, about $\frac{1}{3}$ in. broad ...
C. eleusinoides
- KK. Rhachilla of the spikelets not winged nor with a narrow glass-like margin:
- R. Stolons present, long:
- (t) Rhachis of the spikes glabrous *C. latifolius.*
- (tt) Rhachis of the spikes minutely hairy
C. procerus var. *stenanthus.*
- RR. Stolons absent; roots fibrous:
- S. Spikelets laxly spicate; glumes laxly arranged, broadly obovate or ovate; stamens inserted in a callus ring; nut about equal to the glume *C. iria*

- SS. Spikelets more or less densely spicate; glumes imbricate, ovate, cuspidate or rounded at the apex:
- T. Spikelets compressed-subquadrangular; glumes densely imbricate, acutely keeled on the back, 9-13-nerved *C. compressus*.
- TT. Spikelets more or less swollen; glumes laxly imbricate, not keeled, 5-9-nerved:
- (u) Nut broadly obovoid, 3-angled or concave-convex; stamens 2; glumes spotted with purple
C. pustulatus.
- (uu) Nut broadly ovoid, conspicuously stipitate at the base; stamens 3; glumes yellow or variegated with red-purple *C. podocarpus*.

GROUP 2.

- A. Spikes more than 1:
- B. Spikes umbelled:
- (a) Spikes numerous, cylindric, of many spikelets
C. alopecuroides.
- (aa) Spikes few, of 2-5 spikelets *C. pustulatus*.
- BB. Spikes congested into a dense compound head of many spikelets *C. pygmaeus*.
- AA. Spike solitary, of 1-30 spikelets *C. laevigatus*.

GROUP 3.

- A. Superficial cells of the nut nearly square or hexagonal; nut often appearing very regularly dotted:
- B. Culms clothed for $\frac{1}{4}$ - $\frac{3}{4}$ their length by leaf-sheaths, decumbent at the base *C. mundtii*.
- BB. Culms enveloped by the leaf-sheaths only a little way above the base:
- C. Spikes forming a head or rarely an umbel with very short rays, more or less yellow:
- (a) Spikelets $\frac{1}{8}$ in. broad; culms and leaves rather slender
C. lanceolatus.
- (aa) Spikelets $\frac{1}{2}$ in. broad; culms and leaves thread-like
C. capillifolius.
- CC. Spikes umbelled:
- D. Nut 1-sided, the part next the rhachilla flattened
C. pelophilus.
- DD. Nut not as above:
- E. Spikelets straw-coloured, yellowish or reddish but not chestnut-brown or black:
- (b) Culms $\frac{1}{2}$ -12 in. high *C. pumilus* var. *muticus*.
- (bb) Culms 12-30 in. high *C. polystachyos*.
- EE. Spikelets chestnut, black or dusky-brown:
- F. Stolons absent:
- (c) Culms 2-6 in. high *C. melas*.
- (cc) Culms 6-36 in. high:
- (d) Margins of glumes crisped-wavy *C. unioloides*.

- (dd) Margins of glumes not crisped-wavy:
 - (e) Glumes conspicuously scarious *C. tremulus*.
 - (ee) Glumes not conspicuously scarious:
 - (f) Glumes not overlapping in fruit, black-chestnut with a green keel *C. elegantulus*.
 - (ff) Glumes closely overlapping in fruit:
 - (g) Spikelets blackish, lanceolate, the sides not parallel *C. aethiops*.
 - (gg) Spikelets chestnut- or dusky-brown, linear-oblong, the sides parallel *C. nuerensis*.
- FF. Stolons present *C. lanceus*.
- AA. Superficial cells of the nut longitudinally oblong or elliptic; nut often appearing zonate or muricate; spikelets yellowish *C. flavescens*.

GROUP 4.

- A. Culms at the base not or only shortly tuberous or bulbous, but covered by sheaths foliaceous in texture:
- B. Spikelets typically with at least 3 fertile flowers or very rarely 1-2; glumes not or hardly curved round the nut:
- C. Perennial plants; stamens 3; glumes blunt or shortly mucronate:
 - (a) Spikes broadly hemispherical; spikelets with 4-24 fertile flowers *C. longibracteatus*.
 - (aa) Spikes cylindrical; spikelets with 3 fertile flowers *C. impubes*.
- CC. Annual plant; stamen 1; glumes produced into a recurved bristle *C. squarrosus*.
- BB. Spikelets typically with 1-2 or very rarely 3 fertile flowers; glumes folded round the nut:
 - (b) Umbel clearly defined, the rays 1-4 in. long; style long; nut 3-4 times as long as broad *C. cyperoides*.
 - (bb) Umbel contracted or with short rays; style short; nut up to twice as long as broad *C. macrocarpus*.
- AA. Culms at the base thickened by the swollen membranous coloured (often torn) sheaths:
 - D. Spikes in a clearly defined umbel or contracted into a head in which the spikes are separate and broadly cylindrical; bracts 2-8:
 - (c) Inflorescence an umbel with distinct rays; leaf-sheaths yellow-brown *C. amauiropus*.
 - (cc) Inflorescence a head or an umbel with short rays; leaf-sheaths brown or yellow-purple *C. schimperi*.
 - DD. Spikes confluent into a single head:
 - E. Culms thickened at the base into an ovoid or oblong-ovoid quasi-bulb *C. mollipes*.
 - EE. Culms thickened at the base into an oblong or cylindrical quasi-bulb:

3½ in. long, ½ in. broad; spikes 1 in. long, ½ in. broad, with 20-30 spreading spikelets. Spikelets 6-15-flowered, ½ in. long, ¼ in. broad.

White Nile River and affluents.

C. articulatus L.

Fig. 89.

Glabrous herb; stolons long, hardening into stout woody scented rhizomes; culms 3-6 ft. high, terete or nearly so at the top, showing transverse false joints ½-1½ in. apart. Leaves absent, or the green termination of the top sheath rarely 1 in. long. Umbels 4-8 in. in diameter, compound or small with few spikelets; bracts ¼-¾ in. long, elliptic-lanceolate; clusters of 3-4 spikelets, but several congested into 1 apparent spike of numerous spikelets. Spikelets 12-50-flowered, linear.

Blue Nile Province. Southern Sudan.

C. nudicaulis Poir.

Glabrous herb; rhizome long, ½ in. in diameter; culms tufted, 1-2½ ft. high, ½ in. in diameter at the top. Leaves absent; sheaths pale-brown or reddish. Heads solitary, of 1-12 sessile spikelets; bracts 1-2, the lower often suberect, shorter than the head and resembling a continuation of the culm. Spikelets ½-1 in. long, ¼-½ in. broad (rarely up to ¾ in. broad), much flattened, 30-40-flowered, sometimes up to 70-flowered. Glumes very closely packed, ovate, boat-shaped, apiculate, 3-5-nerved. Base of the nut, especially the margins, corky-thickened.

Southern Sudan.

C. colymbetes Kotschy & Peyr.

Glabrous herb; culms tufted on an oblique rhizome, 1-2 ft. high, ½-¾ in. in diameter at the top. Leaves absent. Heads solitary, of 6-30 sessile spikelets; bracts 2, the lower shorter than the head. Spikelets ½-¾ in. long, ¼-½ in. broad, much flattened, often 40-flowered, pallid or reddish.

Fung District. Southern Sudan.

C. alternifolius subsp. *flabelliformis* (Rottb.) Kükenth.

C. flabelliformis Rottb.

Glabrous herb up to 5 ft. high; rhizome stout (some plants flowering weakly, in tufts, apparently the first season); culms 2-3 ft. high, stout, sometimes terete with striae at the top, sometimes nearly triangular or 6-angular. Leaves absent, except on the first sterile shoots. Umbels 4-12 in. in diameter, usually compound; primary rays often 6-10; bracts 8-12, overtopping the umbel, up to 14 in. long, ½-¾ in. broad, with a lanceolate tip; clusters digitate, of 2-15 spikelets. Spikelets ¼-½ in. long, ¼ in. broad, much compressed, 10-12-flowered. Glumes closely packed, very acutely keeled, hard, shining.

Red Sea Hills: Erkowit. Fung District. Equatoria: Didinga Mountains, 5300 ft.; Iwoca.

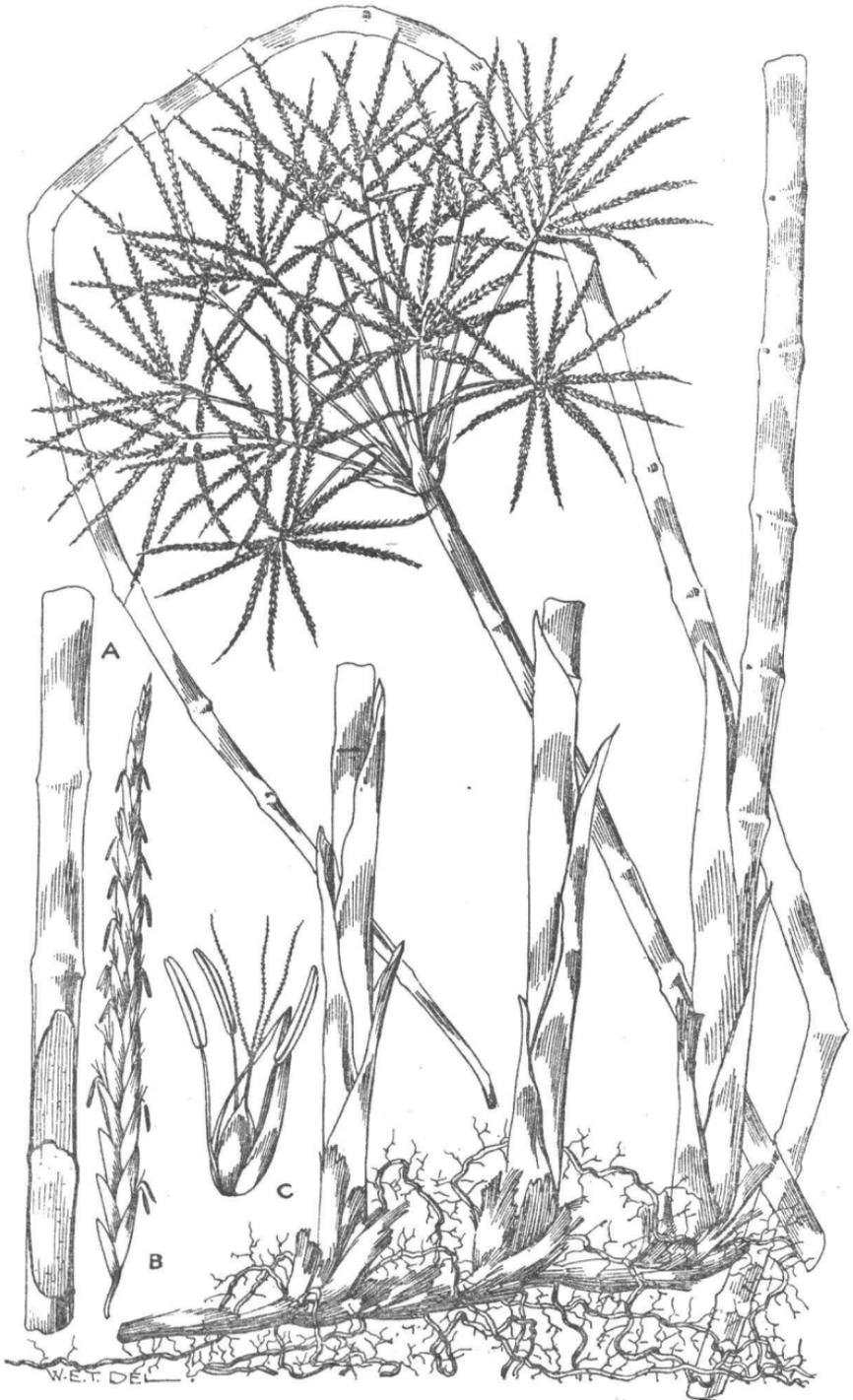


Fig. 89—*CYPERUS ARTICULATUS* L.
 A, part of culm, showing false joints. B, spikelet. C, flower and glume.

C. derreilema Steud.

Robust perennial herb up to 5 ft. high. Umbels 4-7 or more in. in diameter, dense with innumerable heads, red; bracts 6, exceeding the umbel. Spikelets $\frac{1}{4}$ - $\frac{1}{3}$ in. long, $\frac{1}{16}$ in. broad, 6-8-flowered, soft. Glumes rather close together on the rhachilla, neither rigid nor mucronate.

Equatoria: *Imatong Mountains*, 5000-10,000 ft.

C. renschii Boeck.

Glabrous herb; rhizome horizontal; culms up to 6 ft. high, very stout, triquetrous or almost 3-winged at the top. Leaves up to 4 ft. long, $1\frac{1}{8}$ in. broad, 3-nerved. Umbels 8-24 in. in diameter, compound in a rigid somewhat divaricate manner; bracts 2 ft. long, $\frac{3}{8}$ in. broad, similar to the leaves; clusters innumerable, green, finally brown-red, very small, of 2-7 spikelets. Spikelets $\frac{1}{12}$ - $\frac{1}{3}$ in. long, 3-6-flowered.

Equatoria: *Laboni gallery-forest*.

C. mapanioides var. **major** (Boeck.) Kükenth.

C. dichromeniformis var. *major* Boeck.

Herb; rhizome woody, nodose; culms 12-30 in. high, mostly flattened at the top. Leaves nearly as long as the culm, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, 3-nerved, flat, grass-like. Heads solitary, of 12-34 spikelets; bracts 4-5, the lowest up to 10 in. long and $\frac{1}{3}$ in. broad, similar to the leaves. Spikelets $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. broad, much flattened, 12-20-flowered. Glumes boat-shaped, ovate, obtuse, distant on the rhachilla, hardly imbricate in fruit.

Equatoria: *Mount Odo*, south of *Amadi*.

C. fresenii Steud.

C. dichrostachyus Hochst. ex A. Rich.

Glabrous herb, usually stout; rhizome 4-8 in. long, $\frac{1}{2}$ in. in diameter, with chestnut scales; culms $1\frac{1}{2}$ -3 ft. high, subsolitary, acutely triquetrous or almost 3-winged. Leaves $\frac{3}{4}$ - $\frac{3}{2}$ the length of the culm, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Umbels lateral, 2-5 in. in diameter, compound; bracts 3-4, the lowest up to 8 in. long and $\frac{1}{3}$ in. broad and resembling a continuation of the culm; clusters of 3-5 spikelets, digitate, numerous. Spikelets whitish with chestnut spots, $\frac{1}{2}$ in. long, $\frac{1}{4}$ - $\frac{1}{16}$ in. broad, 6-14-flowered. Glumes closely packed, boat-shaped, 1-nerved, obtuse.

Equatoria: *Didinga Mountains*, *Nagichot*, 6500 ft.

C. haspan L.

Perennial herb; rhizome long-creeping, up to $\frac{1}{2}$ in. in diameter; culms distant or close together, 4-28 in. high. Leaves often short or hardly any, sometimes long or overtopping the culm. $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Umbels usually compound or rarely simple, small or large, the rays up to $4\frac{1}{4}$ in. long; bracts usually 2-3, the lower suberect and shorter than the umbel or sometimes far overtopping

it; clusters digitate. Spikelets 2-6 together, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, much compressed, 10-40-flowered. Glumes dusky-green or purplish-red.
Equatoria.

C. difformis L.

Glabrous annual herb up to 3 ft. high but usually much smaller; culms tufted. Leaves $\frac{1}{2}$ - $\frac{2}{3}$ the length of the culm, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Heads in simple or compound umbels or contracted into a single head; bracts 2-4, the lowest 2-10 in. long, similar to the leaves. Spikelets many together in dense heads, dusky or brown, $\frac{1}{2}$ - $\frac{2}{3}$ in. long, 10-30-flowered. Glumes closely packed, concave, very obtuse. Stamens 1 or rarely 2.

Central and Southern Sudan.

C. reduncus Hochst. ex Boeck.

Glabrous herb; culms 2-12 in. high, tufted. Leaves as long as the culm, $\frac{1}{2}$ in. broad. Umbels usually compound, 3-4 in. in diameter, sometimes reduced; bracts overtopping the umbel, similar to the leaves; clusters digitate, of 3-20-spikelets. Spikelets $\frac{1}{2}$ - $\frac{2}{3}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, much flattened, 10-30-flowered. Glumes boat-shaped, obscurely 3-nerved, distinctly mucronate.

Central and Southern Sudan.

C. submicrolepis Kükenth.

C. microlepis Boeck., non Bak.

Herb; culms many, tufted, slender, 2-6 or more in. high. Umbels simple or subcompound, with 3-5 rays; rays not more than $\frac{2}{3}$ in. long; bracts 2-3, overtopping the umbel. Spikelets many, densely clustered, about $\frac{1}{2}$ in. long, 8-20-flowered. Stamens 2.

Equatoria.

C. tenuispica Steud.

C. flavidus (non Retz.) Broun & Massey.

Annual herb; culms 2-9 in. high, tufted, weak. Leaves generally longer than the culm, about $\frac{1}{2}$ in. broad, weak. Umbels usually very compound; bracts 2-3, overtopping the umbel. Stamens 1 or rarely 2. Nut plano-convex, marble-white when ripe.

Equatoria.

C. cuspidatus Kunth.

C. uncinatus (non Poir.) Broun & Massey.

Glabrous annual herb; culms 2-10 in. high, tufted, slender. Leaves setaceous, usually as long as the culm. Umbels simple or rarely compound or reduced to a single head; bracts 3-6, much overtopping the umbel, setaceous. Spikelets digitate, often 3-10 together, $\frac{1}{2}$ in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, 8-28-flowered. Glumes ovate, strongly 3-nerved.

Equatoria.

C. amabilis Vahl.

Glabrous slender annual herb; culms 2-12 in. high, tufted. Leaves $\frac{3}{4}$ - $\frac{1}{2}$ the length of the culm, $\frac{1}{12}$ in. broad, weak. Umbels compound or simple or rarely reduced to a single head; rays sometimes 14, up to 4 in. long; bracts 2-5 in. long. Spikelets 3-10 together, subdigitately arranged, $\frac{3}{8}$ in. long, compressed, 16-36-flowered.

Kordofan. Blue Nile Province: Jebel Arashkol. Equatoria.

C. conglomeratus Rottb.

Glabrous herb; rhizome usually hardly any, sometimes elongate; culms 4-24 in. high. Leaves usually $\frac{1}{2}$ to twice as long as the culm, $\frac{1}{10}$ - $\frac{1}{8}$ in. broad, very stout and tough. Umbels simple, with 2-4 rays, very often condensed into a single head; bracts 3-5, dilated at the base, often 3-6 in. long, similar to the leaves. Spikelets 3-25 to a head, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, 8-16-flowered. Glumes tightly imbricated, ovate, with a minute mucro.

Northern and Central Sudan.

Var. **minor** Boeck.

Leaves rigid, pungent. Spikelets 16-40-flowered, often contracted at intervals.

Red Sea District. Kordofan.

Var. **multiculmis** (Boeck.) Kükenth.

C. cruentus (an Rottb.?) Broun & Massey.

Culms more slender. Leaves long and narrower and less pungent. Umbels with up to 7 rays. Spikelets narrower, 16-40-flowered.

Northern and Central Sudan.

C. pulchellus R. Br.

C. leucocephalus (non Retz.) Broun & Massey.

Glabrous herb; culms 4-10 in. high, slender, bulbous at the base, tufted. Leaves $\frac{1}{3}$ - $\frac{2}{3}$ the length of the culm, $\frac{1}{10}$ - $\frac{1}{12}$ in. broad. Heads solitary, globose, pallid or cinnamon-coloured, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, of 6-40 spikelets; bracts 3, the lowest 2 in. long, similar to the leaves. Spikelets up to $\frac{1}{2}$ in. long but usually much smaller, much compressed. Stamen usually 1.

Darfur: Kulme, 3600 ft.

C. obtusiflorus Vahl.

C. compactus Lam., non Retz.

Glabrous herb; culms 4-20 in. high from a short horizontal rhizome, thickened at the base by hard black-brown leaf-sheaths, contiguous. Leaves as long as or shorter than the culm, $\frac{1}{10}$ - $\frac{1}{8}$ in. broad. Heads solitary, of 5-20 spikelets, $\frac{1}{2}$ - $1\frac{1}{2}$ in. in diameter; bracts 3-4, the lowest 2-4 in. long, spreading, dilated at the base. Spikelets $\frac{1}{2}$ - $\frac{3}{4}$ in. long, about $\frac{1}{4}$ in. broad, compressed, 8-18-flowered. Glumes $\frac{1}{2}$ - $\frac{3}{4}$ in. long, very closely packed, elliptic-oblong, with many conspicuous striations.

Fung District. Equatoria.

C. pygmaeus Rottb.

Juncellus pygmaeus (Rottb.) C. B. Clarke.

Annual herb; culms up to 10 in. high but usually much smaller, usually in dense large tufts. Leaves often longer than the culm, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, flaccid. Heads dense, compound, of very many (often 100) spikelets; bracts 3-8, dilated at the base, the lowest up to 6 in. long, similar to the leaves. Spikelets green to pale-brown, $\frac{1}{2}$ in. long, compressed, 8-24-flowered; rhachilla often curved or twisted. Glumes closely packed; nut-bearing glumes distichous, boat-shaped. Style with sometimes 3 or more usually 2 branches. Nut trigonous or plano-convex.

Northern and Central Sudan.

C. digitatus Roxb.

Glabrous herb; culms 2-6 ft. high, smooth. Leaves $\frac{3}{4}$ the length of the culm, $\frac{1}{2}$ in. broad. Umbels 8-24 in. in diameter, compound; bracts similar to the leaves, the lowest exceeding the umbel; spikes 2 in. long, 1 in. broad, with very many spikelets spreading at right-angles. Spikelets $\frac{1}{2}$ - $\frac{3}{4}$ in. long, 20-flowered, not much compressed, yellowish-brown. Glumes straw-coloured or golden or tawny with a green keel.

Equatoria.

Subsp. **auricomus** (Sieber) Kükenth.

C. auricomus Sieber ex Spreng.

Culms at the top 3-angled with concave faces, becoming almost 3-winged. Rays of the umbel more slender, very unequal.

Central and Southern Sudan.

Var. **minor** (C. B. Clarke) Kükenth.

Plant more slender. Inflorescences small. Glumes chestnut.

Kassala: Gallabat. Upper Nile.

C. immensus var. **pethericki** (C. B. Clarke) Kükenth.

C. pethericki C. B. Clarke.

Glabrous herb; culms up to 4 ft. 6 in. high. Leaves long, up to 1 $\frac{1}{2}$ in. broad. Umbels large, compound, with large many-flowered cylindrical spikes. Spikelets nearly $\frac{1}{2}$ in. long, about 36-flowered, pale-yellowish-brown. Glumes thin, not strongly keeled.

Southern Sudan.

C. dives Del.

C. exaltatus var. *dives* (Del.) C. B. Clarke.

Glabrous herb; culms 3-4 ft. high. Bracts 3-6, exceeding the rigid umbel; spikes rigid, dense. Mature spikelets divaricate or reflexed, hard, often shining and rusty-yellow.

Fung District. Equatoria.

C. exaltatus Retz.

Glabrous herb; culms 1-4 ft. high. Leaves about $\frac{3}{4}$ the length of the culm, up to $\frac{3}{4}$ in. broad. Umbels laxly 5-10-rayed, the rays up to $7\frac{1}{2}$ in. long; bracts 3-6, the lower exceeding the umbel; spikes narrowly cylindric, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long. Spikelets numerous, sub-distichous, $\frac{1}{5}$ - $\frac{1}{3}$ in. long, 6-20-flowered.

Central and Southern Sudan.

C. imbricatus Retz.

C. radiatus Vahl.

Glabrous herb; culms up to 3 ft. high, strongly 3-angled. Leaves about $\frac{3}{4}$ length of the culm, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad. Umbels 6-10 in. in diameter, but often contracted, sometimes into one dense head; rays 6-8, up to $2\frac{1}{2}$ in. long; bracts 3-5, much overtopping the umbel, finely toothed; spikes $\frac{1}{2}$ - $1\frac{1}{4}$ in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Spikelets numerous, $\frac{1}{3}$ - $\frac{1}{2}$ in. long.

Widespread.

C. schimperianus Steud.

Glabrous herb; culms 1-3 $\frac{1}{2}$ ft. high from a woody rhizome, terete, at the very top round or round-trigonous. Leaves absent or short, rarely $\frac{1}{2}$ the length of the culm, $\frac{1}{2}$ in. broad. Umbels 3-10 in. in diameter, usually compound; bracts 4-7, usually exceeding the umbel, similar to the leaves; spikes of 3-20 loosely arranged spikelets, often drooping. Spikelets $\frac{1}{4}$ - $\frac{3}{4}$ in. long, $\frac{1}{2}$ in. broad, compressed, chestnut-brown or bright-brown, 12-24-flowered; wings of the rhachilla narrow-oblong, separating from the glume, finally deciduous.

Widespread.

C. rotundus L.

Glabrous herb; stolons woody, creeping, with tuberosous thickenings; culms 8-24 in. high, triangular and smooth at the top, more or less bulbous at the base. Leaves $\frac{3}{4}$ the length of the culm, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Umbels 1-8 in. in diameter, compound or simple, of 3-8 rays; rays unequal, up to $2\frac{1}{2}$ in. long; bracts 2-4, overtopping the umbel. Spikelets loosely spicate, rust- or chestnut-red, usually $\frac{3}{4}$ -1 in. long, $\frac{1}{16}$ - $\frac{1}{12}$ in. broad and 8-30-flowered but sometimes up to 2 in. long and 50-60-flowered, compressed; wings of the rhachilla conspicuous, transparent, at length deciduous.

Widespread.

Var. nubicus (C. B. Clarke) Kükenth.

Culms stout. Leaves $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Spikelets numerous, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, many-flowered.

Red Sea District: between sea-level and 4000 ft.

C. longus var. **pallidus** Boeck.*C. fenzelianus* Steud.

Glabrous glaucescent herb; rhizome long, creeping; culms 16-36 in. high. Leaves shorter than the culm, up to $\frac{1}{4}$ in. broad. Umbels lax, open, of 6-10 rays; rays unequal, up to 14 in. long; spikes lax, broadly turbinate, of 3-12 spikelets. Glumes pale, at length obscurely straw-coloured or rust-coloured, the margin broadly white-transparent.

*Northern and Central Sudan.***C. maculatus** Boeck.

Glabrous herb; stolons $\frac{1}{16}$ - $\frac{1}{12}$ in. in diameter; culms 12-18 in. high, triangular and smooth at the top, bulbous at the base. Leaves shorter than the culm, about $\frac{1}{2}$ in. broad. Umbels subcompound or simple, with few rays; rays up to $1\frac{1}{2}$ in. long; bracts 3-5, similar to the leaves, the lowest overtopping the umbel; spikes loose, of 5-11 spikelets divaricate in flower. Spikelets straw-coloured, frequently purple- or chestnut-spotted, 20-flowered, $\frac{1}{4}$ - $\frac{1}{2}$ in. long.

*Widespread.***C. esculentus** L.

Glabrous herb; stolons very slender, bearing tubers at their ends; mature tubers $\frac{1}{2}$ or more in. in diameter, zoned by horizontal lines; culms 6-24 in. high. Leaves often $\frac{1}{2}$ - $\frac{2}{3}$ the length of the culm, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad. Umbels compound or simple, 3-12 in. in diameter, 5-10-rayed; rays $1\frac{1}{2}$ in. long; spikes of 4-30 spikelets. Spikelets $\frac{1}{4}$ - $\frac{2}{3}$ in. long, pale-yellow to deep-brown, 6-30-flowered; rhachilla winged. Glumes obscurely keeled, prominently striate.

*Central and Southern Sudan.***C. bulbosus** Vahl.

Glabrous herb; stolons very slender, with yellow or brownish scales, disappearing as soon as the bulbs are completely formed; bulbs formed close to the end of the stolons, when mature ovoid and enclosed in a hard black striate coat which splits irregularly into lanceolate valves; culms arising from a bulb, $2\frac{1}{2}$ -12 in. high, very slender. Leaves numerous, as long as or longer than the culm, $\frac{1}{8}$ in. broad at the base but very narrow and whip-like towards the apex. Umbels contracted, 3-7-rayed; rays usually not exceeding $\frac{1}{2}$ in. long, subcorymbose; bracts 3-6, the lower much exceeding the umbel. Spikelets 4-12 to a spike, rather loosely arranged, about $\frac{1}{2}$ in. long, $\frac{1}{12}$ - $\frac{1}{16}$ in. broad, compressed, red, 8-14-flowered.

*Red Sea District. Blue Nile Province.***C. microbolbos** C. B. Clarke.

Glabrous herb; stolons $\frac{1}{2}$ - $\frac{2}{3}$ in. long, capillary, with thin yellow-brown scales, bearing near their ends bulbs $\frac{1}{2}$ in. in diameter;

culms 3 in. high, arising from a bulb, slender. Leaves twice as long as the culm, setaceous, weak. Inflorescences of 1 spike or an umbel of 2 spikes, the rays $\frac{1}{2}$ in. long; bracts 2, exceeding the umbel, setaceous, weak; spikes of 3-5 loosely arranged spikelets. Spikelets $\frac{1}{2}$ in. long, compressed, chestnut, 24-flowered.

Red Sea District: between sea-level and 4000 ft.

C. gracilinox C. B. Clarke.

Glabrous herb; culms 2 ft. high; stolons numerous, slender, clothed with striate brown scales. Leaves $\frac{2}{3}$ the length of the culm, $\frac{1}{2}$ in. broad. Umbels 6-12 in. in diameter, compound or more rarely simple, laxly 5-10-rayed; rays unequal, up to 6 in. long; bracts 4, longer than the umbel. Spikelets dirty-white, $\frac{2}{3}$ in. long, compressed, 10-16-flowered; wings of the rhachilla elliptic-lanceolate. Glumes elliptic-lanceolate, transparent.

Equatoria.

C. schweinfurthianus Boeck.

C. elatior Boeck. (1879), non Boeck. (1870).

Glabrous herb; culms 2 $\frac{1}{2}$ ft. high, smooth or scabrous at the top; stolons slender, clothed with striate brown scales, hardening into slender woody rhizomes. Leaves $\frac{1}{2}$ - $\frac{2}{3}$ the length of the culm, sometimes attaining $\frac{1}{2}$ in. broad. Umbels compound; rays up to 10 in. long; spikes very loose, of 3-9 spikelets. Spikelets 1 in. long, $\frac{1}{2}$ in. broad, 20-30-flowered, suberect.

Equatoria.

C. distans L. f.

Glabrous herb; stolons elongate, hardening into stout horizontal rhizomes; culms 12-36 in. high, stout or becoming slender, 3-angled. Leaves often as long or $\frac{2}{3}$ as long as the stem, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad. Umbels compound, usually open, 8-12 in. in diameter, 4-12-rayed; bracts 4-8, usually overtopping the umbel. Spikelets usually spicate (rhachis of the spike $\frac{1}{2}$ -2 in. long), $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. broad, almost acicular, reddish, 10-12-flowered, in fruit divaricate at right-angles. Glumes oblong-elliptic.

Equatoria.

Var. **crassispiculosus** Gross & Kükenth.

Spikelets about $\frac{1}{16}$ in. broad, dense-flowered towards the apex. Glumes brownish-yellow, very broadly white-transparent on the margin.

Equatoria: *Gondokoro*.

C. eleusinoides Kunth.

Glabrous herb; culms 1-3 ft. high, throwing out lateral shoots at the base. Spikes about 1 in. long, $\frac{1}{2}$ in. broad, dense, cylindrical, with obliquely spreading green or grey-brown spikelets. Spikelets $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, about 10-flowered. Glumes in fruit spreading but little imbricated. Otherwise as *C. distans*.

Kassala: *Gallabat*. *Fung District*: *Fazoghli*.

C. latifolius Poir.

Glabrous herb; stolons long, $\frac{1}{4}$ - $\frac{1}{2}$ in. thick; culms 2-3 ft. high, acutely 3-angled at the top. Leaves about $\frac{3}{4}$ the length of the culm, $\frac{3}{8}$ in. broad. Umbels compound, dense; secondary umbels obpyramidal, corymbose; bracts overtopping the umbel, scabrous on the margin; spikes of 4-8 spikelets. Spikelets $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, pallid or reddish, 8-16-flowered. Glumes imbricated even in fruit.

Southern Sudan.

C. procerus var. **stenanthus** Kükenth.

C. pilosus (non Vahl) C. B. Clarke.

Herb, glabrous except for the rhachis of the spikes; stolons slender, finally hardening into rhizomes; culms 1-2 $\frac{1}{2}$ ft. high, acutely 3-angled at the top. Leaves $\frac{3}{4}$ the length of the culm, $\frac{3}{8}$ - $\frac{1}{2}$ in. broad. Umbels usually compound; bracts several, similar to the leaves, the lowest overtopping the umbel. Spikelets pale-reddish, spicate, divaricate at right-angles, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{2}$ in. broad, 10-24-flowered. Glumes ovate, rather loosely imbricated.

Equatoria.

C. iria L.

Glabrous annual herb; culms 4-20 in. high, tufted. Leaves often nearly as long as the culm, $\frac{1}{2}$ in. broad. Umbels usually compound, 2-20 in. in diameter; bracts long, often overtopping the umbel; spikes of 5-20 spikelets loosely arranged on a rhachis $\frac{1}{2}$ -2 in. long. Spikelets $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{16}$ in. broad, yellow or brown, 6-20-flowered.

Central and Southern Sudan.

C. compressus L.

Glabrous annual herb; culms 4-16 in. high, tufted. Leaves often $\frac{3}{4}$ the length of the culm, $\frac{1}{8}$ or rarely $\frac{1}{2}$ in. broad. Umbels simple (or appearing nearly so); lowest bract usually longer than the umbel, similar to the leaves. Spikelets 3-10 together, shortly spicate or almost clustered, $\frac{1}{2}$ -1 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad, very much compressed, green or when ripe yellowish, 12-20-flowered. Glumes ovate, conspicuously many-striate, closely packed, the keel very sharp and shortly produced into a mucro.

Northern Sudan: Libyan Desert, approx. 17° 25' N., 24° 10' E.

C. pustulatus Vahl.

Juncellus pustulatus (Vahl) C. B. Clarke.

Annual herb; culms rather slender, tufted, 4-16 in. high. Leaves few, $\frac{1}{4}$ - $\frac{3}{4}$ the length of the culm, $\frac{1}{12}$ - $\frac{1}{8}$ in. broad, weak. Umbels simple or sometimes reduced to 1 spike; rays 1-5, up to 2 $\frac{1}{2}$ in. long; bracts 3, the lowest 3-7 in. long, similar to the leaves; spikes of 2-5 nearly sessile spikelets. Spikelets up to $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. broad, turgid, linear-oblong with parallel sides, 8-18-flowered, glistening-white, purple-marked.

Equatoria.

C. podocarpus Boeck.

Glabrous herb; culms tufted, 4 $\frac{3}{4}$ -10 in. high, slender. Leaves $\frac{3}{4}$ the length of the culm, $\frac{1}{8}$ in. broad. Umbels simple, 1-4-rayed; rays up to 1 $\frac{1}{2}$ in. long; spikes of 3-7 spikelets. Spikelets about $\frac{3}{4}$ in. long, 8-18-flowered, yellow or variegated with red-purple. Glumes ovate, obtuse.

Equatoria.

C. alopecuroides Rottb.

Juncellus alopecuroides (Rottb.) C. B. Clarke.

Large glabrous herb, flowering the first season; culms solitary, 1 $\frac{1}{2}$ -4 ft. high. Leaves as long as or longer than the culm, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Umbels 6-24 in. in diameter, compound; rays 4-10; bracts 3-8, the lowest 6-15 in. long, $\frac{1}{4}$ - $\frac{1}{3}$ in. broad; spikes 3-5 together, sessile, 1-1 $\frac{1}{2}$ in. long, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad, dense, cylindric. Spikelets $\frac{1}{4}$ - $\frac{1}{3}$ in. long, 8-30-flowered. Glumes densely imbricate, ovate, concave, thin; rhachilla not winged.

Central and Southern Sudan.

C. laevigatus L.

Juncellus laevigatus (L.) C. B. Clarke.

Glabrous herb; rhizome woody, creeping horizontally, long with solitary distant culms or short with crowded culms; culms 6-24 in. high, rounded, somewhat fleshy, their bases surrounded by imbricate shining chestnut-red sheaths. Leaves usually short or scarcely any, sometimes exceeding the culm, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad. Heads solitary, apparently lateral, of 1-30 spikelets, straw-coloured, sometimes marked with black-chestnut; bracts 2, the lower resembling a continuation of the culm 1-3 in. long. Spikelets $\frac{1}{3}$ in. long, compressed but thick, with parallel sides, 12-24-flowered. Glumes closely packed, broad-elliptic, the nut-bearing ones falling from the base of the persistent rhachilla upwards.

Red Sea District. Darfur: Jebel Marra. Equatoria.

C. mundtii (Nees) Kunth.

Pycereus mundtii Nees.

Glabrous herb; culms clothed with leaf-sheaths for $\frac{1}{4}$ - $\frac{1}{3}$ of their length, 8-16 in. or sometimes exceeding 2 ft. high, decumbent at the base, creeping and rooting for 3-10 in. Leaves 4-10 in. long, $\frac{3}{8}$ - $\frac{1}{4}$ in. broad. Umbels simple or rarely subcompound or reduced to 1 head; rays 4-8, $\frac{1}{2}$ -2 in. long; bracts 3-5, usually overtopping the umbel; spikes with 3-8 spikelets. Spikelets $\frac{1}{4}$ - $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, 12-16-flowered, brown but varying much in depth of colour. Nut covered with raised dots.

Central and Southern Sudan.

C. lanceolatus Poir.

Pycereus propinquus Nees.

Glabrous herb; rhizome short; culms tufted, decumbent at the base, 8-20 in. high. Leaves nearly as long as the culm, $\frac{1}{4}$ in.

broad; sheath brown. Inflorescences of 10-16 spikelets in 1 compound head; bracts 3, the lowest 3-7 in. long and similar to the leaves. Spikelets $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. broad, 20-36-flowered, compressed, pale-yellow. Glumes ovate.

Equatoria.

C. capillifolius A. Rich.

Pycneus capillifolius (A. Rich.) C. B. Clarke.

Annual herb; culms tufted, 4-8 in. high, very slender. Leaves as long as the culm, capillary or nearly so. Heads of 4-18 spikelets, appearing lateral; bracts 2, the lower 1-2 $\frac{1}{2}$ in. long and resembling a continuation of the culm. Spikelets up to $\frac{1}{2}$ in. long, $\frac{1}{10}$ in. broad, 10-30 flowered, pale-yellow.

Equatoria.

C. pelophilus Ridl.

Glabrous annual herb; roots fibrous; culms tufted, up to 12 in. high, rather stout. Leaves basal, 8 in. long, $\frac{1}{8}$ in. broad, weak; sheath brownish-purple. Umbels compound or simple; rays 4-7, very unequal, up to 4 in. long; bracts 5-6, spreading, the lowest up to 5 in. long; spikes broadly ovoid, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. in diameter, with numerous spikelets. Spikelets 1 in. long, $\frac{1}{10}$ in. broad, yellowish, 12-30-flowered. Nut very 1-sided, black, much compressed, the faces almost concave.

Equatoria.

C. pumilus var. **muticus** (Boeck.) C. B. Clarke.

Pycneus nitens (non Nees) Broun & Massey.

Glabrous annual herb; culms tufted, $\frac{1}{2}$ -12 in. high, rather slender. Leaves basal, often as long as the culm, $\frac{1}{12}$ in. broad, weak. Umbels simple; rays 1-6; bracts 3-6, the lowest $\frac{1}{2}$ -6 in. long. Spikelets 5-30 to a spike, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, $\frac{1}{12}$ in. broad, 8-44-flowered, straw-coloured or pale-brown.

Kordofan. Blue Nile Province.

C. polystachyos Rottb.

Pycneus polystachyos (Rottb.) Beauv.

Glabrous herb; roots fibrous; culms tufted, 1-2 $\frac{1}{2}$ ft. high. Leaves basal, longer or shorter than the culm, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Umbels of many rays or contracted almost into a head, with many spikes each of 10-50 spikelets erect even in fruit. Spikelets $\frac{2}{3}$ in. long, $\frac{1}{12}$ in. broad, linear, 20-50-flowered, dusky-straw-coloured or somewhat red-tinged. Glumes ovate, triangular at the apex.

Equatoria.

Var. **laxiflorus** Benth.

Culms tall. Spikes open, subcorymbose or umbellate. Spikelets subsolitary, spreading horizontally, often yellow or somewhat brown-red.

Equatoria.

C. melas Ridl.

Annual herb; culms tufted, 2-6 in. high, almost setaceous. Leaves $\frac{1}{2}$ - $\frac{3}{4}$ the length of the culm, almost setaceous. Umbels of 5-10 spikelets, nearly contracted into a head; rays 1-4, up to $\frac{2}{3}$ in. long; bracts 2-3, the lowest 2 in. long, similar to the leaves. Spikelets 2-4 together, almost digitately arranged, $\frac{2}{3}$ in. long, $\frac{1}{16}$ in. broad, 8-30-flowered. Glumes ovate, black-chestnut, narrowly scarious-yellow on the margin.

Equatoria.

C. unioloides R. Br.

Herb; rhizome slender; culms 1-3 ft. high. Leaves $\frac{1}{2}$ the length of the culm, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Umbels simple or rarely reduced to 1 head; rays 3-8; bracts 4-5, the lowest up to 10 in. long, similar to the leaves; spikes of 3-20 spikelets, loose. Spikelets up to $\frac{2}{3}$ in. long, $\frac{1}{2}$ in. broad, 22-flowered, compressed. Glumes ovate, keeled, a little inflated, triangular at the apex, crisped-undulate on the margin.

Equatoria: Kagelu, edge of Khor Gurka.

C. tremulus Poir.

Pycurus albomarginatus Nees.

Large annual herb; culms solitary, 1-3 ft. high, 3-angled at the top. Leaves $\frac{2}{3}$ the length of the culm, $\frac{1}{4}$ - $\frac{1}{3}$ in. broad. Umbels usually compound; primary rays 3-11, 1-7 in. long; bracts 3-6, overtopping the umbel; spikes subglobose, $1\frac{1}{2}$ in. long and of 12 spikelets, or very loose, elongate, 2 in. long and of 8-10 spikelets. Spikelets up to $1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, flattened, straw-coloured or yellow, 18-30-flowered. Glumes ovate, distant, with a white margin.

Central and Southern Sudan.

C. elegantulus Steud.

Pycurus elegantulus (Steud.) C. B. Clarke.

Glabrous herb; rhizome shortly creeping; culms tufted, 6-30 in. high. Leaves about $\frac{2}{3}$ the length of the culm, $\frac{1}{16}$ - $\frac{1}{2}$ in. broad. Umbels of 1-7 dense compound spikes, often 1-headed but the rays sometimes 2-3 in. long; bracts 3-5, the lowest 3-9 in. long; spikes dense, of 5-30 spikelets. Spikelets $\frac{1}{4}$ - $\frac{2}{3}$ in. long, $\frac{1}{12}$ in. broad, 6-16-flowered, much compressed, hard. Glumes black-chestnut.

Between Khartoum and Shendi. Darfur: Jebel Marra.

C. aethiops Welw. ex Ridl.

Glabrous herb; culms tufted, 8-16 in. high. Leaves shorter than the culm. Umbels simple, 4-7-rayed; rays slender, up to about $\frac{1}{2}$ in. long; bracts 3, spreading horizontally. Spikelets loosely spicate, much flattened, hard, shining, black-chestnut.

Equatoria: Didinga Mountains, Nagichot, 6700 ft.

C. nuerensis Boeck.

Pycreus globosus var. *nilagiricus* C. B. Clarke p.p.

Annual or biennial herb; culms tufted, firm, 8-16 in. high. Leaves about $\frac{2}{3}$ the length of the culm, $\frac{1}{2}$ in. broad. Umbels compound, 6 in. in diameter; bracts 5-6, the lowest 5 in. long; spikes numerous, of 5-8 spikelets. Spikelets $\frac{2}{3}$ in. long, $\frac{1}{10}$ in. broad, compressed, 30-flowered. Glumes chestnut- or dusky-brown with a green keel.

Equatoria.

C. lanceus Thunb.

Pycreus umbrosus Nees.

Glabrous herb; rhizome descending, giving out long stout stolons, culms 6-18 in. high, thickened at the base. Leaves exceeding the culm, $\frac{1}{2}$ in. broad; sheath fleshy. Umbels simple; rays 3-7, up to 2 in. long; spikes of 3-9 spikelets. Spikelets loosely or closely spicate, brown to chestnut-black, up to $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, 16-flowered, compressed.

Southern Sudan.

C. flavescens L.

Pycreus flavescens (L.) Beauv. ex Reichb.

Annual herb; culms 1-12 in. high, tufted. Leaves $\frac{2}{3}$ as long as the culm, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad. Spikes of 3-12 clustered spikelets, loosely umbellate or solitary; bracts 2-4, overtopping the inflorescence. Spikelets $\frac{1}{2}$ in. long, $\frac{1}{12}$ in. broad, 8-36-flowered, compressed, straw-coloured, more or less red-tinged.

Central and Southern Sudan.

C. longibracteatus (Chermez.) Kükenth.

C. distans (non L. f.) Broun & Massey p.p.

Glabrous perennial herb; culms 1-2 $\frac{1}{2}$ in. high. Leaves longer than the culm, long-acuminate, prominently 3-nerved. Umbels compound, with 4-6 rays; rays up to 4 in. long; bracts 5-6, usually overtopping the umbel; spikes broadly hemispherical, about 1 in. in diameter, of many spikelets. Spikelets $\frac{2}{3}$ - $\frac{3}{4}$ in. long, scarcely $\frac{1}{15}$ in. broad.

Equatoria.

C. impubes Steud.

Glabrous herb; rhizome horizontal, stout; culms 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ ft. high. Leaves shorter than the culm, $\frac{1}{2}$ - $\frac{1}{4}$ in. broad. Umbels simple, with 6-10 rays; rays slender, up to 1 $\frac{1}{2}$ in. long; bracts 4-7, the lower overtopping the umbel; spikes cylindric, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long, with 20-40 spikelets, bright-red in flower, red-brown in fruit. Spikelets with 3 fertile flowers; rhachilla broadly winged. Nut-bearing glumes strongly 9-13-ribbed.

Equatoria: slopes of Mount Lotuke, 6000 ft.

C. squarrosus L.*C. aristatus* Rottb.

Glabrous annual herb; culms tufted, 1-7 in. high. Leaves often as long as the culm, $\frac{1}{2}$ in. broad. Umbels simple or reduced to 1 spike; rays 1-6, up to 3 in. long; bracts 2-5, the lowest usually overtopping the umbel; spikes $\frac{1}{2}$ in. long, $\frac{1}{3}$ in. broad, cylindric or subovoid, dense, of 5-40 spikelets, finally brown. Spikelets up to $\frac{1}{2}$ in. long and $\frac{1}{8}$ in. broad but usually smaller, compressed, 6-30-flowered; rhachilla not winged. Glumes ovate-lanceolate, 7-9-striate, the keel produced into a conspicuous recurved bristle.

*Central and Southern Sudan.***C. cyperoides** (L.) Kuntze.*Mariscus umbellatus* Vahl p.p.; *M. sieberianus* Nees; *M. sublimis* C. B. Clarke p.p.

Glabrous herb; rhizome very short, woody; culms 8-30 in. high, more or less ovoid-thickened at the base; lower sheaths often dull-red. Leaves often $\frac{2}{3}$ the length of the culm, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Umbels simple, 1-5 in. in diameter; rays 5-12, 1-4 in. long; bracts 5-10, similar to the leaves, the lowest 4-8 in. long, scarcely dilated at the base; spikes often 1 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, cylindric. Spikelets very numerous, in fruit spreading upwards or at right-angles on all sides, bearing 1 or sometimes 2 fertile flowers.

*Central and Southern Sudan.***C. macrocarpus** (Kunth) Boeck.*Mariscus macrocarpus* Kunth.

Glabrous herb; rhizome very short; culms up to 24 in. high, thickened at the base. Leaves shorter than the culm, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad. Umbels usually contracted; rays 10-12, rigid, divergent, up to $\frac{3}{4}$ in. long; spikes sessile or rarely shortly pedunculate, $\frac{2}{3}$ - $\frac{3}{2}$ in. long, of numerous spikelets, dense. Spikelets $\frac{1}{2}$ - $\frac{1}{4}$ in. long, with 2-4 fertile flowers; rhachilla broadly winged. Glumes 9-11-ribbed.

*Equatoria.***C. amauropus** Steud.*Mariscus leptophyllus* C. B. Clarke.

Glabrous herb; rhizome very short; culms tufted, 6-16 in. high. Leaves equal to or shorter than the culm, about $\frac{1}{3}$ - $\frac{1}{2}$ in. broad, coiled at the apex. Umbel-rays 2-3, $\frac{1}{4}$ - $1\frac{1}{2}$ in. long, each with 1-3 spikes; bracts 3-4, the lowest up to 6 in. long; spikes ovoid or ellipsoid, varying from nearly white to rich-brown, of 6-16 spikelets. Spikelets $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, with 6-8 fertile flowers. Glumes 9-11-ribbed.

Red Sea District: Khor Tamanib.

C. schimperi (Hochst.) K. Schum.

Glabrous herb; rhizome very short; culms tufted, 4-14 in. high, slender. Leaves often as long as the culm, $\frac{1}{6}$ - $\frac{1}{2}$ in. broad, weak, coiled at the apex. Inflorescences simple, forming a head or an umbel with very short rays; bracts 3-5, the lowest up to 6 in. long; spikes 3-4, the middle one subcylindric, the lateral often shorter. Spikelets numerous, green, more or less variegated with red, $\frac{1}{4}$ in. long, with 2-4 fertile flowers, falling in one piece above the 2 lowest barren glumes. Glumes ovate, 12-20-ribbed.

Red Sea Hills: Erkwit.

C. mollipes (C. B. Clarke) K. Schum.

Mariscus mollipes C. B. Clarke.

Glabrous herb; rhizome very short; culms densely tufted, 4-7 in. high, thickened at the base and surrounded by brown scarious leaf-sheaths torn into many soft fibres. Leaves $\frac{2}{3}$ the length of the culm, $\frac{1}{2}$ in. broad. Heads of 2-3 ovoid spikes nearly fused into 1 dense head $\frac{1}{2}$ - $\frac{1}{3}$ in. in diameter, pale-straw-coloured, more or less purple-spotted; bracts 3-4, spreading divaricately. Spikelets $\frac{1}{2}$ in. long, ovate-oblong in fruit, ripening only 1 nut. Glumes ovate, acuminate.

Equatoria.

C. diurensis Boeck.

Mariscus diurensis (Boeck.) C. B. Clarke.

Glabrous herb; stolons numerous, slender, 1-2 in. long, clothed with striate scales, terminating in a shoot; culms 4-12 in. high, slender, thickened at the base by the leaf-sheaths torn into fibres. Leaves often as long as the culm, $\frac{1}{2}$ in. broad, weak. Heads solitary, ovoid, $\frac{1}{2}$ - $\frac{1}{3}$ in. in diameter, dense; bracts 4-5, dilated at the base. Spikelets $\frac{1}{2}$ in. long, 2-6-flowered, falling in one piece by an articulation above the 2 lowest empty glumes. Glumes distant, very strongly 9-13-ribbed, with red round small glands.

Upper Nile. Equatoria.

C. submacropus Kükenth.

Mariscus macropus C. B. Clarke.

Glabrous herb; culms densely tufted, 6-16 in. high, slender, ovoid-oblong at the base, very much thickened by the leaf-sheaths of which the remains persist as coarse fibres. Leaves $\frac{1}{2}$ - $\frac{2}{3}$ the length of the culm, very narrow, long-setaceous at the apex. Heads solitary, ovoid, $\frac{1}{2}$ in. in diameter; bracts 3, the lowest 1-2 in. long, somewhat dilated at the base. Spikelets $\frac{1}{2}$ in. long, narrow-lanceolate, 8-10-flowered, producing 6-8 nuts, falling in one piece above the 2 lowest empty glumes. Glumes ovate, obscurely 7-11-ribbed.

Equatoria.

C. dubius Rottb.

Glabrous herb; culms densely tufted, 6-14 in. high, oblong-thickened at the base by the scarious coloured leaf-sheaths. Leaves often as long as the culm, $\frac{1}{10}$ - $\frac{1}{8}$ in. broad, weak. Inflorescences $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, appearing as 1 very dense head of narrow spikelets or as 2-3 densely congested spikes; bracts 3-4, the lowest 3-7 in. long. Spikelets quadrangular-cylindric, $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, not compressed, producing 2-6 (usually 3-4) nuts. Glumes ovate, not keeled, strongly 13-15-ribbed, chaffy, persistent. Nut dark-brown to ashy-black, very smooth.
Equatoria.

Var. **coloratus** (Vahl) Kükenth.

Mariscus coloratus var. *macrocephalus* (non C. B. Clarke) Broun & Massey p.p.

Spikelets ovate or lanceolate, acute at the apex. Nut ashy-black, minutely dotted or manifestly reticulated.
Equatoria.

Var. **macrocephalus** (C. B. Clarke) Kükenth.

Mariscus coloratus var. *macrocephalus* C. B. Clarke.

Culms stout. Leaves $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, coriaceous. Spikes large, 5-6 together in 1 head.
Equatoria.

C. purpureoglandulosus Mattf. & Kükenth.

Kyllinga sphaerocephala Boeck.

Glabrous herb; rhizome very short, producing long woody stolons about $\frac{1}{2}$ in. in diameter; culms 4-12 in. high. Leaves $\frac{1}{2}$ - $\frac{2}{3}$ the length of the culm, $\frac{1}{10}$ - $\frac{1}{8}$ in. broad. Heads of 1-3 spikes, about $\frac{1}{2}$ in. in diameter, globose, dense, pale-cinnamon-coloured; bracts 2-3, the lowest 2 in. long, $\frac{2}{10}$ in. broad. Spikelets $\frac{1}{2}$ in. long. Nut-bearing glume ovate-oblong, without a wing on the keel, with or without conspicuous round reddish-purple oil-glands.

Equatoria.

C. triceps (Rottb.) Endl.

Kyllinga triceps Rottb.

Glabrous herb; culms 2-12 in. high, thickened at the base, tufted. Leaves $\frac{1}{10}$ in. broad, $\frac{1}{2}$ as long as or equal to the culm. Heads solitary, of 3 (rarely 1 or 4-5) white or green spikes $\frac{1}{2}$ - $\frac{1}{2}$ in. long; bracts 3-4, the lowest up to 2-3 in. long; middle spike very dense, varying from ovoid to oblong-cylindric. Spikelets $\frac{1}{2}$ in. long, each perfecting 1 nut. Nut-bearing glume ovate, very shortly acute, strongly 3-4-striate on each side, sometimes red-spotted and with sunk glands; keel wingless. Nut ellipsoid.

Equatoria.

Var. **obtusiflorus** (Boeck.) Kükenth.

Spikelets more broadly ovate. Nut subobovate-oblong.

Kassala: Gallabat. Equatoria.

C. aromaticus (Ridl.) Mattf. & Kükenth.

Kyllinga polyphylla Willd. ex Kunth.

Glabrous herb; rhizome horizontal or obliquely descending; culms 10-16 in. high, 3-winged at the top. Leaves 2-4, shorter than the culm, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad. Heads of 1-3 (usually 1) spikes; bracts 5-8, the lowest usually exceeding 4 in. long; spikes ovoid, $\frac{1}{3}$ or more in. in diameter, dense, green, usually tinged with orange or brown. Spikelets $\frac{1}{2}$ - $\frac{1}{3}$ in. long, lanceolate, each perfecting 1 nut. Nut-bearing glume scabrous, wingless on the keel which is produced into a mucro.

Equatoria.

C. melanospermus (Nees) Suringar.

Kyllinga melanosperma Nees.

Glabrous herb; rhizome horizontal, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long; culms 12-48 in. high, 3-winged under the inflorescence. Leaves much shorter than the culm, often 4-6 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad. Heads of 1 spike, ovoid, dull-green, $\frac{1}{3}$ or more in. long; bracts 3-4, the lowest often 4 in. long. Spikelets numerous, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, each producing 1 or very rarely 2 nuts.

Equatoria.

C. obtusatus var. **africanus** Kükenth.

Kyllinga pungens (non Link) Broun & Massey.

Glabrous herb; rhizome horizontal, thick, closely covered by ovate rigid brown scales; culms 4-18 in. high, obscurely quadrangular, contiguous and in one row on the rhizome. Leaves less than $\frac{1}{2}$ the length of the culm, $\frac{1}{8}$ - $\frac{1}{3}$ in. broad, often quite short. Heads of 1 spike, $\frac{1}{4}$ - $\frac{1}{3}$ in. in diameter, dense, subglobose; bracts generally 3-4, sometimes 5, 1-4 in. long. Spikelets $\frac{1}{10}$ - $\frac{1}{3}$ in. long, each perfecting 1 nut.

Equatoria.

C. bulbipes Mattf. & Kükenth.

Kyllinga crassipes Boeck.

Glabrous herb; rhizome horizontal, short; culms 4-12 in. high, contiguous, somewhat thickened by basal leaf-sheaths. Leaves rather longer than the culm, $\frac{1}{15}$ in. broad. Heads of 1-3 spikes, pale-brown; bracts 4-5, very long, the lowest often longer than the culm; middle spike ovoid, $\frac{1}{2}$ in. in diameter. Spikelets $\frac{1}{2}$ in. long, perfecting 1 nut. Nut-bearing glume with sunk round red glands.

Equatoria.



Fig. 90.—CYPERUS ERECTUS (Schumach.) Mattf. & Kükenth.
A, spikelet. B, flower.

C. erectus (Schumach.) Mattf. & Kükenth.

Fig. 90.

Kyllinga erecta Schumach.

Glabrous herb; rhizome creeping, sometimes 4-8 in. long, $\frac{1}{10}$ - $\frac{1}{8}$ in. in diameter with distant culms, or sometimes 1-3 in. long and thicker with contiguous culms often in 1 row. Leaves often $\frac{1}{2}$ the length of the culm, $\frac{1}{4}$ in. broad. Heads of 1 spike, $\frac{1}{4}$ - $\frac{1}{3}$ in. in diameter, ovoid, dense, very commonly (especially when young) showing a golden tinge; bracts 3-4, the lowest 1-3 in. long. Spikelets $\frac{1}{2}$ - $\frac{1}{3}$ in. long, each perfecting 1 nut.

*Equatoria.***C. sesquiflorus** (Torr.) Mattf. & Kükenth.

Glabrous herb; rhizome absent or very short; culms 2-18 in. high, tufted, hardly thickened by the leaf-sheaths. Leaves shorter than the culm, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad. Heads of 1-3 (often 3) white or very pale-brown spikes; bracts 3-4, the lowest 1-6 in. long; middle spike $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. broad, short-cylindric, green or whitish, dense. Spikelets $\frac{1}{2}$ in. long, each perfecting 1 nut.

*Equatoria.***C. tenuifolius** (Steud.) Dandy.*Kyllinga pumila* Michx.

Annual glabrous herb; culms numerous, densely clustered, $1\frac{1}{2}$ -12 (or rarely 1-16) in. high. Leaves generally shorter than the culm, $\frac{1}{10}$ - $\frac{1}{8}$ in. broad; sheath pinkish. Heads of 1-3 green or greenish-white dense spikes with numerous small spikelets; bracts 2-4, the lowest 2-6 in. long, similar to the leaves; middle spike $\frac{1}{4}$ - $\frac{1}{3}$ in. long, $\frac{1}{8}$ - $\frac{1}{5}$ in. broad, short-cylindric or subovoid and hardly longer than broad. Spikelets $\frac{1}{2}$ - $\frac{1}{3}$ in. long, each perfecting 1 or rarely 2 nuts. Nut-bearing glume thin, without glands, the keel produced into a mucro.

*Fung District. Equatoria.***C. cristatus** var. **nigritanus** (C. B. Clarke) Kükenth.

Glabrous herb; rhizome very short, with fibrous roots; culms tufted, 6-12 in. high. Leaves somewhat shorter than the culm, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, long-attenuated. Heads globose, of 1 spike, $\frac{1}{8}$ - $\frac{1}{2}$ in. in diameter, pale-cinnamon-coloured; bracts 3-4, the lowest 2-3 in. long, obscurely dilated-saccate at the base. Spikelets numerous, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, broadly ovate, each perfecting 1 nut. Nut-bearing glume with a broad wing often purple-punctate.

*Red Sea Hills: Erkowit.***C. controversus** var. **subexalatus** (C. B. Clarke) Kükenth.*Kyllinga controversa* var. *subexalata* C. B. Clarke.

Glabrous herb; roots fibrous or rootstock thick and less than $\frac{1}{2}$ in. long; culms densely tufted, $2\frac{1}{2}$ -12 in. high. Leaves often as long as the culm, $\frac{1}{5}$ - $\frac{1}{3}$ in. broad, the sheath becoming much torn.

Heads globose, of usually 3 spikes; bracts 3-4, the lowest often 3-6 in. long. Spikelets numerous, $\frac{1}{2}$ in. long, each perfecting 1 nut.

Kordofan.

C. metzii (Hochst.) Mattf. & Kükenth.

Kyllinga squamulata Vahl.

Glabrous annual herb; culms densely tufted, 2 $\frac{1}{2}$ -15 in. high. Leaves often as long as the culm, $\frac{1}{2}$ in. broad. Heads usually of 1 spike, $\frac{1}{3}$ in. in diameter; bracts 3, the lowest often 4 in. long. Spikelets numerous, $\frac{1}{10}$ - $\frac{1}{8}$ in. long, each perfecting 1 nut. Nut-bearing glume crested with toothed scales coalescent into a wing on its keel.

Central and Southern Sudan.

7. **DIPLACRUM** R. Br.

Diplacrum africanum C. B. Clarke.

Weak nearly glabrous annual herb; culms tufted, 2-5 in. long, slender, leafy their whole length. Leaves rather abruptly acuminate at the apex, 1-1 $\frac{1}{2}$ in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Spikelets in minute axillary heads often occurring nearly to the base of the culm; lower heads on peduncles rarely exerted as much as $\frac{1}{2}$ in. Spikelets green or yellowish, $\frac{1}{12}$ - $\frac{1}{10}$ in. long. Glume of female spikelets ovate-lanceolate, 3-nerved, concave at the base.

Equatoria.

8. **ELEOCHARIS** R. Br.

Eleocharis atropurpurea (Retz.) Kunth.

Glabrous annual herb; culms tufted, 2-6 in. high, slender. Spikelets solitary, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, ovoid or cylindric, very dense with many flowers, dull-greenish-red. Glumes elliptic, obtuse, 1-3-nerved on the keel, falling early. Hypogynous bristles 5-7, white, retrorse-scabrous, usually $\frac{1}{2}$ - $\frac{3}{4}$ the length of the nut, but sometimes absent. Style 2-branched. Nut shining-black.

Blue Nile Province: Jebel Arashkol.

E. brainii Svenson.

E. chaetaria (non Roem. & Schult.) Broun & Massey.

Annual herb; roots fibrous; culms $\frac{1}{2}$ -1 $\frac{1}{4}$ in. long, tufted, spongy, obscurely sulcate; sheaths white, scarious, acuminate at the apex. Spikelets solitary, $\frac{1}{15}$ - $\frac{1}{12}$ in. long, broadly ovoid, 4-8-flowered. Glumes divaricate in fruit, $\frac{1}{15}$ in. long. Style 3-branched. Nut 3-sided, truncate, shining-grey or white, latticed.

Equatoria.

E. nigrescens (Nees) Steud.

E. complanata Boeck.

Annual or perennial herb; roots fibrous or rootstock whitened vertical and much branched; culms very slender, erect, 1 $\frac{1}{2}$ -5 in.

high, obscurely quadrangular-sulcate, punctate; sheaths red or sometimes greenish. Spikelets solitary, many-flowered, ovoid, $\frac{1}{12}$ - $\frac{1}{2}$ in. long. Glumes chestnut-brown with a greenish midrib. Style 3-branched. Nut trigonous, smooth.

Equatoria.

E. acutangula (Roxb.) Schult.

E. fistulosa Schult.

Glabrous herb; stolons long, $\frac{1}{8}$ - $\frac{1}{2}$ in. in diameter; culms 1-3 ft. high, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter, 3-winged at the top. Spikelets solitary, 1-1 $\frac{1}{4}$ in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Glumes $\frac{1}{2}$ - $\frac{1}{4}$ in. long, obovate. Hypogynous bristles 6, as long as the nut, retrorse-scabrous, rusty-red. Style 3- or sometimes 2-branched. Nut unequally 3-angled, latticed.

Equatoria.

E. schweinfurthiana Boeck.

E. microcarpa (non Torr.) Broun & Massey.

Glabrous annual herb; culms tufted, 4-8 in. high, slender. Spikelets solitary, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, 10-20-flowered, pale-brown-green. Glumes ovate, obtuse. Hypogynous bristles 3-5, $\frac{1}{4}$ - $\frac{2}{3}$ the length of the nut, retrorsely hispid, white. Style 3-branched. Nut 3-angled, obovoid, smooth.

Equatoria.

9. **FIMBRISTYLIS** Vahl

A. Style 2-fid:

- B. Style-base with a ring of pendent hairs nearly as long as the nut *F. squarrosa*.

BB. Style-base without long pendent hairs:

- (a) Leaves pubescent or pilose, or setulose only on the margin:
 (b) Glumes densely grey-puberulous on the upper part of their back *F. ferruginea*.
 (bb) Glumes glabrous:
 (c) Spikelets numerous, crowded; glumes triangular, markedly keeled and apiculate *F. bis-umbellata*.
 (cc) Spikelets not crowded; glumes ovate-rounded, hardly keeled, mucronate *F. dichotoma*.

(aa) Leaves glabrous:

- (d) Glumes densely grey-puberulous on the upper part of their back *F. ferruginea*.

- (dd) Glumes glabrous *F. dichotoma*.

AA. Style 3-fid:

C. Plants with fine long white hairs:

- (e) Spikelets $\frac{1}{4}$ - $\frac{1}{2}$ in. long, pale-rust-coloured, usually much tinged with chestnut *F. exilis*.
 (ee) Spikelets $\frac{1}{2}$ - $\frac{1}{2}$ in. long, pale-rust-coloured *F. cioniana*.

CC. Plants without long white hairs, glabrous or nearly so:

- D. Leaves usually $\frac{1}{2}$ in. long, sometimes up to 2 in. long
F. subaphylla.

DD. Leaves more than 2 in. long :

- (f) Umbels of 2-9 spikelets *F. schweinfurthiana*.
 (ff) Umbels of 12 or more spikelets *F. complanata*.

***Fimbristylis squarrosa* Vahl.**

Pubescent or glabrous annual herb; culms 2-7 in. high, tufted. Leaves $\frac{1}{2}$ - $\frac{3}{4}$ as long as the culm, setaceous or narrowly linear. Umbels usually compound; bracts 3-4, similar to the leaves, often nearly as long as the umbel. Spikelets up to $\frac{1}{4}$ in. long, $\frac{1}{2}$ in. broad, dense-flowered, dusky-straw-coloured. Glumes elliptic; nerves 3-5, uniting into a strong recurved apical bristle.

Central and Southern Sudan.

***F. ferruginea* (L.) Vahl.**

Fig. 91.

Herb, frequently biennial or perhaps perennial; culms densely tufted, 8-28 in. high; roots wiry, fibrous. Leaves usually short or sometimes hardly any. Umbels simple or slightly compound, of 5-10 (or rarely -20) spikelets; bracts usually much shorter than the umbel. Spikelets $\frac{2}{3}$ in. long, $\frac{1}{2}$ in. broad, ovoid-oblong, dense-flowered, rust-coloured, more or less variegated with chestnut or green. Glumes ovate, grey-puberulous above on the back.

Central and Southern Sudan.

***F. bis-umbellata* (Forsk.) Bub.**

F. dichotoma Vahl p.p.

Pubescent or puberulous annual herb; culms tufted, 2-10 in. high. Leaves as long as the culm, setaceous or linear. Umbels compound with numerous spikelets; bracts 3-4, similar to the leaves, as long as the umbel. Spikelets $\frac{1}{2}$ in. long, cylindric or oblong, somewhat polygonal, many-flowered, rust-coloured. Glumes triangular, markedly keeled and apiculate.

Northern and Central Sudan.

***F. dichotoma* (L.) Vahl.**

F. diphylla (Retz.) Vahl.

Similar to *F. bis-umbellata* but spikelets not crowded, narrowly ovoid, terete (not polygonal), the glumes hardly keeled.

Central and Southern Sudan.

***F. exilis* (Kunth) Roem. & Schult.**

Hairy annual herb; culms tufted, 4-16 in. high, rather slender. Leaves $\frac{1}{2}$ - $\frac{3}{4}$ the length of the culm, up to $\frac{1}{2}$ in. broad. Umbels of 3-14 pedicellate spikelets; bracts 3-4, about as long as the umbel. Spikelets $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{2}$ in. broad, 10-12-flowered, pale-rust-coloured, usually much tinged with chestnut. Glumes ovate; keel green, produced into a mucro. Nut transversely wrinkled, smooth or obscurely tuberculate.

Central and Southern Sudan.



Fig. 91—FIMBRISTYLIS FERRUGINEA (L.) Vahl.

A. involucre of bracts. B. part of rhachilla of spikelet. C. flower.
D. glumes. E. flower in young fruit.

F. cioniana Savi.

Umbels rather dense, of 10-25 spikelets. Spikelets $\frac{1}{4}$ - $\frac{1}{2}$ in. long, pale-rust-coloured. Nut with transverse wavy lines. Otherwise as *F. exilis*.

Equatoria.

F. subaphylla Boeck.

Glabrous herb; culms 12-16 in. high, closely arranged on a very short woody rhizome, more or less flattened and 4-angular at the top. Umbels 2-4 in. in diameter, with 30-60 spikelets; bracts 2-3, less than 1 in. long. Spikelets $\frac{1}{4}$ in. long, $\frac{1}{12}$ in. broad, 5-14-flowered, cinnamon-brown.

Equatoria.

F. schweinfurthiana Boeck.

Glabrous annual herb; culms 8-12 in. high, tufted, slender; basal sheaths brown with a fringed margin. Leaf on the uppermost sheath $\frac{1}{2}$ the length of the culm, $\frac{2}{10}$ - $\frac{1}{12}$ in. broad. Umbels loose, of 2-9 spikelets; bracts 2-3, $\frac{1}{2}$ in. long. Spikelets $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. broad, rather dense, dull-brown.

Equatoria.

F. complanata Link.

Glabrous herb; culms 8-24 in. high, quadrangular to the top and much flattened, usually with 2 sharp edges and a rib on each of the flat faces. Leaves usually 3-8 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, suddenly narrowed at the apex. Umbels up to 4-5 in. in diameter; bracts 2, suberect, usually 1-2 in. long, similar to the leaves. Spikelets $\frac{1}{4}$ in. long, $\frac{1}{10}$ in. broad, brown or chestnut.

Darfur: Jebel Marra, 8300 ft.

10. **FUIRENA** Rottb.**Fuirena pubescens** (Poir.) Kunth.

Pubescent herb; rhizome long-creeping, $\frac{1}{10}$ - $\frac{1}{8}$ in. in diameter; culms often solitary, 4-16 in. high, almost 3-winged, with nodes throughout their length. Leaves 6 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, ultimately often pendent; base broad with a prominent ligule. Panicles 10 in. long, 2 in. broad, with remote peduncles, but often reduced to 1 or 2 few-flowered subterminal always corymbose not umbelled clusters; lowest bracts similar to the topmost leaves. Spikelets ovoid or broadly ellipsoid, $\frac{1}{4}$ - $\frac{1}{3}$ in. long. Glumes broadly elliptic, obtuse, hairy outside, 3-5-ribbed, blackish-green on the sides, ending in a bristle $\frac{1}{4}$ - $\frac{1}{2}$ the length of the glume. Hypogynous bristles absent or quite rudimentary.

Darfur: Jebel Marra. Upper Nile Province.

F. stricta Steud.

Herb, hairy at least on the backs of the glumes; rhizome absent or sometimes $\frac{1}{2}$ in. long, very slender; culms tufted, 12-18 in.

high, slender, with leaves throughout their length. Leaves 1-2 in. long, $\frac{1}{8}$ - $\frac{1}{6}$ in. broad, with 1 main nerve. Clusters of spikelets usually 1-3, not more than 3 in. from the top of the culm, subsessile, of 1-6 spikelets. Spikelets $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. broad. Glumes elliptic-lanceolate, brown; keel green, produced into a minute mucro. Hypogynous bristles 6, 5 or 3, longer than the nut.

Equatoria.

F. ciliaris (L.) Roxb.

F. glomerata Lam.

Hairy annual herb; culms 4-16 in. high, rather slender. Leaves 4-6 in. long, $\frac{1}{2}$ in. broad, prominently 5-nerved. Panicles oblong, thin, of a few often close clusters. Spikelets $\frac{1}{3}$ - $\frac{1}{2}$ in. long, $\frac{1}{8}$ - $\frac{1}{6}$ in. broad. Glumes dark-green to dull-brown, 3-nerved; keel produced into a long bristle. Hypogynous bristles 3 or 6; outer 3 linear or absent; inner 3 as long as the nut, with a long linear claw, falling with the nut.

Upper Nile Province.

F. leptostachya Oliv.

Annual herb. Leaves often 4-8 in. long. Spikelets $\frac{1}{4}$ - $\frac{1}{2}$ in. long, $\frac{1}{16}$ - $\frac{1}{10}$ in. broad. Inner 3 hypogynous bristles as long as the nut, linear, with a very small elliptic lamina or with 2 recurved teeth.

Equatoria.

F. umbellata Rottb.

Perennial herb, hairy at least on the glumes; rhizome stout, horizontal, woody; culms 1 $\frac{1}{2}$ -5 ft. high, robust, with nodes throughout their length. Leaves up to 6 in. long, $\frac{1}{4}$ -1 in. broad. Panicles long, oblong, often with many axillary compound corymbs and very numerous spikelets. Spikelets $\frac{1}{4}$ - $\frac{1}{3}$ in. long, $\frac{1}{8}$ - $\frac{1}{6}$ in. broad, green or dull-chestnut. Glumes elliptic; keel produced into a curved bristle. Outer 3 hypogynous bristles linear, small or absent; inner 3 as long as the nut, obovate-truncate, sessile or hardly clawed.

Equatoria.

11. **LIPOCARPHA R. Br.**

Lipocarpa senegalensis (Lam.) Th. & H. Dur.

L. argentea R. Br.

Glabrous herb; rhizome usually absent, sometimes up to 1 $\frac{1}{2}$ in. long; culms tufted, 4-24 in. high, without a node between the basal leaves and the single head. Leaves sometimes as long as the culm but often only $\frac{1}{2}$ its length, $\frac{1}{8}$ - $\frac{1}{6}$ in. broad, rather fleshy at its base. Spikelets white, 3-10 to a head, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. broad, ovoid or cylindric, smooth; bracts 2-3, horizontal, the lowest 1-4 in. long. Glumes obovate with an obtuse triangular tip. Style $\frac{2}{3}$ the length of the nut. Nut about $\frac{1}{2}$ the length of the glume.

Fung District. Equatoria.

L. prieuriana Steud.

Glabrous herb; culms annual, tufted, 4-16 in. high, 3-angled, striated. Leaves $\frac{1}{2}$ - $\frac{1}{2}$ the length of the culm, linear. Spikelets 3-18 to a head, $\frac{1}{3}$ in. long, $\frac{1}{8}$ in. broad, very dense, smooth, usually purple or dark-reddish, sometimes paler; bracts 3-7, spreading, up to 1-4 in. long. Glumes broadly obovate, very obtuse. Lower translucent scale ovate, almost orbicular, 5-nerved. Style absent or very short. Nut $\frac{3}{4}$ the length of the glume.

Equatoria.

12. **RHYNCHOSPORA** Vahl**Rhynchospora corymbosa** (L.) Britton.

Fig. 92.

R. aurea Vahl.

Robust nearly glabrous herb; culms 3-6 ft. high, with nodes throughout their length. Leaves 1-2 ft. long, $\frac{1}{4}$ in. broad, the margin scabrous downwards. Panicles often 12-16 in. long, with lower axillary distant corymbs 2-5 in. in diameter, bearing frequently 100-200 spikelets; lowest bract similar to the highest leaf. Spikelets mostly in clusters of 3-10, brown, $\frac{1}{3}$ in. long, lanceolate, perfecting 1 nut. Hypogynous bristles 6, as long as the nut, scabrous with upward-pointing barbs. Nut (excluding the beak) $\frac{1}{2}$ the length of the glume; beak at least as long as the nut.

Equatoria.

13. **SCIRPUS** L.

- A. Spikelets solitary on each culm, subtended by 1 short setaceous bract *S. isolepis*.
- AA. Spikelets few to many on each culm:
- B. Clusters of spikelets solitary, sessile on the culms:
- C. Glumes produced into a long somewhat recurved bristle at the apex *S. squarrosus*.
- CC. Glumes not produced at the apex:
- D. Spikelets very small, clustered into a terminal head $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter, with 3-4 bracts subtending the head
S. microcephalus.
- DD. Spikelets comparatively large, clustered into a lateral head $\frac{1}{2}$ or more in. in diameter, with 1 bract resembling a continuation of the culm and often exceeding it in length:
- (a) Glumes acutely acuminate:
- (b) Culms slender, not jointed, about $\frac{1}{8}$ in. in diameter; nut transversely ribbed *S. supinus*.
- (bb) Culms stout, appearing jointed, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter; nut smooth *S. articulatus*.
- (aa) Glumes at most mucronate-subacute; culms slender, the bract above the flower-cluster much longer than the culm *S. proelongatus*.

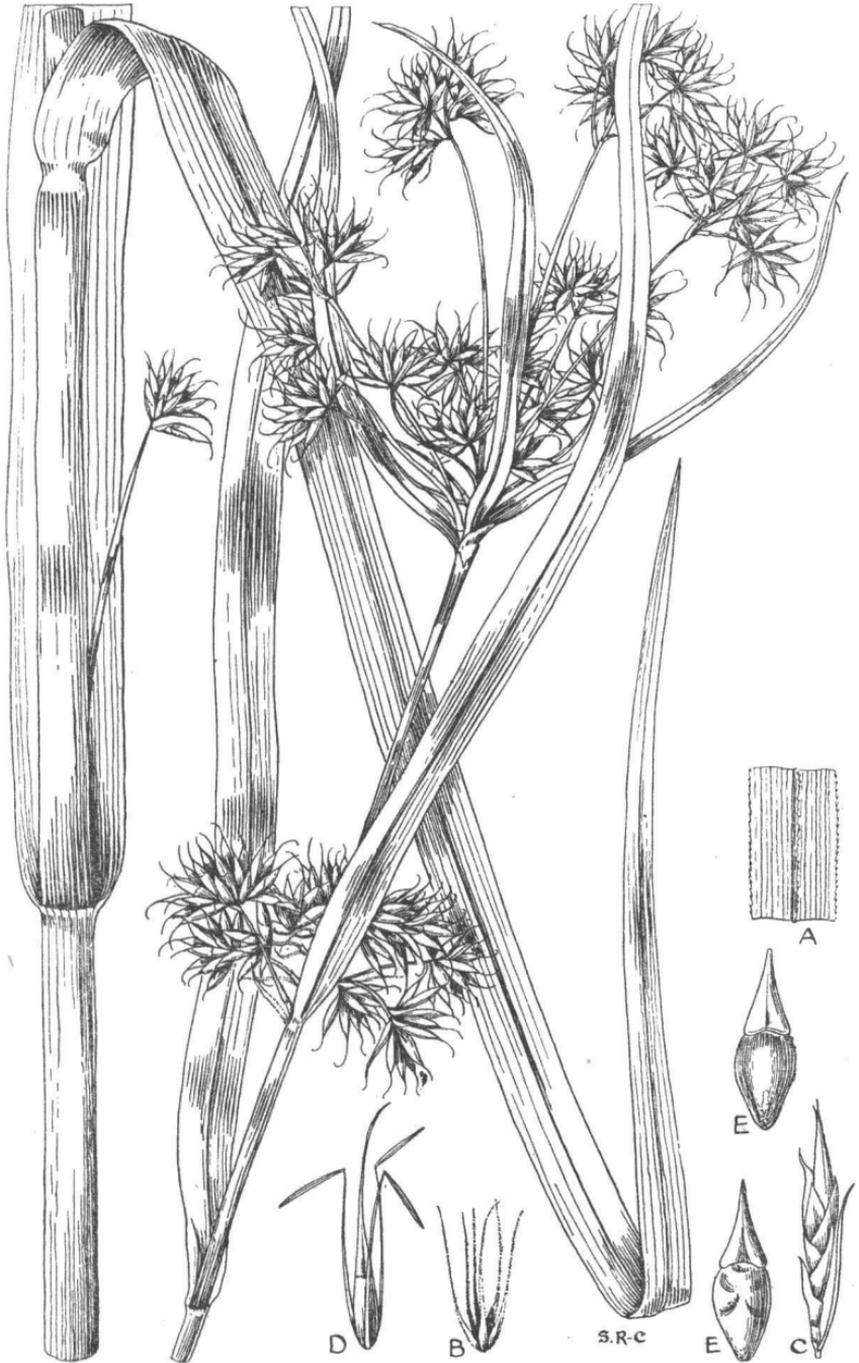


Fig. 92—*RHYNCHOSPORA CORYMBOSA* (L.) Britton.

A, back of leaf. B, bracteoles. C, spikelet. D, stamens and pistil. E, E, nuts.

BB. Clusters of spikelets, or some of them, pedunculate, rarely solitary:

- (c) Spikelets in dense globose clusters *S. cubensis*.
 (cc) Spikelets not in dense globose clusters:
 (d) Culms sharply triangular, with 2 or 3 long well-developed leaves *S. maritimus*.
 (dd) Culms terete, with or without very small leaves
S. brachyceras.

Scirpus isolepis (Nees) Boeck.

Glabrous tufted annual herb; culms 1-10 in. high, setaceous. Leaves $\frac{1}{4}$ - $1\frac{1}{2}$ in. long, setaceous. Spikelets 1 to a culm, $\frac{1}{8}$ - $\frac{1}{4}$ in. long, ovoid-ellipsoid, dense, chestnut-coloured, standing out at right-angles from the culm which is apparently continued by a bract $\frac{1}{4}$ -1 in. long. Glumes obovate with a triangular tip, falling in fruit from the lowest nut-bearing glume upwards. Hypogynous bristles absent.

Kassala: Gallabat.

S. squarrosus L.

Small glabrous tufted annual herb; culms 2-8 (or rarely -16) in. high. Leaves $\frac{1}{3}$ the length of the culm, $\frac{1}{20}$ - $\frac{1}{8}$ in. broad. Heads of 1-6 (rarely -10) spikelets; bracts 3-5, leaf-like, spreading or pendent, 1-2 (sometimes -4) in. long. Spikelets $\frac{1}{8}$ - $\frac{1}{4}$ in. long, with very many flowers, greenish or brownish. Glumes narrowly obovate, suddenly narrowed into a linear subobtuse mucro not longer than the glume, falling early in fruit.

Kassala: Gallabat. Equatoria.

S. microcephalus (Steud.) Dandy, comb. nov.

Kyllinga microcephala Steud.¹; *S. kyllingioides* Boeck.

Glabrous perennial herb; slender stolons sometimes present; culms 1-6 (or rarely -16) in. high, slender. Leaves $\frac{1}{2}$ as long as the culm, $\frac{1}{20}$ in. broad, grass-like. Heads subglobose, $\frac{1}{8}$ - $\frac{1}{4}$ (or rarely - $\frac{1}{4}$) in. in diameter, terminal, green or pale-brown, the numerous glume-points standing out straight on all sides; bracts 3-4, spreading or pendent, leaf-like, longer than the head, sometimes 2-3 in. long. Glumes ovate, contracted rather suddenly into a linear obtuse termination.

Central and Southern Sudan.

S. supinus L.

Glabrous annual herb; culms tufted, 2-12 in. high, terete, without a node between the base and the single head. Leaves very short, usually less than 1 in. long. Spikelets 1-7 to a head, $\frac{1}{2}$ - $\frac{1}{4}$ in.

¹In *Flora*, vol. 25, 2, p. 597 (1842).

long, ellipsoid or oblong, dusky-greenish, obscurely angular; lowest bract resembling a continuation of the culm, 1-6 in. long. Glumes ovate.

Darfur.

S. articulatus L.

Glabrous annual herb; culms tufted, 2-12 in. high, $\frac{1}{4}$ - $\frac{1}{3}$ in. in diameter, terete, when dry showing transverse false joints $\frac{1}{4}$ -2 in. apart. Leaves absent. Heads globose, dense, apparently lateral; lowest bract terete, resembling a continuation of the culm and usually longer than it, sometimes 2 ft. long. Spikelets $\frac{1}{2}$ or more in. long, cylindrical, acute or obtuse, green or variegated with purple-brown. Glumes ovate, subacute and triangular at the apex. Nut smooth.

Central and Southern Sudan.

S. praelongatus Poir.

S. articulatus (non L.) Broun & Massey p.p.

Similar to *S. articulatus* but culms slender, only $\frac{1}{12}$ in. in diameter. Spikelets $\frac{1}{4}$ - $\frac{1}{3}$ in. long, very obtuse. Glumes very obtuse or at most mucronate-subacute at the apex, concave and somewhat inflated. Nut with wavy horizontal lines.

Kordofan.

S. cubensis Poepp. & Kunth.

Herb, glabrous except the glumes; stolons often present; culms 1-2 ft. high, stout, 3-angled at the top, without a node between the base and the umbel. Leaves often as long as the culm, $\frac{1}{2}$ in. broad, nearly smooth or rough on the margin. Umbels simple; heads 4-12 (sometimes 1-3), stellate-globose, about $\frac{1}{2}$ in. in diameter, brown, of numerous spikelets, on peduncles $\frac{1}{2}$ -2 $\frac{1}{2}$ in. long; bracts often 5-10, the lower up to 12 in. long. Spikelets $\frac{1}{4}$ - $\frac{1}{3}$ in. long, many-flowered. Glumes rigid, ovate, acute at the apex, their points spreading on all sides; margin ciliate.

Central and Southern Sudan.

S. maritimus L.

Sea Club-rush.

Glabrous perennial herb; stolons hardening into rhizomes; culms 1-7 ft. high, stout, 3-angled. Leaves several, often as long as the culm, $\frac{1}{4}$ - $\frac{1}{3}$ in. broad. Umbels compound or simple or reduced to a head of 1-3 spikelets, rarely exceeding 4-6 in. in diameter; bracts several, similar to the leaves, the lowest often 4-8 in. long. Spikelets 3-40 to an umbel, $\frac{1}{2}$ -2 in. long, $\frac{1}{2}$ in. broad, dark-brown, often clustered. Glumes ovate, hairy at the apex, the keel produced into a mucro.

Northern Sudan: near Shendi. Blue Nile Province: river-bank opposite Wad Medani.

S. brachyceras Hochst. ex A. Rich.*S. corymbosus* (Roth) Heyne ex Roth, non L.

Glabrous perennial herb; rhizome 2-4 in. long, horizontal; culms up to 5 ft. high, stout, terete. Leaves absent or very small. Umbels apparently lateral, simple or compound, 3-6 in. in diameter; lower bract resembling a continuation of the culm, 1-4 in. long. Spikelets clustered, $\frac{1}{4}$ - $\frac{1}{3}$ in. long, ellipsoid, dusky-brown. Glumes ovate, glabrous, mucronate at the apex.

*Darfur: Jebel Marra, 8700 ft.*14. **SCLERIA** Berg.

- A. Bisexual spikelets many; hypogynous disk rudimentary:
- B. Annual herbs:
- (a) Spikelets thinly hairy or glabrous *S. pergracilis*.
- (aa) Spikelets hispid, long-ciliate *S. melanotricha*.
- BB. Perennial herbs with horizontal rhizomes:
- (b) Bracts and glumes bristly-pilose with dark-purple hairs; stems and leaves usually rather densely pubescent
S. hirtella.
- (bb) Bracts and glumes glabrous or at most shortly pubescent; stems and leaves glabrous or thinly pubescent
S. bulbifera.
- AA. Bisexual spikelets none or very few; hypogynous disk generally conspicuous:
- C. Lobes of the disk forming a cup holding the base of the nut; margin of disk densely yellow-brown-ciliate ... *S. racemosa*.
- CC. Disk not as above:
- D. Rhizome absent or hardly any:
- E. Nut marked with small squares or oblongs:
- (c) Culms smooth or very nearly so:
- (d) Nut ovoid or cylindric-ellipsoid:
- (e) Nut ovoid *S. foliosa*.
- (ee) Nut cylindric-ellipsoid *S. glandiformis*.
- (dd) Nut globose *S. globinux*.
- (cc) Culms minutely retrorse-scabrous *S. complanata*.
- EE. Nut smooth:
- F. Culms, leaves and inflorescences very slender
S. gracillima.
- FF. Culms medium-sized, not very slender:
- (f) Nut broader than long, depressed-globose
S. schimperiana var. *hypoxis*.
- (ff) Nut longer than broad, ovoid or ellipsoid
S. canaliculatotriquetra.
- DD. Rhizome thick, creeping; stout plant with copious inflorescences *S. melanomphala*.

Scleria pergracilis (Nees) Kunth.

Annual herb, glabrous or nearly so; culms tufted, 1-2 ft. high, very slender. Leaves 4-12 in. long, $\frac{1}{20}$ - $\frac{1}{16}$ in. broad. Spikelets

(many bisexual) in clusters of 2-5, $\frac{1}{8}$ - $\frac{1}{4}$ in. long, sessile in sub-simple spikes 2-6 in. long; bracts of the clusters narrowly oblong, shortly subulate-acuminate, glabrous. Bisexual spikelets of about 7 glumes; 2 lowest glumes empty; third glume $\frac{1}{8}$ - $\frac{1}{4}$ in. long, elliptic-oblong, dark-purple with pale margins, subtending the nut; upper glumes male or empty. Male spikelets many, similar to the bisexual ones but without the nut-bearing glume. Nut white, warted or muricate.

Equatoria.

S. melanotricha Hochst. ex A. Rich.

Hairy annual herb; culms 4-24 in. high, slender. Leaves often $\frac{1}{2}$ - $\frac{3}{4}$ the length of the culm, $\frac{1}{16}$ - $\frac{1}{8}$ in. broad. Clusters of spikelets $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter, of 3-12 spikelets, sessile, in simple pendent spikes 2-7 in. long, ciliate with long black-red or white hairs; bracts inconspicuous. Spikelets $\frac{1}{2}$ in. long, black-red or pallid. Nut straw-coloured, transversely muricate.

Equatoria.

S. hirtella Sw.

Hairy perennial herb; rhizome horizontal, $\frac{1}{8}$ - $\frac{1}{4}$ in. in diameter; culms 8-24 in. high, slender, narrowed at the base. Uppermost leaves 4-8 in. long, $\frac{1}{12}$ - $\frac{1}{8}$ in. broad; lower leaves shorter, the lowest reduced to tight sheaths. Spikes 2-5 in. long, with clusters of 3-12 spikelets standing $\frac{1}{4}$ -1 in. apart, pendent in fruit; bracts setaceous. Spikelets $\frac{1}{2}$ in. long, chestnut or brown, hispid.

Equatoria: Imatong Mountains, Mount Baghanj, 6000-7000 ft.

S. bulbifera Hochst. ex A. Rich.

S. schweinfurthiana Boeck.; *S. buchananii* Boeck.

Very thinly hairy or glabrous herb; rhizome horizontal, $\frac{1}{8}$ in. in diameter; culms 1-2 ft. high, slender. Leaves 4-12 in. long, $\frac{1}{12}$ - $\frac{1}{8}$ in. broad. Inflorescences spike-like; clusters distinct, 10-14 on a rachis 4-8 in. long. Spikelets numerous, often 10-12 in a cluster, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, ellipsoid-oblong, chestnut.

Equatoria.

S. racemosa Poir.

Fig. 93.

Glabrous robust perennial herb; rhizome thick, covered with ovate-oblong striate black-red scales; culms 3-6 in. high, $\frac{1}{2}$ - $\frac{1}{4}$ in. in diameter. Leaves 1-2 ft. long, $\frac{1}{2}$ -1 $\frac{1}{4}$ in. broad, 3-nerved, scabrous on the margin; sheath 3-winged, 2 wings much stronger than the third; ligule ovate-triangular, often $\frac{1}{2}$ in. long. Inflorescences often 12 in. long; partial panicles 2-3 in. long on stout axillary peduncles running into a terminal compound panicle. Spikelets all unisexual, $\frac{1}{2}$ in. long, pallid or dusky. Nut $\frac{1}{4}$ - $\frac{1}{2}$ in. long, smooth.

Equatoria.



Fig. 93—*SCLERIA RACEMOSA* Poir.

A, male and female spikelets. B, male spikelet. C, anther. D, pistil.
E, nut with glumes.

S. foliosa Hochst. ex A. Rich.

Herb, glabrous or nearly so; culms 6-24 in. high, rather slender, tufted. Leaves 4-18 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, 3-nerved, mostly with peduncles in their axils. Peduncles bearing 1-4 female nut-bearing spikelets, the lowest hardly exerted from the sheath, thread-like, $\frac{1}{2}$ - $2\frac{1}{2}$ in. long. Nut ovoid.

Upper Nile Province: Sobat.

S. glandiformis Boeck.

Herb, nearly glabrous except the ligules; rhizome hardly any; culms 16-24 in. high. Leaves up to 12 in. long, $\frac{1}{2}$ in. broad. Lower peduncles remote, nearly included in the sheath of the bract, bearing oblong inflorescences with 6-12 nut-bearing spikelets; bracts $\frac{1}{2}$ - $1\frac{1}{2}$ in. long. Spikelets nearly $\frac{1}{2}$ in. long, straw-coloured, marked with brown. Nut $\frac{1}{2}$ in. long, glabrous, marked with small squares or oblongs.

Equatoria.

S. globinix C. B. Clarke.

Leaves with spreading hairs or glabrous. Nut large, globose, marked with small squares or oblongs, the margins of the reticulations glandular or minutely hairy. Otherwise as *S. glandiformis*.

Equatoria.

S. complanata Boeck.

Culms 3 ft. high, minutely rough with rust-coloured downward-pointing points. Nut subglobose, coarsely marked with small squares or oblongs, pale- or discoloured-bluish. Otherwise as *S. foliosa*.

Equatoria.

S. gracillima Boeck.

Glabrous very slender herb; culms 16-24 in. high, almost thread-like. Leaves 4-8 in. long, $\frac{1}{20}$ - $\frac{1}{12}$ in. broad. Panicles very slender, with few branches, the lowest peduncle distant, thread-like, exerted $\frac{1}{2}$ - $1\frac{1}{2}$ in., nodding, with 1 nut-bearing spikelet. Spikelets apparently all unisexual, the female ones fewer, $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Nut globose, smooth, white; 3 lobes of the disk very short.

Equatoria.

S. schimperiana var. **hypoxis** (Schweinf.) C. B. Clarke.

Slightly hairy or almost glabrous herb; culms 16 in. high. Leaves 12 in. long, $\frac{1}{4}$ or more in. broad, very obtuse at the apex. Lowest axillary peduncle exerted 1-2 in., flexuous, slender, thickened-triangular at the top, bearing 3-5 nut-bearing spikelets. Female spikelets $\frac{1}{2}$ in. long, chestnut-brown. Nut large, depressed-globose, smooth, white; 3 lobes of the disk small, oblong, pallid.

Kassala: Gallabat.

S. canaliculatotriquetra Boeck.

Robust herb; culms 3-5 ft. high. Leaves 8-12 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Lowest axillary peduncle remote, often bearing 20-50 spikelets, often exserted 3-6 in., flexuous, not very slender. Nut $\frac{1}{2}$ or more in. long, white, smooth; 3 lobes of the disk small, ovate, tipped with a minute tail.

Equatoria.

S. melanomphala Kunth.

Robust herb, hairy or more often almost glabrous except the inflorescences; rhizome creeping, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter; culms 2-3 ft. high, very scabrous or nearly smooth on the 3 angles. Leaves up to 24 in. long, $\frac{1}{2}$ in. broad, very scabrous on the margin; sheath narrowly 3-winged. Inflorescences straggling, 1-2 ft. long, compound; partial panicles often long-pedunculate, dense, oblong or almost linear. Spikelets unisexual, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Nut $\frac{1}{2}$ in. long excluding the disk, ovoid, smooth, white, the tip often black.

Equatoria.

170. GRAMINEAE

Annual or perennial herbs, rarely shrubs or trees; stems erect, ascending or prostrate and creeping, usually branched at the base, in perennials forming sterile shoots (innovations) and flowering stems (culms), in annuals only the latter present; culms cylindrical, rarely flattened, jointed, usually hollow in the internodes, closed at the nodes. Leaves alternate, distichous, simple, sometimes crowded at the bases of the stems, consisting of sheath, ligule and lamina; sheath encircling the culm, with the margins free and overlapping or more or less connate, frequently swollen at the base (sheath-node); ligule placed at the junction of the sheath and lamina, membranous or reduced to a fringe of hairs, rarely absent; lamina usually long and narrow, rarely broad, usually passing gradually into the sheath, rarely with a petiole-like base, flat or more or less convolute or involute or terete, parallel-nerved. Flowers usually hermaphrodite, sometimes unisexual, small and inconspicuous, usually consisting of stamens and pistil and of 2 or 3 minute hyaline or fleshy scales (lodicules) representing the perianth, subsessile between 2 bracts (lemma¹ and palea²), the whole forming a floret or false flower; florets 1 to many, distichous, sessile on a short or minute slender axis (rhachilla) and usually bearing at the base 2 empty bracts (upper and lower glume), the florets and glumes forming a spikelet; spikelets pedicellate in open or contracted panicles or racemes, or sessile in spikes. Stamens hypogynous, 1-6, rarely more, usually 3, with delicate filaments and 2-locular anthers, the latter opening usually by longitudinal slits. Ovary superior, 1-locular; styles usually 2, rarely 1 or 3; stigmas generally plumose; ovule 1, anatropous, often

¹Lemma = flowering glume = valve = lower palea.

²Palea = valvule = pale = upper palea.

adnate to the adaxial side of the loculus. Fruit usually a caryopsis with a thin pericarp adnate to the seed, or rarely a nut or a berry, with starchy endosperm and a small embryo at the base on the abaxial face.

The following grasses are cultivated in the Sudan: *Zea mays* L., Maize; *Sorghum* spp., Dura; *Triticum* spp., Wheat; *Avena* sp., Oat; *Pennisetum* spp., Bulrush Millet; *Setaria italica* (L.) Beauv., Italian Millet; *Eleusine coracana* (L.) Gaertn., African Millet; *Coix lacrymajobi* L., Job's Tears; *Oryza* spp., Rice.

KEY TO GROUPS.

- A. Spikelets 1- to many-flowered, breaking up at maturity above the more or less persistent glumes, or if falling entire then not 2-flowered with the lower floret male or barren and the upper hermaphrodite, usually more or less laterally compressed or terete:
- B. Spikelets bisexual, similar:
 - C. Shrubs or trees with woody often tall persistent culms, very rarely perennial herbs; leaf-lamina flat, many-nerved, often with transverse veins, usually with a petiole-like base and articulated with the sheath; lemmas 5- to many-nerved, usually awnless; lodicules usually 3; stigmas mostly 2 or 3 GROUP 1.
 - CC. Perennial or annual herbs, with herbaceous or very rarely somewhat woody culms; leaf-lamina usually sessile and not articulated with the sheath, or if with a petiole-like base then not with the characters given above:
 - D. Spikelets borne in open or contracted or spike-like panicles, less often in 1-sided racemes or spikes and then with the lower or both glumes suppressed if on opposite sides of a continuous rhachis, or with 2 or more fertile florets if on one side of the rhachis, or in the latter case if with 1 fertile floret then the leaf-laminae transversely veined:
 - E. Spikelets usually with 2 or more fertile florets, or very rarely with 1 fertile floret (*Pseudobromus*, *Enneapogon*):
 - F. Lemmas and rhachilla-joints glabrous or hairy, in the latter case with the hairs not enveloping the lemma; low or moderately tall grasses:
 - G. Glumes usually shorter than the lowest floret and with the upper florets distinctly exerted; lemmas awnless or with a straight or curved awn from the entire or 2-fid apex, or several-awned or -lobed:
 - H. Lemmas usually 5- to many-nerved, very rarely 3-nerved:
 - I. Lemmas entire or shortly 2- to 5-toothed at the apex, awnless or awned GROUP 2.

- II. Lemmas deeply cleft into 3 to many subulate or lanceolate lobes, with or without fine straight awns from their sinuses
GROUP 3.
- HH. Lemmas 1- to 3-nerved GROUP 4.
- GG. Glumes usually as long as or longer than the lowest floret, often as long as the spikelet and enclosing the florets; lemmas awnless or more often awned from the back or the sinus of the 2-lobed tip, the awn usually bent; glumes or lemmas frequently with thin shining margins
GROUP 5.
- FF. Lemmas or rhachilla-joints bearing long silky hairs which envelop the lemma (at least in fertile florets); lemmas awnless or with a straight awn from the tip, often thin; tall grasses with usually large plume-like panicles GROUP 6.
- EE. Spikelets with 1 fertile floret with or without 1 or 2 male or barren florets below it:
- J. Glumes very minute or suppressed; palea 3- or more-nerved; stamens usually 6; spikelets usually flattened on both sides GROUP 7.
- JJ. Glumes usually well developed, at least the upper; palea usually 2-nerved; spikelets usually not flattened:
- K. Spikelets with 3 florets, the lower 2 florets male or barren and the terminal floret hermaphrodite GROUP 8.
- KK. Spikelets with 2 or 1 florets:
- L. Spikelets with 2 florets, the lower floret male or barren, the upper hermaphrodite
GROUP 9.
- LL. Spikelets with 1 floret:
- M. Spikelets usually breaking up at maturity, the rhachilla disarticulating above the more or less persistent glumes, very rarely falling entire and then with a firmly membranous awned or 5-nerved lemma:
- N. Lemma hyaline or membranous at maturity, rarely indurated and then laterally compressed, awnless or awned from low down on the back or from the 2-fid tip:
- O. Lemma usually 3- to 5-nerved, frequently awned; glumes mostly longer and firmer than the lemma or if the lemma equaling the glumes then sometimes firmer; grain usually with an adhering pericarp GROUP 10.

OO. Lemma 1- to 3-nerved, awnless; glumes and lemma very similar in texture, hyaline or thinly membranous, the lower glume often shorter than the upper; grain usually with a free pericarp

GROUP 11.

NN. Lemma indurated and rigid at maturity terete or dorsally compressed, with involute or convolute margins, tightly enveloping the grain, usually with a terminal awn or 3 awns

GROUP 12.

MM. Spikelets falling entire at maturity, either singly or in clusters, from the axes of slender spike-like panicles or racemes; lemma delicate, 1- to 3-nerved

GROUP 13.

DD. Spikelets sessile or shortly pedicellate along one side of the axes of solitary, digitate or scattered spikes or spike-like racemes with 1 fertile floret (very rarely more in *Tetrapogon* and then with long-ciliate lemmas) and 1- to 3-nerved lemmas

GROUP 14.

BB. Spikelets unisexual, dissimilar, the sexes mixed or in different parts of the same inflorescence:

P Leaf-lamina with slanting lateral nerves running obliquely from the midrib to the margin; fertile lemma papery, much longer than the glumes, clothed with minute hooked hairs; stigmas 3; stamens 6

GROUP 15.

PP. Leaf-lamina with the lateral nerves parallel to the midrib; fertile lemma coriaceous to cartilaginous, smooth, usually shorter than the glumes; stigmas 2; stamens 2 or 3

GROUP 16.

AA. Spikelets 2-flowered, falling entire at maturity, usually with the upper floret fertile and the lower male or barren and in the latter case often much reduced, all alike or differing in size, shape and structure, frequently dorsally compressed:

Q. Spikelets solitary or paired, more or less similar; glumes usually membranous, the lower usually smaller or sometimes suppressed; lower lemma mostly resembling the upper glume in texture; upper lemma papery to very tough and rigid, usually awnless

GROUP 17.

QQ. Spikelets often paired, with one sessile and the other pedicellate, those of each pair similar or more often dissimilar, rarely solitary and all alike; glumes as long as the spikelet and enclosing the florets, more or less rigid and firmer than the hyaline or membranous lemmas; upper lemma usually awned

GROUP 18.

GROUP 1.

- A. Fruit a nut or berry; stamens 6; spikelets 1-3-flowered, in dense terminal heads or globose whorls; bamboos of the plains and lower mountains OXYTENANTHERA. 79.
- AA. Fruit a caryopsis; stamens 3; bamboos of the high mountains ARUNDINARIA. 11.

GROUP 2.

- A. Leaf-lamina lanceolate or ovate-lanceolate, flat, with numerous transverse veins between the main nerves; spikelets subsessile in long one-sided racemes; lemmas awned from the tip STREPTOGYNA. 105.
- AA. Leaf-lamina more or less linear, without transverse veins:
- B. Spikelets in very short secund spikes or singly on the branches of much-contracted almost capitate panicles, laterally very much compressed; herbs 2-5 in. high DRAKE-BROCKMANIA. 38.
- BB. Spikelets not arranged as above:
- C. Spikelets arranged in open or contracted panicles, or on opposite sides of the axes of racemes:
- D. Lemmas rounded on the back or only keeled towards the tip, usually mucronate or awned:
- E. Lemmas lanceolate to broadly oblong; glumes not markedly unequal:
- F. Spikelets subsessile on opposite sides of the axes of simple spike-like racemes:
- (a) Perennial herbs BRACHYPODIUM. 16.
- (aa) Annual herbs TRACHYNIA. 109.
- FF. Spikelets pedicellate in panicles:
- G. Fertile floret 1; lemma lanceolate, 3-nerved, awned from close to the tip ... PSEUDOBROMUS. 90.
- GG. Fertile florets more than 1:
- H. Lemmas usually awned from the often 2-toothed tip; styles on a hairy appendage of the ovary BROMUS. 17.
- HH. Lemmas mucronate or awned from the entire tip; styles terminal on the top of the glabrous or hairy ovary FESTUCA. 51.
- EE. Lemmas subulate-lanceolate, awned from the tip; glumes generally very unequal VULPIA. 120.
- DD. Lemmas compressed and keeled, awnless, often hairy at the base POA. 88.
- CC. Spikelets densely imbricate, in compact ovoid short heads or rarely elongated spikes AELUROPUS. 3.

GROUP 3.

- A. Lemmas divided into 9 similar subulate lobes; fertile floret 1 ENNEAPOGON. 44.
- AA. Lemmas divided into 4 thin lobes alternating with 5 straight awns; fertile florets 3-5 SCHMIDTIA. 97.

GROUP 4.

- A. Spikelets pedicellate in open or contracted sometimes spike-like panicles:
- B. Lemmas toothed or lobed, awned:
- C. Lemmas 3-awned TRIRAPHIS. 114.
- CC. Lemmas 1-awned:
- (a) Spikelets in slender more or less secund racemose arranged racemes; racemes dense, very numerous in spike-like inflorescences LEPTOCARYDION. 66.
- (aa) Spikelets in loose or contracted panicles; lemmas keeled, usually long-awned CRINIPES. 24.
- BB. Lemmas entire, awnless or mucronate or shortly 1-awned:
- D. Lemmas gradually tapering into a rough bristle; keels of the paleas broadly winged; stamen 1 ELYTROPHORUS. 43.
- DD. Lemmas awnless; keels of the paleas usually wingless; stamens 3 or 2 ERAGROSTIS. 46.
- AA. Spikelets sessile or very shortly pedicellate in 2-rowed secund spikes or spike-like racemes:
- E. Spikes solitary and terminal on the culms:
- (b) Lemmas shortly awned TRIPOGON. 113.
- (bb) Lemmas not awned HARPACHNE. 54.
- EE. Spikes or racemes digitate or scattered, never solitary:
- F. Spikes or racemes arranged on an elongated axis; lemmas mostly emarginate or lobed:
- G. Florets conspicuously exerted from the glumes:
- H. Spikelets strongly laterally compressed and keeled, falling entire DESMOSTACHYA. 32.
- HH. Spikelets terete or not strongly compressed and keeled, breaking up at maturity between the florets:
- I. Spikelets $\frac{1}{4}$ - $\frac{1}{2}$ in. long, subterete, in loose racemes, often dark-coloured DIPLACHNE. 37.
- II. Spikelets usually less than $\frac{1}{4}$ in. long, compressed, in dense racemes or spikes, usually pale LEPTOCHLOA. 67.
- GG. Florets not exerted from the glumes:
- J. Racemes not deciduous; lemmas mucronate or awned TRICHONEURA. 112.
- JJ. Racemes finally deciduous; lemmas obscurely mucronulate DINEBRA. 36.
- FF. Spikes or racemes digitate or subdigitate:
- K. Glumes strongly keeled; grain not hollowed out:
- L. Spikes terminating with a spikelet; glumes and lemmas not mucronate ELEUSINE. 41.
- LL. Spikes terminating with a sharp point; upper glume and lemmas mucronate or shortly awned DACTYLOCTENIUM. 30.
- KK. Glumes not keeled; grain deeply hollowed out; lemmas awnless COELACHYRUM. 22.

GROUP 5.

- A. Panicles very dense and spike-like; lemmas awnless, mucronate or minutely awned from close to the tip KOELERIA. 61.
- AA. Panicles loose or contracted but not spike-like; lemmas awned:
- B. Lemmas awned from the base of the 2-lobed tip:
- C. Florets 3 to many in a spikelet:
- (a) Spikelets pedicellate, paniced or racemose:
- (b) Florets long-exserted; leaf-lamina short, horizontally spreading; awns not flattened, up to $\frac{3}{4}$ in. long PHAENANTHOECIUM. 86.
- (bb) Florets and leaf-lamina not as above; awns flattened, much less than $\frac{1}{2}$ in. long ASTHENATHERUM. 12.
- (âa) Spikelets sessile or subsessile in usually paired flexuous spiciform racemes LINTONIA. 68.
- CC. Florets 2 in a spikelet; awns kneed, twisted below the bend ... PENTASCHISTIS. 84.
- BB. Lemmas awned from the back:
- D Perennial herbs; spikelets 2-6-flowered; rhachilla more or less hairy; lemmas 2-fid at the apex HELICTOTRICHON. 55.
- DD. Annual herbs; spikelets 2-flowered; rhachilla glabrous; lemmas 2-toothed at the apex AIRA. 5.

GROUP 6.

- Only Sudan genus PHRAGMITES. 87.

GROUP 7.

- A. Spikelets with 2 reduced sterile lemmas at the base of the fertile floret; fertile lemma coriaceous; stamens 6 ORYZA. 78.
- AA. Spikelets without sterile lemmas; fertile lemma papery; stamens 6-3 LEERSIA. 64.

GROUP 8.

- Only Sudan genus EHRHARTA. 40

GROUP 9.

- A. Lemma of the upper floret evenly pubescent or pilose, very rarely glabrous, shortly 2-lobed or entire at the apex, the lobes acute or obtuse LOUDETIA. 69.
- AA. Lemma of the upper floret transversely bearded or with a tuft of hairs near each margin, deeply 2-fid ... DANTHONIOPSIS. 31.

GROUP 10.

- A. Axis of the spikelet not produced beyond the floret:
- B. Glumes awnless AGROSTIS. 4.
- BB. Glumes awned from the notched or lobed tip; panicles more or less spike-like POLYPOGON. 89.

- AA. Axis of the spikelet usually prolonged beyond the floret into a glabrous or hairy bristle; glumes saccate at the base; panicles spike-like, cylindric GASTRIDIMUM. 52

GROUP 11.

- A. Spikelets arranged in ovoid or ellipsoid heads; annual herbs CRYPSIS. 25.
- AA. Spikelets not arranged as above:
- B. Grain with a prominent beak at the apex; perennial herbs UROCHONDRA. 117.
- BB. Grain not as above SPOROBOLUS. 104.

GROUP 12.

- Only Sudan genus ARISTIDA. 9.

GROUP 13.

- A. Glumes awnless, the upper or both muricate:
- B. Lower glume minute or suppressed; spikelets in sessile deciduous clusters of 2-5 TRAGUS. 110.
- BB. Lower glume well developed; spikelets in pairs or solitary on a flattened branch and deciduous with it ... LATIPES. 63.
- AA. Glumes finely long-awned, smooth; spikelets solitary PEROTIS. 85.

GROUP 14.

- A. Spikelets with 1 (rarely more) fertile and 1 or more imperfect florets above or below the fertile:
- B. Fertile floret with 2 imperfect florets below and 2 or more above it; upper glume with a stiff bristle from the back; spikes mostly solitary CTENIUM. 26.
- BB. Fertile floret with imperfect florets only above it:
- C. Awns plumose-hairy in the lower part; spikelets in pedicellate deciduous articulate distant clusters in 2 or more spikes MELANOCENCHRIS. 71.
- CC. Awns not plumose-hairy in the lower part:
- (a) Lemmas narrow; spikelets in sessile inarticulate clusters in solitary elongate spikes ENTEROPOGON. 45.
- (aa) Lemmas usually widened upwards or if narrow then the spikes digitate:
- (b) Spikes 1 to 3 together; fertile florets 2 or more with more than 2 awns TETRAPOGON. 106.
- (bb) Spikes usually 4 or more together, digitate; fertile floret 1 with a single awn CHLORIS. 20.
- AA. Spikelets with 1 fertile floret and no imperfect florets:
- D. Spikelets awnless or very shortly awned:
- E. Glumes much compressed and both keeled; spikes digitate CYNODON. 28.
- EE. Lower glume boat-shaped; upper glume with a flat back MICROCHLOA. 73.

DD Spikelets with long flexuous awns; spikes digitate
SCHOENEFELDIA. 98.

GROUP 15.

Only Sudan genus LEPTASPIS. 65.

GROUP 16.

Only Sudan genus OLYRA. 75.

GROUP 17.

- A. Spikelets falling entire and singly, not subtended by bristles, or if so then the bristles persisting after the spikelets have fallen.
- B. Upper glume and lower lemma usually entire at the apex (except in *Oplismenus*), awnless or awned from the tip:
- C. Spikelets arranged in more or less open panicles or the panicles contracted and spike-like:
- D. Spikelets not subtended by bristle-like branches:
- E. Spikelets arranged in open or contracted panicles:
- F. Spikelets not or only slightly gibbous
PANICUM. 80.
- FF. Spikelets distinctly gibbous and laterally much compressed CYRTOCOCCUM. 29.
- EE. Spikelets usually arranged in cylindric spike-like panicles:
- (a) Spikelets awnless SACCIOLEPIS. 95.
- (aa) Spikelets distinctly awned SNOWDENIA. 101.
- DD. Spikelets subtended by 1 to many bristle-like branches
SETARIA. 100.
- CC. Spikelets arranged in one-sided spikes or spike-like racemes; spikes or racemes usually digitate or somewhat distant along a short or long rhachis, rarely solitary:
- G. Lemma of the upper floret more or less crustaceous or coriaceous, usually with narrow inrolled margins and exposing much of the palea:
- H. Lower glume and lowest internode of the rhachilla not forming a swollen callus at the base of the spikelet:
- I. Lower glume (when present) turned away from the rhachis of the raceme or spike, the back of the upper lemma facing it:
- J. Lower glume developed, although sometimes small:
- K. Glumes acuminate or awned, rarely only acute; upper lemma not mucronate:
- L. Culms erect or suberect; leaf-lamina linear; racemes dense ECHINOCHLOA. 39.
- LL. Culms creeping and ascending; leaf-lamina short, lanceolate to ovate; racemes loose to moderately dense OPLISMENUS. 77.

- KK. Glumes awnless, if acuminate then the upper lemma mucronate:
- M. Upper lemma acute, not mucronate
PASPALIDIUM. 81.
- MM. Upper lemma obtuse, mucronate or very shortly awned
UROCHLOA. 116.
- JJ. Lower glume absent; spikelets plano-convex
PASPALUM. 82.
- II. Lower glume turned towards the rachis, the back of the upper lemma turned away from it:
- N. Upper glume and lemmas with laterally compressed crested tips
ACROCERAS. 2.
- NN. Upper glume and lemmas not as above:
- O. Caryopsis with a linear hilum extending for almost its whole length; spikelets lanceolate in outline; aquatic grasses
LOUSIELLA. 70.
- OO. Caryopsis with a punctiform or elliptic basal hilum; spikelets usually oblong to ovate or obovate in outline; not aquatic
BRACHIARIA. 15.
- HH. Lower glume and lowest internode of the rachilla forming a swollen callus at the base of the spikelet; upper lemma mucronate or shortly awned
ERIOCHLOA. 48.
- GG. Lemma of the upper floret thinly cartilaginous, usually with flat thin margins covering much of the palea:
- P. Spikelets awned or with the upper lemma mucronate:
- Q. Upper glume and lower lemma with fine long entangled awns
ACRITOCHEAETE. 1.
- QQ. Upper glume and lower lemma awnless; upper lemma awned or mucronate
ALLOTEROPSIS. 6.
- PP. Spikelets awnless; upper lemma obtuse
DIGITARIA. 35.
- BB. Upper glume and lower lemma usually 2-lobed or emarginate at the apex, usually awned or mucronate from the sinus:
- R. Upper glume more or less gibbous on the back, usually with a distinct internode between it and the lower glume; spikelets often silky-villous ...
RHYNCHELYTRUM. 91.
- RR. Upper glume more or less straight on the back, without a distinct internode between it and the lower glume:
- S. Upper glume narrower than the lower lemma, 5-nerved; lemma and palea of the upper floret thinly crustaceous
TRICHOLAENA. 111.
- SS. Upper glume wider than the lower lemma, usually 7-nerved; lemma and palea of the upper floret thinly chartaceous
MELINIS. 72.
- AA. Spikelets falling in clusters with or without an involucre of bristles, or if falling singly then surrounded by an involucre of bristles or subtended by 1 to several bristles and falling with the bristles:

- T. Spikelets in clusters, not surrounded nor subtended by bristles; lower glume indurated ANTHEPHORA. 8.
- TT. Spikelets surrounded or subtended by 1 to many bristles; lower glume not indurated:
- U. Bristle solitary below each spikelet ... BECKEROPSIS. 13.
- UU. Bristles few to many, forming an involucre around the solitary or clustered spikelets:
- V. Bristles free to the base, fine to very fine PENNISETUM. 83.
- VV. Bristles connate at the base or to beyond the middle, often rigid or spine-like CENCHRUS. 18.

GROUP 18.

- A. Internodes of the rhachis and pedicels slender, filiform or linear, rarely thickened upwards and then the upper lemma awned and the pedicellate spikelets male or barren:
- (a) Racemes reduced to 1 spikelet, the other spikelets represented by 2 slender hairy pedicels SORGHASTRUM. 102.
- (aa) Racemes not as above:
- B Spikelets of each pair alike in sex and shape, or if different in sex then the pedicellate female one usually enveloped by long silky hairs from the base:
- C. Spikelets all pedicellate; rhachis of racemes continuous and tough; panicles spike-like, whitish ... IMPERATA. 58.
- CC. Spikelets paired, with 1 sessile and the other pedicellate; panicles large and broad, silvery and purplish SACCHARUM. 94.
- BB. Spikelets of each pair different in sex and usually also in shape and size, the pedicellate one female or barren, or if all are similar then the spikelets solitary or with only the pedicel of the pedicellate spikelets present:
- D. Racemes arranged in usually large compound panicles, not subtended by leaf-like spathes:
- E. Spikelets dorsally compressed; lower glume more or less flattened on the back SORGHUM. 103.
- EE. Spikelets laterally compressed or terete; lower glume rounded on the back:
- F. Racemes reduced to 1 sessile and 2 pedicellate spikelets CHRYSOPOGON. 21.
- FF. Racemes composed of many pairs of spikelets VETIVERIA. 118.
- DD. Racemes usually subtended by spathes, or if not then not forming large panicles:
- G. Fertile lemma awned from the tip or the sinus of the 2-toothed tip, rarely awnless:
- H. Column of awn glabrous; margins of lower glume of fertile spikelets inflexed and the glume therefore sharply 2-keeled, or if the keels rounded then the back of the glume depressed between them; callus usually short and obtuse:

- I. Awn forming a continuation of the narrow fertile lemma:
- J. Racemes **digitate** or racemously arranged on a common axis:
- K. Sessile spikelets of all the pairs bisexual and awned **BOTHRIOCHLOA**. 14.
- KK. Sessile spikelets of the lowest 1 to 3 pairs male or barren and awnless:
- L. Racemes not nodding; joints and pedicels solid; anthers of all the spikelets alike ...
DICHANTHIUM. 33.
- LL. Racemes nodding; joints and pedicels hyaline and balsamiferous between the thickened margins; anthers of the sessile spikelets much smaller than those of the pedicellate spikelets **EUCLASTA**. 49.
- JJ. Racemes solitary at the ends of the culms and their branches **EREMOPOGON**. 47.
- II. Awn from the sinus of the 2-toothed or 2-fid fertile lemma:
- M. Racemes solitary at the ends of the culms and their branches:
- N. Pedicellate spikelets usually smaller than the sessile; upper glume awnless
SCHIZACHYRIUM. 96.
- NN. Pedicellate spikelets very much larger than the sessile; upper glume awned
DICTOMIS. 34.
- MM. Racemes paired or digitate, very rarely solitary and then terminal on simple culms:
- O Racemes paired or digitate at the ends of simple or branched culms, rarely solitary or in a spatheate false panicle; plants not aromatic **ANDROPOGON**. 7.
- OO. Racemes paired, each pair supported by a spathe, gathered into often large branched false panicles; aromatic grasses
CYBOPOGON. 27.
- HH Column of awn hairy or glabrous; margins of lower glume of fertile spikelets involute, keelless or 2-keeled only at the tip, the glume therefore with rounded sides; callus often elongated and acute:
- P. Awn from the sinus of the 2-toothed fertile lemma:
- Q. Racemes paired; column of awn hairy:
- R. Lower glume coriaceous with an herbaceous beak; pairs of racemes terminal on the culms and their distant 1-3 branches, long-exserted from the supporting sheath
EXOTHECA. 50.

- RR. Lower glume without an herbaceous beak; pairs of racemes usually in a very distinct compound spatheate panicle
HYPARRHENIA. 57.
- QQ. Racemes solitary at the ends of the culms and their branches; column of awn glabrous; racemes partially enclosed in large coloured boat-shaped spathes **MONOCYMBIUM. 74.**
- PP. Awn forming a continuation of the narrow fertile lemma, hairy:
- S. Racemes solitary, composed of more than 3 pairs of spikelets and without a false involucre of sterile spikelets at the base
HETEROPOGON. 56.
- SS. Racemes solitary, composed of 2 pairs of similar sterile spikelets forming a false involucre around a sessile fertile awned spikelet and 2 pedicellate sterile awnless spikelets, each raceme supported by a leaf-like spathe
THEMEDA. 108.
- GG. Fertile lemma awned from low down on the back; leaf-lamina short, lanceolate to ovate
ARTHAXON. 10.
- AA. Internodes of rhachis and pedicels more or less stout, 3-angled or rounded, thickened upwards or more or less widened and flattened; fertile florets awnless or if awned then the spikelets similar in sex and the lower floret male:
- T. Lemma of fertile floret awned:
- U. Pedicellate spikelets well developed:
- V. Racemes paired or digitate **ISCHAEMUM. 59.**
- VV. Racemes solitary **SEHIMA. 99.**
- UU. Pedicellate spikelets reduced to the narrow curved pedicel; lower glume transversely rugose ... **THELEPOGON. 107.**
- TT. Lemma of fertile floret awnless:
- W. Lower glume produced into a long flattened tail; spikelets glabrous, similar **VOSSIA. 119.**
- WW. Lower glume not as above:
- X. Lower glume of the pedicellate spikelets long-awned
URELYTRUM. 115.
- XX. Lower glume of all the spikelets awnless or rarely with a very short awn:
- Y. Racemes paniced or racemosely arranged on a long common axis **JARDINEA. 60.**
- YY. Racemes solitary at the ends of simple or branched culms:
- Z. Racemes usually more or less villous:
- (b) Spikelets 2-flowered, the lower floret male with a well-developed palea **LASIURUS. 62.**
- (bb) Spikelets 1-flowered, the lower floret barren and reduced to the lemma **ELYONURUS. 42.**

ZZ. Racemes glabrous or rarely sparingly hairy:

- (c) Pedicels free from the internodes of the rhachis:
- (d) Spikelets similar, 2-flowered; pedicels and internodes gaping CHASMOPODIUM. 19.
- (d^c) Spikelets dissimilar, the pedicellate usually much reduced or rudimentary; pedicels and internodes not gaping:
- (e) Racemes terminating the culms and their branches, subtended by spathes COELORACHIS. 23.
- (ee) Racemes terminal and solitary on the simple culms, not subtended by spathes RHYTACHNE. 92.
- (cc) Pedicels fused with the internodes of the rhachis:
- (f) Sessile spikelets globose; lower glume pitted and tubercled HACKELOCHLOA. 53.
- (ff) Sessile spikelets not globose; lower glume smooth:
- (g) Racemes stout, few from each culm; sessile spikelets 2-flowered ROTTBOELLIA. 93.
- (gg) Racemes slender, in ample spatheate panicles; sessile spikelets 1-flowered OPHIUROS. 76.

1. ACRITOCOAETE Pilg.

***Acritochaete volkensis* Pilg.**

Stoloniferous scrambling perennial herb; culms very slender, weak, many-noded. Leaf-sheaths loose, closely ribbed, glabrous except near the top; ligule conspicuous, submembranous; lamina narrowly lanceolate, setaceously acuminate at the apex, narrowed at the base, up to 4 in. long, $\frac{3}{8}$ in. broad, thinly pilose on both surfaces. Inflorescences narrowly racemose; peduncles very slender. Spikelets green, subsecund, about $\frac{1}{4}$ in. long, with fine long entangled awns from the upper glume and lower lemma. Lower glume truncate, nerveless, about $\frac{1}{5}$ in. long.

Equatoria: Imatong Mountains, Kimisu, 6900 ft.

2. ACROCERAS Stapf

***Acroceras zizanioides* (Kunth) Dandy.**

Perennial herb, sometimes in pure stands in marshy ground, often slightly creeping. Leaf-laminae rather broadly lanceolate, about 6 times as long as broad, acutely pointed at the apex, rounded and contracted at the base, $2\frac{1}{2}$ - $4\frac{3}{4}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, with about 5 prominent nerves above on each side of the midrib, glabrous or thinly pubescent beneath, the margin minutely scabrous; sheath tight, densely ciliate; ligule very short, ciliate. Panicles lax, slender, composed of 4-7 slender interrupted racemes. Spikelets pale-green, about $\frac{1}{2}$ in. long, apiculate. Lower glume $\frac{2}{3}$ the length of the spikelet, 3-nerved, the middle nerve keeled upwards.

Equatoria: Kagelu, on edge of gallery-forest.

A. amplexens Stapf.

Perennial or annual herb up to 3 ft. high, often occurring in swamps, sometimes with runners. Leaf-laminas linear or narrowly linear-lanceolate, about 10-20 times as long as broad, rounded-subcordate and amplexicaul at the base, with numerous contiguous nerves on the upper side, glabrous except on the minutely scabrous margin; sheath densely ciliate upwards. Spikelets as in *A. zizanioides* but more apiculate.

Equatoria.

3. **AELUROPUS** Trin.**Aeluropus lagopoides** (L.) Trin. ex Thw.

A. repens (Desf.) Parl.

Rigid densely tufted stoloniferous perennial herb; culms procumbent, wiry, woody, 6-12 in. high. Leaf-sheaths overlapping; ligule shortly ciliate; lamina spreading, infolded, subulate-lanceolate, pungent-pointed, resembling a thorn, $\frac{1}{2}$ -1 $\frac{1}{4}$ in. long, very closely nerved. Spikelets in compact ovoid heads or short (rarely elongated) interrupted spikes, villous with soft hairs.

Red Sea District: coast.

4. **AGROSTIS** L.**Agrostis producta** Pilg.

Compact tufted perennial herb 1-2 $\frac{1}{2}$ ft. high; culms erect, slender, simple, 2-4-noded, glabrous, somewhat scabrous towards the nodes and panicle or smooth. Leaves glabrous; sheath striate, in the lowermost leaves finally splitting into fibres and coating the base of the culm; ligule lanceolate-oblong, truncate or obtuse at the apex, up to $\frac{1}{2}$ in. long, membranous; lamina narrowly linear or subsetaceous, finely pointed, up to 10 in. long. Panicles loose or contracted, flexuous, 4-10 in. long, up to 4 in. wide; branches at length spreading, thread-like, up to 4 in. long. Spikelets green or purple, oblong, gaping, up to $\frac{1}{2}$ in. long; rhachilla produced, shortly plumose at the base, terminating in a fine bristle. Glumes narrowly lanceolate, acuminate at the apex, 1-nerved or the lower with 2 short side nerves, very minutely granular-asperulous on the sides especially towards the base. Lemma ovate-oblong when flattened, 5-nerved; awn inserted near the base of the lemma, up to $\frac{1}{2}$ in. long.

Equatoria: Imatong Mountains, near Itobol, 6000-8000 ft.

A. sororia C. E. Hubbard.

Perennial herb up to 3 ft. high; culms erect, sometimes from a prostrate base and rooting at the nodes, simple or branched, 3-7-noded, glabrous. Leaves glabrous; sheath striate; ligule oblong, lacerate, up to about $\frac{1}{2}$ in. long, scarious; lamina linear, tapering to a fine point, up to 8 in. long, flat, closely nerved, somewhat scabrous on both surfaces or smooth beneath. Panicles loose, flexuous, up to 12 in. long, 4 in. wide; branches thread-like.

Spikelets green or purplish, widely gaping, usually about $\frac{3}{8}$ in. long; rhachilla produced as a hairy mucro sometimes bearing a fine bristle. Glumes membranous, unequal, smooth and shining on the sides, 1-nerved or with 2 short side nerves. Lemma broadly ovate when flattened, truncate or shortly 2-fid at the apex, loosely and shortly pilose, 5-nerved; awn inserted near the base of the lemma, up to $\frac{1}{2}$ in. long; callus bearded.

Equatoria: *Imatong Mountains, Mount Kineti, near summit.*

A. *lachnantha* Nees.

Tufted perennial or annual herb about 1-4 ft. high; culms erect, usually simple, 2-6-noded, glabrous, smooth or finely scabrous below the nodes. Leaves glabrous; sheath striate; ligule oblong, up to $\frac{1}{2}$ in. long, scarious, becoming lacerate; lamina linear, tapering to a fine hard tip, 1 $\frac{1}{2}$ -8 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad. Panicles narrow, contracted, 2-18 in. long, up to 1 $\frac{1}{2}$ in. broad, more or less interrupted, nodding; rhachis smooth or nearly so in the lower part, scabrous above; branches in distinct clusters, very unequal, thread-like, up to 4 in. long. Spikelets pale-green or tinged with purple, narrowly oblong, at length gaping, $\frac{1}{8}$ - $\frac{1}{10}$ in. long, shining; rhachilla not produced. Glumes linear-oblong to narrowly lanceolate-oblong, membranous, 1-nerved.

Darfur: *Jebel Marra.*

5. AIRA L.

Aira caryophyllea var. *latigluma* (Steud.) C. E. Hubbard.

Annual herb 2-10 in. high; culms loosely tufted or solitary, erect or abruptly bent, very slender to thread-like, simple, 1-7-noded, glabrous and smooth. Leaf-sheaths striate, minutely scabrous on the nerves; ligule lanceolate-oblong, acute at the apex, becoming lacerate, up to $\frac{1}{2}$ in. long, transparent; lamina thread-like, subsetaceous, up to 2 in. long, glabrous. Panicles erect, ovoid to oblong or obovoid, at length open and loose, $\frac{3}{4}$ -3 in. long; rhachis thread-like; branches usually paired. Spikelets pallid or purplish, sometimes shining, ovate or oblong, $\frac{1}{2}$ - $\frac{1}{3}$ in. long. Glumes obliquely lanceolate in side view. Lemma narrowly lanceolate in side view, awned, becoming brown; awn $\frac{1}{2}$ - $\frac{1}{3}$ in. long.

Red Sea Hills: *Erkowitz.*

6. ALLOTEROPSIS Presl

Alloteropsis semialata (R. Br.) Hitchc.

Perennial herb, compactly tufted on a short rhizome with a thick basal covering of silky-tomentose sheath-bases or their remains; culms erect, simple, 1-3 or more ft. high, 2-3-noded with the uppermost node long-exserted. Leaf-sheaths tight, the basal ones crowded, very firm and more or less silky-tomentose downwards forming a dense persistent hard coat; ligule a ciliate rim; lamina linear from a more or less narrowed base, long-tapering to a sharp acute point, from a few to over 12 in. long, 1 $\frac{1}{2}$ -3 in.

broad, glabrous or more or less loosely hairy or ciliate along the lower margin, the hairs and cilia tubercle-based. Inflorescences mostly of 2-3 or more rarely of 4-5 digitate racemes or occasionally reduced to a solitary raceme. Spikelets greenish or variously tinged with brown or purple, ovate-lanceolate to ovate-oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; awn up to $\frac{1}{2}$ in. long.

Kassala: Gallabat. Equatoria.

A. cimicina (L.) Stapf.

Annual herb 1-2 or more ft. high; culms solitary or more often clustered, usually simple, 3-5-noded, glabrous to hirsute with tubercle-based hairs, striate. Leaf-sheaths rather tight or more or less loose, glabrous and smooth or more often finely hairy or hirsute with tubercle-based hairs; ligule a densely ciliate rim; lamina lanceolate from a cordate base, shortly acuminate or acute at the apex, $\frac{1}{2}$ -3 in. long, $\frac{1}{8}$ - $\frac{3}{8}$ in. broad, the margin rigidly ciliate with tubercle-based cilia. Inflorescences clustered, of 2-6 digitately arranged racemes or the primary axis bearing higher up 1-several scattered racemes; racemes slender, 2-6 or more in. long. Spikelets dorsally much compressed but distinctly convex on the back in fruit, ovate to elliptic, $\frac{1}{2}$ in. long, $\frac{1}{4}$ - $\frac{1}{8}$ in. broad; awn rarely more than $\frac{1}{2}$ in. long.

Kordofan: Sidr el Bannu.

7. ANDROPOGON L.

Andropogon distachyos L.

Perennial tufted herb 1-2 $\frac{1}{2}$ ft. high; culms erect, slender, about 3-noded, simple or branched below, glabrous. Leaf-sheaths tight, glabrous or particularly the lower ones hairy; ligule hairy, truncate, up to $\frac{1}{2}$ in. long, ciliolate; lamina linear, tapering to a long and setaceous point, 2-8 or more in. long, $\frac{1}{16}$ - $\frac{1}{8}$ in. broad. Peduncles thread-like, glabrous, 5-9 in. long, shortly bearded; racemes in pairs (or exceptionally 3-5 together), one sessile, the other with a short base, straight or curved, greenish, often tinged with dull- or livid-purple, 2-4 in. long; joints cuneate-linear, hollow and very slightly inflated, up to $\frac{1}{2}$ in. long; pedicels similar. Sessile spikelets broad-lanceolate, acuminate at the apex, $\frac{3}{8}$ - $\frac{1}{2}$ in. long; glumes unequal; keels of lower glume produced into mucros or fine bristles, distinctly winged; pedicellate spikelets similar to the sessile but narrower, about $\frac{1}{2}$ in. long, the lower glume very narrowly winged and terminated by a bristle up to over $\frac{1}{2}$ in. long.

Darfur: Jebel Marra.

A. tenuiberbis Hack.

Perennial herb; culms up to 15 ft. high, stout, terete, smooth and glabrous upwards. Leaf-sheaths tight, glabrous, smooth, produced at the mouth into erect oblong to lanceolate auricles; ligule a ciliolate rim; lamina linear from the base, tapering to an acute point, over 12 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad, bearded or ciliate

towards the ligule, otherwise glabrous, the margin spinulose. Inflorescences forming elongate lax spatheate panicles up to $2\frac{1}{2}$ ft. long, of about 6 distant 2-4-rayed often mixed tiers; rays thread-like, very unequal, if compound 2-noded and up to over 1 ft. long; spatheoles very narrow, at length tightly inrolled, reddish, glabrous, $2\frac{1}{2}$ -3 in. long; racemes 4-8 together in corymbs, the lateral ones sessile, $1\frac{1}{2}$ -3 in. long, lax, slender; joints thread-like, very gradually and slightly widened upwards, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, all shortly ciliate from the middle upwards; pedicels similar, up to $\frac{1}{2}$ in. long. Sessile spikelets linear-lanceolate, reddish or purplish, up to $\frac{1}{2}$ in. long; awn up to $\frac{1}{3}$ in. long, very fine: pedicellate spikelets male, lanceolate, up to $\frac{1}{2}$ in. long, usually darker than the sessile.

Equatoria.

A. schirensis Hochst. ex A. Rich.

Fig. 94.

Perennial herb 3-10 ft. high, densely tufted; culms erect, slender, glabrous, about 4-noded, simple, rarely with a flowering branch from one of the upper nodes. Leaf-sheaths terete, tight, glabrous or rarely hairy to almost tomentose; ligule very short, truncate, glabrous; lamina linear, long-tapering to a fine point, up to $1\frac{1}{2}$ ft. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, more or less glaucous, often turning reddish, the margin scabrous. Peduncles stoutly thread-like, erect, terminating with a minute crenulate cupule; racemes in pairs, one sessile, the other with a short base (exceptionally several, up to 5, on a very short common axis), $2\frac{1}{2}$ -5 in. long, silky-villous, conspicuously dorsi-ventral, exhibiting on one side the sessile spikelets with their joints and the pedicels and on the other the broad backs of the pedicellate spikelets with the dense cilia of the pedicels between them; joints and pedicels club-shaped-cuneate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, densely ciliate on both sides. Sessile spikelets yellowish to olive-green, often dull-purplish upwards, laterally very much compressed; glumes equal, the lower laterally compressed, wedged in between joint and pedicel; awn light-brown, slender, 1- $1\frac{1}{2}$ in. long, the column bent at the middle, the bristle yellowish and as long as the column: pedicellate spikelets male, oblong, dorsally much compressed, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, usually reddish or purplish-brown.

Kassala: Gallabat. Equatoria.

A. gayanus Kunth.

A. gayanus var. *genuinus* Hack.

Tufted perennial herb; culms up to 10 ft. high, more or less stout, up to over $\frac{1}{2}$ in. in diameter, glabrous, many-noded, producing flowering branches from the third node or above it. Leaves glabrous or softly pubescent, rarely villous or tomentose; sheath tight, striate; ligule short, rounded or truncate, glabrous or more or less hairy on the back, rarely exceeding $\frac{1}{2}$ in.; lamina linear to lanceolate-linear, in the lower leaves usually from a much attenuated base and there often forming a terete petiole, tapering to a fine point, over 12 in. long, up to $\frac{3}{4}$ in. broad, glaucous or at length reddish, the margin scabrous. Inflorescences



Fig. 94.—*ANDROPOGON SCHIRENSIS* Hochst. ex A. Rich.

A, ligule. B, C, pairs of spikelets; B₁, C₁, joints of raceme; B₂, C₄, sessile spikelets; B₃, C₃, pedicels of pedicellate spikelets; B₄, C₂, pedicellate spikelets.

forming often ample panicles of up to 6 or more primary downwards frequently mixed 2-many-rayed tiers, the inner ray of the lower or lowest tiers often up to 1 ft. (sometimes up to 2 ft.) long with 2-4 secondary few-rayed tiers; spatheoles pale-green, herbaceous, lanceolate-oblong, 2½-3 in. long, at length more or less tightly inrolled, rarely turning red; peduncles stoutly thread-like, at length terminally exerted; racemes in pairs, 1½-2½ in. long, one sessile, the other with a bare base about ½ in. long; joints stout, cuneate-club-shaped, ½-¾ in. long, terminating in an unequally dentate cupule, villously ciliate on one side only. Sessile spikelets greenish or sometimes tinged with brown or red, about ½ in. long including the obtuse callus which is scantily bearded at the base, oblong; glumes equal; awn ½-¾ in. long, kneed and twisted well below the middle, the column brown, the bristle pale: pedicellate spikelets male, glabrous.

Southern Sudan.

Var. squamulatus (Hochst.) Stapf.

Joints and pedicels ciliate on both margins; callus-beard usually rather dense, frontal and lateral. Awn usually ¾-1½ in. long: pedicellate spikelets almost scabrous to puberulous.

Central and Southern Sudan.

Var. bisquamulatus (Hochst.) Hack.

Joints and pedicels ciliate on 1 or both margins; callus-beard rather dense, frontal and lateral. Sessile spikelets about ½ in. long; awn up to 1 in. long: pedicellate spikelets (all or sometimes only the upper) more or less hairy to villous, normally more or less hidden by the long silky hairs.

Central and Southern Sudan.

A. annuus Hack.

Annual herb; culms 2-2½ ft. high. Leaves flat, linear, setaceous at the apex, 8-14 in. long, ⅓-⅜ in. broad, glabrous; ligule truncate, somewhat dark-membranous, decurrent into the sheath, glabrous. Racemes 2½-2¾ in. long, slender. Sessile spikelets yellow-green, linear; awn very strong, 3¼-3½ in. long, the column pale, turning brown: pedicellate spikelets similar to the sessile.

Equatoria.

8. ANTHEPHORA Schreb.

Anthephora lynesii Stapf & Hubbard.

A. elegans (non Schreb.) Broun & Massey.

Herb; culms up to 4 ft. high, simple, glabrous, relatively stout, 2-3- or more-noded, the uppermost internode (peduncle) up to 1½ ft. long. Leaf-sheaths loose, longer than the internodes, finely striate, auriculate, the auricles up to ½ in. long; ligule firmly membranous, truncate, up to ½ in. long, adnate to the auricles, glabrous; lamina linear from a slightly contracted base, long and

finely acute at the apex, 7-10 in. long, about $\frac{1}{4}$ in. broad, glabrous, rough on both surfaces, the margin cartilaginous. False spikes cylindrical, dense, $6\frac{1}{2}$ - $7\frac{1}{2}$ in. long, up to $\frac{1}{4}$ in. in diameter, straw-coloured and suffused with purple or dark-grey; clusters $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, densely and shortly bearded at the base, composed of 7 mostly perfect spikelets. Spikelets about $\frac{1}{2}$ in. long. Lower glume oblong to elliptic or obliquely ovate, acute at the apex.

Darfur: *Kulme*, 3600 ft.

A. hochstetteri Nees ex Hochst.

Tufted perennial herb; culms up to 3 ft. high, simple or sometimes branched, glabrous, 2-3-noded, the uppermost internode (peduncle) up to $1\frac{1}{2}$ ft. long. Leaf-sheaths finely striate, the lower ones persistent and hairy, the upper ones usually glabrous; ligule obtuse to rounded-truncate, scarious, glabrous; lamina linear from a narrowed base, finely acute at the apex, up to 15 in. long and $\frac{1}{4}$ in. broad, glabrous, slightly scaberulous, glaucous, the margin cartilaginous and crinkled. False spikes cylindrical, dense, 4-7 in. long, straw-coloured or purplish; clusters oblong, up to $\frac{1}{2}$ in. broad, composed of up to 10 spikelets, villous at the base. Spikelets $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Lower glume lanceolate, usually setaceously acuminate at the apex.

Northern Sudan: *Berber*. *Fung District*: *opposite Zamarka*.

9. ARISTIDA L.

- A. Lemma or its prolongation (column of the awns) not articulated: lateral awns well developed:
- B. Panicles loose and delicate, not secund; glumes mauve or purplish; awns comparatively short:
- (a) Annual herbs:
- (b) Lemma minutely scabrous at the summit ... *A. cumingiana*.
- (bb) Lemma with longitudinal rows of spiny hairs
A. rhiniochloa.
- (aa) Perennial densely tufted herb *A. recta*.
- BB. Panicles dense, narrow, more or less secund; glumes usually greenish:
- (c) Awns terete or usually subtriquetrous, sometimes narrowly winged only at the base, without broad hyaline margins *A. adscensionis*.
- (cc) Awns triquetrous above, very flat over a long distance with a thick green midnerve and hyaline rather broadly winged margins *A. submucronata*.
- AA. Lemma or column of awns articulated, the articulation sometimes at the top of the column below the awns:
- C. Awns never plumose; column absent or well developed:
- D. Lemma not produced into a column, the body of the lemma immediately passing into the 3 awns *A. hordeacea*.
- DD. Lemma prolonged into a more or less twisted column:

- E. Articulation at the base of the column:
- (d) Lower glume always longer than the upper
A. funiculata.
- (dd) Lower glume shorter than the upper, or glumes equal:
- (e) Callus of the lemma with a 2-fid prolongation
A. stipoides.
- (ee) Callus of the lemma conical, acute, not 2-fid
A. pallida.
- EE. Articulation at the top of the column, just below the awns:
- (f) Column very long, usually 2-3 times as long as the body
of the lemma *A. cassanellii.*
- (ff) Column much shorter than or as long as the body of the
lemma, sometimes slightly longer and up to $1\frac{1}{2}$ times
its length *A. mutabilis.*
- CC. Awns, at least the central, always plumose; column more or less
developed and articulated at its junction with the lemma:
- F. Nodes long-bearded with spreading hairs, the hairs some-
times deciduous in old culms *A. ciliata.*
- FF. Nodes not as above:
- G. Central awn without a tuft of hairs at the base:
- (g) Lower internodes very hairy:
- (h) Internodes woolly-tomentose; leaf-lamina with a pun-
gent tip, up to 4 in. long *A. plumosa.*
- (hh) Internodes appressed-silky; leaf-lamina acute at the
apex, 2-2 $\frac{1}{2}$ in. long *A. acutiflora.*
- (gg) Lower internodes glabrous or nearly so ... *A. hirtigluma.*
- GG. Central awn with a dense tuft of hairs at the base
A. papposa.

***Aristida cumingiana* Trin. & Rupr.**

Densely tufted annual herb up to 15 in. high, usually much branched below. Leaf-sheaths smooth, striate, keeled; ligule shortly ciliate, the auricles pubescent; lamina linear, about 2 $\frac{1}{2}$ in. long, with scattered long white hairs. Panicles half as long as the whole plant or even longer; branches thread-like. Glumes glabrous. Lemma lanceolate or ovate-lanceolate, bearing 3 unequal scabrous awns.

Equatoria.

***A. rhinlochloa* Hochst.**

Annual herb up to 2 ft. high, branched in the lower parts and from the middle nodes. Lower leaf-sheaths slipping from the culm, prominently striate, very scabrous and retrorsely hispidulous especially on the nerves; ligule long-ciliate, the auricles with a tuft of long hairs; lamina 4-9 in. long, up to $\frac{1}{4}$ in. broad, very scabrous on both surfaces. Panicles up to 8 in. long, the branches and pedicels very scabrous. Awns very scabrous, nearly equal or the central one slightly longer, about 1 in. long or sometimes up to $1\frac{1}{2}$ in.

Central Sudan.



Fig. 95—*ARISTIDA ADSCENSIONIS* L.

A, plant. B, spikelet. C, lower glume. D, upper glume. E, lemma (ends of awns cut off). F, stamens and pistil.

A. recta Franch.

Densely tufted low perennial herb, clothed at the base with the often burnt leaf-sheaths, up to about $1\frac{1}{2}$ ft. high; culms erect, elegant, glabrous, simple, 1-noded. Leaf-sheaths glabrous, striate, the outer ones gaping, the inner ones tight, about $\frac{1}{2}$ as long as the culm; ligule a shortly ciliate rim, the auricles bearded; lamina setaceous, in the lower leaves $3\frac{1}{2}$ -4 in. long, in the upper leaves shorter. Panicles delicate, ovoid-lanceolate, 2-2 $\frac{1}{2}$ in. long, up to $1\frac{1}{4}$ in. broad. Spikelets lanceolate-linear, dark-purple. Lower glume 3-keeled but 1-nerved. Awns scabrous, all about equal or the lateral ones slightly shorter.

Equatoria.

A. adscensionis L.

Fig. 95.

Annual herb, very variable in the vegetative parts and shape of the inflorescences, up to 20 or more in. high; culms few- to many-noded. Leaf-sheaths quite tight or in branched specimens slipping from the culm, never with long hairs; ligule a short ciliate rim, the auricles smooth or minutely ciliate; lamina linear, long-pointed. Upper glume always distinctly emarginate or 2-fid at the summit and with a very distinct mucro or short awn from between the acute or obtuse lobes. Lemma about as long as or exceeding the upper glume, not beaked, smooth to very scabrous with thick hooked or curved white fragile hairs in longitudinal rows; awns scabrous, about $\frac{3}{4}$ in. long.

Widespread.

A. submucronata Schumach.

Annual herb up to $2\frac{1}{2}$ ft. high; culms dichotomously branched from most of the lower nodes, many-noded, the culm-nodes swollen and protruding above the dark annual sheath-nodes, distinctly scabrous. Leaf-sheaths not much compressed, striate, scabrous with translucent margins, slipping from the culm or at least gaping upwards; ligule a short ciliate rim, the auricles distinctly ciliate; lamina 6-8 or more in. long, about $\frac{1}{16}$ in. broad, very scabrous on both surfaces. Panicles contracted, often secund with lax and laterally curved branches. Spikelets densely congested. Awns flat and distinctly winged, about $\frac{3}{4}$ in. long.

Fung District: Jebel Maiak.

A. hordeacea Kunth.**A. steudeliana** Trin. & Rupr.

Erect annual herb, much branched from the base, up to 16 in. high; culms few-noded, the internodes densely pubescent to nearly glabrous. Leaf-sheaths striate, keeled, pubescent; ligule and auricles forming a shortly bearded rim; lamina more or less glaucous, up to 4 or more in. long, scabrous on both surfaces or becoming glabrous beneath. Panicles dense and continuous, spike-like, usually $2\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, the branches and pedicels always very

short and the spikelets clustered; peduncles densely pubescent. Glumes very shortly awned. Lemma narrowly linear, scabrous with longitudinal spiny rows; awns about equal, $\frac{2}{3}$ - $\frac{3}{4}$ or more in. long.

Widespread.

A. funiculata Trin. & Rupr.

Densely tufted herb up to 12 or more in. high, pale-green or somewhat glaucous. Leaf-sheaths striate, keeled, glabrous; ligule a short ciliate rim, the auricles bearded with long weak hairs; lamina narrowly linear, very scabrous on the upper surface, with long white hairs especially near the base and along the margin. Panicles linear, few-flowered, up to 4 in. long, mostly sheathed by the uppermost leaf. Column of awns not twisted for a short distance, soon becoming strongly twisted, up to $1\frac{3}{4}$ in. long; awns subequal, the lateral ones about $1\frac{1}{4}$ in. long.

Northern and Central Sudan.

A. stipoides Lam.

Loosely tufted robust perennial herb; culms stout, thick, up to 3 ft. high, the culm-nodes swollen and protruding above the annular dark glabrous sheath-nodes. Leaf-sheaths glabrous, striate; ligule a short hairy rim, the auricles woolly; lamina narrow, about 8 in. long, scabrous on the upper surface. Panicles more than 12 in. long, very lax and open, rather few-flowered. Spikelets nodding. Glumes pale or tinged with red or purple, broadly ovate-lanceolate. Callus of lemma up to $\frac{1}{2}$ in. long; column of awns scabrous, prominently twisted; awns scabrous, up to $2\frac{1}{4}$ in. long.

Central and Southern Sudan.

A. pallida Steud.

A. sieberiana (non Trin.) Broun & Massey.

Herb; culms simple below, branched from the lower and upper nodes, 6 in.-3 ft. high, with old broad and papery sheaths at the base. Leaf-sheaths shorter than the internodes, very distinctly rough, striate, with hyaline mostly inrolled margins; ligule shortly ciliate, the auricles pubescent-ciliate; lamina up to 8 or more in. long, $\frac{1}{12}$ - $\frac{1}{8}$ in. broad, glabrous beneath, scabrous on the upper surface and on the margin. Panicles exserted; branches up to 4 in. long. Spikelets golden-yellow. Glumes slightly scabrous on the keels, the lower $\frac{9}{10}$ in. long, the upper $1\frac{1}{4}$ in. long including the awn. Lemma with a shortly pilose callus about $\frac{1}{2}$ in. long; column of awns strongly twisted, 1- $1\frac{1}{4}$ in. long; awns erect, the central one up to $2\frac{3}{4}$ in. long, the lateral ones shorter.

Darfur. Kordofan.

A. cassanellii Terracc.

Tufted erect annual herb; culms simple or sometimes slightly branched from some of the middle nodes, up to 16 or more in.

high, thin, minutely scabrous, 2-3-noded, the nodes glabrous. Leaf-sheaths short, glabrous in the lower leaves, tight and distinctly scabrous in the culm-leaves; ligule a rim of short hairs, the auricles densely bearded; lamina up to 4 in. long, scarcely $\frac{1}{5}$ in. broad. Panicles usually long-exserted, up to 6 in. long, 2-2 $\frac{1}{4}$ in. broad; branches naked at the base over a long distance, bearing at the summit 6-8 or sometimes only 3-4 congested spikelets. Glumes yellowish, the lower lanceolate and rather abruptly narrowed into a very scabrous awn $\frac{1}{16}$ in. long; upper glume narrower, 2-fid at the summit, with an awn from the sinus. Lemma passing into a twisted column of awns $\frac{1}{4}$ in. long; awns about 1 in. long.

Red Sea Hills: Soturba.

A. mutabilis Trin. & Rupr.

Straggling annual herb 12-16 or more in. high; culms more or less branched. Leaf-sheaths shorter than the internodes, compressed-keeled, striate and somewhat scabrous; ligule a ciliate rim, the auricles with a tuft of hairs; lamina linear, up to 4 in. long, rather rigid, glabrous beneath, somewhat scabrous-hairy above. Panicles long-exserted, with solitary branches up to 2 $\frac{3}{4}$ in. long, the spikelets at the summit densely congested and forming curved false spikes. Lemma up to $\frac{1}{4}$ in. long including the $\frac{1}{5}$ -in. densely hairy conical callus and the laxly twisted scabrous column of awns; awns very fine, the central one usually about $\frac{1}{16}$ in. longer than the others.

Northern and Central Sudan.

A. ciliata Desf.

Tufted perennial herb; culms few-noded, with a prominent viscosed ring below the nodes, up to 2 ft. high. Leaf-sheaths crowded at the base of the culm, densely striate, glabrous or more or less woolly along the margins; ligule a short ciliate rim, the auricles shortly ciliate; lamina varying in length, usually curved. Panicles narrow but open, linear-oblong, 4-6 in. long. Spikelets linear-oblong, often with a purple spot at the base. Glumes linear-oblong, not awned, about $\frac{3}{4}$ in. long. Lemma gradually narrowed into a straight or slightly twisted thread-like column of awns; central awn up to 1 $\frac{3}{4}$ in. long.

Northern Sudan.

A. plumosa L.

Densely tufted perennial herb, with a short not creeping root-stock; culms dwarf or up to 12 in. high, woolly, 2-3-noded. Lowest leaf-sheaths scale-like with a reduced very short lamina and with a fugacious wool, the following ones more or less lanate but usually soon becoming more or less glabrous, the upper ones glabrous and smooth throughout; ligule a ciliate rim of a flake of wool, the auricles densely bearded; lamina stiff but not very

rigid, with a pungent apex, up to 4 in. long, scarcely $\frac{1}{5}$ in. broad, glabrous or scabrous. Panicles up to 6 in. long, erect, lanceolate in outline, usually sheathed by the uppermost leaf; branches in pairs, one up to $3\frac{1}{2}$ in. long, many-flowered, naked at the base, the other $1\frac{1}{4}$ - $1\frac{1}{2}$ in. long and branched from the base with 2-4 spikelets. Lemma with a densely hairy very acute callus, $\frac{1}{4}$ - $\frac{1}{2}$ in. long; column of awns up to $\frac{2}{3}$ in. long, not twisted, glabrous; central awn up to 2 in. long; lateral awns about $\frac{3}{4}$ in. long.

Northern Sudan.

A. acutiflora Trin. & Rupr.

Slender tufted or more or less stoloniferous perennial herb, branched from the base; culms few-noded, the nodes nearly glabrous, up to 16 in. high including the panicles. Leaf-sheaths more or less compressed, with translucent margins; ligule and auricles ciliate; lamina 2-2 $\frac{1}{2}$ or more in. long. Panicles linear, ovoid-lanceolate or pyramidal, sheathed by the uppermost leaf or shortly exerted, about 4 or more in. long, the lateral panicles usually much shorter; peduncles pubescent. Lemma about $\frac{1}{2}$ in. long including the densely hairy callus; central awn up to $\frac{2}{3}$ in. long; lateral awns about $\frac{1}{2}$ as long.

Northern Sudan: between Suakin and Berber. Kordofan.

A. hirtigluma Steud. ex Trin. & Rupr.

Compact tufted annual herb; culms up to 16 in. high, glabrous, 2-4-noded. Leaf-sheaths shorter than the internodes, striate, scabrous especially on the nerves, slightly compressed and with broad hyaline margins; ligule shortly ciliate; lamina thin and flaccid, rolled, setaceous, narrowed to a fine point, 2 $\frac{1}{2}$ -4 in. long, scarcely $\frac{1}{5}$ in. broad. Panicles narrow, contracted, up to 8 in. long; branches short, sessile, with few spikelets. Lemma about $\frac{1}{2}$ in. long including the oblique-pointed callus; column of awns up to $\frac{2}{3}$ in. long; central awn up to 2 in. long; lateral awns about $\frac{2}{3}$ in. long.

Red Sea District.

A. papposa Trin. & Rupr.

Densely tufted erect perennial herb up to 2 ft. high including the panicles; culms sparingly branched, rather few-noded. Lower leaf-sheaths with a reduced lamina or scale-like, yellow, glabrous; upper leaf-sheaths narrower and tight, more or less slipping from the culm; ligule a densely ciliate rim, the auricles long-bearded; lamina narrow, linear, rough on the upper surface with long white hairs, ending in a setaceous not pungent tip. Panicles rather narrow, up to 4 or more in. long. Spikelets yellowish-white with a dark spot at the base. Glumes lanceolate, acuminate and notched or slightly 2-fid with a mucro at the apex. Lemma scarcely $\frac{1}{2}$ in. long; column of awns about $\frac{1}{2}$ in. long, laxly

twisted, with a very prominent tuft of long hairs just below and above the knee; central awn up to $1\frac{1}{4}$ in. long; lateral awns naked, up to $\frac{3}{4}$ in. long.

Central Sudan.

10. **ARTHRAOXON** Beauv.

Arthraxon prionodes (Steud.) Dandy, comb. nov.

Andropogon serrulatus A. Rich., non Link; *A. prionodes* Steud.¹;
Arthraxon serrulatus Hochst.

Perennial herb; rhizome short, emitting clusters of closely set culms and shoots which are covered with reddish-silky leaf-like structures; culms rather slender, up to 2 ft. high, many-noded, with vegetative branches below and usually solitary flowering branches above. Leaf-sheaths tight, more or less hairy with tubercle-based hairs and often softly pubescent at the node; lamina glaucous or greenish, lanceolate to ovate-lanceolate, setaceously acuminate at the apex, tailed-amplexicaul at the base, 1-2 in. long, $\frac{1}{4}$ - $\frac{3}{4}$ in. broad, the margin cartilaginous and ciliate with cilia from tubercles. Racemes 2-5 together, green or suffused with purple, $1\frac{1}{4}$ -2 or more in. long, on a short common axis. Sessile spikelets narrowly lanceolate-linear to linear, about $\frac{1}{4}$ in. long, glabrous; lemma awned from near the base; awn about $\frac{1}{2}$ in. long, very fine, kneed about the middle, twisted below.

Kassala: Gallabat.

A. quartinianus (A. Rich.) Nash.

Annual herb; culms very slender, decumbent, from 3 in. to 1 or more ft. high, smooth, with 1-3 branches above. Leaf-sheaths lax, the upper ones often more or less inflated and without a lamina, more or less hirsute in the upper part with tubercle-based hairs and densely ciliate along the upper margins, shortly bearded at the node; ligule membranous, ciliolate, short, truncate; lamina ovate-lanceolate to oblong-lanceolate from a cordate-amplexicaul base, finely acuminate at the apex, 1- $1\frac{1}{2}$ or more in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, with scattered tubercle-based hairs on both surfaces, ciliate towards the base. Racemes 1 to about 9 together, glabrous or nearly so, borne on thread-like ultimately long-exserted peduncles, 1-6 in. long, very slender. Spikelets solitary, sessile, oblong-lanceolate in profile, $\frac{1}{2}$ - $\frac{1}{3}$ in. long.

Red Sea Hills: Erkwit. Equatoria: Imatong Mountains.

A. lancifolius (Trin.) Hochst.

Annual herb; culms very slender, ascending from a more or less prostrate much-branched and rooting base, 2-8 or more in. high, smooth, glabrous, branched above. Leaf-sheaths lax, the uppermost ones slightly inflated and without a lamina, glabrous except the bearded node and sometimes hairy upper margins; ligule membranous, short, ciliate; lamina oblong-lanceolate from a cordate

¹*Synops. Pl. Glum.*, vol. 1, p. 383 (1854).

and amplexicaul base, finely acuminate at the apex, $\frac{1}{2}$ -1 or more in. long, $\frac{1}{4}$ - $\frac{3}{8}$ in. broad, more or less softly hairy on both surfaces, ciliate towards the base. Racemes few or up to 9 together, conspicuously hairy, about $\frac{3}{4}$ in. long, borne on thread-like ultimately long-exserted peduncles, very slender, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Spikelets usually sessile and solitary, or sometimes paired (1 sessile, the other pedicellate).

Kordofan.

11. **ARUNDINARIA** Michx.

Arundinaria alpina K. Schum.

Bamboo, growing gregariously, up to 25 or more ft. high. Leaves lanceolate, acuminate at the apex and ending in a fine bristle, up to 6 in. long but usually shorter, $\frac{2}{3}$ in. broad, glabrous. Panicles large, lax. Spikelets up to 1 $\frac{1}{4}$ in. long, up to 10-flowered. *Equatoria: Imatong Mountains, Kippia, 8000-10,000 ft.*

12. **ASTHENATHERUM** Nevski

Asthenatherum forskalei (Vahl) Nevski.

Danthonia forskalei (Vahl) R. Br.

Loosely tufted pale finely velvet-pubescent perennial desert herb, with woolly root-fibres, 1-20 in. high; culms suberect or ascending from a short decumbent base, 2-5-noded, minutely tomentose. Leaves glaucous; sheath villous at the node; ligule a densely ciliate rim; lamina linear-lanceolate to lanceolate or narrowly ovate, pungent at the apex, $\frac{1}{4}$ - $2\frac{1}{2}$ in. long, up to $\frac{1}{2}$ in. broad at the base, tomentose all over or only on the upper surface. Panicles dense, narrow, enveloped at the base by the broad uppermost leaf-sheath, $\frac{1}{2}$ -8 in. long, $\frac{1}{4}$ - $\frac{3}{4}$ in. broad. Spikelets straw-coloured or tinged with purple, crowded, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, Glumes subequal, as long as the spikelet, prominently 7-9-nerved.

Northern and Central Sudan.

13. **BECKEROPSIS** Fig. & De Not.

Beckeropsis pirottai (Chiov.) Stapf & Hubbard.

Pennisetum unisetum (non Benth.) Broun & Massey p.p.

Perennial herb; culms bent, up to 10 ft. high and $\frac{1}{2}$ in. in diameter, hard, rigid, slender to moderately stout, pale-green or glaucous, glabrous, several-noded, profusely branched from most nodes. Leaf-sheaths tough, loose, glabrous except for the ciliate mouth; ligule a ciliate rim; lamina narrowly lanceolate, finely acute at the apex, tapering towards the sheath, 3-8 in. long, $\frac{1}{4}$ -1 in. broad, glabrous, somewhat scabrous above and on the margin. Racemes numerous, in clusters of 3-12 on rather short thread-like peduncles, slender, straight, $\frac{1}{2}$ -1 in. long; rhachis with internodes up to $\frac{1}{4}$ in. long. Spikelets lanceolate-oblong to narrowly-oblong, appressed to the rhachis.

Blue Nile Province. Upper Nile Province: Khor Daga.

B. uniseta (Nees) K. Schum.*Pennisetum unisetum* (Nees) Benth.

Perennial herb 3-12 ft. high; rhizome short, densely silky-tomentose; culms glaucous or flushed with purple, up to $\frac{1}{2}$ - $\frac{1}{3}$ in. in diameter, erect, branched or simple below, glabrous or hairy at the nodes, 8- or more-noded, the longest internodes $\frac{1}{2}$ -1 ft. long. Leaf-sheaths strong, glabrous or with a dorsal beard at the junction with the lamina; ligule very short, ciliate; lamina lanceolate-linear from a usually long narrow or petiole-like base, long-tapering to a setaceous point, $\frac{1}{2}$ -2 ft. long, $\frac{1}{4}$ -1 in. broad, scabrous above, glabrous or sometimes more or less hairy, the margin very rough. Racemes on long fine peduncles, solitary or in clusters of up to 5 from the upper nodes, $\frac{1}{2}$ -2 in. long; rhachis with internodes up to $\frac{1}{4}$ in. long. Spikelets often purplish, subimbricate, oblong or lanceolate-oblong, spreading, about $\frac{1}{2}$ in. long.

*Central and Southern Sudan.***B. nubica** (Hochst.) Fig. & De Not.*Pennisetum unisetum* (non Benth.) Broun & Massey p.p.

Annual herb up to 5 ft. high; culms erect, copiously branched from the upper nodes, with rather numerous nodes, the longest internodes up to 6 in. long. Lower leaf-sheaths shorter than the internodes, the upper ones as long as or longer than the internodes, glabrous; ligule very short, long-ciliate; lamina linear from a sometimes long and petiole-like narrow base, long-tapering at the apex, up to 9 or 12 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ or rarely 1 in. broad, somewhat scabrous above, the margin rough. Racemes in very copious flaccid false panicles, long-bristled with often purple bristles, on long thread-like peduncles, 1-2 in. long; basal bristle about 1-1 $\frac{1}{2}$ in. long. Spikelets loosely imbricate.

*Northern and Central Sudan.***B. petiolaris** (Hochst.) Fig. & De Not.*Pennisetum unisetum* (non Benth.) Broun & Massey p.p.

Annual herb, with thick adventitious roots from the lowest nodes; culms erect, 1 $\frac{1}{2}$ -4 ft. high, branched from the upper nodes, glabrous, 8- or more-noded, the longest internodes up to 9 in. long. Leaf-sheaths pale, rather loose, glabrous except for the ciliate mouth; ligule very short, ciliate or reduced to a line of hairs; lamina thin, in the lower leaves suddenly contracted from a cordate sagittate or rounded base into a petiole up to 5 in. long or rarely some or all gradually narrowed into the petiole, in the upper leaves sessile or subsessile, all long-tapering to a fine point, 4-9 in. long, $\frac{1}{3}$ -1 in. broad, glabrous or pilose with long soft hairs. Racemes 1 or several together on long fine peduncles, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long; basal bristle up to 1 in. long.

Kassala: Gallabat. Kordofan.

14. **BOTHRIOCHLOA** Kuntze**Bothriochloa pertusa** (L.) A. Camus.*Amphilophis pertusa* (L.) Stapf.

Perennial herb; rhizome short; culms slender, many-noded, sometimes trailing or rambling over the ground, rooting and throwing up tufted or single shoots from the nodes, glabrous. Leaf-sheaths more or less keeled, usually bearded at the node; ligule very short, truncate, or in the lower leaves up to $\frac{1}{15}$ in. long and rounded, ciliate; lamina pale-green to glaucous, linear, long-attenuated at the apex to a fine point, rarely over 2 in. long on new growth, on culms up to 6 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad, pubescent or hirsute, often with tubercle-based hairs particularly towards the ligule, the margin rough upwards. Panicles subdigitate, 2-3 in. long; racemes pale- or dull-purplish, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, silky-villous. Sessile spikelets pale-greenish, oblong; glumes equal, a pit always present on the lower; awn $\frac{1}{2}$ -1 in. long including the stipe: pedicellate spikelets male, the lower glume not pitted.

*Equatoria.***B. radicans** (Lehm.) A. Camus.

Perennial herb; rhizome very short; culms slender, 3-6-noded, erect or ascending or prostrate and sending up bunches of short leafy shoots and culms, sometimes rooting at the nodes. Leaf-sheaths bearded at the node or some of the nodes (particularly the upper ones) beardless; ligule very short, truncate, ciliate; lamina linear, gradually attenuated to a fine point, up to 3 in. long, $\frac{1}{2}$ - $\frac{1}{4}$ in. broad, glabrous or sparsely hairy with minutely tubercle-based hairs. Panicles subdigitate, up to 3 in. long; racemes greyish-villous, few to 9, up to nearly 2 in. long. Sessile spikelets pale, linear-oblong, up to $\frac{1}{4}$ in. long; glumes equal, the lower always unpitted; awn $\frac{1}{2}$ - $\frac{3}{4}$ in. long including the stipe: pedicellate spikelets male or neuter, linear.

*Equatoria: 39 miles east of Kapoeta.***B. insculpta** (Hochst.) A. Camus.

Perennial herb; rhizome very short; culms slender, up to 3 or more ft. high, many-noded, the lower internodes often much lengthened and wiry. Leaf-sheaths glabrous, sometimes bearded at the mouth, long-bearded at the node; ligule short and truncate or broad-ovate and up to $\frac{1}{4}$ in. long; lamina pale-green to glaucous, linear, long-attenuated to a fine point, rounded and distinctly contracted at the base, on the culms up to 9 or more in. long, $\frac{1}{2}$ - $\frac{1}{4}$ in. broad, usually glabrous, rarely pubescent or sparingly beset with long fine hairs. Panicles subdigitate, 3-4 in. long; racemes olive-green variously flushed with dull-purple, 6-12 together, usually over 2 in. long. Sessile spikelets linear-oblong; glumes equal, a pit nearly always present on the lower; awn $\frac{3}{4}$ -1 in. long including the stipe, the column very dark, the bristle

tawny: pedicellate spikelets male or neuter; lower glume with 2-3 (or rarely 1 or 0) shallow pits.

Equatoria: *Torit*.

Var. *vegetior* (Hack.) C. E. Hubbard.

Amphilophis insculpta var. *vegetior* (Hack.) Stapf.

Leaf-laminas up to 1 ft. long, $\frac{3}{4}$ in. broad, usually very rough all over on the lower surface except towards the base. Primary axis of the panicles elongated, up to 3 in. long.

Kassala: *Gallabat*.

15. BRACHIARIA (Trin.) Griseb.

A. Lower glume reduced to a minute scale:

(a) Leaf-lamina $\frac{1}{2}$ - $\frac{3}{4}$ in. broad *B. reptans*.

(aa) Leaf-lamina $\frac{1}{2}$ - $\frac{3}{4}$ in. broad *B. eruciformis*.

AA. Lower glume not reduced to a minute scale:

B. Lower glume $\frac{3}{4}$ or more the length of the spikelet:

C. Spikelets hairy; perennial herbs:

(b) Rhachis of racemes almost 3-angled, usually wavy, the flat back up to $\frac{1}{2}$ in. broad *B. dictyoneura*.

(bb) Rhachis of racemes more or less ribbon-like with setulously ciliate margins curving over the bases of the spikelets which are placed alternately to right and left of the slender often purplish pubescent zigzag midrib, up to $\frac{1}{2}$ in. broad *B. jubata*.

CC. Spikelets glabrous; annual herb *B. stigmatiflora*.

BB. Lower glume $\frac{1}{2}$ or less the length of the spikelet:

D. Rhachis of racemes more or less flat, herbaceous, sometimes ribbon-like with a slender raised midrib *B. mutica*.

DD. Rhachis of racemes more or less 3-angled, sometimes thread-like:

E. Spikelets $\frac{1}{2}$ - $\frac{3}{4}$ in. long:

F. All spikelets sessile, their pedicels rarely exceeding $\frac{1}{4}$ in. long:

G. Lower floret male:

(c) Racemes usually with 1 row of spikelets, falcate, 2-6 or more in. long; perennial herb ... *B. brizantha*.

(cc) Racemes 2-4-rowed, more or less straight and sub-erect; annual herbs with stout culms:

(d) Racemes 2-rowed; spikelets with a conspicuous globose stipe *B. callopus*.

(dd) Racemes irregularly 2-4-rowed, broad; spikelets with a short cylindric stipe, quite glabrous and smooth *B. obtusiflora*.

GG. Lower floret barren or rarely male *B. lata*.

FF. Spikelets (at least those near the base of the raceme) normally in 2 rows with the primary on elongated pedicels:

H. Spikelets more or less beaked-acuminate or cuspidate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long *B. xantholeuca*.

HH. Spikelets obtuse to subacute or minutely apiculate:

I. Spikelets $\frac{1}{2}$ - $\frac{1}{4}$ in. or more long:(e) Spikelets $\frac{1}{2}$ in. long, pubescent or glabrous:(f) Spikelets or pairs or clusters (secondary racemes) of spikelets close; primary pedicels up to $\frac{1}{2}$ in. long *B. ramosa*.(ff) Spikelets or pairs of spikelets or secondary racemes very loosely scattered, distant by about $\frac{1}{2}$ in., glabrous or hairy; primary pedicels $\frac{1}{2}$ - $\frac{1}{4}$ in. or more long *B. deflexa*.(ee) Spikelets more than $\frac{1}{2}$ in. and up to $\frac{1}{4}$ in. or more long; leaf-lamina markedly cartilaginous and spinulously serrulate *B. serrifolia*.II. Spikelets $\frac{1}{2}$ in. or less long:

(g) Palea of lower floret with distinct inflexed flaps, not papillose; ligule a fringe of hairs

B. glauca.(gg) Palea of lower floret almost without flaps, slightly papillose at the base; ligule thinly membranous, truncate, ciliate *B. leersioides*.EE. Spikelets from less than $\frac{1}{2}$ to $\frac{1}{4}$ in. long, on the very slender rhachis of simple or more often compound racemes, somewhat flattened on the back or rarely rather convex and swollen; annual herbs:(h) Spikelets glabrous *B. secernenda*.

(hh) Spikelets hairy:

(i) Spikelets finely pubescent *B. kotschyana*.(ii) Spikelets silky with a tuft of long white soft hairs concealing the obtuse or subacute tip *B. comata*.**Brachiaria reptans** (L.) Gardn. & Hubbard.*Urochloa reptans* (L.) Stapf.

Annual or subperennial herb, usually prostrate or creeping, throwing up secondary culms from the rooting nodes of the often long-decumbent base, $\frac{1}{2}$ - $1\frac{1}{2}$ ft. high. Leaf-sheaths usually loose, quite glabrous and smooth except at the densely ciliate margins and often pubescent node; ligule a shortly ciliate rim; lamina lanceolate to ovate- or linear-lanceolate, $\frac{1}{2}$ - $2\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, rounded to subcordate at the base, attenuated from low down to an acute point, glabrous or ciliate downwards with long stiff hairs or softly hirsute. Inflorescences at length usually long-exserted, ovoid to obovoid-oblong, 1-3 or more in. long, of few to 12 or more secund spiciform racemes; racemes solitary, $\frac{1}{2}$ - $1\frac{1}{4}$ in. long, sessile or subsessile, 2-many-rowed; rhachis slender, slightly wavy, 3-angled, pubescent or somewhat villous at the base. Spikelets (or their pairs or clusters) more or less closely arranged, greenish or rarely tinged with purple, up to $\frac{1}{2}$ in. long, glabrous or grey-pubescent. Glumes very dissimilar.

Upper Nile Province.

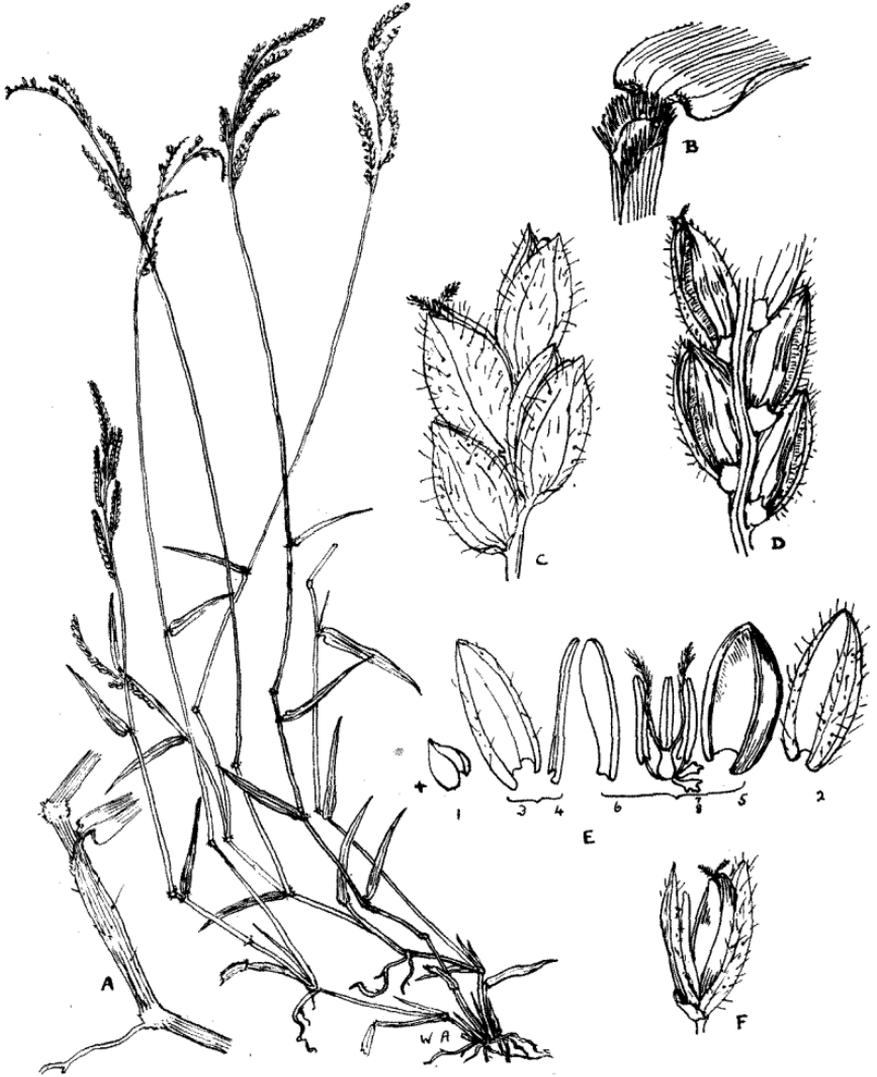


Fig. 96—*BRACHIARIA ERUCIFORMIS* (Sm.) Griseb.

A, showing nodes with root arising from one of them. B, ligule with portion of leaf-sheath and lamina. C, portion of raceme from front. D, portion of raceme from back. E, spikelet dissected; + indicates position of rachis. F, partially opened spikelet.

B. eruciformis (Sm.) Griseb.

Fig. 96.

B. isachne (Roth) Stapf.

Annual herb 1-2 ft. high, loosely tufted; culms jointed, ascending from a sometimes decumbent and rooting base, very slender, 3-many-noded, much branched below. Leaf-sheaths strongly striate, softly and loosely hairy or glabrous except at the minutely villous node; ligule a dense fringe of short hairs; lamina linear-lanceolate from a rounded base, acute at the apex, 1-2½ in. long, ½-⅓ in. broad, hairy or glabrous, the margin very scabrous. Inflorescences secund or subsecund, very narrow, 1-3 in. long, of 2-10 secund spike-like racemes usually appressed to the thread-like scabrous common axis; racemes simple, dense, ½-1 in. long; rhachis scabrous or finely setulose. Spikelets pallid with a purplish tip, in 2 rows, subimbricate, oblong, ⅓-½ in. long, softly pubescent. Glumes very unequal, the upper minutely hairy.

*Widespread.***B. dictyoneura** (Fig. & De Not.) Stapf.

Perennial herb 1½-3 ft. high, tufted apparently from a short rhizome; culms 4-9-noded, simple. Lower leaf-sheaths soon slipping off the culm and inrolled and thus almost resembling petioles, 1½-4 in. long, striate, glabrous and smooth except along the ciliolate or pubescent upper margins and mouth; ligule a fringe of hairs; lamina linear to linear-lanceolate, tapering to an acute point, broad and slightly rounded at the base, in the basal leaves 2-10 in. long, ½-¾ in. broad, glabrous or with some hairs at the base or rarely very loosely hairy all over, in the uppermost leaf nearly suppressed and subulate. Inflorescences at length exerted, secund, often arching, of 3-6 solitary oblique distant secund spiciform racemes; common axis 6-12 in. long, often produced above the uppermost raceme into a short barren point; racemes very dense, 2-7 in. long, 2-ranked, the ranks closed up or divergent, sessile or subsessile, sometimes with 1-3 arrested spikelets at the base; rhachis often dark-purple. Spikelets greyish-green with a usually deep-purple lower glume, close, broad-oblong, up to over ½ in. long, silky-hirsute.

*Kordofan. Fung District.***B. jubata** (Fig. & De Not.) Stapf.*B. fulva* Stapf.

Perennial herb up to 3 ft. high, densely tufted on a rather slender rhizome; culms 3-4-noded, usually simple, with internodes glabrous or more or less hirsute below the nodes. Leaf-sheaths rather tight, glabrous or hirsute and often densely so; ligule a narrow ciliolate rim; lamina lanceolate-linear to linear from an equally wide base, long-tapering to a fine point, from a few inches to over 12 in. long, ¼-⅓ in. broad, glabrous or more frequently shortly and finely hirsute. Inflorescences erect, secund, of 4-12

distant frequently arched dense spike-like racemes; common axis 2-5 or more in. long; racemes 2-ranked, up to 1½ in. long, simple, tawny. Spikelets almost imbricate, oblong, obtuse or subacute at the apex, ½ or more in. long, hairy.

Kassala: Gallabat. Kordofan. Equatoria.

B. stigmatisata (Mez) Stapf.

Annual herb over 2 ft. high; culms tufted or almost solitary, ascending from a somewhat decumbent base, branched or almost simple, 5-many-noded, glabrous and smooth. Leaves glabrous apart from the ciliate sheath-margins; ligule a narrow minutely ciliolate membranous rim; lamina linear to linear-lanceolate from a more or less rounded or shortly narrowed base, tapering to an acute point, 1-7 or more in. long, ¼-½ in. broad, the margin minutely spinulose. Inflorescences of 1-3 (sometimes -5) oblique secund spike-like racemes; common axis ¾-2 in. long, sometimes continued beyond the uppermost raceme as a thread-like point, shortly hairy at the nodes, otherwise glabrous; racemes simple, dense, 1-2½ in. long; rhachis with an almost straight slightly prominent keel on the face, ¼ in. broad. Spikelets pale-greenish, often imbricate, oblong, about ½ in. long.

Equatoria.

B. mutica (Forsk.) Stapf.

Perennial herb 3-8 ft. high; culms ascending from a sometimes long, prostrate and copiously rooting base, usually many-noded and sheathed high up, simple or sparingly branched, glabrous, often waxy-powdery below the nodes. Leaf-sheaths tight, glabrous and smooth or hirsute with tubercle-based hairs, usually copiously bearded at the node; ligule a ciliolate rim; lamina linear from a shortly and slightly constricted base, long-tapering to a slender point, few-12 or more in. long, ¼-¾ in. broad, glabrous or rarely more or less hirsute. Panicles oblong to ovoid-oblong, subsecund, 4-8 (usually 6) in. long; common axis glabrous; racemes greenish or tinged with purple, numerous, solitary or sometimes paired or in false whorls, 2-many-ranked, 1-3 (rarely -5) in. long, usually compound and then frequently interrupted, glabrous. Spikelets laterally touching, oblong to lanceolate-oblong, about ½ in. long, glabrous.

White Nile. Equatoria.

B. brizantha (Hochst.) Stapf.

Perennial herb up to 6 or more ft. high from a short sometimes stout rhizome, with stout tomentose root-fibres; culms stout, 4-6- (or sometimes many-) noded, simple or scantily branched. Leaves glabrous or softly hairy to almost velvety; sheath not persisting very long; ligule a narrow fringed rim; lamina light-green, linear or sometimes oblanceolate, acute or long-tapering to a slender point, 2-15 in. long, ¼-¾ in. broad, the margin cartilaginous and

spinulose. Inflorescences secund, of 2-8 (very rarely 1) distinct sessile straight or arching spike-like racemes; common axis glabrous with scabrous or ciliolate angles; racemes secund, dense, 2-6 or more in. long, sometimes with 1 or more arrested spikelets superposed. Spikelets closely touching, turgid, oblong to ellipsoid-oblong, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, glabrous or rarely sparingly hairy upwards, pallid and frequently with a purple tip or variously tinged with purple.

Central and Southern Sudan.

B. callopus (Pilg.) Stapf.

Annual herb over 2 ft. high, copiously rooting from the lowest nodes; culms erect, simple, stout, sheathed all along, glabrous, about 7-noded. Leaf-sheaths rather thin, compressed upwards and broadly keeled; ligule a fringe of white hairs; lamina linear, passing into the sheath, acute at the apex, keeled with the keel thinning out upwards, up to 8 in. long, finely hairy at least downwards. Inflorescences erect, about 6 in. long, of 6-8 more or less erect secund subequally distant racemes; racemes dense, in 2 rows, sessile, from 2 in. (the lowest) to $\frac{2}{3}$ in. long. Spikelets pale-straw-coloured, touching, ellipsoid, stoutly stipitate, about $\frac{1}{2}$ in. long. Glumes very unequal.

Equatoria.

B. obtusiflora (Hochst.) Stapf.

Annual herb up to 3 ft. high; culms erect or bent, stout, 4-5-noded, simple, glabrous; upper internodes exerted. Leaf-sheaths not very firm, the lower slipping from the culm, glabrous or more or less loosely hairy, the hairs from minute tubercles; ligule quite suppressed; lamina linear to linear-lanceolate from an equally broad or constricted and rounded base, tapering to a slender acute point, 3-8 or more in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, the margin cartilaginous, spinulously scabrous, the midrib whitish. Inflorescences contracted, 2-6 or more in. long, erect, narrowly oblong, more or less secund, of 5-8 dense and broad spiciform racemes; racemes irregularly many-rowed, compound, 2- $\frac{2}{3}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, straight; secondary racemes of usually 3 or rarely 4 spikelets, very short and contracted, forming clusters of as many spikelets. Spikelets pale or yellowish, sometimes variegated with purple, densely crowded, very swollen, ellipsoid to oblong-ellipsoid, about $\frac{1}{2}$ in. long.

Widespread.

B. lata (Schumach.) C. E. Hubbard.

Urochloa insculpta (Steud.) Stapf.

Annual herb up to 5 ft. high but usually much smaller; culms solitary or in scanty tufts, often rooting at the lower nodes, simple or more or less branched, 4-7- (rarely more-) noded, glabrous. Leaf-sheaths finely ciliate along the margins, the lowest

often slipping off the culm, nearly always greyish-pubescent at the node, otherwise glabrous or more or less softly hirsute with tubercle-based hairs; ligule a densely ciliate rim; lamina lanceolate to lanceolate-linear from a rounded or subcordate subamplexicaul base, long-tapering to a slender point, $2\frac{1}{2}$ -9 or more in. long, $\frac{1}{3}$ -1 in. broad, more or less ciliate downwards along the scabrous cartilaginous margin. Inflorescences on slender peduncles which on maturity are more or less exerted from the uppermost sheaths, of generally numerous obliquely erect sessile or subsessile rarely shortly pedunculate spiciform secund racemes crowded into an oblong or ovoid-oblong panicle 3-7 in. long; racemes more or less straight, usually very irregularly many-rowed. Spikelets pale-green, ellipsoid-oblong, shortly acute or apiculate at the apex, about $\frac{1}{3}$ in. long, nearly always glabrous.

Central and Southern Sudan.

B. xantholeuca (Hack.) Stapf.

Annual herb up to 2 or more ft. high, loosely tufted; culms ascending or rooting at the base, few- to about 8-noded, branched, softly hairy at least upwards. Leaf-sheaths more or less softly hairy to subtomentose or villous with rather long spreading hairs, hairy at the node; ligule a dense fringe of short hairs; lamina lanceolate-linear to linear from a slightly and shortly contracted base, tapering to a callous acute or subacute point, $1\frac{1}{2}$ -4 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, softly pubescent to tomentose or velvety on both surfaces, the margin finely cartilaginous and very scabrous. Inflorescences more or less secund, $1\frac{1}{2}$ -4 in. long, of 3-8 stiff sessile or subsessile spiciform racemes; racemes $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, 2-rowed, simple. Spikelets pale-green, touching, ovoid to oblong-ellipsoid, shortly cuspidate to beaked-acuminate at the apex, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, hairy or rarely glabrous.

Equatoria.

B. ramosa (L.) Stapf.

Annual herb up to 2 or more ft. high; culms clustered, slender, usually ascending from a frequently prostrate and rooting base, 4-many-noded, branched below, glabrous or softly and finely pubescent upwards. Leaf-sheaths glabrous with only a few marginal cilia towards the mouth to finely pubescent all over; ligule a line of short white hairs; lamina linear-lanceolate from a rounded and often clasping base, finely long-acuminate at the apex, up to 6 in. long, $\frac{1}{4}$ -1 in. broad, glabrous or finely pubescent beneath near the base or all over, the margin sharply scabrous. Panicles at length usually more or less exerted, narrowly oblong, 2-6 in. long, of 5-many solitary suberect or oblique spike-like racemes; racemes moderately slender, the lower ones $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long. Spikelets solitary or in pairs or clusters, greenish, at length pale-straw-coloured, somewhat swollen, ovoid, subacute or apiculate at the apex, $\frac{1}{2}$ in. long.

Red Sea District: Port Sudan. Blue Nile Province: Gezira.

B. deflexa (Schumach.) C. E. Hubbard ex Robyns.*B. regularis* (Nees) Stapf.

Annual herb rarely much over 1½ ft. high; culms clustered, slender, usually erect or suberect, rarely more than 4-noded, branched, finely pubescent at least towards the panicle. Leaf-sheaths delicately pubescent all over or at least upwards; ligule a fringe of short stiff hairs; lamina often glaucous, linear to sub-lanceolate-linear from a rounded rarely clasping base, long-tapering to a slender point, up to 8 or more in. long, ¼-⅓ in. broad, finely pubescent, the margin scabrous. Panicles at length more or less exserted, oblong to broad-ovoid, 4-6 in. long, 3-5 in. broad, of 5 to many solitary or paired at length much spreading or horizontal very lax racemes; racemes slender, the lower and intermediate ones 1½-2½ or even -5 in. long; pedicels thread-like, the longer of a pair up to ¼ or even 1 in. long. Spikelets (or pairs of spikelets or secondary racemes) distant by ¼-⅓ in., hence usually very loosely scattered.

Northern and Central Sudan.

B. serrifolia (Hochst.) Stapf.

Annual herb up to 3 or more ft. high; culms single or scantily clustered, suberect, 5-many-noded, branched from near the base or all along, glabrous, usually loosely hairy on the upper parts of the internodes. Leaf-sheaths often slipping off the culm and rolling round the subtended branch, more or less hirsute with tubercle-based hairs; ligule a narrow ciliolate rim; lamina lanceolate-linear from a rounded or cordate or obtusely auricled base, long-tapering to a slender point, 3-8 in. long, ½-1 in. broad, glabrous but often rough on the nerves above. Panicles at length more or less exserted, rather secund, of 5-7 solitary slightly lax racemes; racemes stout, 1-3 or more in. long, usually simple; pedicels paired or solitary upwards, thread-like, with or without long very fine spreading hairs. Spikelets (or pairs of spikelets) greenish, distant by ⅓-½ in., ellipsoid to obovoid-oblong, quite glabrous, ⅓-½ in. long.

Kordofan: Rahad el Sidr.

B. glauca Stapf.

Glaucous possibly perennial herb 1-2 ft. high, densely tufted on a short rhizome, whitish-pubescent; culms slender, simple or sparingly branched, up to 7-noded, glabrous or more or less pubescent or the lowest internodes almost villous. Leaves delicately pubescent to almost villous or the uppermost ones sometimes becoming glabrous; ligule a dense fringe of hairs; lamina linear from an equally wide or attenuated base, long-tapering to a fine somewhat callous point, 3-6 in. long, ¼-½ in. broad. Panicles at length exserted, 3-5 in. long, subsecund, of 3-9 usually solitary distant oblique spike-like racemes; racemes slender, the lower ones 1-1½ in.

long, with a marked villous pulvinus at the base. Spikelets broad-oblong, obtuse or subobtuse at the apex, not apiculate, up to $\frac{1}{2}$ in. long, quite glabrous.

Red Sea Hills: Wadi O-Mareg, west of Sinkat, 3000 ft.

B. leersioides (Hochst.) Stapf.

Annual more or less glaucous herb 1-2 ft. high; culms in clusters, about 4-noded, branched below, glabrous, often with a fine waxy coating. Leaf-sheaths glabrous or the lower ones with spreading tubercle-based hairs; ligule thinly membranous, truncate, ciliate; lamina linear from an equally broad or somewhat narrowed base, long-tapering to a slender point, 3-6 or more in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, glabrous or with a few tubercle-based hairs downwards, slightly rough. Panicles at length usually long-exserted, ovoid to oblong, 3-9 in. long, of 4-12 solitary distant horizontally spreading or somewhat deflexed slender spike-like racemes; racemes up to $1\frac{1}{2}$ or more in. long; pedicels very unequal. Spikelets glaucous, oblong, slightly convex on the back, $\frac{1}{10}$ - $\frac{1}{8}$ in. long, glabrous.

Red Sea Hills: Wadi O-Mareg, west of Sinkat.

B. secernenda (Hochst.) Henrard.

B. epaleata Stapf.

Annual herb up to $1\frac{1}{2}$ ft. high; culms rooting from the lower nodes, sparingly branched below, 5-6-noded, sparingly and minutely pubescent or slightly rough upwards. Leaf-sheaths tight, glabrous except on the sometimes pubescent or shortly ciliate outer margin; ligule a fringe of short stiff hairs; lamina linear-lanceolate to sublinear from a shortly rounded never-clasping base, the margin cartilaginous, closely crisped and spinulose ciliate. Panicles long-exserted, $2\frac{1}{2}$ -4 in. long, 1-2 in. broad, of 6-8 moderately distant solitary slender interrupted and compound or simple racemes; racemes all simple or the lower ones compound to beyond the middle with the secondary racemes loose; pedicels solitary or in pairs, thread-like, loosely pubescent. Spikelets (or pairs of spikelets or secondary racemes) distant by $\frac{1}{2}$ - $\frac{1}{3}$ in., greenish, slightly flattened on the back, $\frac{1}{2}$ in. long, glabrous.

Kassala: Gallabat.

B. kotschyana (Hochst.) Stapf.

Fig. 97.

Annual herb $\frac{1}{2}$ -2 or more ft. high; culms usually ascending from a shortly decumbent or prostrate and then rooting base, more or less branched, few-many-noded. Leaf-sheaths rather firm and tight, those subtending a branch slipping off the culm and often rolled round the branch, pubescent to softly and shortly hirsute; ligule a narrow ciliolate rim; lamina lanceolate to linear-lanceolate from a shortly rounded but not clasping base, tapering to an acute point from low down, 1-3 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, stiff and somewhat succulent, the margin cartilaginous

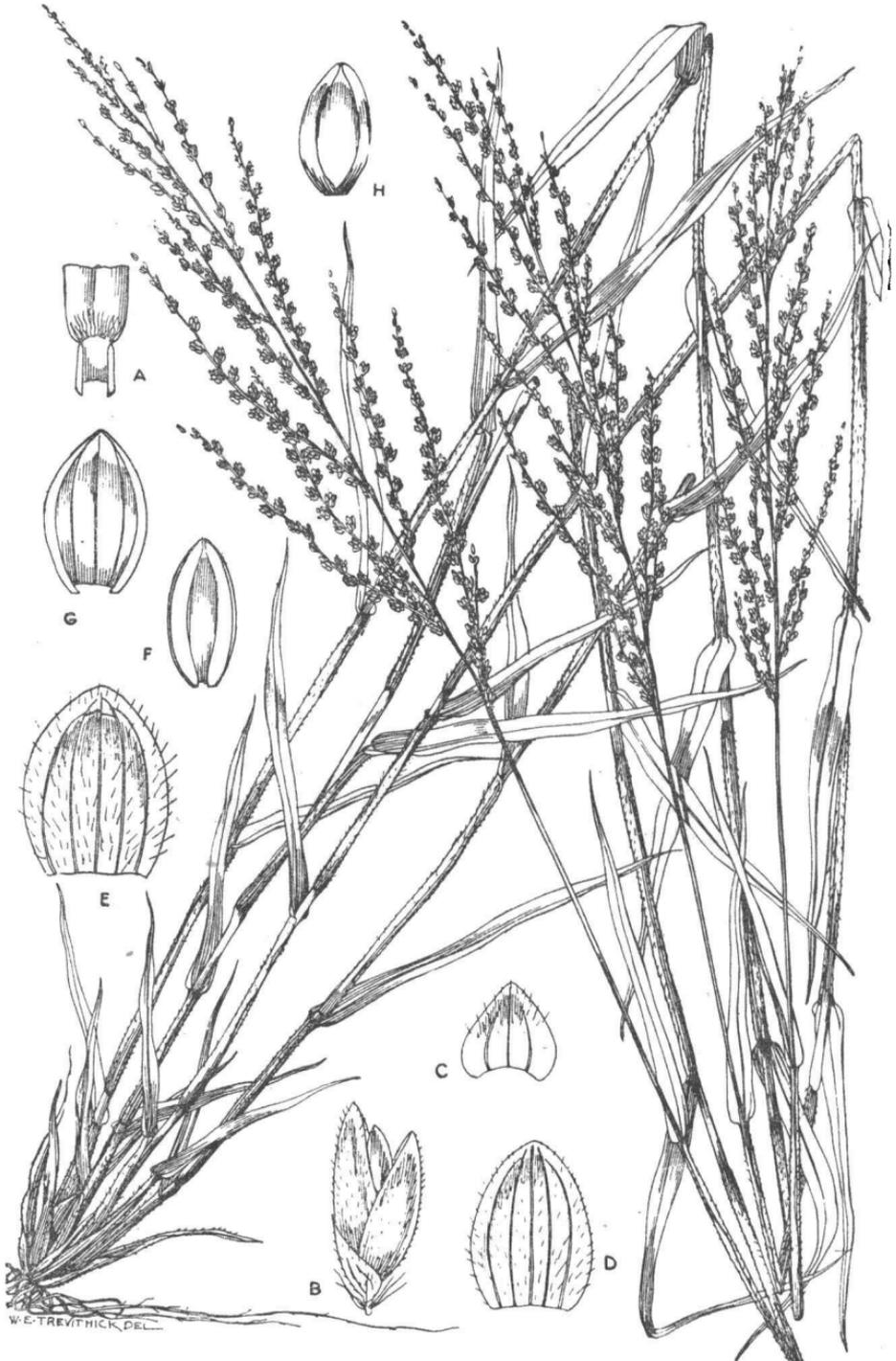


Fig. 97—*BRACHIARIA KOTSCHYANA* (Hochst.) Stapf.

A, ligule. B, spikelet. C, lower glume. D, upper glume. E, lemma of lower floret. F, palea of same. G, lemma of upper floret. H, palea of same.

and minutely spinulously ciliate and frequently closely crisped. Panicles more or less exserted, secund or subsecund, 2-6 or more in. long, of 6 to numerous oblique solitary slender more or less interrupted mostly compound racemes; racemes straight or sometimes nodding, the lowest and intermediate ones $\frac{1}{2}$ -3 or more in. long. Spikelets usually in secund short clusters of 2-6, pale or tinged with purple, oblong, slightly swollen and much gaping during flowering, about $\frac{1}{2}$ in. long.

Kordofan: Jebel Kon. Ekuatoria.

B. comata (Hochst.) Stapf.

Annual herb up to 1 or more ft. high, loosely tufted; culms ascending from a decumbent base, usually very slender, more or less pubescent to almost glabrous, 4-many-noded, branched below to almost all along. Leaf-sheaths softly hairy to subhirsute or glabrous with the exception of the pubescent outer margin and the node; ligule a dense fringe of short hairs; lamina lanceolate to linear-lanceolate from a rounded base, tapering to a very acute point, $1\frac{1}{2}$ -3 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, sometimes subhirsute with minutely tubercle-based hairs, the margin markedly cartilaginous, closely crisped and spinulously ciliate. Panicles secund or subsecund, narrow or semi-ovoid, $2\frac{1}{2}$ - $3\frac{1}{2}$ in. long, of 7-10 secund oblique and often arching somewhat loose racemes; racemes sessile or subsessile, mostly compound downwards, the lowest ones 1-3 in. long. Spikelets (or pairs or clusters of spikelets) about $\frac{1}{2}$ in. apart, obovoid, about $\frac{1}{16}$ in. long.

Southern Sudan.

16. **BRACHYPODIUM** Beauv.

Brachypodium flexum var. **abyssinicum** Hochst.

Perennial herb up to 3 ft. high; culms branched, slender. Leaves broadly linear, scabrous. Spikelets pubescent, compressed, alternate and shortly pedicellate in spike-like racemes, about 1 in. long, about 10-flowered. Lemma lanceolate, gradually narrowed to the apex, with a scabrous awn about $\frac{1}{2}$ in. long.

Ekuatoria: Imatong Mountains.

17. **BROMUS** L.

Bromus adoensis Hochst. ex A. Braun.

Annual herb about 1 ft. high; culms slender. Leaves long and narrow. Panicles lax. Spikelets purplish, 6-9-flowered, with a slender flexuous rhachilla, tassel-like, about 1 in. long; awns up to $\frac{3}{4}$ in. long.

Red Sea Hills. Darfur: Jebel Marra, 6500-10,000 ft.

B. runssoroensis K. Schum.

Tufted perennial herb; culms 3-4 $\frac{1}{4}$ ft. high, glabrous or pilose. Leaf-laminas scabrous, pubescent especially beneath. Panicles large and open, of many spikelets, the branches scabrous. Spikelets about $\frac{3}{4}$ in. long, 5-6-flowered. Lemma awned near the apex. Palea ciliate.

Equatoria: Imatong Mountains, Kippia, 8000 ft.

18. **CENCHRUS** L.**Cenchrus prieurii** (Kunth) Maire.

C. macrostachyus Hochst. ex Steud.

Annual herb; culms erect or ascending, 1-2 $\frac{1}{2}$ ft. high, branched from near the base or up to the middle, 5-6-noded, scabrous just beneath the inflorescence. Leaf-sheaths somewhat scabrous, glabrous, the basal ones longer than the internodes and compressed and keeled, the upper ones at length shorter than the internodes and keeled towards the mouth; ligule a densely ciliate rim; lamina linear, finely acute at the apex, 3 $\frac{1}{2}$ -11 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad. False spikes straw-coloured or purplish, 2 $\frac{1}{2}$ -5 $\frac{1}{2}$ in. long, $\frac{7}{8}$ -1 $\frac{1}{4}$ in. broad; involucre with a wide naked connate base; bristles or prickles barbed upwards and connate at the base only; inner bristles subequal, $\frac{1}{2}$ -1 in. long.

Red Sea District. Darfur. Kordofan.

C. ciliaris L.

Pennisetum cenchroides Rich.

Perennial herb, with a stout tough or woody rootstock; culms ascending, often from a decumbent many-noded base, $\frac{1}{2}$ -3 or more ft. high, branched, glabrous or scantily hairy. Leaves glabrous or loosely beset with fine usually tubercle-based stiff hairs; ligule a dense ciliate rim; lamina linear, long-tapering to a setaceous tip, 3-12 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad. False spikes cylindric, pallid or purplish, slender to stout, straight or flexuous, $\frac{1}{4}$ in. long; involucre with a small circular or semi-elliptic naked connate base; bristles or prickles barbed upwards, connate at the base only; inner bristles subequal and up to $\frac{1}{2}$ in. long or with 1 exceeding the rest and up to $\frac{3}{4}$ in. long.

Northern and Central Sudan.

C. pennisetiformis Steud. & Hochst.

Pennisetum cenchroides (non Rich.) Broun & Massey p.p.

Perennial herb, sometimes behaving as an annual and flowering the first year; culms erect or ascending, $\frac{1}{2}$ -2 ft. high, usually branched, 1-6-noded. Leaf-sheaths loosely pilose or glabrous except for the ciliate margins and loosely bearded mouth; ligule a ciliate rim; lamina narrowly linear to linear, finely acute at the apex, 1-6 in. long, $\frac{1}{4}$ - $\frac{1}{8}$ in. broad. False spikes pale-brown or purple, cylindric, $\frac{3}{4}$ -2 $\frac{1}{2}$ in. long, $\frac{1}{4}$ -1 in. broad; involucre

subsessile; bristles barbed upwards, connate above the base for $\frac{1}{4}$ - $\frac{1}{2}$ in.; outer bristles numerous, up to nearly $\frac{1}{2}$ in. long; inner bristles very slender, slightly widened at the base, up to $\frac{1}{4}$ - $\frac{1}{2}$ in. long.

Red Sea District. Kordofan.

C. setigerus Vahl.

C. biflorus (non Roxb.) Broun & Massey.

Perennial herb, with a stout rootstock or sometimes behaving as an annual and flowering the first year; culms erect or ascending, $\frac{1}{2}$ -1 $\frac{1}{2}$ ft. high, slender, 1-6-noded, branched with the branches erect, glabrous or rarely pilose towards and at the nodes. Leaf-sheaths compressed and keeled, ciliate on the margins or glabrous except for the bearded mouth or loosely hairy with tubercle-based hairs; ligule a shortly ciliate rim; lamina linear, tapering to a fine point, up to 6 (or rarely 12) in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad. False spikes straw-coloured, pale-green or purple, cylindric, dense, erect, $\frac{1}{2}$ -3 $\frac{1}{2}$ in. long, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad; involucre suberect, sessile, up to $\frac{1}{2}$ in. long; outer bristles suppressed or very minute; inner bristles up to 13, connate for $\frac{1}{4}$ - $\frac{1}{3}$ their length, the free portions forming short rigid subulate prickles barbed upwards.

Northern and Central Sudan.

C. biflorus Roxb.

C. catharticus Del.

Annual herb; culms erect or ascending from a decumbent base and rooting at the lower nodes, $\frac{1}{2}$ -3 $\frac{1}{2}$ ft. high, simple or branched, 4-8-noded. Leaf-sheaths compressed and keeled, scabrous upwards, glabrous; ligule a densely ciliate rim; lamina linear or lanceolate-linear, tapering to a fine point, 1 $\frac{1}{2}$ -12 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, scabrous on both surfaces or smooth beneath. False spikes straw-coloured or rarely purplish, dense-cylindric, 1 $\frac{1}{2}$ -6 in. long, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad; involucre sessile or minutely stalked, $\frac{1}{3}$ - $\frac{1}{2}$ in. long; bristles numerous, united at the base into a shallow crescent-shaped or elliptic disk, those of the outer row shorter and at length horizontally spreading, rigid, prickle-like, barbed downwards.

Northern and Central Sudan.

19. CHASMOPODIUM Stapf

Chasmopodium caudatum (Hack.) Stapf.

Annual herb, rooting from the lower nodes; culms up to 10 ft. high, 8- or more-noded, branched above with branches all flowering. Leaf-sheaths hirsute with tubercle-based hairs or glabrous, sometimes bearded at the node; ligule a line of short hairs; lamina lanceolate-linear, setaceously acuminate at the apex, 10-20 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, more or less scabrous on both surfaces. Racemes up to 3 in. long, erect, $\frac{1}{2}$ - $\frac{1}{2}$ in. in diameter, the first glume of the terminal spikelet being produced into a scabrous

somewhat twisted green tail about $\frac{1}{2}$ in. long; joints $\frac{1}{2}$ in. long, nearly as long as the sessile spikelets, club-shaped from a narrow-linear base, ciliate along the outer angle; pedicels about as long as and similar to the joints or almost linear. Sessile spikelets broadly ovate from a narrow annuliform shortly bearded and well marked-off callus about $\frac{1}{4}$ in. long; glumes equal: pedicellate spikelets ovate to ovate-oblong, compressed, $\frac{1}{3}$ in. long.

Equatoria.

20. CHLORIS Sw.

A. Lemma long-pilose with silky white hairs:

- (a) Annual herb; upper leaf-sheath spathaceous, more or less embracing the inflorescence *C. lamproparia*.
 (aa) Perennial herb; upper leaf-sheath not spathaceous, the inflorescence exserted *C. robusta*.

AA. Lemma without long white hairs (except the upper part of the margin):

B. Lemma shortly awned, the awn less than twice as long as the lemma:

- (b) Lemma shortly ciliate on the keel and nerves *C. pilosa*.
 (bb) Lemma glabrous on the keel and shortly ciliate only at the apex and base of the nerves *C. gayana*.

BB. Lemma long-awned, the awn more than twice as long as the lemma:

C. Rudimentary flower very minute on a long rhachilla-joint; spikelets 2-awned *C. pycnothrix*.

CC. Rudimentary flower cuneate on a rather short joint:

D. Spikelets 2-awned *C. virgata*.

DD. Spikelets more than 2-awned:

- (c) Spikelets 4-6-awned; lemma oblong-lanceolate, ciliate towards the apex *C. prieurii*.
 (cc) Spikelets 3-awned; lemma elliptic, ciliate in the upper part *C. barbata*.

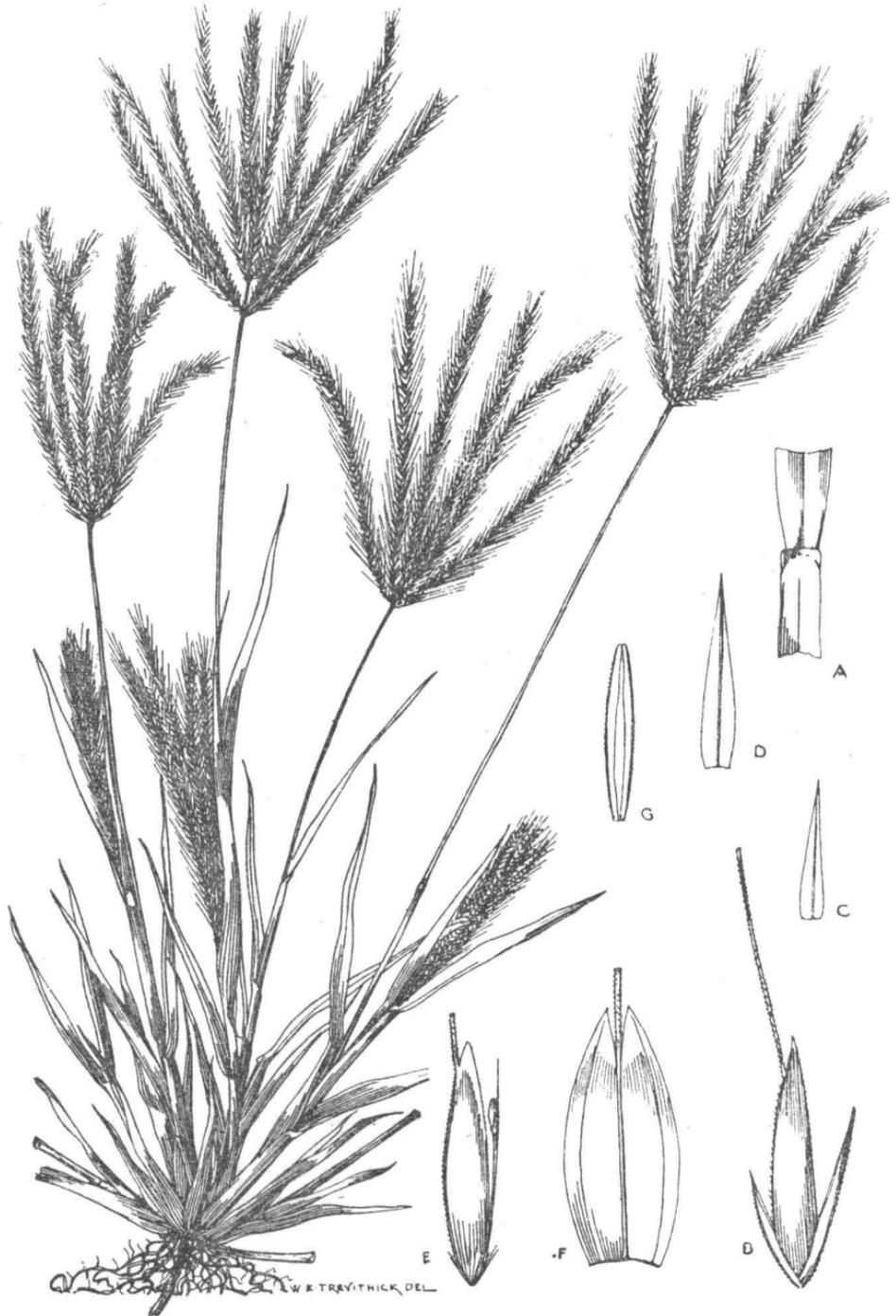
Chloris lamproparia Stapf.

Tufted annual herb about 1-2 ft. high; culms 4-5-noded. Ligules membranous, very short, ciliolate; lamina linear-lanceolate, long-attenuated, 2 $\frac{3}{4}$ -3 $\frac{1}{2}$ in. long, about $\frac{1}{2}$ in. broad. Spikes 2-3 together, digitately arranged, sessile, 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ in. long. Spikelets pale-brown, $\frac{1}{4}$ in. long. Glumes unequal. Lemma boat-shaped, awned near the apex; awn minutely barbed, $\frac{1}{2}$ in. long.

Kordofan: Muglad.

C. robusta Stapf.

Perennial herb 4-9 ft. high, often on banks or in river-beds; culms robust, 7-many-noded, glabrous. Ligules membranous, very short, minutely ciliolate; lamina linear, long-attenuated at the apex, 6-10 in. long, $\frac{1}{4}$ - $\frac{3}{8}$ in. broad. Spikes 15-30 together, slender, umbelled or in tiers, up to 6 in. long. Spikelets about $\frac{1}{2}$ in. long. Glumes very unequal, persistent, narrowly lanceolate, closely

Fig. 98—*CHLORIS PYCNOTHRIX* Trin.

A, ligule. B, spikelet. C, lower glume. D, upper glume. E, fertile floret and rudimentary floret by the side. F, lower lemma. G, palea.

folded, keeled. Lemma laterally compressed, linear-lanceolate, awned; awn about $\frac{1}{8}$ in. long.

Equatoria.

C. pilosa Schumach.

C. breviseta Benth.

Perennial herb up to 3 or more ft. high; culms stout. Spikes 7-12 together, 2-3 in. long. Glumes compressed, unequal, mucronate-awned. Lemma shortly ciliate on the keel and nerves, compressed, 2-lobed, at length appearing truncate, with a short awn.

Central and Southern Sudan.

C. gayana Kunth.

Perennial or annual herb up to 4 ft. high; culms erect or ascending, often emitting clusters of barren shoots or short runners from the lower nodes, often robust, 3-9-noded, glabrous. Ligules membranous, very short, long-hairy; lamina linear, long-tapering to a fine point, 6-12 or more in. long. Spikes 6-15 together, umbelled, 2 $\frac{1}{4}$ -4 in. long. Lemma glabrous on the keel and shortly ciliate at the apex and base of the nerves, not at length appearing truncate; awn about as long as the lemma.

Central and Southern Sudan.

C. pycnothrix Trin.

Fig. 98.

Perennial or annual herb 6-12 in. high; culms prostrate, emitting tufts of barren shoots and culms from the rooting nodes; culms ascending, 2-3-noded. Leaves conspicuously distichous; ligule membranous, very small, ciliolate; lamina linear, 1 $\frac{1}{2}$ -2 in. long. Spikes 3-9 together, pallid or purplish, more or less umbelled, 1 $\frac{1}{2}$ -3 in. long. Spikelets 2-awned, the awns more than twice as long as the nearly glabrous lemmas; rudimentary floret very minute on a long rhachilla-joint.

Equatoria.

C. virgata Sw.

Fig. 99.

Perennial or annual herb 1-3 ft. high; culms erect or ascending or prostrate below, rooting and emitting clusters of barren shoots from the nodes, 3-5-noded, glabrous, smooth. Ligules membranous, very short, very minutely ciliolate; lamina linear, gradually tapering to an acute point, 1-4 in. long, glabrous or rarely sparingly hairy, the margin rough. Spikes whitish-green or purplish, 6-15 or more together, sessile, 1-3 in. long. Spikelets 2- or rarely 3-flowered, 2-awned, almost $\frac{1}{8}$ in. long.

Northern and Central Sudan.



Fig. 99—CHLORIS VIRGATA Sw.

A, portion of spike. B, portion of spike after florets have fallen. C, spikelet. D, spikelet dissected. E, ligule with portion of leaf-sheath and lamina.

C. prieurii Kunth.

C. punctulata Hochst. ex Steud.

Tufted annual herb; culms erect, 1-2 ft. high. Leaves linear, elongated, glaucescent. Spikes 5-8 together, $1\frac{1}{2}$ - $3\frac{1}{4}$ in. long. Spikelets 4-6-awned, the awns more than twice as long as the lemmas; rudimentary floret cuneate on a rather short joint. Lemma oblong-lanceolate, acute and ciliate at the apex.

Northern and Central Sudan.

C. barbata Sw.

Perennial herb; culms stout, 1-3 ft. high, with long creeping runners at the base. Spikes 4-20 together, digitately arranged, $\frac{3}{4}$ -4 in. long. Spikelets green or red-purple, $\frac{1}{16}$ - $\frac{1}{8}$ in. long, 3-awned. Glumes very hairy, acute at the apex. Lemma elliptic, ciliate in the upper part; awn $\frac{1}{4}$ - $\frac{1}{3}$ in. long.

Darfur.

21. **CHRYSOPOGON** Trin.**Chrysopogon aucheri** var. **quinqueplumis** (A. Rich.) Stapf.

Perennial herb; culm-bases elongated, wiry, abundantly branched, the branches forming clusters of culms and short leafy branches; culms very slender, 1-2 or more ft. high. Leaf-sheaths very tight except those enclosing the young panicles, glabrous; ligule a ciliate rim; lamina linear, usually tapering to a fine point, usually 1-4 in. long, $\frac{1}{12}$ - $\frac{1}{8}$ in. broad, delicately puberulous on both surfaces, frequently with some stiff tubercle-based hairs on the lower margin. Panicles short- or long-exserted, ovoid-oblong to linear-oblong, 2-4 in. long; branches in whorls of up to 12 or rarely solitary. Sessile spikelets linear-subulate, up to $\frac{1}{2}$ in. long excluding the callus; callus over $\frac{1}{2}$ in. long, densely bearded with pale-tawny hairs; glumes subequal, the upper produced into a plumose awn 1-2 times the length of the spikelet: pedicellate spikelets with membranous glumes having plumose awns $\frac{1}{4}$ -1 (usually about $\frac{1}{2}$) in. long.

Northern Sudan.

22. **COELACHYRUM** Hochst. & Nees**Coelachyrum brevifolium** Nees.

Tufted annual herb up to 2 ft. high, frequently with long trailing stems with leafy branches at the joints. Ligules very small, truncate, incised; lamina lanceolate, 1-2 in. long, glabrous, with a cartilaginous and sometimes minutely spinulose margin. Panicles loose; branches up to 2 in. long, irregularly arranged. Spikelets crowded on the branches, ovate, 5-6-flowered, about $\frac{1}{2}$ in. long.

Northern and Central Sudan.

23. **COELORACHIS** Brongn.**Coelorachis afraurita** (Stapf) Stapf.

Glabrous perennial herb; culms over 3 ft. high, many-noded, erect, branched above with the branches solitary or in the upper part 2 or more, the whole collected into loose leafy panicles. Leaf-sheaths smooth, broad, up to 1 ft. long; ligule very short, truncate, ciliate; lamina long-attenuated from the base, up to 2 $\frac{1}{2}$ ft. long, $\frac{1}{2}$ in. broad. Panicles 1 or more ft. long, the branches and branchlets subtended by leaves with a narrow lamina or re-

duced to a spathe; racemes clustered, unequally pedunculate, overtopped by leaves of the primary branches, subcylindric, $\frac{1}{2}$ -1 in. long, $\frac{1}{10}$ in. broad. Sessile spikelets oblong, up to $\frac{1}{2}$ in. long; lower glume winged upwards, the wings produced beyond the tip and leaving a narrow sinus: pedicellate spikelets smaller than the sessile; pedicel with a lanceolate wing-like appendage from the outer angle.

Equatoria.

24. CRINIPES Hochst.

Crinipes longifolius C. E. Hubbard.

Laxly tufted perennial herb $1\frac{1}{2}$ -3 or more ft. high; culms erect, simple, few-noded, glabrous. Leaf-sheaths sparsely pubescent; ligule a rim of silky hairs; lamina lanceolate-linear, long-attenuated towards the base, up to 2 ft. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad. Panicles nodding, up to 12 in. long, $2\frac{1}{2}$ in. broad; branches clustered, thread-like. Spikelets oblong, about $\frac{1}{2}$ in. long, 2-3-flowered, yellow-green or suffused with purple. Awn stiff, about $\frac{1}{2}$ in. long.

Equatoria: Dongotona Mountains, over 8000 ft.

25. CRYPISIS Ait.

Crypsis schoenoides (L.) Lam.

Heleochloa schoenoides (L.) Host.

Annual herb; culms prostrate, spreading in a circle from the root, 1-10 in. long. Leaves 1-2 in. long; sheath broad, strongly nerved, membranous on the margins and ciliate, in the upper leaves embracing the inflorescence; ligule a ring of hairs. Spikelets densely crowded into sessile ovoid or ellipsoid heads up to $\frac{3}{4}$ in. long.

Northern and Central Sudan.

26. CTENIUM Panz.

Ctenium elegans Kunth.

Tufted annual or perennial herb $1\frac{1}{2}$ - $2\frac{1}{2}$ ft. high. Leaves few, narrow. Spikes solitary, curved, up to 12 in. long. Spikelets very narrow, densely packed on one side of the axis like the teeth of a comb. Fourth and fifth glumes weakly hairy with single long hairs; bristle from the lateral nerve of the second glume short or absent.

Central and Southern Sudan.

C. schweinfurthii Pilg.

Tufted perennial herb up to 4-5 ft. high; culms 3-noded. Leaf-laminas narrow-linear, up to 8 in. long; ligule very short, membranous. Spikes solitary, $7\frac{1}{2}$ or more in. long; two of the glumes densely hairy; bristle from the lateral nerve of the second glume conspicuous. Otherwise as *C. elegans*.

Equatoria.

27. **CYMBOPOGON** Spreng.**Cymbopogon sennarensis** (Hochst.) Chiov.

Perennial herb; culms erect, glabrous. Leaf-sheaths compressed, very narrow, the lowest ones up to 8 in. long, firm and tough, glabrous; ligule oblong, membranous, up to over $\frac{1}{2}$ in. long, ciliolate; lamina linear, almost setaceous upwards, up to over 1 ft. long, glabrous, glaucous. Spatheate panicles several times divided, obovoid, 1-1 $\frac{1}{2}$ ft. long, $\frac{1}{2}$ ft. broad, formed upwards of more or less dense balls of racemes and spathes; lower internodes up to 5 in. long, the uppermost quite short; spathes narrowly lanceolate, 2-2 $\frac{3}{4}$ in. long; spatheoles pale-green, narrowly lanceolate, up to $\frac{3}{4}$ in. long; racemes in pairs each surrounded by a spathe, divaricate, at length deflexed, about $\frac{1}{2}$ in. long, white-villous; fertile joints densely hairy on the back and the angles. Fertile spikelets linear to linear-lanceolate, shortly awned, glabrous; keels of lower glume acute and wingless upwards with 4 nerves.

Fung District.

C. proximus (Hochst.) Stapf.

Compactly tufted perennial herb 1 $\frac{1}{2}$ -3 or more ft. high; culms slender, erect, glabrous, 3-4-noded and simple below the spatheate panicle, the intermediate and upper nodes exserted. Leaf-sheaths firm, glabrous, long-persistent, 2-3 in. long; ligule membranous, ciliolate, truncate; lamina narrow, tapering to a long setaceous point. Spatheate panicles linear-oblong, narrow, interrupted below, $\frac{1}{4}$ -1 or more ft. long, up to 2 in. broad; lower internodes 3-6 in. long; spathes lanceolate, 1-1 $\frac{1}{2}$ in. long; spatheoles pale-green, lanceolate, acute to subulate-acuminate, about $\frac{1}{2}$ in. long; racemes in pairs, at length deflexed, $\frac{1}{3}$ - $\frac{1}{2}$ or more in. long, white-villous; fertile joints densely hairy on the back and the angles. Fertile spikelets linear to linear-lanceolate, acute to acuminate, shortly awned; keels of lower glume acute, wingless upwards, with 2 short nerves or nerveless.

Northern and Central Sudan.

C. commutatus (Steud.) Stapf.

Perennial herb up to 4 ft. high; culms erect, simple and about 5-noded below the panicle, finely pubescent below the nodes. Leaf-sheath firm, tight, glabrous, the basal ones up to 4 in. long; ligule membranous, truncate, up to $\frac{1}{3}$ in. long, ciliolate; lamina linear, tapering to a setaceous point, up to $\frac{3}{4}$ or more ft. long. Spatheate panicles very narrow, interrupted below, up to 1 ft. long; internodes 5-6, the lowest up to over 6 in. long; spathes very narrow, linear, acute, glabrous, up to 1 $\frac{1}{2}$ in. long; spatheoles very narrow, reddish, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long; racemes in pairs, reddish-brown, hardly diverging, $\frac{2}{3}$ -1 in. long, moderately villous; joints and pedicels glabrous or pubescent on the back. Fertile spikelets greenish,

turning straw-coloured or reddish, linear, more or less acuminate, glabrous, $\frac{1}{4}$ - $\frac{3}{8}$ in. long, shortly awned; keels of lower glume acute, wingless upwards.

Darfur: Jebel Marra and between Kebkabiya and Kulme.

C. nervatus (Hochst.) Chiov.

Fig. 100.

Usually annual herb; culms erect, up to 3 ft. high, usually simple, 5-7-noded below the panicle, glabrous, smooth. Leaf-sheaths glaucous, the basal ones up to over 6 in. long and slipping early from the culm; ligule membranous, truncate, glabrous, less than $\frac{1}{4}$ in. long; lamina linear from a rounded or slightly attenuated base, tapering to an acute point, up to 1 or more ft. long, $\frac{1}{2}$ in. broad. Spatheate panicles narrow, more or less dense, 4-6 or more in. long; spathes narrowly lanceolate, long and finely acuminate at the apex; spatheoles very narrow, at length subulate-lanceolate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; racemes in pairs, olive-green, finally more or less spreading, $\frac{1}{4}$ - $\frac{3}{4}$ in. long; adjacent pedicel and base of the sessile raceme not connate. Fertile spikelets lanceolate-oblong, subobtuse, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; glumes bordered by a green intracardinal nerve and a broad brown oil-mark on each side, the keels winged upwards with whitish transparent wings.

Central Sudan.

C. excavatus (Hochst.) Stapf.

Perennial herb 2-4 ft. high; culms clustered, erect or shortly ascending, often wiry, 4-7-noded and usually simple below the panicle, often waxy-powdery below the nodes. Leaf-sheaths firm, tight, persistent, glabrous, 2-4 in. long; ligule very short, rounded, scarious; lamina dull-green or subglaucous, linear to linear-lanceolate, tapering to a long setaceous point, up to 6 or more in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, glabrous. Spatheate panicles narrow, mostly 3-6 or rarely 12 in. long or very much reduced, more or less interrupted below; spathes narrowly lanceolate, long and finely acuminate, glabrous; spatheoles very narrow, lanceolate-linear to linear, $\frac{1}{2}$ -1 in. long, soon turning reddish or russet; racemes in pairs, greenish and variously tinged with red or dull-purple, more or less divaricate and finally deflexed, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; adjacent pedicel and base of the sessile raceme connate; joints and pedicels shortly ciliate at the sides. Fertile spikelets lanceolate-oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; lower glume with obscure and short or no oil-streaks.

Khartoum. Blue Nile Province.

C. caesius (Nees) Stapf.

Tufted perennial herb up to 3 ft. high; culms erect or ascending, more or less wiry, frequently branched below, the branches often in clusters from the knee-joints, often many-noded, glabrous. Leaf-



Fig. 100—CYBOPOGON NERVATUS (Hochst.) Chiov.

A, inflorescence. B, ligule with portion of leaf-sheath and lamina. C, pair of racemes with spatheole. D, pair of spikelets. E, sessile spikelet dissected. F, pedicellate spikelet dissected. G, lower glume of sessile spikelet.

sheaths tight, the basal ones mostly short; ligule very short, rounded, scarious; lamina bluish-glaucous, linear from a scarcely narrowed rarely slightly rounded base, tapering to a long setaceous point, in the culm-leaves up to over 6 or even 12 in. long, $\frac{1}{2}$ - $\frac{1}{4}$ or even $\frac{1}{2}$ in. long. Spatheate panicles narrow, mostly 3-6 or rarely more in. long or sometimes reduced, dense or interrupted; spathes glaucous, sometimes turning reddish, lanceolate, acuminate, $\frac{3}{4}$ -1 in. long; spatheoles narrowly lanceolate, acuminate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, turning dirty-straw-colour or slightly reddish; racemes in pairs, greenish, obliquely erect, about $\frac{1}{2}$ in. long, more or less white-villous; adjacent pedicel and base of the sessile raceme not connate; joints and pedicels densely villous-ciliate. Fertile spikelets greenish, oblong, $\frac{1}{2}$ in. long, glabrous; lower glume with winged keels, awned.

Darfur: Jebel Marra.

C. giganteus Chiov.

Perennial herb up to 8 ft. high; culms up to $\frac{1}{2}$ in. in diameter, many-noded and simple below the panicle, glabrous, smooth. Leaf-sheaths green or glaucous and waxy at the nodes; ligule almost reduced to a rim or up to $\frac{1}{2}$ in. long, scarious, glabrous; lamina linear from a rounded broader base, long-tapering to a fine point, up to 1 or more ft. long, up to 1 or more in. broad. Spatheate panicles narrow-linear to oblong, frequently over 1 ft. long; internodes numerous, the lowest 4-6 in. long; spathes glaucous, lanceolate, $\frac{1}{2}$ -1 in. long, acutely acuminate; spatheoles greenish, turning straw-coloured or reddish, very narrow, acuminate or acute, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; racemes in pairs, more or less diverging and at length deflexed, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; adjacent pedicel and base of the sessile raceme connate. Fertile spikelets oblong, obtuse, $\frac{1}{2}$ in. long; glumes equal, the keels winged, the intracardinal nerves 2 (one on each side of the groove), with brown oil-streaks in the upper third or quarter and joining across the tip.

Kordofan. Southern Sudan.

28. **CYNODON** Rich.

Cynodon dactylon (L.) Pers.

Bermuda-grass. Fig. 101.

Perennial herb; rhizome creeping, rooting at the nodes and emitting from them clusters of barren shoots and flowering culms; culms a few to 12 in. long, glabrous, many-noded. Leaves usually conspicuously distichous on the barren shoots and at the base of the culms; sheath tight, often bearded at the mouth; ligule a very fine ciliate rim; lamina linear, finely acute at the apex, $\frac{1}{2}$ -6 in. long, up to $\frac{1}{2}$ in. broad. Spikes 2-6 together, straight, $\frac{1}{2}$ -2 $\frac{1}{2}$ in. long. Spikelets light-green or purplish; rhachilla produced to $\frac{1}{2}$ the length of the spikelet.

Widespread.

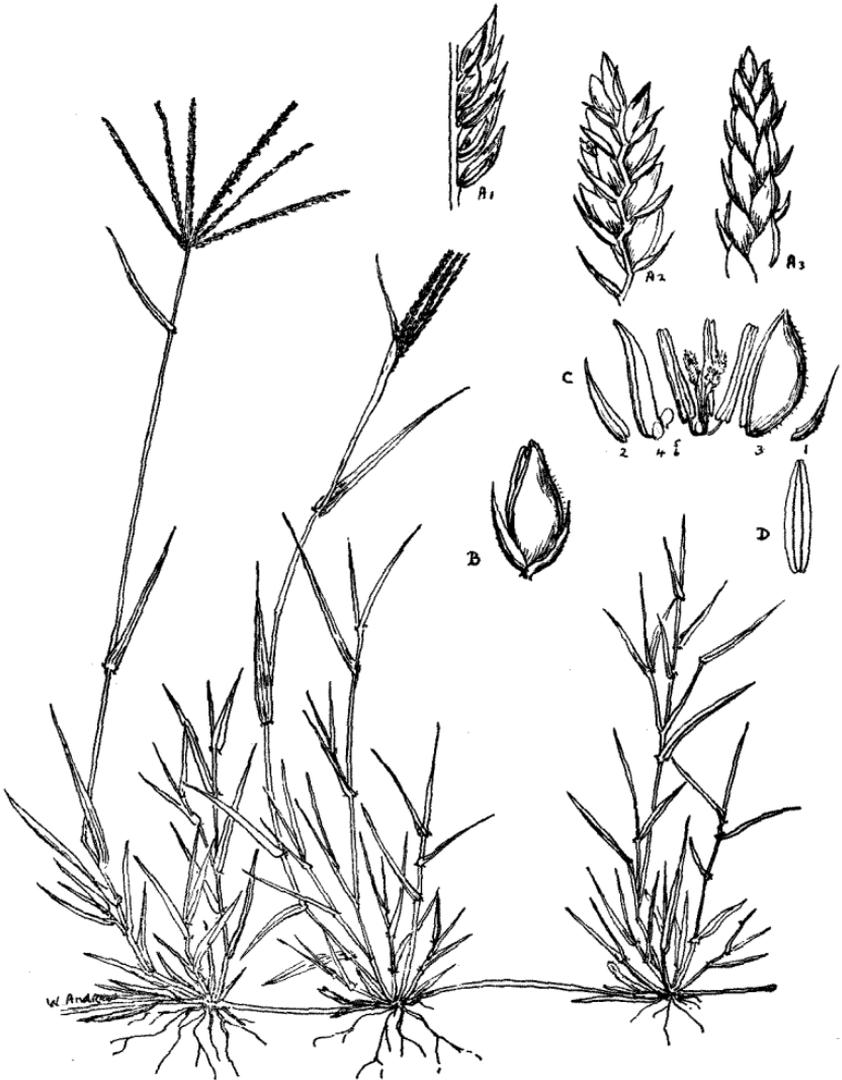


Fig. 101—*CYNODON DACTYLON* (L.) Pers.

A₁, part of spike from side. A₂, same from back. A₃, same from front.
 B, spikelet. C, spikelet dissected. D, lemma from back.

29. **CYRTOCOCCUM** Stapf**Cyrtococcum chaetophoron** (Roem. & Schult.) Dandy.

Perennial herb 1-3 ft. high; culms ascending or with a prostrate base, rooting from the nodes, more or less branched. Leaf-sheaths tight, often scantily pubescent at the node, ciliate along the outer margin, often bearded at the mouth; ligule membranous, rounded, $\frac{1}{4}$ in. long; lamina dark-green, linear-lanceolate to sublinear from a more or less narrowed base, tapering to a very fine point, 3-5 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, long and finely fringed-ciliate at the base. Panicles terminal on the culms and their branches, the base enclosed in the uppermost sheath, obovoid to broad-oblong and very loose and open or more or less contracted, 4-9 in. long; axis very slender, loosely beset with long and short silky hairs. Spikelets dark olive-brown, broadly and obliquely obovate to semi-obovate, laterally much compressed, up to $\frac{1}{2}$ in. long, very loosely scattered. Glumes very unequal, thinly membranous.

Equatoria: Azza Forest.

30. **DACTYLOCTENIUM** Willd.**Dactyloctenium aegyptium** (L.) Beauv.

Fig. 102.

D. aegyptiacum Willd.

Annual herb 1-1 $\frac{1}{2}$ ft. high; stems sometimes prostrate, rooting at the nodes; culms ascending, compressed, 2-3-noded, glabrous, smooth. Leaf-sheaths striate, keeled above, glabrous or scantily hispid; ligule membranous, very short, scantily ciliate; lamina linear, tapering to a fine point, 1-5 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, glabrous or hispid or hispidly ciliate, the hairs tubercle-based. Spikes 2-6 together or rarely solitary, light- or dark-olive-grey, $\frac{1}{2}$ -2 in. long; rhachis keeled, scabrous. Spikelets 3-5-flowered, spreading at right-angles, up to $\frac{1}{2}$ in. long, glabrous. Upper glume cuspidately mucronate or awned, the awn curved and sometimes exceeding the glume.

Widespread.

D. scindicum Boiss.*D. glaucophyllum* Courb.

Similar to *D. aegyptium* but perennial. Spikes not exceeding $\frac{2}{3}$ in. long, the inflorescence being thus more crowded and head-like.

Red Sea District.

D. aristatum Link.

Graceful low annual herb; stems prostrate, glabrous; culms up to 4 in. high. Spikes short, usually 6 together. Spikelets 3-flowered; rhachis mucronate, naked for a little less than half its length. Grain finely punctate.

Red Sea District.



Fig. 102—*DACTYLOCTENIUM AEGYPTIUM* (L.) Beauv.

A, portion of spike from side. B, spikelet. C, floret dissected. D, grain.
 E, ligule with portion of leaf-sheath and lamina.

31. **DANTHONIOPSIS** Stapf**Danthoniopsis barbata** (Nees) C. E. Hubbard.*Tristachya barbata* Nees.

Densely tufted perennial herb; culms erect or ascending, 1-2 ft. high, branched towards the base, up to 6- or more-noded. Leaf-sheaths tight, villous at the node; ligule a densely ciliate rim; lamina linear-lanceolate, contracted at the base, tapering to a subpungent tip, 1-7 in. long, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad, loosely pilose to glabrous. Panicles narrow, loose or contracted, 1 $\frac{1}{2}$ -7 in. long. Spikelets pallid or purplish, usually in 3's or rarely paired or solitary, lanceolate-oblong, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, at the tips of the branches. Lemma of upper floret acutely 2-lobed, the lobes up to $\frac{1}{8}$ in. long and produced into a fine somewhat scabrous bristle up to $\frac{1}{8}$ in. long, silky-pubescent and with a broad transverse beard of silky white hairs; awn up to $\frac{3}{4}$ in. long.

*North-eastern Sudan.*32. **DESMOSTACHYA** (Stapf) Stapf**Desmostachya bipinnata** (L.) Stapf.*D. cynosuroides* (Retz.) Stapf ex Massey.

Coarse tufted perennial herb; culms firm, erect, up to 3 ft. high, glabrous, smooth, about 3-noded. Leaves in a compact basal rosette; ligule a minutely ciliolate rim; lamina linear, often pungent at the apex, 2 $\frac{1}{2}$ -9 $\frac{1}{2}$ in. long, glabrous. Panicles cylindric, spike-like, flattened, 10-16 in. long. Spikelets many-flowered, linear, strongly laterally compressed, closely imbricate, alternate, sessile or subsessile, falling entire from the slender rhachis of secund more or less distinctly 2-ranked crowded spikes.

*Northern and Central Sudan.*33. **DICHANTHIUM** Willem.**Dichanthium annulatum** (Forsk.) Stapf.

Fig. 103.

Densely tufted perennial herb; culms up to 3 or more ft. high, suberect or ascending, usually slender, grooved on alternate sides of the internodes, simple or very frequently branched. Leaf-sheaths tight, glabrous, usually bearded at the node; ligule firmly scarious, oblong, up to over $\frac{1}{2}$ in. long; lamina linear, tapering to a fine point, up to 12 in. long but usually shorter, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad. Inflorescences subdigitate, erect; common axis thread-like, $\frac{1}{4}$ - $\frac{3}{4}$ or rarely 1 in. long, shortly bearded at the branch-axils; racemes pale or flushed with purple, 3-9, rarely only 1 or more than 12. Sessile spikelets subimbricate, oblong, $\frac{1}{3}$ - $\frac{1}{2}$ in. long; lower glume often with a purplish tip, with some long very fine spreading hairs from near the keels; awn $\frac{3}{8}$ -1 in. long, very fine.

Northern and Central Sudan.



Fig. 103—*DICHANTHIUM ANNULATUM* (Forsk.) Stapf.

A, ligule with portion of leaf-sheath and lamina. B, culm with inflorescence. C, base of inflorescence enlarged. D, two pairs of spikelets (sessile and pedicellate), front and back views. E, pedicellate spikelet dissected. F, sessile spikelet dissected. G, grain.

34. **DIETOMIS** Kunth**Diectomis fastigiata** (Sw.) Beauv.

Annual herb; culms up to 5 or more ft. high, clustered, branched almost from the base, all the branches flowering. Leaf-sheaths lax, keeled, glabrous; ligule ovate-lanceolate, acute, scariosus, $\frac{1}{4}$ - $\frac{1}{2}$ in. long; lamina narrowly linear, long-tapering to a setaceous point, in the lowest leaves up to 12 or more in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad. Inflorescences with more or less parallel erect clustered branches, formed by the solitary 2- or 3-rowed simple or sparingly divided flowering branches; spathes turning reddish, linear-lanceolate or narrowly linear, acuminate at the apex, 2-3 in. long, glabrous; racemes reddish, $1\frac{1}{2}$ -2 in. long, rather stout on account of the enlarged pedicellate spikelets, very fragile, 12-15-jointed; joints densely ciliate on both sides. Awn $1\frac{1}{4}$ -2 in. long, kneed at the middle; column brown, twisted; bristle yellowish.

Central Sudan.

35. **DIGITARIA** P. C. Fabr.

- A Pedicels of spikelets with long stiff smooth bristles forming a kind of involucre of various length round the spikelet:
- (a) Delicate erect or somewhat kneed slender annual herb; upper glume absent *D. intacta*.
- (aa) Perennial tufted herb with a short rhizome; upper glume present *D. uniglumis*.
- AA. Pedicels of spikelets with very short spinular hairs or becoming more hairy upwards, but never with bristle-like hairs:
- B. Pairs of spikelets or solitary spikelets about $\frac{3}{8}$ in. apart *D. pennata*.
- BB. Pairs of spikelets or solitary spikelets not so distant:
- C. Upper glume the longer, lanceolate, 5-nerved, gradually long-acuminate, as long as the spikelet *D. debilis*.
- CC. Upper glume nearly always shorter than the spikelet:
- D. Upper glume provided upwards at or below the middle with a row of transverse groups of rigid hairs with sharp points *D. xanthotricha*.
- DD. Upper glume variously hairy or glabrous but never provided with rigid hairs with sharp points in rows at the middle:
- E. Hairs on the spikelets with club-shaped tips; lower glume absent *D. ternata*.
- EE. Hairs on the spikelets (if any) without club-shaped tips:
- F. Hairs on the spikelets very fine and very conspicuously and characteristically provided with superficial irregular prominent minute warts:
- (b) Spikelets oblong-lanceolate, acuminate at the apex, silkily shaggy with long hairs produced beyond the tip of the spikelet *D. argyrotricha*.

- (bb) Spikelets elliptic-oblong, subacute to acute at the apex, appressed-silky with short hairs
D. longiflora.
- FF. Hairs on the spikelets (if any) not as above:
- G. Lower glume a very characteristic broad hyaline nerveless truncate membrane totally embracing the base of the spikelet; spikelets with a copious silvery or purplish lateral fringe of hairs
D. gayana.
- GG. Lower glume (if present) not totally embracing the base of the spikelet:
- H. Spikelets glabrous:
- (c) Perennial herb; spikelets ovate or ovate-oblong or elliptic to broadly lanceolate-ovate; racemes $1\frac{1}{4}$ - $1\frac{1}{2}$ in. long *D. vestita*.
- (cc) Annual herb; spikelets lanceolate-elliptic; racemes 2-6 in. long
D. adscendens subsp. *nubica*.
- HH. Spikelets more or less densely hairy or pubescent:
- J. Lower glume either absent or reduced to a minute scale:
- (d) Spikelets 3 times as long as broad, not narrowed upwards *D. velutina*.
- (dd) Spikelets 4-5 times as long as broad, narrowed upwards and acuminate ... *D. horizontalis*.
- JJ. Lower glume always present and well developed:
- (e) Robust rigid erect compactly tufted or shortly ascending perennial herb, usually with subterranean stolons which root and shoot at the nodes; culms usually thickened or bulbous at the base *D. nodosa*.
- (ee) Not very robust nor rigid perennial or annual herbs, variously branched but not provided with stolons which root at the nodes; culms not thickened at the base:
- (f) Perennial tufted herb with a rhizome
D. macroblephara.
- (ff) Annual variously branched herbs without rhizomes:
- (g) Nerves of the sterile lemma very distinctly scabrous with short hyaline prickles over their whole length or at least upwards
D. sanguinalis subsp. *aegyptiaca*.
- (gg) Nerves of the sterile lemma quite glabrous and smooth *D. adscendens*.

***Digitaria intacta* Stapf.**

Annual herb up to 3 ft. high; culms rather slender, solitary, simple or with a branch from one of the lower nodes, up to 5-noded, glabrous. Leaf-sheaths rather loose, more or less beset with stiff tubercle-based hairs to glabrous, frequently bearded at the node; ligule up to $\frac{1}{2}$ in. long, scarious, truncate, glabrous; lamina linear, up to 12 in. long, $\frac{1}{4}$ in. broad, glabrous or sparingly hairy, rough above and on the margin. Racemes 8-20 together in clustered panicles 5-8 in. long. Spikelets pale to deep-chestnut-brown, elliptic-oblong, shining.

Kassala: Gallabat.

***D. uniglumis* (Hochst.) Stapf.**

Tufted perennial herb, with a short rhizome; culms erect, coated at the base with the fibrous remains of the old sheaths, simple, 2-10 ft. high, 1-3-noded. Leaves mostly crowded near the base of the culms; ligule short or sometimes up to $\frac{1}{2}$ in. long, scarious, obtuse or truncate, glabrous; lamina linear, tapering to a fine point, up to 9 or more in. long. Racemes 2-10 or more in. long, usually very numerous, gathered into oblong panicles 5-7 in. or sometimes up to 2 ft. long, solitary or clustered on a scabrous or hirsute angular common axis of variable length. Spikelets oblong to ovate-oblong, brownish-green on the flat side, chestnut to black-brown on the convex side, quite glabrous.

Equatoria.

***D. pennata* (Hochst.) Cooke.**

Shrubby herb 1 $\frac{1}{2}$ -3 ft. high, with a short rhizome and with densely hairy to white-tomentose modified leaves which surround the bulbously thickened culm-bases; culms very slender, erect or ascending, many-noded, with barren branches from the lower nodes and clustered flowering and barren branches from the upper nodes; nodes swollen. Leaves glaucous; ligule hyaline, white, truncate, up to $\frac{1}{2}$ in. long; lamina linear, tapering to an acute point, 2-4 in. long. Racemes 6-10 to a whorl, followed by 1 or few solitary racemes from the continued axis, spreading at length stiffly and more or less horizontally, up to 5 in. long; rhachis thread-like, loosely plumose, bare for 2 or 3 in., then bearing up to 10 (usually 5 or 3) distant paired or upwards solitary spikelets. Spikelets linear-oblong, greyish-green to white.

Red Sea District.

***D. debilis* (Desf.) Willd.**

Annual herb; culms ascending from a prostrate and rooting base and usually branched from it or all along, 1-2 ft. high, the primary culms many-noded, the secondary culms usually 6-noded. Leaf-sheaths glabrous or the lower ones more or less softly-hairy and slightly keeled; ligule membranous, rounded, up to $\frac{1}{2}$ in long; lamina linear, long-tapering to a slender point, in the lower

leaves usually not much over 1 in. long, in the upper leaves up to 4 in. long, glabrous or softly hairy to almost tomentose. Racemes 5-11 together, sessile, 3-5 or rarely up to 8 in. long. Spikelets pale or yellowish-green, sometimes tinged with purple, loosely appressed, lanceolate, fine- to almost tailed-acuminate at the apex, $\frac{1}{5}$ - $\frac{1}{3}$ in. long.

Kordofan. Fung District.

D. xanthotricha (Hack.) Stapf.

Annual herb 2-3 ft. high; culms erect or ascending, very slender, 3-4-noded, glabrous. Leaf-sheaths glabrous or more or less hirsute with short tubercle-based hairs; ligule brown, very short, truncate, ciliate; lamina linear, long-tapering to an acute point, 2-4 in. long, thin, glabrous. Racemes 2 together, one sessile, the other pedunculate, or 3-4, subdigitately arranged, slender, 3-7 in. long, dense or somewhat lax; rhachis thread-like, 3-angled; pedicels scabrous, with a short beard of pale-green or at length yellowish hairs. Spikelets subimbricate or in slightly distant clusters, lanceolate-oblong to lanceolate, pale-yellowish or tinged with purple.

Equatoria.

D. ternata (A. Rich.) Stapf.

Annual herb; culms clustered, erect, slender, simple or rarely branched low down, $\frac{1}{2}$ -2 ft. long, glabrous or more or less beset with long fine spreading hairs below the racemes, about 2-noded. Leaf-sheaths glabrous, smooth; ligule short, membranous, truncate; lamina linear-lanceolate to linear, acute at the apex, 2-9 in. long, $\frac{1}{4}$ in. broad. Racemes greyish-green, 2-7 together, sessile, subdigitately arranged, very slender, 2-6 in. long, usually rather dense; rhachis more or less winged. Spikelets appressed, subimbricate, oblong-elliptic, obtuse or subobtuse at the apex.

Fung District.

D. argyrotricha (Anderss.) Chiov.

Fig. 104.

Annual herb; culms tufted, erect, sparingly branched below, glabrous, slender, 4-5-noded. Leaf-sheaths glabrous or the lower ones more usually ciliate along the margins or rarely loosely hairy all over; ligule short, truncate, denticulate; lamina lanceolate to linear, acutely acuminate at the apex, 1-4 in. long, obliquely spreading, usually glabrous. Racemes 2 or 3 together, sessile, digitately arranged, slender, 3-6 or more in. long, erect or oblique, white-silky on the face. Spikelets appressed, subimbricate, oblong-lanceolate, acuminate at the apex, $\frac{1}{6}$ - $\frac{1}{2}$ in. long excluding the terminal tuft of hairs, densely long-white-silky.

Equatoria.

D. longiflora (Retz.) Pers.

Annual herb; culms usually rising in clusters from a long prostrate rooting base and its numerous nodes, the ultimate flowering branches 4-5-noded. Leaf-sheaths glabrous or more rarely the lower ones more or less hairy and sparingly bearded at the node; ligule very short, membranous; lamina lanceolate to linear, acute at the apex, $\frac{1}{2}$ -4 in. long. Racemes usually 2 or 3 together, or rarely more, sessile, digitately arranged, very slender, 1-3 in. long. Spikelets appressed, subimbricate, elliptic-oblong, up to $\frac{1}{8}$ in. long, pale-green or whitish owing to the delicate appressed pubescence.

Equatoria.

D. gayana (Kunth) Stapf.

Annual herb 1-4 ft. high; culms clustered, erect or ascending, 4-5-noded, slender, glabrous. Leaf-sheaths pale, very closely striate, shortly hirsute; ligule very short, truncate, ciliate; lamina linear, tapering very gradually to an acute somewhat rigid point, 2-6 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Racemes 2-6 together or rarely solitary, sessile, digitately or subdigitately arranged, slender, straight or almost so, 2-6 in. long, silvery-silky. Spikelets ovate-oblong to ovate-lanceolate, acutely and finely acuminate at the apex, up to $\frac{1}{2}$ in. long excluding the apical tuft of hairs.

Kordofan. Equatoria.

D. vestita Fig. & De Not.

D. abyssinica (non Stapf) Broun & Massey.

Creeping and ascending perennial herb, much branched at the base and rooting below; culms 6-12 in. high. Leaf-sheaths and laminas glabrous or with a sparse to dense pubescence; lamina often 2-4 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, in robust specimens up to 6 in. long and broader. Racemes often 3-4 together, sometimes 7-9 or more, 1 $\frac{1}{2}$ -1 $\frac{1}{2}$ in. or up to 4 in. long.

Fung District. Equatoria.

D. velutina (Forsk.) Beauv.

Fig. 105.

D. horizontalis (non Willd.) Broun & Massey p.p.

Herb; culms ascending, slender, 1 $\frac{1}{2}$ -3 ft. high, many-noded, branched and flowering from the lower nodes. Leaf-sheaths and laminas softly grey-villous with spreading or subappressed hairs which usually are not or only slightly tubercle-based; lamina 1 $\frac{1}{2}$ -3 $\frac{1}{2}$ in. long, with a wavy margin. Racemes 8-12 together along an elongated common axis, finally widely spreading, slender, 1 $\frac{1}{2}$ -2 $\frac{3}{4}$ in. long, the lower ones in a cluster of 2-4, the upper ones solitary. Spikelets green to brownish-purple, ovate-lanceolate.

Northern and Central Sudan.

D. horizontalis Willd.

Herb; culms branching, rooting at a decumbent base, up to 3 ft. high, with ascending flowering shoots. Leaf-sheaths commonly laxly hirsute with long spreading tubercle-based hairs, the upper ones becoming glabrous; lamina more or less hirsute, becoming glabrous, up to 4 in. long. Panicles corymbiform, consisting of 5-15 ascending finally spreading mostly solitary or upwards subverticillate racemes up to 4 in. long along a slender common axis up to 2½ in. long. Spikelets linear-lanceolate.

Darfur. Equatoria.



Fig. 104—*DIGITARIA ARGYROTRICHA* (Anderss.) Chiov.

A, ligule with portion of leaf-sheath and lamina. B, tip of raceme, front and back view. C, axes of racemes after spikelets have fallen. D, spikelet. E, spikelet dissected. F, grain.

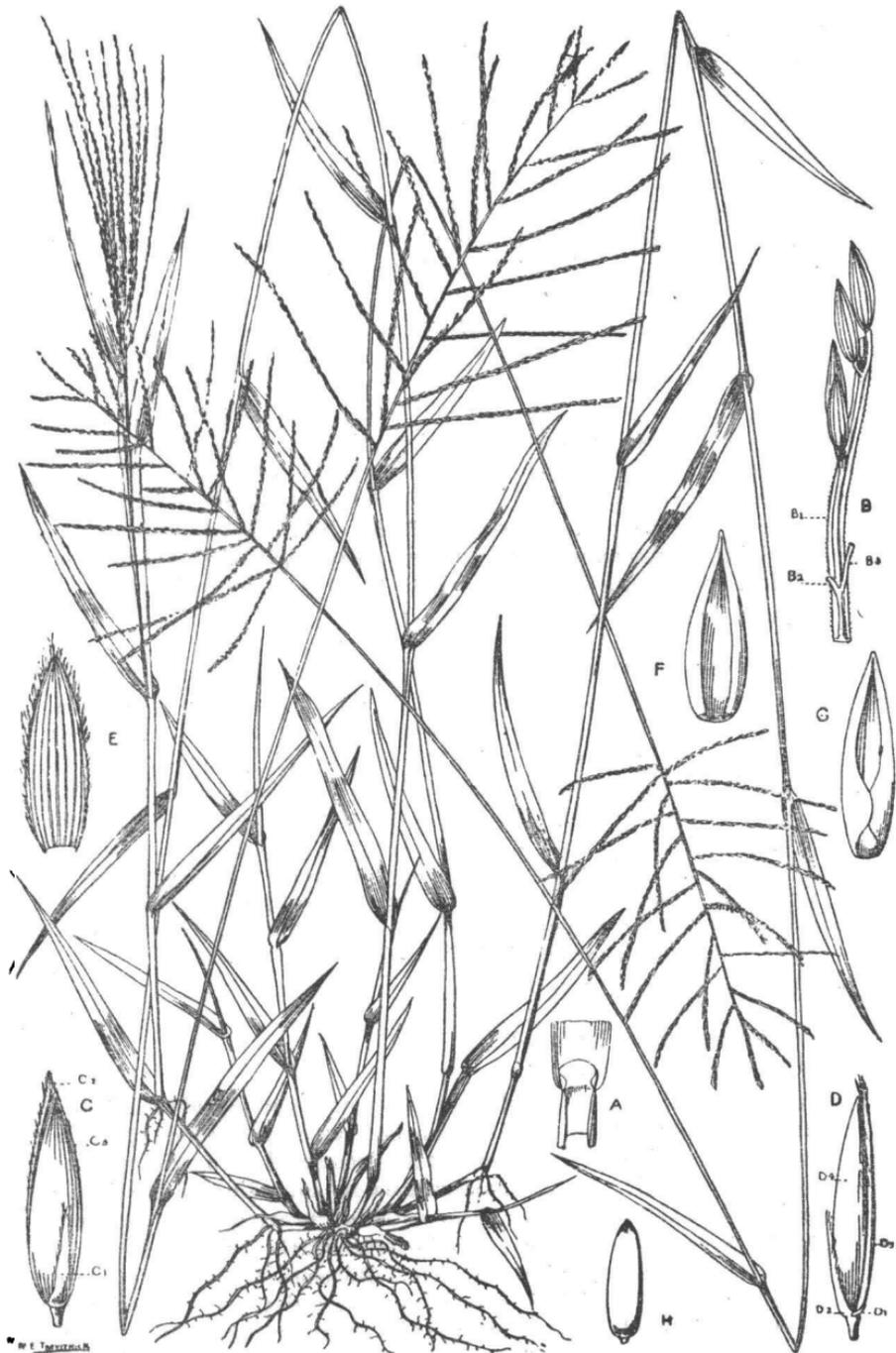


Fig. 105—*DIGITARIA VELUTINA* (Forsk.) Beauv.

A, ligule. B, portion of raceme; B₁, axis of raceme; B₂ and B₃, pedicels of spikelets. C, spikelet, front view; C₁, upper glume; C₂, lower lemma; C₃, upper lemma. D, spikelet, side view; D₁, lower glume; D₂, upper glume; D₃, lower lemma; D₄, upper lemma. E, grain. F, upper lemma. G, palea. H, grain.

D. nodosa Parl.

Tufted perennial herb, with a stout rhizome; culms shortly ascending, up to 20 in. high, few-noded, branching below. Leaf-sheaths glabrous to villous at the base; lamina $3\frac{1}{2}$ - $6\frac{1}{2}$ in. long, $\frac{1}{10}$ - $\frac{1}{2}$ in. broad, glabrous or pubescent and with spreading hairs at the base. Racemes 2-6 or more together, sessile, digitately arranged or with a common axis up to 2 in. long, rather loose, 2-4 in. long, the rhachis distinctly winged. Spikelets $\frac{1}{2}$ - $\frac{3}{4}$ in. long, lanceolate-elliptic, silky. Lower glume reduced to a triangular-ovate short nerveless scale.

Equatoria: Alakapoy, near Kapoeta.

D. macroblephara (Hack.) Stapf.

Perennial herb; culms slender, simple. Leaf-sheaths tight, quite glabrous or appressed-hairy at the node; ligule membranous, short, truncate, denticulate; lamina linear, gradually tapering to an acute point, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, somewhat rigid, smooth, glaucescent. Racemes 3-5 together, digitately arranged, $1\frac{3}{4}$ - $2\frac{1}{4}$ in. long, flexuous, very loose, villous, pale. Spikelets more or less spreading, linear-lanceolate, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. long, villous.

Equatoria: 64 miles east of Kapoeta.

D. sanguinalis subsp. *aegyptiaca* (Retz.) Henrard.

Annual herb, often reddish in colour; culms 4-12 or even 28 in. long, branched, decumbent at the base and rooting at the lower nodes, erect or ascending above. Leaf-sheaths glabrous or with tubercle-based spreading hairs, the node often villous; lamina $1\frac{1}{2}$ -4 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, glabrous or finely hairy above, often more densely pubescent beneath. Racemes 4-10 or more together, $1\frac{1}{4}$ -4 in. long, solitary or subdigitately arranged in a few whorls. Spikelets often purplish, narrowly ovate-elliptic, acute, quite glabrous on both upper glume and sterile lemma, the nerves of both being very characteristically spiny.

Equatoria: Juba, Nile bank.

D. adscendens (Kunth) Henrard.

D. marginata Link.

Annual herb; culms tufted, ascending or prostrate often rooting at the lower nodes and much branched, up to 2 or more ft. high, few- to many-noded. Leaf-sheaths loose and thin, glabrous or more or less hirsute with tubercle-based spreading hairs; ligule truncate, glabrous; lamina lanceolate to linear, up to 6 in. long, $\frac{1}{2}$ - $\frac{2}{3}$ in. broad, glabrous or sparsely hairy at the base, the margin finely cartilaginous and often crisp. Racemes 4-9 or rarely more together, sessile, subdigitately arranged, solitary or in pairs or subverticillate along a common axis, erect or spreading, 2-6 in. long, the rhachis often finely pubescent at the base. Spikelets appressed, not or only slightly imbricate, lanceolate-elliptic, acutely acuminate at the apex, about $\frac{1}{2}$ in. long, variously hairy

or rarely quite glabrous. Upper glume usually considerably exceeding $\frac{1}{2}$ the length of the spikelet.

Equatoria.

Subsp. **nubica** (Stapf) Henrard.

D. marginata var. *nubica* Stapf.

Spikelets quite glabrous and smooth, about $\frac{1}{10}$ in. long. Upper glume scarcely $\frac{1}{2}$ as long as the spikelet.

Northern and Central Sudan.

Subsp. **chrysolephara** (Fig. & De Not.) Henrard.

D. marginata var. *imbriata* Stapf p.p.

Spikelets, at least the pedicellate ones, provided along the lateral nerves and margins with soft hairs intermixed with yellowish stiff smooth shining tubercle-based bristles; all the hairs spreading out at maturity and forming a fringe.

Northern Sudan: Berber. Fung District. Equatoria.

36. DINEBRA Jacq.

Dinebra retroflexa (Vahl) Panz.

Fig. 106.

D. arabica Jacq.

Annual herb; culms $\frac{1}{2}$ -3 ft. long, tufted, branching from the base, erect or ascending, leafy throughout. Leaves flat, $2\frac{1}{4}$ -8 in. long, flaccid, finely acuminate at the apex, sparsely hairy; ligule very short. Inflorescences $3\frac{1}{4}$ -12 in. long, erect; spikes green or pale-yellow, shining, $\frac{3}{4}$ -2 in. long, opposite or alternate or verticillate, sessile, at first erect, at length deflexed. Spikelets loosely imbricate, the glumes with a straight terminal rigid-pointed awn.

Widespread.

37. DIPLACHNE Beauv.

Diplachne fusca (L.) Beauv. ex Roem. & Schult.

Glabrous perennial herb; culms tufted, stout, ascending or erect, often branched from the lower nodes, 3-5 ft. long, smooth, 3-4-noded or many-noded when branched. Leaf-sheaths smooth and almost shining or the upper ones rough, bluntly keeled; ligule hyaline, oblong, acute at the apex, up to $\frac{1}{2}$ in. long; lamina linear, tapering to a fine almost pungent point, 3-6 in. long, usually rough on both surfaces. Panicles erect, straight or slightly nodding, obovate-oblong to linear; branches scattered or 2-3 close together, the longest 3-5 in. long. Spikelets usually dark-olive-grey, distant by half their length or more, narrow, oblong, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, 5-10-flowered.

Blue Nile Province: Jebel Arashkol.



Fig. 106—*DINEBRA RETROFLEXA* (Vahl) Panz.

A, ligule with portion of leaf-sheath and lamina. B, spike from front and back. C, spikelet. D, floret dissected.

38. **DRAKE-BROCKMANIA** Stapf**Drake-brockmania somalensis** Stapf.

Herb up to 5 in. high; culms glabrous. Leaf-sheaths sparsely hirsute with tubercle-based hairs; ligule membranous, short, truncate, denticulate; lamina linear or lanceolate, long-attenuated upwards, $\frac{1}{2}$ - $2\frac{1}{2}$ in. long, many-nerved, hirsute below. Panicles capitate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long and broad; branches few, short, compressed. Spikelets white-green-variegated, broadly ovate, about $\frac{1}{4}$ in. long. Glumes lanceolate, acuminate at the apex, persistent.

Darfur.

39. **ECHINOCHLOA** Beauv.**Echinochloa obtusiflora** Stapf.

Possibly annual herb $\frac{1}{2}$ - $1\frac{1}{2}$ ft. high, scantily tufted; culms ascending, slender, branched, about 2-noded, glabrous. Leaf-sheaths glabrous, smooth; ligule a fine ciliolate rim; lamina narrowly linear, gently tapering to an acute point, 2-4 in. long, glabrous, the margin rough. Panicles long-exserted, erect, very narrow or spike-like, $1\frac{1}{2}$ -5 in. long; branches 2-5, solitary, erect and mostly appressed to the axis, distant by less or slightly more than their own length, rarely over 1 in. long, forming dense simple 2-4-ranked subsecund sessile false spikes. Spikelets very pale or brownish on the back, crowded, elliptic, very obtuse at the apex. Lower glume and lemma equally obtuse or acute or cuspidulate.

Kordofan: between Um Bel and Armel.

E. colonum (L.) Link.

Fig. 107.

Annual herb, forming small tufts, up to 2 ft. high; culms erect or ascending, branched mostly in the lower part only, soft, glabrous and smooth. Leaves glabrous or rarely with some minute hairs on the lamina; ligule absent, the junction of lamina and sheath glabrous inside; lamina green or glaucous, sometimes with black or purple cross-bands, linear, tapering to a slender acute point, 3-12 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad, delicately waxy-powdery. Panicles erect, mostly straight, at length more or less exserted, 2-5 in. long, very narrow; branches usually 6 to many, rarely in pairs, erect and often appressed to the axis or something obliquely spreading, usually distant by much less than their own length, the lower ones $\frac{1}{2}$ -1 in. long, forming dense simple moderately stout subsecund sessile false spikes. Spikelets greenish or tinged with purple, crowded, usually approximately 4-ranked, ovate or ovate-elliptic, acute or cuspidate at the apex. Lower glume very broadly ovate, acute to somewhat cuspidate at the apex.

Widespread.

E. crus-pavonis (Kunth) Schult.

Annual herb up to 5 ft. high, with copious plump root-fibres; culms erect, stout, up to over $\frac{1}{4}$ in. thick and spongy below, glabrous, 5-8-noded, usually simple, sheathed all along or the



Fig. 107—ECHINOCHLOA COLONUM (L.) Link.

A, portion of leaf-sheath and lamina, no ligule. B, portion of spike from front and back. C, spikelet from side, slightly opened out. D, spikelet dissected. E, fertile upper floret enclosed in hard shining lemma.

internodes at length more or less exerted. Leaf-sheaths striate, usually quite glabrous; ligule absent; lamina lanceolate-linear to linear from a base which is often long-decurrent in the upper leaves, tapering to a very fine point, 5-15 or more in. long, $\frac{1}{2}$ -1 in. broad, glabrous, the margin scabrous to spinulose. Panicles erect, linear-oblong to linear-lanceolate, 4-12 in. long, usually dense; branches usually solitary on the axis, obliquely erect, often very numerous, 1-4 in. long, forming sessile stout mostly very dense downwards compound false spikes, leaving after the fall of the spikelets a neatly pinnate skeleton of axes. Spikelets green or tinged with purple, in compact clusters, ovate-elliptic or elliptic-oblong, abruptly tailed-acuminate or beaked at the apex, about $\frac{1}{2}$ in. long. Lemma of lower floret with a cusp or slender awn rarely over $\frac{1}{2}$ in. long.

Equatoria.

E. pyramidalls (Lam.) Hitchc. & Chase.

Fig. 108.

Perennial reed-like herb up to 15 ft. high, with a long and often strong rhizome; culms ascending or kneed or often long-prostrate or floating and abundantly rooting at the base, up to over $\frac{1}{2}$ in. in diameter, many-noded, simple, usually sheathed all along, quite glabrous. Leaf-sheaths tight, striate, glabrous except for the frequently coarsely ciliate or upwards bearded margins, up to almost 1 ft. long and very broad; ligule a fringe of mostly long and somewhat stiff hairs; lamina linear, long-tapering to a fine point, 1-2 ft. long, $\frac{1}{4}$ -1 in. broad, the margin scabrous or spinulose. Panicles erect or somewhat nodding, usually linear-oblong and dense, $\frac{1}{2}$ to over 1 ft. long, spreading on all sides or subsecund; branches numerous, some solitary, others in pairs or clustered, the lower ones 1-3 in. long, forming dense simple or subsimple false spikes $\frac{1}{4}$ - $\frac{1}{2}$ in. in diameter. Spikelets greenish or variegated with purple, sometimes almost blackish-purple, ovate, acute to cuspidate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ or more in. long.

Central and Southern Sudan.

E. stagnina (Retz.) Beauv.

Perennial herb, occasionally annual or at least flowering the first year, up to 6 ft. high from a long creeping and copiously rooting rhizome; culms ascending, rooting and frequently branching from the submerged nodes, up to over $\frac{1}{2}$ in. in diameter, many-noded, smooth and glabrous. Leaf-sheaths smooth and glabrous or rarely pubescent or silkily hairy at the node, usually more or less ciliate or bearded close to the mouth, the basal ones often spongy and up to over 6 in. long; ligule a fringe of rather long stiff hairs or absent in the uppermost leaves; lamina linear, long-tapering to a fine point, $\frac{1}{2}$ -1 $\frac{1}{2}$ or more in. long, $\frac{1}{2}$ -1 in. broad. Panicles more or less nodding and secund, 4-10 in. long; branches few to many, distant or rather crowded, 1-2 or even 6 in. long, often forming stout dense 2-4-ranked simple secund false spikes. Spikelets



Fig. 108—*ECHINOCHLOA PYRAMIDALIS* (Lam.) Hitchc. & Chase.
 A, ligule. B, spikelet from back. C, spikelet from side. D, lower glume.
 E, upper glume. F, lemma of lower floret. G, palea. H, upper floret showing
 palea and edges of lemma.

usually pale-green or rarely tinged with purple or red, crowded, ovate-oblong to lanceolate-ovate, $\frac{1}{2}$ - $\frac{1}{2}$ in. long (excluding the awn if any). Upper glume concave, tailed-acuminate at the apex or produced into a short scabrous compressed awn.

Widespread.

40. **EHRHARTA** Thunb.

Ehrharta abyssinica Hochst.

Herb; culms erect, up to 3 ft. high, striate. Leaf-sheaths elongate; ligule membranous, elongated, acute at the apex, at length splitting; lamina generally glabrous. Panicles simple, secund. Spikelets glabrous, oblong-ovate or oblong-elliptic, up to $\frac{1}{4}$ in. long.

Equatoria: Imatong Mountains.

41. **ELEUSINE** Gaertn.

Eleusine verticillata Roxb.

Tufted annual herb 1-3 ft. high. Leaves flat, 3-4-nerved on each side of the midrib, the margin scabrous; ligule densely ciliate. Inflorescences of numerous spikes; spikes arranged in more than 1 whorl, slender, up to 4 in. long, bearing the spikelets on the lower side. Spikelets compressed, contiguous, several-flowered, up to $\frac{3}{8}$ in. long. Glumes glabrous, the lower awned-acuminate.

Red Sea Hills: Jebel O-Kurr, south-west of Sinkat.

E. indica (L.) Gaertn.

Fig. 109.

Erect annual herb; culms 2-3-noded, the upper nodes exserted. Leaves crowded near the base of the culms; sheath compressed, glabrous except the ciliate margins; ligule long-fringed; lamina linear, acute at the apex, up to $\frac{1}{4}$ in. broad, smooth. Inflorescences of digitately arranged spikes in 1 whorl with occasionally 1 or 2 odd spikes below; spikes slender, up to $7\frac{1}{4}$ in. long. Spikelets crowded, secund, about $\frac{1}{8}$ in. long, 3-6-flowered, disarticulating above the glumes.

Central and Southern Sudan.

E. compressa (Forsk.) Aschers. & Schweinf.

E. flagellifera Nees.

Perennial desert herb, with long stiff wiry creeping stems much branched and rooting at the joints; culms erect, about 10 in. long. Spikes 3-6 together, 1-1 $\frac{1}{2}$ in. long. Spikelets often purplish crowded, overlapping, $\frac{1}{8}$ - $\frac{1}{8}$ in. long.

Northern Sudan.

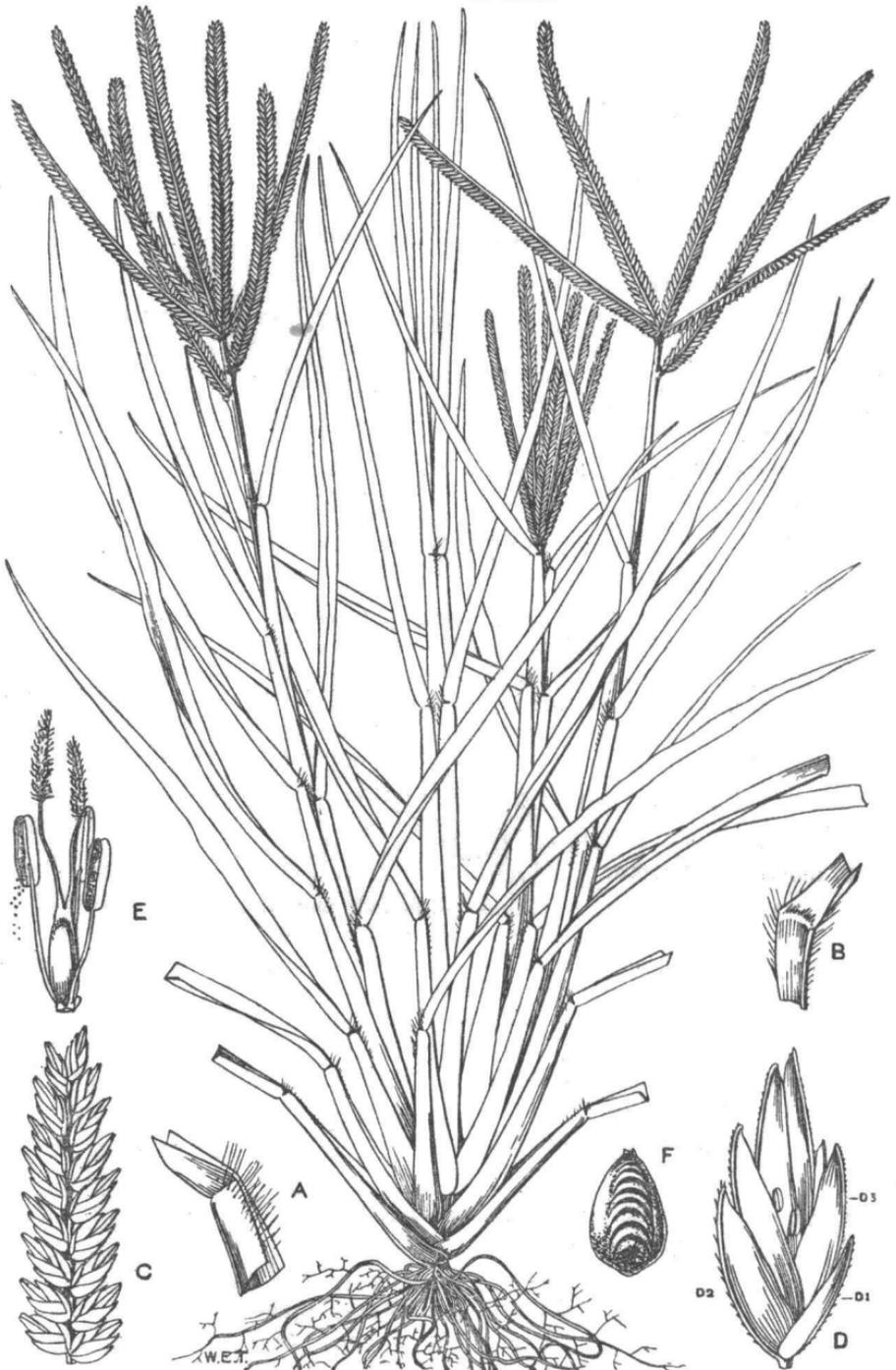


Fig. 109—*ELEUSINE INDICA* (L.) Gaertn.

A, junction of leaf-sheath and lamina. B, ligule. C, portion of spike. D, spikelet; D₁, lower glume; D₂, upper glume; D₃, lemma. E, stamens and pistil. F, grain.

42. **ELYONURUS** Humb. & Bonpl. ex Willd.**Elyonurus hirtifolius** Hack.

Densely tufted perennial herb; culms erect, about $1\frac{1}{2}$ ft. high, usually simple, bearded close below the nodes, 3-4-noded. Basal leaf-sheaths lax, covered with silky appressed hairs, at length becoming almost glabrous, long-persistent; upper leaf-sheaths tight, hairy towards the mouth, otherwise mostly glabrous, the uppermost without a lamina; ligule very short, membranous, densely ciliate; lamina linear, 2-4 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, more or less hirsute and sometimes very densely so. Racemes greenish tinged with purple, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, straight or curved, pedunculate, the terminal one finally more or less (sometimes long-) exerted from the subspathaceous subtending sheath, villous. Sessile spikelets broadly ovate-lanceolate, acuminate at the apex, about $\frac{1}{4}$ in. long including the small stipitate hairy callus but excluding the bristles; lower glume with warts bearing tufts of hairs.

Equatoria.

E. royleanus Nees ex A. Rich.

Annual herb; culms erect, from a few inches to 1 or more ft. high, tufted, erect, much branched upwards, the branches flowering and spreading in 2's and 3's from the upper internodes, 4-5-noded. Leaf-sheaths glabrous, the lower ones tight, the upper ones wide and spathaceous and without or almost without a lamina, at last turning red; ligule short, membranous, densely ciliate; lamina linear, tapering to a fine point, 2-6 in. long, $\frac{1}{2}$ in. broad. Racemes pale-straw-coloured or more or less tinged with purple or reddish, $1\frac{1}{4}$ - $2\frac{1}{2}$ in. long, erect, straight, usually in bunches and more or less embraced below by the spathe. Sessile spikelets lanceolate-oblong, about $\frac{1}{4}$ in. long including the short obconical densely bearded callus but excluding the beak; lower glume with warts bearing tufts of hairs.

Northern and Central Sudan.

43. **ELYTROPHORUS** Beauv.**Elytrophorus spicatus** (Willd.) A. Camus.

E. articulatus Beauv.

Annual herb up to about 14 in. high, erect. Leaf-sheaths with membranous margins, glabrous; lamina linear from a broad base, tapered to an acute apex, usually shorter than the longest spike, glabrous. Spikes continuous or interrupted, cylindrical. Spikelets small, in sessile clusters on the pubescent rachis, with awned glumes subtended by many empty glumes.

Kordofan. Equatoria.

44. **ENNEAPOGON** Desv.**Enneapogon brachystachyus** (Jaub. & Spach) Stapf.

Perennial herb, often tufted, finely glandular-pubescent, rarely subglabrous; culms clustered, ascending, 2-6 in. long, slender, often with a bulbous thickening at the base, 2-4-noded. Leaves

mostly near the base of the culms; sheath tight or in the lower leaves loose, pubescent to villous at the node; lamina very narrow, linear, finely attenuated, 1-5 in. long. Panicles light- to dark-grey, spike-like, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, dense. Spikelets up to $\frac{1}{2}$ in. long; awns about $\frac{1}{2}$ in. long, shortly plumose to or beyond the middle.

Red Sea Hills.

E. cenchroides (Licht.) C. E. Hubbard.

E. mollis Lehm.

Perennial herb, more or less glandular-pubescent or villous all over; culms clustered, erect or ascending, 1-3 ft. long, pubescent to finely villous, 2-5 noded. Leaf-sheaths rather tight, villous at the node; lamina linear to lanceolate-linear, long-tapering to a fine point, 3-8 in. long, $\frac{1}{2}$ - $\frac{1}{4}$ in. broad. Panicles spike-like, often interrupted and lobed below, 1-6 in. long. Spikelets crowded, $\frac{1}{2}$ - $\frac{1}{3}$ in. long; awns $\frac{1}{2}$ - $\frac{1}{3}$ in. long, plumose beyond the middle.

Central Sudan.

E. elegans (Nees) Stapf.

Slender perennial herb; culms 3-18 in. high, wiry, erect or ascending from a woody often thickened base. Leaves setaceous, flat or rolled; ligule a ridge of hairs. Panicles 1-3 in. long, the branches very short; rhachis villous. Spikelets with awns $\frac{1}{2}$ - $\frac{1}{4}$ in. long, sessile and pedicellate, softly tomentose, nearly white.

Red Sea District: Wadi Eremit. Khartoum.

45. **ENTEROPOGON** Nees

Enteropogon macrostachyus (Hochst.) Munro ex Benth.

Rather wiry somewhat tufted perennial herb up to 3 or more ft. high. Leaf-sheaths loose, glabrous; ligule a tuft of long fine hairs; lamina glaucous-green, elongate-linear, up to 10 in. long, with 4 main nerves on each side of the midrib, glabrous. Spikelets overlapping, arranged in long-pedunculate second solitary spikes 6-8 in. long. Glumes long-awned, about $\frac{2}{3}$ in. long including the awn.

Darfur: Jebel Barkin.

46. **ERAGROSTIS** Beauv.

- A. Spikelets $\frac{1}{2}$ - $\frac{2}{3}$ in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, flat, falling entire
E. superba.
- AA. Spikelets smaller than above, or if as long or longer then not as broad:
- B. Spikelets up to $\frac{1}{10}$ in. broad, linear to lanceolate or oblong or ovate; margin of leaf-lamina without glands:
- C. Spikelets breaking up from the apex downwards; rhachilla jointed and readily disarticulating between the florets:

- (a) Keels of palea ciliate with spreading hairs:
- (b) Panicles narrow, more or less spike-like, dense:
- (c) Keel of lemma with minute hairs; inflorescences more or less lobed *E. ciliaris*.
- (cc) Keel of lemma without hairs; inflorescences not lobed ...
E. arenicola.
- (bb) Panicles ovoid or oblong, loose and open or contracted but not spike-like:
- (d) Spikelets long-hirsute *E. hispida*.
- (dd) Spikelets glabrous or nearly so *E. tenella*.
- (aa) Keels of palea smooth or somewhat scabrous:
- (e) Spikelets up to $\frac{1}{16}$ in. long, oblong, 3-10-flowered, on pedicels about $\frac{1}{12}$ in. long:
- (f) Paleas somewhat scabrous on the keels; glumes lanceolate to lanceolate-oblong, acute or obtuse at the apex *E. diplachnoides*.
- (ff) Paleas smooth on the keels; glumes oblong, obtuse, truncate or emarginate at the apex
E. namaquensis.
- (ee) Spikelets $\frac{1}{2}$ - $\frac{2}{3}$ in. long, linear, 6-22-flowered, on fine pedicels $\frac{1}{2}$ or more in long *E. aspera*.
- CC. Spikelets breaking up from the base upwards; rachilla tough and persistent or only articulated at the base; lemmas and paleas separately deciduous and not enclosing the grain:
- D. Spikelets reddish-brown; stamens 2 *E. chapelieri*.
- DD. Spikelets not reddish-brown:
- E. Lemmas contiguous, with a usually incurved margin, lanceolate to oblong or narrowly ovate in side view:
- F. Annual herbs:
- (g) Spikelets blackish or dark-purplish-grey, scattered, oblong or lanceolate-oblong; panicles very loose, nodding, open, up to 14 in. long, 6 in. broad ...
E. macilenta.
- (gg) Spikelets pallid, green, purple or greenish-grey:
- (h) Panicles usually open and loose, ovoid to oblong:
- (i) Panicle-branches not solitary:
- (j) Grain broadly elliptic to orbicular in outline, about $\frac{1}{2}$ in. long; spikelets about $\frac{1}{4}$ in. broad *E. gangetica*.
- (jj) Grain oblong or elliptic in outline, $\frac{1}{2}$ - $\frac{2}{3}$ in. long; spikelets less than $\frac{1}{4}$ in. broad .. *E. pilosa*.
- (ii) Panicle-branches solitary, alternate or subopposite; spikelets $\frac{2}{3}$ - $\frac{3}{4}$ in. long *E. barrelieri*.
- (hh) Panicles usually dense or spike-like, the branches 2 or more together; spikelets dense, $\frac{1}{2}$ - $\frac{2}{3}$ in. long *E. aegyptiaca*.
- FF. Perennial herbs; spikelets linear:
- G. Glumes subequal:

- (k) Panicles ovoid, very delicate, lax, open, sparingly branched; branches stiff and divaricate; spikelets $\frac{1}{8}$ - $\frac{1}{2}$ in. long *E. papposa*.
- (kk) Panicles oblong, open, often nodding; branches solitary, rather distant, more or less flexuous; spikelets $\frac{1}{2}$ - $\frac{3}{4}$ in. long *E. atrovirens*.
- GG. Glumes clearly unequal:
- (l) Panicles 3-6 in. long, very open; spikelets linear, $\frac{3}{8}$ - $\frac{1}{2}$ in. long *E. tenuifolia*.
- (ll) Panicles 1-3 in. long, more or less contracted; spikelets about $\frac{1}{2}$ in. long *E. racemosa*.
- EE. Lemmas closely imbricate, with a flat margin, ovate to broadly ovate in side view; spikelets on long fine pedicels, $\frac{1}{2}$ -2 in. long, 10-100-flowered; annual herb ...
E. tremula.
- BB. Spikelets linear or oblong to ovate or elliptic, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad, if less than $\frac{1}{8}$ in. broad then ovate in outline or glands present on the margin of the leaf-lamina:
- H. Glumes quite glabrous:
- (m) Lemmas glandular on the keel and usually also glands present on the margin of the leaf-lamina
E. cilianensis.
- (mm) Lemmas and leaf-laminae not glandular ... *E. paniciformis*.
- HH. Glumes pubescent to pilose; lemmas hairy near the margin or only with a few short rigid hairs at the base ... *E. turgida*.

Eragrostis superba Peyr.

Densely tufted glabrous perennial herb; culms erect or ascending, 2-3 ft. long, rather stout, smooth, 2-noded. Leaf-sheaths smooth, bearded at the mouth, the lowest crowded, keeled, persistent; ligule a fringe of short hairs; lamina linear, long-tapering to an acute point, 2-8 or more in. long. Panicles narrow, linear or oblong, often interrupted below, erect, 4-10 in. long; branches distant, erect, solitary, thread-like, usually simple-racemose, $\frac{1}{2}$ -3 in. long, with 1-10 spikelets. Spikelets straw-coloured or more or less purplish, ovate or ovate-oblong, $\frac{1}{4}$ - $\frac{3}{4}$ in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad, 7-37-flowered.

Equatoria.

E. ciliaris (L.) R. Br.

Tufted herb, usually annual but may be perennial; culms ascending, often from a procumbent base, slender, $\frac{1}{2}$ -2 ft. long, glabrous, about 3-noded. Leaf-sheaths tight, glabrous or scantily hairy, bearded with long hairs at the mouth; ligule a fringe of short hairs; lamina linear, tapering to a fine point, 3-6 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Panicles spike-like, dense, more or less lobed, 2-6 in. long; branches appressed, nearly all very short. Spikelets crowded, ovate, strongly compressed, loosely 6-12-flowered. Keel of lemma minutely ciliate.

Widespread.



Fig. 110—ERAGROSTIS DIPLACHNOIDES Steud.

A, portion of inflorescence. B, portion of inflorescence further enlarged. C, spikelet. D, floret dissected. E, ligule with portion of leaf-sheath and lamina.

Var. brachystachya Boiss.

Panicles shorter, very condensed, oblong-cylindric.

Red Sea Hills: Erkowit.

E. arenicola C. E. Hubbard.

Similar to *E. ciliaris* but keel of the lemma glabrous. Inflorescences not lobed, stiffer and less spike-like.

Equatoria: Imatong Mountains, Katire, 3600 ft.

E. hispida K. Schum.

Tufted perennial herb; culms erect, 8-15 in. high, glabrous or hispid with long white hairs. Leaf-sheaths hispid; lamina grey-green, setaceous, hispid. Panicles up to 4 in. long, flaccid yet erect; branches thread-like, glabrous. Spikelets 5-6-flowered, long-hirsute.

Equatoria: Imatong Mountains, Kippia, 8000 ft.

E. tenella (L.) Beauv. ex Roem. & Schult.

Loosely tufted annual herb 2½-20 in. high. Leaf-sheaths bearded at the mouth; lamina flat or rolled, glabrous. Panicles 1¼-5¼ in. long, ½-1½ in. broad. Spikelets green or purplish, loosely 3-9-flowered.

Red Sea Hills.

E. diplachnoides Steud.

Fig. 110.

E. interrupta (non Beauv.) Broun & Massey; *E. namaquensis* (non Nees) Broun & Massey.

Loosely tufted annual herb, often growing near water and on seasonally flooded land, 4-28 in. high. Leaf-sheaths glabrous at the mouth; lamina flat, up to ½ in. broad. Panicles contracted or open, 4-16 in. long. Spikelets pale-green or tinged with purple. Stamens 2.

Widespread.

E. namaquensis Nees.

Tufted annual herb ½-3½ in. high; culms glabrous, 1-noded, simple. Leaf-sheaths glabrous at the mouth; lamina flat, up to ½ in. broad. Panicles contracted or open, 4-18 in. long. Spikelets pale-green or purplish. Stamens 2.

Equatoria.

E. aspera (Jacq.) Nees.

Fig. 111.

Annual herb 6-16 in. high; culms glabrous, simple, 2-3-noded. Leaf-sheaths bearded at the mouth; ligule a fringe of long hairs; lamina linear, tapering to a long setaceous point, 4-12 or more in. long, ¼-½ in. broad, rather scabrous on both surfaces. Panicles large, very lax, broadly ovoid to broadly obovoid-oblong, 4-26 in. long. Spikelets pale or purplish.

Widespread.



Fig. 111—*ERAGROSTIS ASPERA* (Jacq.) Nees.

A, ligule. B, spikelet. C, portion of spikelet showing rhachilla. D, lower glume.
E, upper glume. F, lemma. G, side view of palea. H, grain.

E. chapelleri (Kunth) Nees.

Fig. 112.

Tufted perennial herb; culms erect, simple, 2-3 ft. high, glabrous, 3-4-noded. Leaf-sheaths more or less bearded at the mouth, persistent; ligule a narrow long hairy rim; lamina linear, tapering to a fine point, 3-10 in. long, $\frac{1}{2}$ in. broad. Panicles erect, contracted, very narrow, $2\frac{1}{2}$ -9 in. long; branches erect, more or less appressed to the axis; lowest branches solitary, 2-5 in. long, undivided for some distance, then (like the upper part of the axis) bearing clusters of shortly pedicellate or sessile spikelets on short branchlets crowded towards the tip, the panicle sometimes resembling an interrupted false spike. Spikelets linear, reddish-brown, black-spotted, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, 7-20-flowered.

Equatoria.

E. macilenta (A. Rich.) Steud.

Annual herb up to 28 in. high; culms slender. Leaf-sheaths bearded at the mouth; lamina flat, up to $\frac{1}{2}$ in. broad. Spikelets scattered, loosely 4-10-flowered.

Equatoria: Imatong Mountains, Katire.

E. gangetica (Roxb.) Steud.

Loosely tufted annual herb. Leaf-sheaths more or less hairy at the mouth; lamina up to 6 or more in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, rolled or flat. Panicles ovoid to elliptic, 2-10 in. long, $1\frac{1}{4}$ - $3\frac{1}{4}$ in. broad. Spikelets scattered or clustered, linear to oblong, closely 10-40-flowered. Lemma narrowly ovate, acute or subobtusely, glabrous.

Darfur. Equatoria.

E. pilosa (L.) Beauv.

Slender annual herb up to $2\frac{1}{2}$ ft. high; culms erect or kneeed. Leaf-sheaths bearded at the mouth; lamina flat or rolled, up to 8 in. long and $\frac{1}{2}$ in. broad, glabrous. Panicles $1\frac{1}{2}$ -12 in. long, up to 4 in. broad. Spikelets loosely scattered, linear, 4-14-flowered, $\frac{1}{2}$ - $\frac{3}{4}$ in. long.

Central and Southern Sudan.

E. barrelieri Daveau.

Densely tufted annual herb about 1 ft. high; culms slender, many-jointed, simple. Panicles with stiff branches, $1\frac{1}{2}$ -3 in. long, $1-1\frac{1}{2}$ in. broad. Spikelets few-flowered.

Northern Sudan: Halfa.

E. aegyptiaca (Willd.) Link.

Tufted annual herb up to 12 in. high; culms slender, kneeed. Leaf-sheaths bearded at the mouth; lamina short, flat or rolled, up to $\frac{1}{10}$ in. broad. Panicles narrowly oblong to ovoid, $\frac{1}{2}$ -8 in. long. Spikelets pale-green, dense, linear, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, 14-20-flowered.

Northern and Central Sudan.



Fig. 112—*ERAGROSTIS CHAPELIERI* (Kunth) Nees.

A, spikelet. B, floret. C, lower glume. D, upper glume. E, lemma.
F, palea.

E. papposa (Roem. & Schult.) Steud.

Delicate perennial herb 6-18 in. high; culms very slender, simple. Leaves short, very narrow; mouth of sheath bearded with long silky hairs. Panicles 3-8 in. long; axis thread-like. Spikelets very pale-yellow or dark- or pale-olive-grey, very narrow.

Rea Sea District.

E. atrovirens (Desf.) Trin. ex Steud.

Densely tufted perennial herb 2-4 ft. high; culms more or less erect, rather stout, simple or branching below, glabrous, about 4-noded. Leaves few at the base of each culm; sheath glabrous except at the bearded mouth; ligule a minutely ciliate rim; lamina linear, tapering to an acute or setaceous point, 2-8 or more in. long, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad, rather rigid. Panicles open, 2-6 in. long. Spikelets oblong to linear, 8-30-flowered.

Darfur. Equatoria.

E. tenuifolia (A. Rich.) Hochst. ex Steud.

Perennial herb; culms erect, 2-3 ft. high, slender, branched. Leaves long, narrow; mouth of sheath naked. Panicles oblong to ovoid, open, 3-6 in. long; branches solitary or in pairs, distant, the branchlets thread-like and stiff. Spikelets olive-grey, linear, 5-15-flowered.

Equatoria.

E. racemosa (Thunb.) Steud.

Fig. 113.

E. chalcantha Trin.

Tufted perennial herb; culms erect, straight, 6-16 or more in. high, glabrous, 1-noded. Leaves crowded at the base of the culms, more or less covered with spreading often tubercle-based hairs or rarely quite glabrous; sheath tight, bearded at the mouth or not; ligule a dense fringe of very short hairs; lamina linear, tapering to a fine point, 1-4 in. long, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad. Spikelets olive-green to almost leaden-grey, closely 7-15-flowered.

Equatoria.

E. tremula Hochst. ex Steud.

Tufted annual herb $\frac{1}{2}$ -4 ft. high, leafy usually at the base; culms erect or suberect. Leaves few, short, up to $\frac{1}{2}$ in. broad; mouth of sheath slightly hairy. Panicles ovoid to ellipsoid, very loose and open, nodding, 2-20 in. long, 2-12 in. broad. Spikelets pallid or purplish, scattered, linear, often curved.

Central and Southern Sudan.

E. cillanensis (All.) Link ex Vign. Lut.

E. major Host.

Tufted annual herb; culms ascending or suberect, usually branched below, $\frac{1}{2}$ -2 ft. long, glabrous, 3-4-noded. Leaf-sheaths loose, strongly striate, keeled in the upper part, often glandular,



Fig. 113—*ERAGROSTIS RACEMOSA* (Thunb.) Steud.

A, spikelet. B, lower glume. C, upper glume. D, lemma. E, palea showing rough keels.

glabrous or scantily hairy, bearded at the mouth; ligule a fringe of short hairs; lamina linear or lanceolate-linear, long-tapering to a fine point, 2-6 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, flat, usually glandular along the margin. Panicles oblong to ovoid-oblong, stiff, 2-6 or more in long, dense or rather lax. Spikelets light- or dark-olive-green, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, few-50-flowered.

Widespread.

E. paniciformis (A. Braun) Steud.

E. obtusa (non Munro) Broun & Massey.

Densely tufted perennial herb; culms usually repeatedly kneeed, wiry, $\frac{1}{2}$ -1 $\frac{1}{2}$ ft. long, glabrous, 2-4-noded. Leaf-sheaths bearded at the mouth, persistent; ligule a line of short hairs; lamina linear, long-tapering to a point, 2-5 in. long, usually glabrous. Panicles erect, ovoid to oblong, 2-4 in. long, $\frac{3}{4}$ -3 in. broad, rather lax; branches solitary, thread-like, divided from near the base. Spikelets loose or rather crowded on the branchlets, broadly ovate-oblong or oblong or almost orbicular, obtuse, strongly laterally compressed, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, closely 8-20-flowered.

Equatoria.

E. turgida (Schumach.) De Wild.

E. rubiginosa Trin.

Loosely tufted annual herb 4-24 in. high; culms erect. Leaves more or less forming a basal tuft; lamina sometimes reddish-tinged, 2-4 in. long, $\frac{1}{2}$ - $\frac{1}{4}$ in. broad. Panicles ovoid to oblong, open or contracted, 1 $\frac{1}{2}$ -6 $\frac{1}{2}$ in. long, $\frac{1}{2}$ -1 $\frac{1}{4}$ in. broad; branches often divided. Spikelets red-tinged, contiguous, broadly ovate or oblong, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, $\frac{1}{2}$ - $\frac{1}{4}$ in. broad, closely 8-40-flowered.

Equatoria.

47. **EREMOPOGON** Stapf

Eremopogon foveolatus (Del.) Stapf.

Dense cushion-like perennial herb, often much grazed, or up to 2 ft. high; culms very slender, about 3-noded. Basal leaf-sheaths whitish, more or less silky, those of the culms terete and glabrous except at the node; ligule hyaline, ciliolate, continuous with the membranous margins of the sheath, lamina linear, acute at the apex, up to 3 $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, glaucous. Inflorescences composed of a solitary silky raceme, 1 $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, supported by a spathe-like sheath without a lamina, the flowering branches solitary or clustered. Sessile spikelets pale and shining with a reddish tip, lanceolate; glumes equal, glabrous; intracarpal nerves of lower glume 2, with a circular pit between them above the middle; lemma reduced to an awn up to $\frac{1}{2}$ in. long.

Red Sea District.



Fig. 114—*ERIOCHLOA NOBILIS* (SCRIBN.) HACK. & STAPF EX THELL.

A, ligule. B, spikelet. C, upper glume. D, lemma of lower floret. E, F, upper floret from back and front.

48. **ERIOCHLOA** Kunth**Eriochloa nubica** (Steud.) Hack. & Stapf ex Thell.

Fig. 114.

E. acrotricha (Steud.) Hack. (1908), non Hack. (1906).

Tufted annual herb $\frac{1}{2}$ -2 or more ft. high; culms erect or ascending. Leaf-sheaths loose, closely nerved; ligule a line of hairs; lamina linear, up to 6 in. long, about $\frac{1}{4}$ in. broad, glabrous or slightly hairy. Panicles raceme-like, slender, of few loosely arranged racemes about $1\frac{1}{4}$ or slightly more in. long. Spikelets oblong-lanceolate, sharply acuminate, more or less appressed-pilose. Lower glume reduced to a rim. Upper glume silky.

*Central and Southern Sudan.*49. **EUCLASTA** Franch.**Euclasta condylotrleha** (Hochst.) Stapf.

Annual herb; culms up to nearly 6 ft. high, slender, bearded at the nodes. Leaf-sheaths glabrous or slightly hairy; ligule short, ciliate; lamina linear, tapered to a fine point, 6-10 in. long, up to $\frac{1}{2}$ in. broad, pilose beneath, nearly glabrous above but with a few long bristle-like hairs near the base, the margin scabrid. Panicles umbelliform, pilose, composed of several (up to 15) nodding racemes 2-3 $\frac{1}{2}$ in. long, with very long twisted hairy awns; common axis long-pilose at the nodes. Spikelets oblong-lanceolate, $\frac{1}{2}$ in. long, strongly nerved, pilose towards the base.

*Central and Southern Sudan.*50. **EXOTHECA** Anderss.**Exothea abyssinica** (Hochst.) Anderss.

Densely tufted herb up to 3 or more ft. high; culms erect, rather slender, 2-3-noded, glabrous. Leaf-sheaths produced at the mouth into firm lanceolate to subulate acute auricles up to 1 in. long, glabrous, smooth; ligule scarious, truncate, glabrous, adnate to the auricles of the sheath; lamina narrowly linear from a gradually attenuated base, tapering to a long fine point up to 1 or more ft. long. Inflorescences, if not reduced to a single raceme-pair, with all the internodes much elongated, the lower ones up to over 6 in. long; spatheoles narrow, acute to finely acuminate at the apex, 3-5 in. long; peduncles long-exserted from the spatheoles; racemes greenish, often tinged with purple or violet, about 1 in. long. Fertile spikelets about $\frac{1}{4}$ in. long, the callus densely tawny-bearded; awn stout, 2 $\frac{1}{4}$ -4 in. long, tawny, the column longer than the bristle, shortly tawny-hairy; pedicellate spikelets lanceolate-oblong, $\frac{2}{3}$ in. long, glabrous.

Equatoria: Imatong Mountains, 8000-10,400 ft.

51. **FESTUCA** L.**Festuca rigidula** Steud.

Somewhat tufted perennial herb; roots fibrous; culms rather rigid, up to 2 or more ft. high, glabrous. Ligules membranous; lamina narrow-linear, 1-3½ or more in. long, glabrous. Panicles loosely subracemose; racemes with 4-10 spikelets. Spikelets swollen, 4-6-flowered, shortly awned.

Equatoria: Imatong Mountains, Kippia, 8000 ft.

F. simensis Hochst. ex A. Rich.

Perennial herb; culms ascending, 1½-3 ft. long. Leaves glabrous; sheath slightly swollen, striate; ligule membranous, short; lamina linear, attenuated, about 9 or more in. long. Panicles sheathed at the base, almost spike-like. Spikelets pedicellate, lanceolate, 4-flowered, the flowers distant; awns up to ½ in. long.

Equatoria: Imatong Mountains, 7000 ft.

52. **GASTRIDIVM** Beauv.**Gastridium ventricosum** (Gouan) Schinz & Thell.

Nitgrass.

Annual herb 3-16 in. high. Leaves linear, flat. Panicles spike-like, cylindric, tapering at both ends, up to 2½ in. long. Glumes lanceolate, acuminate at the apex, scabrous on the keel, glossy. Lemma hirsute, usually with a bent awn from the back below the tip sometimes exceeding the glumes.

Red Sea Hills: Erkowit. Darfur: Jebel Marra, 10,000 ft.

53. **HACKELOCHLOA** Kuntze**Hackelochloa granularis** (L.) Kuntze.

Manisuris granularis (L.) L. f.

Annual herb; culms erect, branched, up to over 3 ft. high, glabrous or hirsute with tubercle-based hairs. Leaf-sheaths loose, hirsute with tubercle-based hairs, usually more or less bearded at the node; ligule very short, ciliate; lamina lanceolate or linear-lanceolate from a cordate and amplexicaul base, acute at the apex, 2-4 in. long, ¼-½ in. broad, more or less hirsute with fine tubercle-based hairs, the margin ciliate. False spikes solitary, ½-1 in. long, axillary and terminal, borne on short or long peduncles, partly enclosed in to completely exerted from the supporting spathe-like sheath, glabrous. Spikelets globose.

Kassala: Gallabat. Equatoria.



Fig. 115 --HARPACHNE SCHIMPERI Hochst. ex A. Rich.

A. ligule. B, spikelet. C, lower glume. D, upper glume. E, lowest lemma. F, one of the upper lemmas. G, palea. H, palea flattened.

54. **HARPACHNE** Hochst. ex A. Rich.**Harpachne schimperi** Hochst. ex A. Rich.

Fig. 115.

Tufted herb; culms erect, up to 1 ft. high. Leaves narrow-linear; sheath usually glabrous; ligule densely pilose. Spikelets arranged almost horizontally in dense secund terminal spikes, 8-flowered, the pedicels hairy.

Darfur: Jebel Marra, 7500 ft.

55. **HELICTOTRICHON** Bess.**Helictotrichon thomasi** C. E. Hubbard.

Perennial herb; culms ascending, up to 3½ ft. long, slender, simple, 3-noded, slightly scabrous towards the panicle. Leaf-sheaths narrow, glabrous; ligule truncate, lacerate; lamina narrowly linear, tapering to a fine tip, up to 7 in. long, ½ in. broad, with or without a few scattered hairs on the upper surface. Panicles linear, interrupted, 4-6 in. long, about ¼ in. broad; branches erect, paired or solitary, with 1-3 spikelets, thread-like. Spikelets pale-green, narrowly oblong, about ½ in. long, appressed to the branches; florets 3-4; awns up to ½ in. long.

Equatoria: Imatong Mountains, Mount Kineti, 9000 ft.

H. elongatum (Hochst.) C. E. Hubbard.

Perennial herb; culms erect or ascending, up to 4 ft. high, simple, 2-4-noded, glabrous and smooth; longest internode up to 2 ft. long, finally long-exserted. Leaf-sheaths smooth, glabrous; ligule rounded-truncate, up to ½ in. long; lamina linear, tapering to an acute apex, ¾-1½ ft. long, flat, firm, usually glabrous. Panicles lanceolate to narrowly oblong, loose, nodding, 4-12 in. long, up to 2½ in. broad; branches in clusters of 2-4, thread-like, the lower ones up to 4 in. long. Spikelets green or purplish, oblong, ½-¾ in. long; florets 2-3; awns up to ¾ in. long.

Equatoria: Imatong Mountains, near Itobol, 6400 ft.

56. **HETEROPOGON** Pers.**Heteropogon contortus** (L.) Beauv. ex Roem. & Schult.

Fig. 116.

Tufted perennial herb up to 3 or more ft. high; culms erect or ascending. Leaves glaucous; sheath compressed, keeled; ligule short, truncate, ciliate; lamina linear, in the upper leaves sometimes tapering to a fine point, 3-9 in. long, ½-¾ in. broad, folded in bud. Inflorescences composed of a simple terminal raceme or usually of several flowering branches, forming tiers and collected into a scanty rarely copious and more or less clustered spatheate panicle; spatheoles narrow, long-tapering, about 3-4 in. long, soon tightly inrolled; racemes 1-3 in. long. Awns 2-4 or more in. long, becoming twisted together.

Central and Southern Sudan.



Fig. 116—*HETEROPOGON CONTORTUS* (L.) Beauv. ex Roem. & Schult.

A, ligule. B, sessile fertile spikelet showing glumes, awn and pointed base. C, D, lower glume, front and back view. E, upper glume. F, grain. G, pedicellate sterile spikelet showing lower glume. H, upper glume.

57. **HYPARRHENIA** Anderss. ex Fourn.

- A. Raceme-bases (formed from the joint or joints below the lowest fertile spikelet) unequal to very unequal, that of the lower raceme very short, the upper one up to $\frac{1}{2}$ in. long and thread-like:
- B. Raceme-bases not produced into a long bract-like appendage at the insertion of the lowest fertile spikelet:
- C. Upper raceme with or without 1 pair of homogamous awnless male or neuter spikelets:
- D. Hairs of the racemes tawny or reddish throughout or almost so:
- E. Mature peduncles $\frac{1}{2}$ -1 in. long, enclosed in the narrow loosely inrolled spatheoles which usually much exceed the peduncles on maturity *H. finitima*.
- EE. Mature peduncles more than $\frac{2}{3}$ in. long, almost as long as or longer than the spatheoles:
- (a) Fertile spikelets awned; perennial herbs:
- (b) Raceme-bases not becoming deflexed, the upper one pubescent but not bearded with stiff hairs; spikelets usually reddish *H. rufa*.
- (bb) Raceme-bases becoming deflexed, the upper one scantily bearded with stiff tubercle-based hairs; spikelets tinged with purple or violet ... *H. altissima*.
- (aa) Fertile spikelets awnless; annual herb ... *H. exarmata*.
- DD. Hairs of the racemes white throughout; awns dark-brown ...
H. hirta.
- CC. Upper raceme with 2 pairs of homogamous awnless male or neuter spikelets persistent on the tardily disarticulating raceme-base:
- (c) Annual herb *H. barteri* var. *calvescens*.
- (cc) Perennial herb *H. filipendula*.
- BB. Raceme-bases produced into a long scarious bract-like appendage at the insertion of the lowest fertile spikelet, the appendage appressed to the latter:
- (d) Perennial herb; awns about 3 in. long *H. dissoluta*.
- (dd) Annual herbs; awns up to $6\frac{1}{2}$ in. long:
- (e) Ligule about $\frac{1}{2}$ in. long; herb up to 8 ft. high; culms slender; fertile spikelets $\frac{1}{2}$ - $\frac{1}{2}$ in. long ... *H. macrolepis*.
- (ee) Ligule $\frac{1}{2}$ -1 in. long; robust herb up to 17 ft. high; fertile spikelets up to 1 in. long *H. edulis*.
- AA. Raceme-bases more or less equal, short and somewhat stout, dorsally flattened, rarely the upper one elongated and thread-like upwards:
- F. Raceme-bases both or at least the upper one bearded with spreading or suberect tubercle-based hairs:
- G. Raceme-bases not produced at the insertion of the lowest fertile spikelet into a scarious denticulate appendage:
- H. Mature peduncles much shorter than the boat-shaped spatheoles which retain their shape after flowering:
- I. Awns $1\frac{1}{4}$ - $2\frac{1}{2}$ in. long; annual herbs:

- (f) Panicle several times divided, showy; spatheoles broad, often vividly coloured, about 1 in. long, shortly tapering *H. pseudocymbaria*.
- (ff) Panicle reduced to 2 or 3 few-rayed tiers; spatheoles 1-2 in. long, narrowed to a long slender point *H. anthistirioides*.
- II. Awns $\frac{1}{4}$ - $1\frac{1}{4}$ in. long; perennial herbs:
- (g) Peduncles $\frac{1}{8}$ - $\frac{2}{3}$ in. long; spatheoles $\frac{1}{3}$ - $\frac{4}{5}$ in. long, broad:
- (h) Awns $\frac{1}{4}$ - $\frac{1}{2}$ in. long; spatheoles $\frac{1}{3}$ - $\frac{2}{3}$ in. long; peduncles $\frac{1}{8}$ - $\frac{1}{4}$ in. long *H. cymbaria*.
- (hh) Awns $\frac{3}{4}$ - $1\frac{1}{4}$ in. long; spatheoles $\frac{1}{2}$ -1 in. long; peduncles usually more than $\frac{1}{4}$ in. long *H. variabilis*.
- (gg) Peduncles $\frac{1}{4}$ - $\frac{2}{3}$ in. long; spatheoles $\frac{2}{3}$ - $1\frac{1}{3}$ in. long *H. umbrosa*.
- HH. Mature peduncles equalling (or almost so) or exceeding the spatheoles, which after flowering are more or less inrolled from the margin *H. papillipes*.
- GG. Raceme-bases produced at the insertion of the lowest fertile spikelet into a scarious usually denticulate appendage:
- J. Awns 2 per raceme-pair:
- (i) Mature peduncles about equalling the spatheoles or only slightly shorter *H. confinis*.
- (ii) Mature peduncles very much shorter than the spatheoles *H. macrarrhena*.
- JJ. Awns 3 per raceme-pair *H. gracilescens*.
- FF. Raceme-bases not bearded although usually finely pubescent or villous at least in the fork:
- (j) Racemes-bases without a large cornucopia-like appendage ... *H. diplandra*.
- (jj) Raceme-bases produced into a large obovoid-cuneate cornucopia-like appendage about $\frac{1}{2}$ in. long, embracing the base of the succeeding spikelets *H. cornucopiae*.

***Hyparrhenia finitima* (Hochst.) Anderss. ex Aschers. & Schweinf.**

Perennial herb; culms usually branched from the base, passing into a spatheate panicle, erect, glabrous. Leaf-sheaths with tubercle-based hairs in the upper part or quite glabrous; ligule rounded, $\frac{1}{8}$ in. long; lamina linear, dull-green or reddish, tapering to a fine point, up to 2 ft. long, $\frac{1}{3}$ in. broad, scabrous to spinulously ciliolate on the margin, glabrous or coarsely hirsute. Spatheate panicles narrow, compound, interrupted and rather lax below; spatheoles narrowly lanceolate, long-acuminate at the apex, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. long, sparingly and softly hairy or glabrous; peduncles thread-like, up to 1 or more in. long; racemes laterally exerted, $\frac{1}{2}$ - $\frac{2}{3}$ in. long, 4-5-awned per pair. Fertile spikelets pale below, reddish upwards or purplish-brown all over, linear-oblong, $\frac{1}{4}$ in. long including the callus; awn about $1\frac{1}{4}$ in. long, the column shortly reddish-hairy.

Kassala: Gallabat.



Fig. 117—*HYPARRHENIA RUFA* (Nees) Stapf.

A, ligule. B, C, pairs of spikelets; B₁, joint of raceme; B₂, C₁, pedicels of pedicellate spikelets; B₃, C₂, sessile spikelets from back and front; B₄, C₃, pedicellate spikelets.

H. rufa (Nees) Stapf.

Fig. 117.

Perennial herb up to 8 or more ft. high, tufted; culms erect or ascending, often up to $\frac{1}{4}$ in. in diameter, solid, glabrous, usually simple and 5-7-noded below the panicle. Leaf-sheaths glabrous or rarely hairy upwards; ligule scarious, up to $\frac{1}{2}$ in. long, often with hairs from behind; lamina linear, narrow and long-tapering to a fine point, 1-2 $\frac{1}{4}$ ft. long. Spatheoles very narrowly linear-lanceolate, acuminate at the apex, at length reddish, 1 $\frac{1}{2}$ -3 in. long, ultimately tightly inrolled; peduncles thread-like, 1-2 in. long; racemes reddish to tawny, often nodding, slender, $\frac{3}{4}$ -1 in. long, 7-13-awned per pair. Awn $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long, shortly tawny- or reddish-hirsute below the bend.

Central and Southern Sudan.

H. altissima Stapf.

Perennial herb up to 7 ft. high; culms erect or ascending, up to $\frac{1}{4}$ in. in diameter, solid, simple and 5-6-noded below the panicle. Leaf-sheaths glabrous; ligule scarious, rounded, up to $\frac{1}{2}$ in. long; lamina linear, long-tapering to a fine point, 6-9 in. long. Spatheate panicles very lax, somewhat scanty, up to over 1 ft. long; spatheoles very narrow, linear-lanceolate, acuminate at the apex, at length reddish, 2-3 in. long; peduncles thread-like, at length 3-4 in. long, with beards of long spreading whitish tubercle-based hairs; racemes slender, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long. Awn $\frac{3}{4}$ -1 in. long.

Southern Sudan.

H. exarmata (Stapf) Stapf.

Annual herb up to 8 ft. high; culms stout, about 7-noded and simple below the spatheate panicle. Leaf-sheaths tight, glabrous; ligule scarious, rounded, 1-1 $\frac{1}{2}$ in. long; lamina linear, long-attenuated upwards, up to 1 $\frac{1}{2}$ ft. long, glabrous. Spatheate panicles narrow, about 1 ft. long; spatheoles pale-reddish, narrowly lanceolate, 1 $\frac{1}{4}$ -1 $\frac{3}{4}$ in. long, acuminate at the apex, soon tightly inrolled, bearded at the node; peduncles thread-like, erect, at length equalling or exceeding the spatheole, minutely pubescent upwards with longer delicate hairs; racemes suberect, up to 1 in. long, 12-19-awned per pair.

Equatoria: Tambura.

H. hirta (L.) Stapf.

Andropogon gayanus var. *squamulatus* (non Stapf) Broun & Massey p.p.

Perennial herb up to 3 or more ft. high, densely tufted from a sometimes creeping rhizome; culms erect, slender, passing about the third or fourth internode into a spatheate panicle. Ligules scarious or membranous, truncate, up to $\frac{1}{2}$ in. long, ciliate-denticulate; lamina very narrowly linear, tapering to a fine point, from a few to 12 or more in. long. Spatheate panicles elongated, loose, from a few to 12 or more in. long; spatheoles linear-lanceolate,

long-tapering to an acute point, about 2 in. long; peduncles 2-3 in. long; racemes 1-1½ or more in. long, 10-14 awned per pair, more or less whitish- or greyish-silky-villous. Awn slender, ¾-1 or more in. long; column minutely reddish-hirsute.

Northern and Central Sudan.

H. barteri var. **calvescens** (Hack.) Stapf.

Annual herb up to 10 ft. high; culms erect, solitary or clustered, simple and 3-5-noded below the panicle. Leaf-sheaths glabrous; ligule up to ½ in. long, truncate, ciliolate; lamina narrowly linear, up to 1 ft. long, tapering to a fine point. Spatheate panicles several times divided, rather dense, rather fan-shaped; spatheoles reddish, very narrow, linear, long-tapering to a fine point, 1½-2 in. long, at length inrolled; peduncles thread-like, more or less equaling the spatheole; racemes greenish, rather loose, ¼-½ in. long, 2-awned per pair, one sessile, the other with a thread-like base ½-¾ in. long. Awn up to 2 or more in. long; column reddish-hairy.

Equatoria.

H. filipendula (Hochst.) Stapf.

Perennial herb 3-5 or more ft. high, tufted from an often much-branched rhizome; culms erect, slender, glabrous, 4-5-noded below the panicle. Leaf-sheaths tight; ligule up to ¼ in. long, truncate, scarious; lamina narrowly linear, tapering upwards to a long fine point, up to 1 ft. or more long. Spatheate panicles very narrow, contracted, 1-3 ft. long, the upper tier more or less fan-shaped; spatheoles very narrowly linear, tapering to a setaceous point, up to over 2 in. long, scarious, reddish, glabrous, finally tightly inrolled; peduncles thread-like; racemes greenish or tinged with purple, almost parallel, about ½ in. long, 2-awned per pair. Awn about 2 in. long; column tawny-hairy.

Equatoria.

H. dissoluta (Nees) C. E. Hubbard.

H. ruprechtii Fourn.

Perennial herb, forming dense tufted clumps from a few to 10 ft. high; culms rather stout, glabrous, sometimes waxy-powdery, simple and 3-4-noded below the panicle. Leaf-sheaths glabrous or very rarely hirsute, those of the culm-leaves produced at the mouth into triangular or lanceolate auricles up to ½ in. long; ligule scarious, broadly ovate, rounded, glabrous, up to over 1 in. long, laterally adnate to the auricles; lamina glaucous, linear, tapering to a fine point, up to 1 or more ft. long, rough on both surfaces. Spatheate panicles erect, narrow and interrupted; spatheoles dull-purple or reddish, narrowly lanceolate, long-acuminate at the apex, usually 2-3 in. long, at length loosely inrolled from the margins and rather narrow; peduncles thread-like, from less than 1 to 2 in. long; racemes almost contiguous, never recurved, rarely nodding, up to 1 or more in. long, 2-awned per pair. Awn 2-3½ in. long, very shortly tawny-hairy.

Southern Sudan.

H. macrolepis (Hack.) Stapf.

Annual herb 5-8 ft. high; culms rather slender. Leaf-sheaths glabrous, produced at the mouth into triangular-ovate auricles; ligule broadly ovate, rounded, glabrous, about $\frac{1}{2}$ in. long, laterally adnate to the auricles; lamina dull-green, linear, tapering to a long fine point, up to 1 ft. long, smooth on both surfaces. Spatheate panicles erect, narrow; spatheoles purplish or reddish and more or less glaucescent, lanceolate, long-acuminate, usually 3 in. long, at length inrolled from the margin and very narrow; peduncles thread-like, $1\frac{1}{2}$ in. long, enclosed in the spatheole; racemes almost contiguous, up to $1\frac{1}{4}$ in. long, 2-awned per pair, never recurved. Awn yellowish, stout, up to 5 in. long, shortly tawny-hairy.

Equatoria.

H. edulis C. E. Hubbard.

Robust annual herb, usually with stilt-roots, up to 17 ft. high; culms erect, solid, simple or branched and up to 10-noded below the inflorescence. Leaf-sheaths glabrous or bearded at the node; ligule narrowly oblong or lanceolate-oblong, truncate, $\frac{1}{2}$ -1 in. long; lamina linear-lanceolate, long-attenuate at the apex, up to 3 or more ft. long. Spatheate panicles up to 5 or more ft. long, very lax, generally much branched; spatheoles lanceolate, $2\frac{1}{2}$ -4 in. long; peduncles thread-like, glabrous, $\frac{1}{2}$ - $\frac{1}{4}$ in. long; racemes $1\frac{3}{4}$ - $2\frac{1}{2}$ in. long. Awn up to $5\frac{1}{2}$ in. long.

Equatoria: Tambura, Abu Satta Hills.

H. pseudocymbaria (Steud.) Aschers. & Schweinf.

Annual herb up to 3 or more ft. high; culms erect or ascending, with powerful root-fibres, sometimes producing stilt-roots from the lower nodes, glabrous, rarely up to $\frac{1}{2}$ in. in diameter, usually simple and 3-4-noded below the panicle. Ligules very short, rounded or truncate, glabrous; lamina linear, long-tapering to a fine point, from a few to over 12 in. long. Spatheate panicles interrupted, up to $1\frac{1}{2}$ ft. long; spatheoles greenish or often brilliantly red- or orange-coloured, permanently boat-shaped, usually more or less horizontal, broad-lanceolate in profile, about 1 in. long; peduncles thread-like, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, with a spreading or deflexed beard below the top and on the outer side, the hairs white and $\frac{1}{2}$ - $\frac{1}{4}$ in. long; racemes almost touching, laterally and vertically exerted from the spatheoles, or reflexed, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, dense, 3-5-awned per pair, with very short densely bearded bases. Awn slender, 2- $2\frac{1}{2}$ in. long; column brown, tawny-hairy.

Darfur: Jebel Marra. Fung District: Roseires.

H. anthistirioides (Hochst.) Anderss. ex Aschers. & Schweinf.

Annual herb; culms very slender, erect, up to 1 ft. high, glabrous, simple and 4-5-noded below the inflorescence. Leaf-sheaths glabrous, produced at the mouth into short triangular auricles;

ligule scarious, very short, truncate, adnate to the auricles; lamina linear, acutely acuminate at the apex, up to 3 or more in. long, slightly rough all over. Spatheate panicles very scanty, $\frac{1}{2}$ -1 in. long, arched or flexuous, glabrous; spatheoles lanceolate, finely acuminate at the apex, scarious, glabrous, boat-shaped during flowering, then loosely inrolled upwards; peduncles $\frac{3}{4}$ -1 in. long, thread-like; racemes pale-reddish or olive-green, almost contiguous, laterally exerted, finally sharply deflexed, about $\frac{1}{2}$ in. long, 2-5-awned per pair, pubescent and densely bearded with hairs. Awn stout, 2 in. long; column dark, tawny-hispid.

Darfur: *Jebel Marra*, 9000 ft.

H. cymbaria (L.) Stapf.

Fig. 118.

Perennial herb 6-20 ft. high from a creeping branched rhizome; culms erect or ascending from a sometimes prostrate base, often rooting at the lower nodes, glabrous, many-noded with vegetative branches from all or some of the lower nodes. Leaf-sheaths glabrous, often ciliate along the margins; ligule scarious, up to $\frac{1}{2}$ in. long, rounded or truncate; lamina linear, long-tapering to a fine point, $\frac{1}{2}$ -1 $\frac{1}{2}$ or more ft. long. Spatheate panicles often very large and dense, leafy, $\frac{1}{2}$ -2 or more ft. long; spatheoles often brilliantly red or purple, permanently boat-shaped, broad-lanceolate or ovate-lanceolate in profile, acutely acuminate at the apex, usually $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glabrous; peduncles thread-like, about $\frac{1}{2}$ - $\frac{1}{3}$ in. long, densely bearded at the top with white or yellowish hairs up to $\frac{1}{4}$ in. long; racemes subsessile, laterally and usually vertically exerted from the spatheoles, at length deflexed, dense, up to $\frac{1}{2}$ in. long, 2-6-awned per pair, densely bearded. Awn $\frac{1}{4}$ - $\frac{1}{3}$ in. long; column brown, hairy.

Equatoria.

H. variabilis Stapf.

Perennial herb 2 $\frac{1}{2}$ -8 $\frac{1}{2}$ ft. high; culms erect, 5-6- or more-noded. Leaf-sheaths glabrous, at length inrolled; ligule firm, scarious, rounded, up to $\frac{1}{2}$ in. long; lamina pale-green, linear, gradually narrowed downwards to an almost semi-amplexicaul base, long-tapering to a fine point, over 12 in. long, $\frac{1}{2}$ in. broad, glabrous. Spatheate panicles many times divided, leafy, linear-oblong, over 12 in. long, usually dense; spatheoles green to bright-brick-red, permanently boat-shaped, usually more or less horizontal, lanceolate to ovate-lanceolate, acutely acuminate at the apex, $\frac{3}{4}$ -1 in. long; peduncles thread-like, at length $\frac{1}{3}$ - $\frac{2}{3}$ in. long, the top bearded with fine white stiff hairs up to $\frac{1}{2}$ in. long; racemes subsessile, laterally and usually vertically exerted from the spatheoles, at length reflexed, about $\frac{1}{2}$ in. long, dense, 3-6-awned per pair. Awn slender, about 1 in. long; column brown, tawny-hairy.

Equatoria.



Fig. 118—*HYPARRHENIA CYMBARIA* (L.) Stapf.

A, ligule. B, C, pairs of spikelets; B., C., joints of racemes; B., C., sessile

H. umbrosa (Hochst.) Anderss. ex Aschers. & Schweinf.

Tufted perennial herb up to 4-5 ft. high; culms erect or ascending, 5-7-noded and simple below the panicle. Leaf-sheaths usually glabrous; ligule scarious, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, rounded; lamina linear, long-tapering to a fine point, up to 1 or more ft. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, glabrous. Spatheate panicles narrow, more or less lax, $\frac{1}{2}$ -1 $\frac{1}{2}$ ft. long; spatheoles permanently boat-shaped, lanceolate, acutely acuminate at the apex, $\frac{2}{3}$ -1 $\frac{1}{2}$ in. long, thinly scarious, usually glabrous; peduncles thread-like, $\frac{2}{3}$ - $\frac{1}{2}$ in. long, the top together with the very short raceme-bases densely bearded with white or yellowish hairs up to $\frac{1}{4}$ in. long; racemes sessile or subsessile, at length reflexed, exerted laterally from the spatheoles together with the strongly arching peduncles, about $\frac{1}{2}$ in. long, about 5-awned per pair. Awn fine, up to 1 $\frac{1}{2}$ in. long; column brown, finely hairy.

Darfur: Jebel Marra.

H. papillipes (Hochst.) Anderss. ex Aschers. & Schweinf.

Andropogon linearis (non Stapf) Broun & Massey.

Perennial herb up to 3 or more ft. high, tufted from a short rhizome; culms usually erect, wiry or woody and solid below, glabrous. Leaf-sheaths glabrous, tight; ligule scarious, truncate, up to $\frac{1}{2}$ or more in. long, ciliolate or glabrous; lamina linear, long-tapering to a fine point, up to 6 or 8 in. long, usually glabrous. Spatheate panicles elongated, usually scanty, lax, $\frac{1}{2}$ -2 ft. long; spatheoles early turning red or reddish, linear-lanceolate, tapering to an acute point, 1 $\frac{1}{2}$ -2 $\frac{1}{4}$ in. long, at length loosely inrolled; peduncles at length 1 $\frac{1}{2}$ -3 in. long, long-exserted, mostly recurved in a semi-circle, the curvature with stiff tubercle-based whitish hairs up to $\frac{1}{4}$ in. long; racemes somewhat diverging, rarely at right-angles, at length reflexed, more or less silky, $\frac{2}{3}$ -1 $\frac{1}{2}$ in. long, 7-15 awned per pair. Awn slender, $\frac{2}{3}$ -1 in. long; column reddish- or tawny-hairy.

Darfur: Jebel Marra, 6500-8000 ft.

H. confinis (Hochst.) Anderss. ex Aschers. & Schweinf.

Annual herb 3 or more ft. high; culms erect, glabrous, simple and 3-5-noded below the panicle. Leaf-sheaths smooth, produced at the mouth into triangular-ovate acute auricles, glabrous; ligule ovate, up to $\frac{1}{4}$ or more in. long, scarious, glabrous, laterally adnate to the auricles; lamina linear, more or less narrowed at the base, tapering to a fine point, up to 2 ft. long, $\frac{1}{2}$ in. broad, glabrous. Spatheate panicles somewhat flaccid, leafy; spatheoles pale-reddish, boat-shaped-lanceolate, long and finely acuminate at the apex, 1 $\frac{1}{2}$ -2 in. long, $\frac{1}{2}$ in. broad, scarious, glabrous, at length inrolled from the margin; peduncles thread-like, beset upwards with fine spreading tubercle-based

hairs; racemes pale-reddish or brownish, almost touching, more or less nodding, at length reflexed, 2-awned per pair. Fertile spikelets pubescent; awn rather stout, up to over 3 in. long, tawny-hairy.

Kassala: Gallabat. Darfur: Kulme.

Var. *pellita* (Hack.) Stapf.

Leaves more rigid and narrower, the lower ones almost reduced to the midrib at the base of the lamina. Fertile spikelets covered with long silvery silky hairs.

Kassala: Gallabat.

H. *macrarrhena* (Hack.) Stapf.

Annual herb up to 5 ft. high; culms erect, glabrous except for a spreading beard up to $\frac{1}{2}$ in. long from below the insertion of the leaves, simple and 2-noded below the panicle. Leaf-sheaths smooth, glabrous, produced at the mouth into narrow lanceolate auricles; ligule oblong, adnate to the auricles, up to $\frac{1}{4}$ in. long; lamina glaucous, linear, up to 9 in. long, $\frac{1}{2}$ in. broad, glabrous. Spatheate panicles leafy; spatheoles purple or violet with a glaucous bloom, boat-shaped, lanceolate, acute or shortly acuminate at the apex, up to $1\frac{1}{2}$ in. long, scarious, glabrous; peduncles thread-like, up to $\frac{3}{4}$ in. long, beset upwards with fine spreading tubercle-based hairs; racemes purplish, almost touching, laterally exerted from the spatheoles, at length reflexed, loose, up to over $\frac{1}{2}$ in. long, 2-awned per pair. Awn stout, about 3 in. long, minutely appressed-hairy.

Equatoria.

H. *gracilescens* Stapf.

Annual herb up to 4 or more ft. high, with stilt-roots from the lowest nodes; culms slender, smooth, simple and 4-5-noded below the panicle. Leaf-sheaths glabrous, the lower ones inrolled upwards, not produced into auricles; ligule firmly scarious, truncate, glabrous, $\frac{1}{2}$ in. long; lamina linear, over 1 ft. long. Spatheate panicles interrupted below, narrowly oblong, lax, over 1 ft. long; spatheoles pale-reddish, linear-lanceolate, finely acuminate at the apex, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. long, scarious; peduncles thread-like, with long stiff yellow tubercled-based spreading hairs; racemes subparallel, finally sharply reflexed, loose, about $\frac{1}{2}$ in. long, 3-awned per pair. Awn stout, 2-3 in. long; column tawny or dark-brown, hairy.

Equatoria.

H. *diplandra* (Hack.) Stapf.

Perennial herb up to 12 or more ft. high, densely tufted from a short descending rhizome; culms robust, up to $\frac{1}{4}$ or more in. in diameter, simple and 3-9-noded below the panicle, glabrous. Leaf-sheaths tight, the lower ones often up to 1 ft. long; ligule very firmly scarious, truncate, hardly up to $\frac{1}{2}$ in. long, ciliolate; lamina



Fig. 119.—*IMPERATA CYLINDRICA* var. *AFRICANA* (Anderss.) C. E. Hubbard.
 A, ligule. B, portion of raceme. C, spikelet enveloped by long hairs.
 C₁, spikelet. D, joint.

linear, tapering to a long very fine point, up to 2 or more ft. long, usually densely hirsute behind the ligule and just above it. Spatheate panicles large, narrow, loose, often over 2 ft. long, with pubescent or shortly bearded nodes; spatheoles reddish or purplish or brownish-yellow, lanceolate, finely acuminate at the apex, 1-1½ in. long; peduncles thread-like, ¼-½ in. long, hairy upwards, the hairs silky; racemes almost touching, laterally exerted from the spatheoles, at length reflexed, usually ½-¾ in. long, dense, 4-8 (usually 6-) awned per pair. Awn 1-1½ or more in. long; column and bristle pale, hairy.

Equatoria.

H. cornucopiae (Hack.) Stapf.

Herb; culms simple below the panicle, glabrous, smooth. Leaf-sheaths glabrous, smooth; ligule scarious, rounded, ⅓-½ in. long, glabrous; lamina green to purplish or reddish, linear, tapering to an acute point, up to 1½ or more ft. long, ¼-½ in. broad. Spatheate panicles leafy, loose, up to 1 ft. long; spatheoles narrowly lanceolate, very long and finely acuminate, up to 3 in. long, glabrous, at length inrolled from the margin; peduncles very slender, thread-like, 1-1½ in. long, arching or recurved, shortly bearded; racemes dull-purplish or -reddish, touching, at length reflexed, stout, up to 1 or more in. long, 2-awned per pair. Awn tawny, very stout, up to 5 or more in. long.

Equatoria.

58. **IMPERATA** Cyr.

Imperata cylindrica var. **africana** (Anderss.) C. E. Hubbard. Fig. 119.

I. cylindrica var. *koenigii* Franch. p.p.

Perennial herb; culms 1½-4 ft. high, erect, 2-4-noded, glabrous. Lower leaf-sheaths elongated, bearded at the mouth, the upper ones usually glabrous, less often bearded at the node; ligule very short, truncate; lamina linear to linear-lanceolate, tapering to an acute point, in the lowest leaves up to 3 or more ft. long, ½-¾ in. broad, glabrous or bearded at the base. Panicles spike-like, 1½-8 in. long, cylindric, very dense. Spikelets about ¾-1 in. long, densely enveloped by hairs about ¼ in. long. Stigmas purple.

Equatoria.

59. **ISCHAEMUM** L.

Ischaemum afrum (J. F. Gmel.) Dandy, comb. nov.

Fig. 120.

Andropogon afer J. F. Gmel.¹; *I. brachyatherum* (Hochst.) Fenzl ex Hack.

Densely tufted perennial herb; culms up to 3 or more ft. high, erect, simple, 5-6-noded, glabrous. Leaf-sheaths tight; ligule scarious, up to ⅓ in. long, truncate, glabrous or ciliolate; lamina linear, long-tapering to a setaceous point, up to 1 ft. long.

¹In L., *Syst. Nat.*, ed. 13, vol. 2, p. 166 (1791).

Racemes 2-3 together, rarely solitary or more than 3, the lower shortly pedunculate, straw-coloured or slightly tinged with purple, moderately hairy; joints very stout, club-shaped, about $\frac{1}{2}$ in. long, glabrous or more or less hairy to villous on the back. Sessile spikelets lanceolate, about $\frac{1}{3}$ in. long, shortly bearded from the obscure callus, the beard whitish or purplish but absent from the lowermost spikelets; awn sometimes purplish, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, twisted: pedicellate spikelets lanceolate, acuminate at the apex, up to $\frac{1}{4}$ in. long.

Central and Southern Sudan.

60. JARDINEA Steud.

Jardinea congoensis (Hack.) Franch.

Perennial herb up to 10 ft. high; culms erect, stout, very smooth and glabrous. Leaf-sheaths firm; ligule very short, membranous, reddish, minutely ciliolate; lamina linear, very long, tapering to a fine point, up to $1\frac{1}{2}$ or more ft. long, $\frac{1}{2}$ in. broad, firm. Racemes dull-purplish or yellowish-green, usually very many together on a common axis, simple or compound, the lower verticillate, slender, up to 10 in. long; common axis up to 6 in. long; joints linear, slender, slightly widened and hollow above, $\frac{1}{4}$ - $\frac{1}{3}$ in. long, very scabrous along the inner angles, disarticulating horizontally. Sessile spikelets narrowly linear-lanceolate, about $\frac{1}{4}$ in. long; lower glume usually produced into a rigid scabrous mucro, glabrous, more or less muricate at least along the sides, the tubercles often bearing sharp points.

Equatoria.

61. KOELERIA Pers.

Koeleria cristata var. **brevifolia** (Nees) C. E. Hubbard.

Tufted perennial herb; culms erect or knee at the base, $\frac{1}{2}$ -3 ft. high, 1-3-noded, the uppermost node at length exerted from the sheath. Leaf-sheaths glabrous or loosely to densely pubescent; ligule truncate, $\frac{1}{4}$ - $\frac{1}{2}$ in. long; lamina very narrowly linear to thread-like with a hard tip, up to 12 in. long, glabrous to densely pubescent. Panicles linear to lanceolate-oblong or lanceolate, somewhat dense, often lobed and interrupted, $1\frac{1}{2}$ -5 in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad. Spikelets shining and pallid or variegated with brown and purple or greenish, at first elliptic, at length gaping, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Glumes ciliolate or scabrous on the keel especially above the middle, glabrous or minutely pubescent on the sides towards the apex.

Equatoria: Imatong Mountains, Kippia grassland.

K. phleoides (Vill.) Pers.

Annual herb; culms loosely tufted or solitary, erect or ascending, 2-18 or more in. high, slender, 2-4-noded, glabrous and smooth. Leaf-sheaths glabrous to densely hairy; ligule delicate, about $\frac{1}{2}$ in. long, lacerate; lamina linear, tapering to an acute apex,



Fig. 120—*ISCHAEMUM AFRUM* (J. F. Gmel.) Dandy.

A, ligule with portion of leaf-sheath and lamina. B, culm with inflorescence, with sheath cut away to expose lower inflorescence. C, portion of raceme showing paired spikelets. D, pair of spikelets. E, sessile spikelet dissected. F, pedicellate spikelet of upper part of raceme. G, pedicellate spikelet of lower part of raceme dissected.

1-6 or more in. long, up to $\frac{1}{2}$ in. broad, glabrous to densely pubescent or pilose. Panicles pale-green, spike-like, very dense, linear to lanceolate or narrowly oblong, cylindric and continuous or lobed and interrupted in the lower part, $\frac{1}{2}$ -4 or more in. long, $\frac{1}{4}$ - $\frac{2}{3}$ in. broad. Spikelets oblong to broadly ovate-oblong, about $\frac{1}{2}$ in. long. Glumes glabrous or thinly pubescent.
Red Sea Hills. Darfur: Jebel Marra, 7000 ft.

62. LASIURUS Boiss.

Lasiurus hirsutus Boiss.

Tufted perennial herb, sometimes almost shrubby at the base; culms from an often woody rhizome, erect, branched from the base, up to 3 ft. high. Leaf-sheaths tight, the lower ones crowded, long-persistent, smooth; ligule a fringe of hairs; lamina linear, long-attenuated to a fine point, in the lower leaves up to 12 or more in. long, $\frac{1}{2}$ in. broad. Racemes erect, up to about $4\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, densely villous and more or less fragile. Sessile spikelets pale-green, lanceolate, about $\frac{1}{2}$ in. long, with a narrow ring-like callus bearing dense erect hairs; lower glume usually glabrous on the back but densely long-ciliate almost from the base.

Northern Sudan.

63. LATIPES Kunth

Latipes senegalensis Kunth.

Wiry creeping perennial herb, with many erect or spreading branches leafy up to the panicle. Leaf-sheaths tight; ligule a rim of hairs; lamina linear, $1\frac{1}{4}$ -4 in. long, divergent. Panicles subspiciform, up to 6 in. long. Spikelets often purplish, 1-flowered, persistent on the hard flattened truncate spreading ciliolate pedicels. Glumes thick and hard; lower narrow, recurved, pectinate, smooth on the back; upper as long as the lower, spinulose-tuberculate.

Red Sea District. Darfur: Meidob Hills. Kordofan.

64. LEERSIA Sw.

Leersia hexandra Sw.

Fig. 121.

Perennial herb up to about 4 ft. high, semi-erect from a creeping stoloniferous rhizome, usually growing in swampy soil; culms erect, rooting at the lower nodes, usually unbranched, slender and weak, many-noded. Leaf-sheaths usually loose and glabrous; ligule short, membranous; lamina bluish-green, broadly linear, tapering to a fine point, up to 8 in. long, $\frac{1}{2}$ - $\frac{2}{3}$ in. broad, rough, glabrous. Panicles narrow, erect or nodding, 2-4 $\frac{1}{2}$ in. long; branches erect or slightly spreading, undivided, up to $1\frac{1}{2}$ in. long, fine, wavy. Spikelets about $\frac{1}{2}$ in. long, imbricate on one side of the branches. Glumes reduced to a minute and obscure transparent rim. Lemma as long as the spikelet, almost glabrous except for the keel and sides which are rough with minute stiff straight or almost straight hairs, hard and tough.

Equatoria.



Fig. 121—LEERSIA HEXANDRA Sw.

A, ligule. B, spikelet showing lemma (left) and palea (right). C, side view of same. D, palea showing stamens. E, stamens and pistil.



Fig. 122—*LEPTASPIS COCHLEATA* Thw.

A, leafy shoot. B, inflorescence. C, pair of spikelets. D, male floret.
E, female spikelet. F, pistil. G, lemmas. H, part of leaf showing venation.

L. drepanothrix Stapf.

Slender herb 1-1½ ft. high. Leaf-sheaths very long, ribbed; ligule ½ in. long; lamina narrowly linear, tapered to the apex, up to 6 in. long, scabrous beneath. Panicles narrow, slender, 4-6 in. long; branches thread-like, ascending, the flowering part very flexuous. Spikelets pale or purplish, elliptic, ⅓ in. long, minutely apiculate. Glumes very minute. Lemma hairy, the hairs curved almost to a semi-circle.

Equatoria.

L. angustifolia Munro ex Prodoehl.

Tufted herb up to 2 ft. high, growing in swamps; culms very slender. Leaves very narrowly linear, up to ½ in. broad. Panicles purplish, narrow, slender, 4-6 in. long. Spikelets about ½ in. long. Glumes very minute. Lemma hairy with stiff minute almost straight hairs on the sides and keel and smaller hairs between.

Equatoria.

65. **LEPTASPIS** R. Br.**Leptaspis cochleata** Thw.

Fig. 122.

Perennial herb, culms ascending, rooting at the lower nodes. Leaf-sheaths open in the upper part, closely nerved; ligule a short ciliolate rim; lamina oblong or broadly oblong-lanceolate, very acute at the apex, subacute and narrowed to a short petiole at the base, 4-8 in. long, 1½-2 or more in. broad, thin; petiole pubescent, about ¼ in. long. Panicles terminal, slender; branches usually 2-3 in a whorl, shortly pubescent. Grain free within the inflated accrescent oblique pubescent ribbed utricle.

Equatoria.

66. **LEPTOCARYDION** Hochst. ex Rendle**Leptocarydion vulpiastrum** (De Not.) Stapf.

Fig. 123.

Annual herb; culms erect or ascending, 2-4 ft. high, many-noded, glabrous, smooth. Leaf-sheaths tight, glabrous; ligule very small, truncate, ciliolate, soon falling; lamina glaucescent, lanceolate-oblong, acute at the apex, 1-3 in. long, ¼-½ in. broad. Panicles pallid or faintly purplish, spike-like, 2-8 in. long, ½-¾ in. broad, very dense; branches up to 1 in. long, branched from the villous base. Spikelets crowded, appressed, up to ¼ in. long. Glumes reddish, about ½ in. long. Lemma pubescent below the middle, finely long-ciliate along the side-nerve.

Kordofan.



Fig. 123—*LEPTOCARYDION VULPIASTRUM* (De Not.) Stapf.

A, spikelet. B, lower glume. C, upper glume. D, floret, showing side of lemma. E, lemma. F, palea. G, grain.

67. **LEPTOCHLOA** Beauv.**Leptochloa chinensis** (L.) Nees.

Annual herb; culms about 4-noded, very slender; internodes long-exserted. Leaf-sheaths open upwards, pilose with a few slender tubercle-based hairs; ligule membranous and jagged; lamina broadly linear, tapered to a point, about $3\frac{1}{4}$ in. long, $\frac{1}{8}$ in. broad, very minutely scabrous on the close nerves. Racemes arranged on an elongated common axis, slender, with very small minutely scabrous spikelets. Glumes keeled, membranous.

Equatoria.

L. coerulescens Steud.

Perennial herb, often growing in swamps; culms about 10-12-noded, hard and rooting at the lower nodes. Leaf-sheaths open upwards, closely nerved; ligule membranous and jagged; lamina linear, up to 8 in. long, $\frac{1}{4}$ in. broad, minutely scabrous on the very close nerves. Racemes arranged on an elongated common axis, oblong, up to 10 in. long. Spikelets purplish, up to $\frac{1}{4}$ in. long. Glumes keeled, membranous.

Equatoria.

68. **LINTONIA** Stapf**Lintonia nutans** Stapf.

Tufted perennial herb $1\frac{1}{2}$ -2 ft. high; culms slender, about 6-noded. Lower leaf-sheaths very compressed and keeled; ligule truncate, up to $\frac{1}{4}$ in. long; lamina pale-green or glaucous, narrow-linear, long-attenuated towards the apex, up to 1 ft. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, glabrous or nearly so. Racemes purplish, 1-4 (usually 2-3) together, narrow, $1\frac{1}{2}$ - $3\frac{1}{4}$ in. long, nodding, shortly pedunculate. Spikelets loosely to closely imbricate, 2-rowed, broadly obovate to broadly elliptic-oblong or oblong, up to $\frac{5}{12}$ in. long. Glumes glabrous, 1-nerved, about $\frac{1}{2}$ - $\frac{1}{3}$ in. long. Lemma with an awn up to $\frac{1}{2}$ in. long.

Equatoria: Mukwecha Waha, near Moru Yakipi.

69. **LOUDETIA** Hochst. ex Steud.

- A. Lower floret male; anther-tips glabrous; awn up to 5 in. long:
- B. Spikelets $\frac{3}{4}$ - $1\frac{1}{2}$ in. long excluding the awn:
- (a) Axis of panicle glabrous; upper glume truncate at the apex ...
L. esculenta.
- (aa) Axis of panicle villous at the nodes or all over; upper glume acuminate at the apex *L. superba.*
- BB. Spikelets less than $\frac{3}{4}$ in. long excluding the awn:
- C. Lemma of the upper floret loosely pilose with long hairs; awn $\frac{1}{4}$ - $\frac{2}{3}$ in. long; reed-like perennial herb
L. phragmitoides.
- CC. Lemma of the upper floret pubescent to almost glabrous; awn $\frac{1}{2}$ -5 in. (usually over 1 in.) long; perennial or annual herbs:

- D. Perennial usually densely tufted herbs; lemma of the lower floret $\frac{2}{3}$ the length of to as long as the spikelet; awn up to 2 in. long:
- (b) Panicles loose or contracted but not spike-like, up to 2 or more ft. long and 6 in. broad:
- (c) Callus of the upper floret truncate or slightly emarginate *L. arundinacea*.
- (cc) Callus of the upper floret emarginate and 2-toothed
L. simplex.
- (bb) Panicles very dense and spike-like, 2-4 in. long and $\frac{1}{2}$ - $\frac{1}{4}$ in. broad *L. coarctata*.
- DD. Annual herb; lemma of the lower floret $\frac{1}{2}$ - $\frac{2}{3}$ the length of the spikelet; awn 3-5 in. long *L. annua*.
- AA. Lower floret barren and reduced to the lemma; anthers 2, their tips minutely hairy; awn up to $7\frac{1}{2}$ in. long *L. togoensis*.

Loudetia esculenta C. E. Hubbard.

Herb; culms tall. Leaf-sheaths purple-tinged, elongate, glabrous; ligule a dense ciliate rim; lamina linear, attenuated at the base, 16 in. long, about $\frac{1}{2}$ in. broad, glabrous, rather rough. Panicles yellowish-brown, erect, slightly contracted, up to 14 in. long, $2\frac{3}{4}$ in. broad. Spikelets lanceolate, acuminate at the apex, $\frac{3}{4}$ - $1\frac{1}{4}$ in. long excluding the awn.

Equatoria: Tambura, Abu Satta Hills.

L. superba De Not.

Trichopteryx gigantea Stapf.

Perennial herb; culms erect from a stout creeping rhizome, bulbous and yellowish at the base, usually 5-12 ft. high, up to $\frac{1}{2}$ in. in diameter, simple, 2-3-noded, glabrous or loosely pilose. Leaves mostly basal; sheath tough, the lowermost tomentose to villous at the base; ligule a densely ciliate rim; lamina linear to linear-lanceolate, finely acuminate at the apex, $\frac{1}{2}$ - $2\frac{1}{4}$ ft. long, $\frac{1}{2}$ -1 in. broad, glaucous, usually densely bearded at the back of the ligule. Panicles narrow, erect, usually rather dense and contracted, $\frac{1}{2}$ -2 ft. long. Spikelets yellowish to reddish-brown with yellow nerves, narrowly lanceolate, acuminate at the apex, mostly 1- $1\frac{1}{2}$ in. long excluding the awn. Glumes coriaceous. Awn slender to stout; column twisted, up to 3 in. long; bristle becoming falcate, up to 2 in. long.

Equatoria.

L. phragmitoides (A. Peter) C. E. Hubbard.

Trichopteryx flammida (non Benth.) Broun & Massey.

Reed-like perennial herb; culms erect, stout, 5-15 or more ft. high, up to $\frac{1}{2}$ in. in diameter, simple, up to 5-noded. Leaf-sheaths tough, densely pilose, villous or hispid and tuberculate towards the lamina or glabrous except for the usually densely bearded node; ligule a densely ciliate rim; lamina linear, up to 3 or more ft. long, $\frac{3}{8}$ in. broad, pilose or glabrous. Panicles yellowish-brown,

erect, narrowly oblong, dense and contracted, 1-2 ft. long, up to 4 in. broad. Spikelets yellowish-brown, linear or linear-cuneate, about $\frac{1}{2}$ in. long excluding the awn. Awn slender, $\frac{1}{2}$ - $\frac{2}{3}$ in. long, becoming falcate; column $\frac{1}{2}$ - $\frac{1}{3}$ in. long.

Equatoria.

L. arundinacea (Hochst.) Steud.

Tufted perennial herb; culms erect or ascending, 3-10 ft. high, simple, 3-6-noded. Ligule a densely ciliate rim; lamina linear, up to 2 or more ft. long, $\frac{2}{3}$ in. broad. Panicles narrowly oblong, loose or contracted, up to 2 or more ft. long and 6 in. broad. Spikelets yellowish to dark-brown, narrowly lanceolate, at length narrowly oblong and gaping, up to $\frac{1}{2}$ in. long excluding the awn. Glumes glabrous or rarely with a few hairs towards the tip. Awn up to $1\frac{1}{2}$ in. long; column $\frac{1}{2}$ - $\frac{1}{3}$ in. long, at length dark-brown.

Southern Sudan.

Var. *hensii* (De Wild.) C. E. Hubbard.

Glumes sparsely to densely setulose or pilose with white hairs from dark-brown or blackish tubercles.

Equatoria.

L. simplex (Nees) C. E. Hubbard.

Tufted perennial herb; culms erect or ascending, 1-5 ft. high, 1-4-noded, simple, glabrous, pubescent or pilose. Leaves mostly basal; sheath firm, glabrous or hairy; ligule a densely ciliate rim; lamina narrowly linear, 5-12 or more in. long, up to $\frac{1}{2}$ in. broad. Panicles contracted and dense or open and loose, 3-16 in. long, up to 3 in. broad. Spikelets light to dark-brown, linear-lanceolate or narrowly lanceolate, usually $\frac{1}{2}$ in. long excluding the awn. Awn $1\frac{1}{4}$ -2 in. long.

Equatoria.

L. coarctata (A. Camus) C. E. Hubbard.

Densely tufted perennial herb; culms erect or ascending, 3-4 ft. high, simple, 2-3-noded, glabrous and smooth. Leaf-sheaths firm; ligule a densely ciliate rim; lamina narrowly linear, setaceous, up to $1\frac{1}{4}$ ft. long. Panicles spike-like, very dense, 2-4 in. long. Spikelets straw-coloured, narrowly lanceolate, acuminate, about $\frac{1}{2}$ in. long excluding the awn. Glumes sparingly setulose along or near the nerves with stiff white hairs from minute dark-brown tubercles. Awn slender, $1\frac{1}{4}$ - $1\frac{1}{3}$ in. long.

Equatoria.

L. annua (Stapf) C. E. Hubbard.

Annual herb; culms erect or kneed at the base, up to $3\frac{1}{2}$ ft. high, slender, 2-3-noded, glabrous and smooth. Leaf-sheaths usually with a ring of hairs at the node; ligule a ciliate rim; lamina linear, up to 8 in. long, $\frac{1}{2}$ in. broad. Panicles ellipsoid to

oblong, contracted, $3\frac{1}{2}$ -8 in. long, up to 2 in. broad. Spikelets yellowish-brown, narrowly lanceolate, about $\frac{3}{4}$ in. long excluding the awn. Glumes loosely setose with stiff spreading white hairs from dark-brown tubercles and minutely hairy between them. Awn slender, 3-5 in. long; column dark-brown, minutely pubescent, $1-1\frac{1}{2}$ in. long.

Equatoria.

L. togoensis (Pilg.) C. E. Hubbard.

Annual herb; culms solitary or erect or ascending, 1-3 $\frac{1}{2}$ ft. high, usually simple, 2-3-noded. Leaf-sheaths tight; ligule a ciliate rim; lamina linear, tapering to a fine acute rigid tip, 1-8 in. long, flat. Panicles erect or slightly nodding, $2\frac{1}{2}$ -10 in. long, up to $1\frac{1}{2}$ in. broad, contracted. Spikelets yellowish-brown or tinged with green or purple, mostly in 3's, narrowly lanceolate, acuminate at the apex, up to $1\frac{1}{2}$ in. long excluding the awn. Awn up to $7\frac{1}{2}$ in. long.

Fung District: Fazoghli.

70. **LOUSIELLA** Hubbard & Léonard

Louisiella fluitans Hubbard & Léonard.

Perennial aquatic herb, with decumbent culms rooting in the mud and becoming erect at the tips, forming floating mats. Leaf-sheaths lax, prominently nerved, glabrous; ligule ciliate; lamina linear or lanceolate-linear, long-attenuate to an acute apex, 4-8 in. long, $\frac{1}{4}$ - $\frac{3}{8}$ in. broad, glabrous, with a scabrid margin and with a rust-coloured spot above the ligule. Panicles lax, up to 4 in. long, with obliquely spreading or reflexed branches. Spikelets pale-green, lanceolate, acutely acuminate, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, glabrous. Lower glume small, about $\frac{1}{2}$ the length of the spikelet; upper glume as long as the spikelet.

Upper Nile: Lake Yirol.

71. **MELANOCENCHRIS** Nees

Melanocenchris abyssinica (R. Br.) Hochst.

Small slender annual herb; culms 4-8 in. long, thread-like, nodding, branched below from the few nodes. Leaf-sheaths glabrous or hairy; ligule bearded; lamina short, narrow. Spikelets in clusters up to $\frac{1}{2}$ in. long including the awns.

Northern and Central Sudan.

72. **MELINIS** Beauv.

Melinis macrochaeta Stapf & Hubbard.

M. minutiflora (non Beauv.) Broun & Massey.

Annual herb up to 4 ft. high; culms erect or ascending, frequently with stilt-roots from the lower nodes, firm, many noded, the nodes pilose. Leaf-sheaths eventually exposing the frequently purplish culm, sparsely pilose, densely and finely tubercled; ligule a short

ciliate rim; lamina linear to linear-lanceolate, long and finely acute, 2½-8 in. long, ¼-½ in. broad, sparsely hairy above, hairy and tuberculate below on the nerves. Panicles pale-green to purplish, narrowly oblong to broadly ovoid, 3-8 in. long, ½-3 in. broad. Spikelets linear to ovate-oblong, not grooved, finely nerved, up to ⅓ in. long. Awn ½-1 in. long.

Equatoria.

M. tenuinervis Stapf.

Perennial herb; culms erect or ascending from a more or less prostrate base, 1-6 ft. high, frequently branched, many-noded, the nodes pilose to villous. Leaves from nearly glabrous to loosely or densely hirsute; sheath tight below, finely tuberculate; ligule a ciliate rim; lamina linear to linear lanceolate, long-tapering to a fine point, 2-6 in. long, about ⅓ in. broad. Panicles greenish-purple to purple, linear to oblong, 3½-8 in. long, ½-2 in. broad. Spikelets yellowish-green to purple, oblong, finely grooved, about ⅓ in. long, shortly pilose. Awn up to ½ in. long or absent.

Equatoria: Imatong Mountains, Ibahin, 6100 ft.

M. minutiflora Beauv.

Fig. 124.

Viscous odorous perennial herb; culms green or purplish, erect or ascending from a prostrate many-noded base, up to 6 ft. high, usually much branched, many-noded, sometimes rooting at the lower nodes. Leaves hairy, finely tuberculate; sheath finely striate; ligule a short ciliate rim; lamina linear to linear-lanceolate, 2½-7 in. long, ⅓-½ in. broad. Panicles pale-green or purplish, linear to ovoid-oblong, 4-12 in. long. Spikelets pallid or purplish, narrowly oblong, strongly grooved, about ⅓ in. long, quite glabrous. Awn ¼-⅓ in. long or absent.

Equatoria.

73. **MICROCHLOA** R. Br.

Microchloa indica (L. f.) Beauv.

M. setacea R. Br.

Tufted annual herb; culms erect or ascending, very slender, simple or branched, 2-12 or more in. long, 1-3-noded, glabrous. Leaves crowded at the base of the culms; sheath tight, compressed, keeled, glabrous, breaking up into fibres; lamina subsetaceous, with an acute or callous point, ½-1½ in. long. Spikes solitary, often purplish, 1-6 in. long, very slender, usually curved. Spikelets 1-flowered, dorsally compressed, in a single row, ⅓-½ in. long, glabrous.

Equatoria.

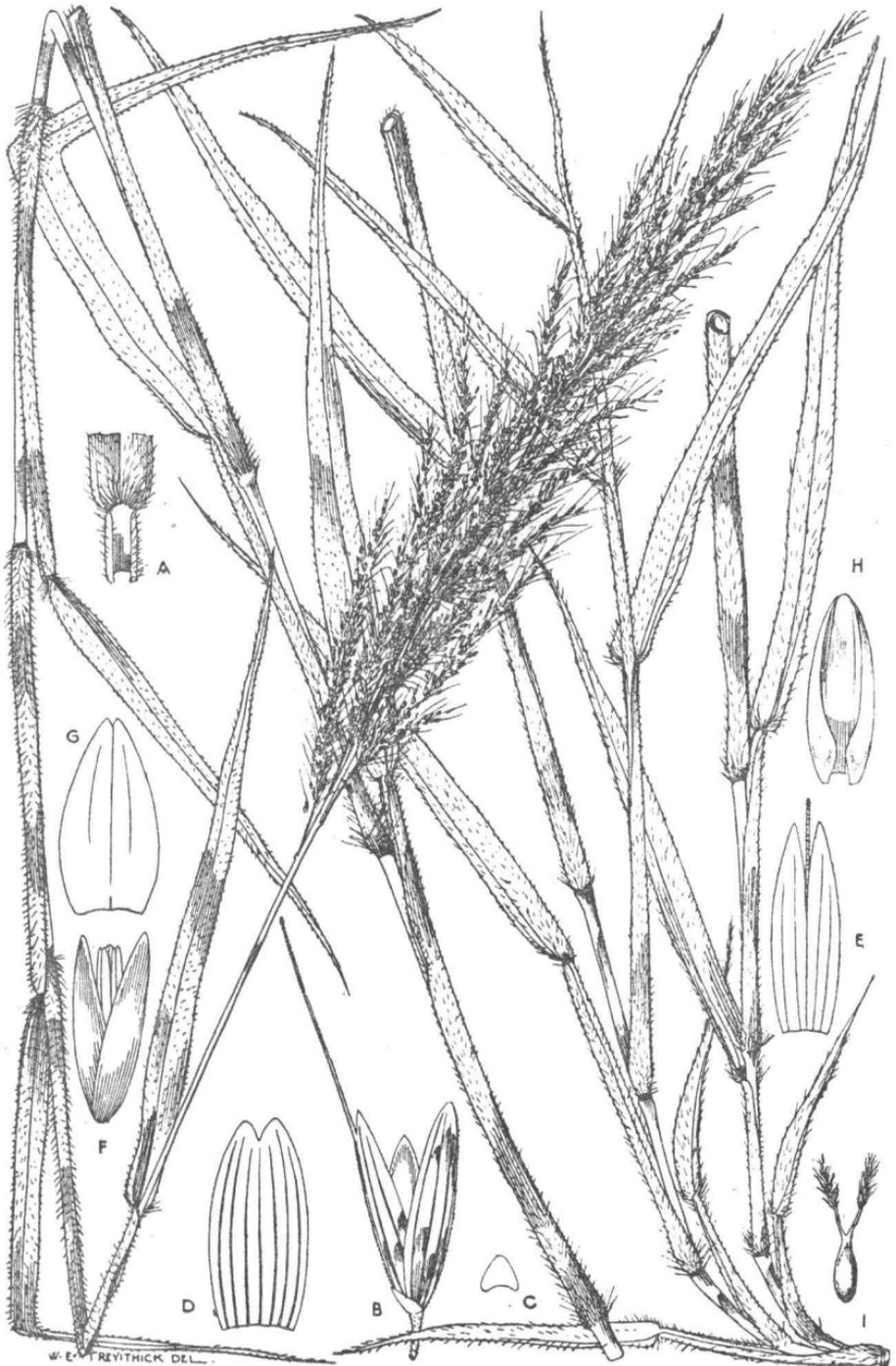


Fig. 124—*MELINIS MINUTIFLORA* Beauv.

A, ligule. B, spikelet. C, lower glume. D, upper glume. E, lemma of lower floret. F, upper floret. G, lemma of same. H, palea. I, pistil.

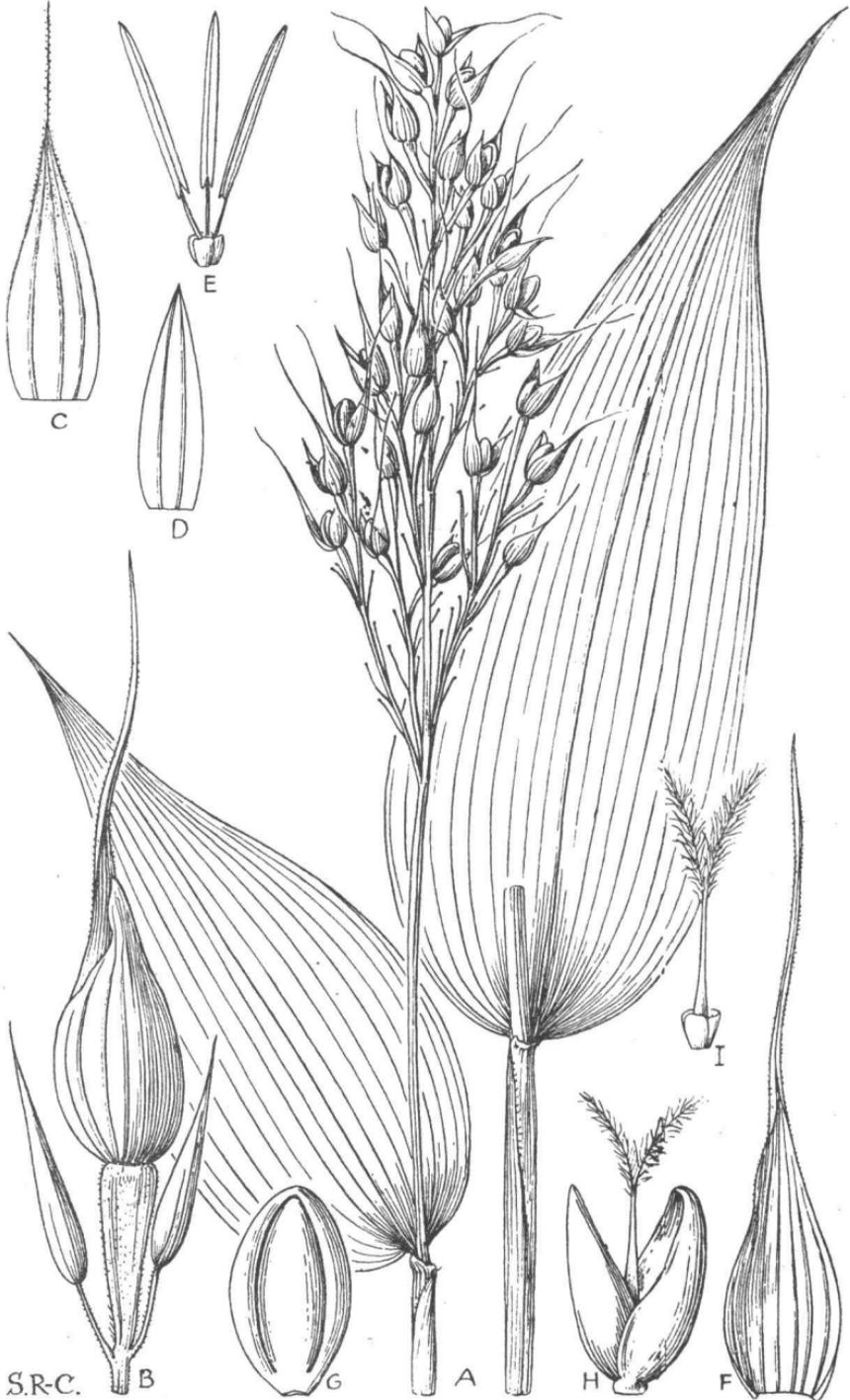


Fig. 125—OLYRA LATIFOLIA L.

A, flowering shoot. B, male and female spikelets. C, lemma of male floret. D, palea. E, stamens. F, lower glume of female spikelet. G, H, female florets. I, pistil.

74. **MONOCYBIUM** Stapf**Monocymbium cereasiiforme** (Nees) Stapf.

Usually tufted perennial herb 1-4 ft. high; culms erect or rarely ascending, slender, 6- or more-noded. Leaf-sheaths tight, glabrous or hairy; ligule short to very short, rounded or truncate; lamina pale-green, often turning red, tapering to an acute point, 2-6 in. long, up to $\frac{1}{2}$ in. broad, glabrous or hirsute. Spatheate panicles narrow, very loose, up to $1\frac{1}{2}$ ft. long, often much reduced; spatheoles often brilliantly coloured, reddish or purplish to dark-brown, narrowly and permanently boat-shaped, linear-lanceolate to lanceolate, acutely acuminate at the apex, $\frac{3}{4}$ - $1\frac{1}{4}$ in. long, scarious, glabrous; peduncles very short, permanently enclosed in the spatheole; racemes somewhat secund, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, 6-8-awned. Sessile spikelets straw-coloured or tinged with brown, oblong, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, hairy; awn usually up to $\frac{1}{2}$ in. long but sometimes much reduced or even suppressed.

Equatoria.

75. **OLYRA** L.**Olyra latifolia** L.

Fig. 125.

Tall cane-like perennial herb up to 15 ft. high, growing especially in or near forest; culms erect. Leaf-sheaths closely nerved, usually ciliate upwards; lamina shortly petiolate, ovate-elliptic or ovate-oblong, tailed-acuminate at the apex, rounded at the base, 4-8 in. long and $1\frac{1}{2}$ - $2\frac{1}{4}$ in. broad (but sometimes smaller on lateral shoots), glabrous or slightly pubescent beneath; petiole pubescent. Panicles narrow to subpyramidal; axis and branches shortly pubescent; male pedicels slender, the female ones club-shaped. Male spikelets lateral, awned from the lemma; glumes rudimentary: female spikelets terminal on the branchlets, ovoid, long-awned from the lower 7-9-nerved glume. Grain tightly enclosed by the hardened shining whitish lemma.

Equatoria.

76. **OPHIUROS** Gaertn.**Ophiuros papillosus** Hochst.

Fig. 126.

Annual herb; culms rather stout, $1\frac{1}{2}$ - $4\frac{1}{2}$ ft. high, much branched, the branches forming ultimately a large and more or less leafy panicle, glabrous or sparingly hirsute. Leaf-sheaths wide, glabrous or hirsute with tubercle-based hairs; ligule short, thinly membranous, glabrous; lamina lanceolate from a broad subcordate base, 3-10 in. long, $\frac{1}{3}$ -1 in. broad, soft, usually more or less hirsute with tubercle-based hairs particularly on the cartilaginous often minutely wavy margin. Panicles up to 2 or more ft. long, with distant clusters of branches; branches unequal; racemes whitish, variegated with green, cylindric, slender, erect, straight or nearly so, 2-3 or more in. long, glabrous; joints completely fused with the pedicels, cylindric, green, deeply hollowed out behind the spikelet, disarticulating horizontally with a circular scar and a hollow tip. Sessile spikelets pale-straw-coloured, elliptic-oblong, very obtuse at the apex, somewhat shorter than the joint.

Central Sudan.



Fig. 126—*OPHIUROS PAPILLOSUS* Hochst.

A, ligule with portion of leaf-sheath and lamina. B, raceme. C, two joints of raceme, with sessile spikelets somewhat pulled out. D, sessile spikelet, back view. D₁, sessile spikelet dissected. E, sessile spikelet, front view.

77. **OPLISMENUS** Beauv.**Oplismenus hirtellus** (L.) Beauv.

Perennial herb up to several ft. high; culms slender, ascending from a decumbent or rambling rooting base, many-noded, the nodes emitting aerial roots, branched from the base. Leaf-sheaths strongly striate, densely ciliate along the margins; ligule very short, truncate, ciliate; lamina lanceolate to linear-lanceolate, acutely acuminate at the apex, $1\frac{1}{2}$ -5 in. long, $\frac{1}{8}$ - $\frac{3}{4}$ in. broad. Inflorescences of 3-8 dense spike-like racemes; racemes distant, the lower ones by more than their own length, erect or obliquely spreading, linear, decreasing upwards, usually about 1 in. long but sometimes much smaller; rhachis usually terminated by a solitary spikelet. Spikelets closely touching, green to greyish-green, ovate-oblong, $\frac{1}{3}$ - $\frac{1}{2}$ in. long excluding the awns, minutely bearded at the base. Glumes produced into a thread-like more or less viscous and purplish awn.

Equatoria.

O. compositus (L.) Beauv.

Inflorescences up to 1 ft. long, secund or subsecund, of up to 10 or more loose mostly interruptedly spike-like racemes; racemes distant, at least the intermediate ones by less than their own length, the lowest ones by 1-2 $\frac{1}{2}$ in. Spikelets (or pairs of spikelets) not touching and often conspicuously distant, green to greyish-green, often with a purple tip or altogether red-purple, lanceolate to lanceolate-oblong, acuminate at the apex, $\frac{1}{3}$ - $\frac{1}{2}$ in. long excluding the awns. Otherwise similar to *O. hirtellus*.

Equatoria: Imatong Mountains.

O. burmanni (Retz.) Beauv.

Annual herb up to 1 $\frac{1}{2}$ ft. high; culms very slender, ascending from a decumbent or rambling rooting base. Leaf-sheaths prominently striate, ciliate along the margins and pubescent at the node; ligule very short, truncate, ciliate; lamina lanceolate, acutely acuminate at the apex, $\frac{3}{4}$ -2 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, loosely beset with fine rather long white hairs. Inflorescences more or less secund, of 3-8 very dense pale spike-like racemes; lower racemes distant by more than their own length. Spikelets pale-green, touching, oblong-lanceolate, rarely much over $\frac{1}{2}$ in. long, one of a pair often imperfect. Awns hair-like, flexuous, slightly rough, pale.

Equatoria.

78. **ORYZA** L.**Oryza barthli** A. Chev.

Coarse leafy perennial herb, growing in inundated watercourses near rivers; culms stout, ribbed, up to 6 ft. high. Leaves up to $\frac{3}{4}$ in. broad; ligule elongated, acute or at length splitting, $\frac{2}{3}$ -1 $\frac{1}{2}$ in. long. Panicles rather lax, up to 1 or more ft. long. Spikelets

reddish-yellow, oblong or oblong-elliptic, 2-3 times as long as broad, awned, setulose mainly on the ribs and keels. Awn less than 3 in. long.

Equatoria.

O. breviligulata Chev. & Roehr.

Annual herb; culms rooting at the base, 3 ft. high. Leaves less than $\frac{3}{8}$ in. broad; ligule $\frac{1}{8}$ - $\frac{1}{6}$ in. long, oblong, rounded at the base, normally not split. Panicles little branched, stiff. Spikelets about $\frac{3}{8}$ in. long. Glumes finely and regularly pubescent. Awn strong, stiff, usually about 6 in. long, appressed-setulose upwards.

Equatoria.

O. brachyantha Chev. & Roehr.

Tall leafy herb, growing in inundated or swampy soil, 2 or more ft. high; culms stout. Leaves long, long-attenuated at the apex, $\frac{1}{2}$ in. broad; ligule small, not split. Panicles stiff. Spikelets linear-oblong, $\frac{1}{25}$ - $\frac{1}{16}$ in. broad, minutely pubescent towards the apex. Sterile lemmas subulate-thread-like. Awn stout, stiff, 4-8 in. long, setulose upwards.

Equatoria.

O. punctata Kotschy ex Steud.

Herb, growing in flooded watercourses; culms moderately stout, 2-3 or more ft. high. Leaves linear-lanceolate, under $\frac{1}{2}$ in. broad, finely striate; ligule not fringed, $\frac{1}{8}$ - $\frac{1}{4}$ in. long. Panicles lax, up to 10 in. long, with few branches. Spikelets oblong, about $\frac{1}{4}$ in. long. Awn $1\frac{1}{4}$ - $2\frac{3}{4}$ in. long.

Central Sudan.

O. schweinfurthiana Prodoehl.

O. officinalis (non Wall.) Broun & Massey.

Moderately stout herb up to 5 ft. high; culms erect or ascending, glabrous at the nodes. Ligules fringed; lamina linear or linear-lanceolate, long-attenuated at the apex, up to 12 in. long, $\frac{7}{8}$ in. broad. Inflorescences laxly paniculate, of many spikelets, up to 12 in. long. Spikelets erect, $\frac{1}{8}$ - $\frac{1}{6}$ in. long. Glumes glabrous. Awn about $\frac{3}{4}$ in. long.

Equatoria.

79. **OXYTENANTHERA** Munro

Oxytenanthera abyssinica (A. Rich.) Munro.

Tall leafy bamboo; culms woody, rising from a thick rhizome, 25-50 ft. high, $1\frac{1}{2}$ -3 in. in diameter; branches whorled. Leaves linear or oblong-lanceolate generally 6-7 in. long and $\frac{1}{2}$ -1 in. broad, but sometimes up to 10 in. long and $1\frac{3}{4}$ in. broad. Spikelets in dense globose axillary or terminal clusters, narrowly lanceolate, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long.

Central and Southern Sudan.

80. PANICUM L.

- A. Spikelets symmetrical in profile:
- B. Ligule $\frac{1}{2}$ or more in. long *P. comorense*.
- BB. Ligule less $\frac{1}{2}$ in. long:
- C. Leaf-lamina usually much more than $1\frac{1}{2}$ in. long, or if shorter then subulate-inrolled and pungent:
- D. Upper lemma very minutely mucronate, like the palea finely transversely rugose; spikelets shortly pedicellate and subsecund; plant often growing in or near water
P. meyerianum.
- DD. Upper lemma not mucronate; spikelets not arranged as above:
- E. Spikelets more or less obtuse to shortly acute, plump, not gaping:
- F. Spikelets oblong, $\frac{1}{10}$ - $\frac{1}{2}$ in. long; upper lemma quite smooth:
- (a) Glumes similar *P. deustum*.
- (aa) Glumes dissimilar:
- (b) Leaves $\frac{1}{2}$ -2 ft. long, $\frac{1}{8}$ -1 in. broad; spikelets $\frac{1}{2}$ - $\frac{1}{2}$ in. long; panicles $\frac{1}{2}$ -1 $\frac{1}{2}$ ft. long *P. maximum*.
- (bb) Leaves up to 6 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad; spikelets about $\frac{1}{10}$ in. long; panicles 2-6 in. long
P. trichocladum.
- FF. Spikelets broad-ellipsoid to subglobose, about $\frac{1}{8}$ in. long, breaking up; upper lemma minutely warty:
- (c) Culms erect, stiff or slightly bent, somewhat robust; leaf-lamina 4-12 or more in. long, $\frac{1}{2}$ in. broad
P. carinifolium.
- (cc) Culms slender to very slender, weak and generally ascending; leaf-lamina 2-4 in. long, $\frac{1}{12}$ - $\frac{1}{8}$ in. broad *P. fulgens*.
- EE. Spikelets acuminate or distinctly acute or apiculate, usually not plump:
- G. Spikelets much gaping early and permanently:
- (d) Upper glume and lower lemma 7-9-nerved
P. anabaptistum.
- (dd) Upper glume and lower lemma 3-5-nerved, or only the former 7-nerved:
- (e) Leaves up to 9 in. long, $\frac{1}{12}$ - $\frac{1}{4}$ in. broad; culms up to $\frac{1}{12}$ in. in diameter *P. dregeanum*.
- (ee) Leaves $\frac{1}{2}$ -1 $\frac{1}{2}$ ft. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad; culms up to $\frac{1}{4}$ in. in diameter *P. aphanoneurum*.
- GG. Spikelets not conspicuously and permanently gaping or only gaping when mature:
- H. Spikelets mostly very loosely scattered on long pedicels, or if paired then on long fine branchlets; false fruits at length brownish to almost black:
- I. Panicles much divided; leaf-lamina $\frac{1}{2}$ -1 in. broad:

- (f) Spikelets $\frac{1}{2}$ in. long *P. callosum*.
- (ff) Spikelets $\frac{1}{2}$ - $\frac{1}{3}$ in. long:
- (g) Spikelets usually in pairs, touching and shortly pedicellate at the ends of long finely thread-like branches *P. kerstingii*.
- (gg) Spikelets usually distant, often on long pedicels:
- (h) Panicles just exerted from the subtending sheaths, 2-3 in. long, finely hairy all over; delicate herb *P. sociale*.
- (hh) Terminal panicles at length distinctly exerted, 3-6 in. long, glabrous or hairy only in the lower part
P. atrosanguineum.
- II. Panicles reduced to 3-1 branches each bearing 4-1 spikelets; leaf-lamina $\frac{1}{8}$ in. broad
P. haplocaulos.
- HH. Spikelets not arranged as above; false fruits whitish or yellowish:
- J. Lower glume as long as or almost as long as the upper, 7-9-nerved *P. turgidum*.
- JJ. Lower glume very small, up to $\frac{1}{2}$ the length of the spikelet, few- or imperfectly nerved:
- K. Erect or procumbent tufted perennial herb with long more or less wiry stolons; leaf-lamina firm to hard; spikelets pale *P. repens*.
- KK. Erect perennial herbs without stolons or rarely with short stolons, or annual herbs; spikelets pale-green or vividly variegated or uniformly tinged with dark-purple:
- (i) Spikelets $\frac{1}{2}$ - $\frac{1}{3}$ in. long, with a slender acumen ...
P. porphyrrhizos.
- (ii) Spikelets $\frac{1}{2}$ - $\frac{1}{3}$ in. long:
- (j) Plant of dry land, with somewhat plump often variegated apiculate spikelets; ligule distinctly ciliate; perennial herb with short stolons *P. coloratum*.
- (jj) Plants of marshland or land plenteously watered:
- (k) Annual herb; panicles 3-4 (rarely to over 6) in. long *P. hygrocharis*.
- (kk) Perennial herb with a readily disintegrating rhizome; panicles up to 12 or more in. long, abundantly divided
P. glabrescens.
- CC. Leaf-lamina usually $\frac{1}{2}$ -1 in. long, flat, thin and soft; annual herb; culms very weak *P. pusillum*.
- AA. Spikelets slightly oblique in profile; leaf-lamina lanceolate to lanceolate-ovate; annual herb *P. brevifolium*.

***Panicum comorense* Mez.**

Procumbent annual herb; culms slender, up to 18 or more in. high, glabrous, rooting at the nodes. Leaf-sheaths tight; ligule ovate, $\frac{1}{2}$ or more in. long, glabrous or very shortly hairy; lamina linear-lanceolate, tapered to the apex and base, up to 5 or more in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, glabrous. Panicles open. Spikelets obtuse at the apex, up to $\frac{1}{2}$ in. long.

Equatoria: Imatong Mountains.

***P. meyerianum* Nees.**

Perennial herb up to 5 or more ft. high, often growing in or near water; culms erect or ascending from a decumbent rooting base, often rooting at the nodes, stout, glabrous, 5-many-noded. Leaves more or less glaucous; sheath tight, firm, silky-pubescent or villous at the node; ligule a fine ciliate rim; lamina linear-lanceolate, long-tapering to a fine point, 3-8 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, glabrous. Panicles oblong to ovoid-oblong, 3-6 in. long. Spikelets rather crowded, ovate-oblong, about $\frac{1}{2}$ in. long, glabrous, sometimes tinged with purple. Glumes very dissimilar; lower minute, truncate or apiculate at the apex, white or purple; upper membranous, oblong, acute at the apex, the tip or back often purple.

Central and Southern Sudan.

***P. deustum* Thunb.**

Robust perennial herb up to 7 ft. high, tufted on a short rhizome; culms erect or ascending, up to $\frac{1}{2}$ in. in diameter, up to 9-noded. Leaves glabrous or sparingly to densely hirsute with tubercle-based hairs; sheath finely pubescent or quite glabrous at the node; ligule a narrow membranous ciliate rim; lamina linear to lanceolate-linear, long-tapering to a very fine point, $\frac{1}{2}$ -1 $\frac{1}{2}$ ft. long, $\frac{1}{2}$ -1 $\frac{1}{4}$ in. broad. Panicles erect or slightly nodding, at first contracted, ultimately widely open, 3-9 in. long. Spikelets light-green with a usually purple or blackish tip, swollen, oblong, obtuse at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Glumes similar.

Equatoria.

***P. maximum* Jacq.**

Fig. 127.

Perennial herb up to 10 or more ft. high, densely tufted on a short sometimes very stout rhizome; culms erect or ascending, usually stout, up to $\frac{1}{2}$ or more in. in diameter, 3-4-noded. Leaves glabrous or more or less softly hairy or coarsely hirsute with tubercle-based hairs; sheath often bearded at the mouth and usually so at the node; ligule membranous, very short, ciliolate, usually with dense hairs from behind it; lamina linear, long-tapering to a fine point, $\frac{1}{2}$ -2 ft. long, $\frac{1}{2}$ -1 in. broad, the margin somewhat spinulosly scabrous. Panicles erect or nodding, contracted or open, $\frac{1}{2}$ -1 $\frac{1}{2}$ or more ft. long. Spikelets light-green or tinged with purple, oblong, broadly rounded on the back, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glabrous to densely pubescent. Glumes very dissimilar; lower about $\frac{1}{4}$ - $\frac{1}{3}$ the length of the spikelet; upper corresponding in shape and size to the spikelet.

Equatoria.

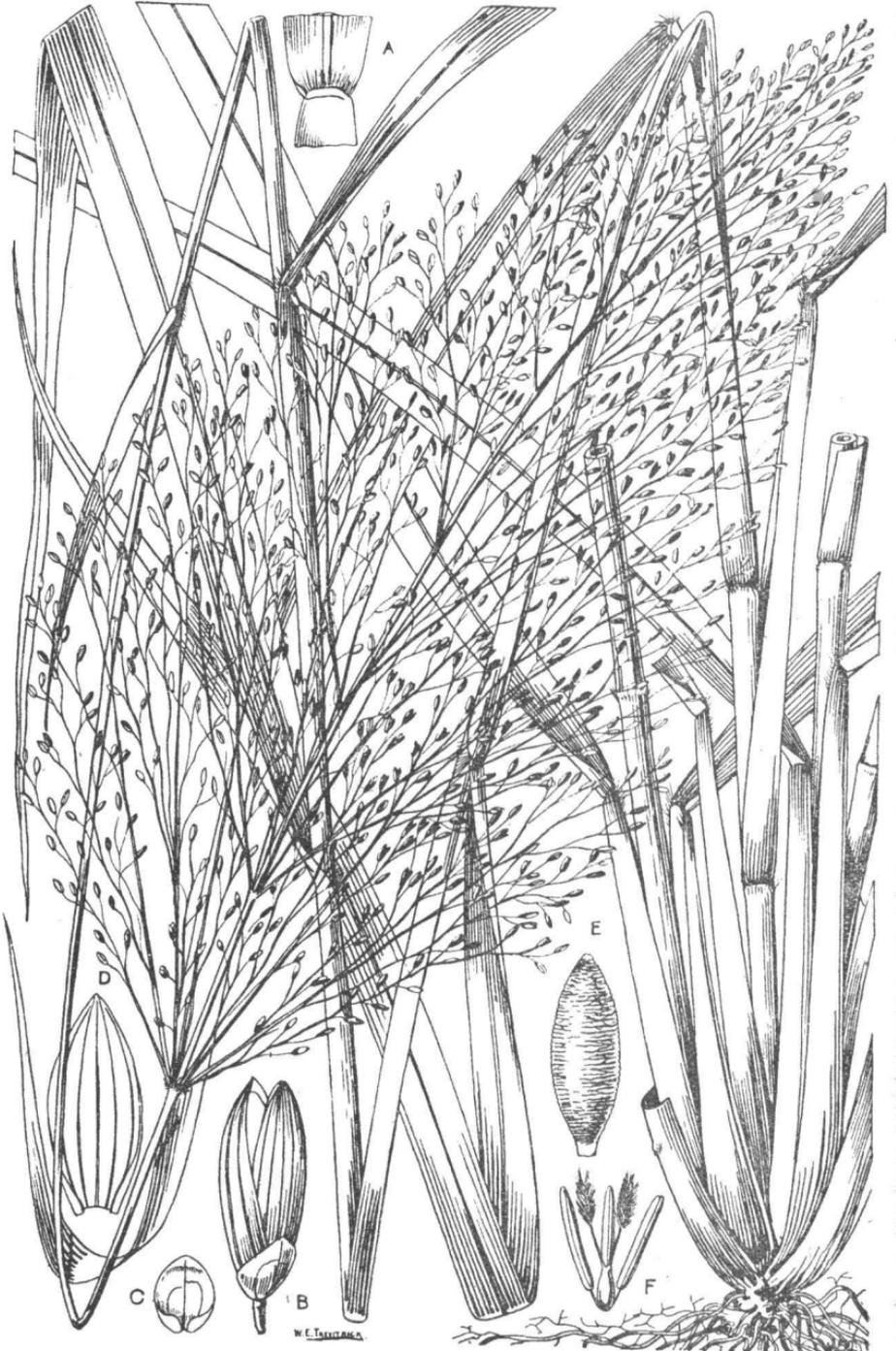


Fig. 127.—*PANICUM MAXIMUM* Jacq.

A, ligule. B, spikelet. C, lower glume. D, upper glume. E, upper floret showing lemma. F, stamens and pistil.

P. trichocladum Hack. ex K. Schum.

Fig. 128.

Perennial herb, rambling or climbing, up to 8 ft. high; culms slender, many-noded, branched particularly from the prostrate sometimes rooting base. Leaf-sheaths all usually quite glabrous and smooth except at the mouth or rarely softly pubescent all over, beardless at the node; ligule a narrow membranous ciliate rim; lamina almost horizontally spreading, linear-lanceolate from a suddenly contracted and rounded base, tapering to a long fine point, $1\frac{1}{2}$ -6 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad, more or less softly and shortly hairy, sometimes almost velvety or rarely quite glabrous. Panicles soon expanding, broad-oblong to ovate in outline, 2-6 in. long, the axis with fine spreading white usually tubercle-based hairs. Spikelets pale-green or flushed with purple, oblong, obtuse at the apex, about $\frac{1}{10}$ in. long. Glumes very dissimilar; lower very small, rounded $\frac{1}{4}$ - $\frac{1}{2}$ (rarely $-\frac{1}{3}$) the length of the floret; upper corresponding in size and shape to the spikelet.

*Equatoria.***P. carinifolium** Stapf.

Perennial herb from a short rhizome, 4-5 ft. high; culms erect, straight and stiff, about 6-noded, only the upper nodes exerted from the sheaths. Leaf-sheaths glabrous except along the upper ciliate margins; ligule a rim or transverse line; lamina linear, in the lower leaves from a very long and gradually attenuated base, in the upper leaves from an equally wide base, tapering upwards to a long fine point, up to 1 or more ft. long, $\frac{1}{4}$ in. broad, quite glabrous. Panicles oblong to ovate- or lanceolate-oblong in outline, stiffly erect, 4-5 in. long, 1-2 in. broad. Spikelets pale-brownish-green, very broadly ellipsoid to globose, obtuse at the apex, slightly over $\frac{1}{8}$ in. long, quite glabrous, almost dull. Glumes membranous, very concave, dissimilar.

*Equatoria.***P. fulgens** Stapf.

Perennial herb up to 3 ft. high, forming large easily disintegrating tufts; culms erect or more or less ascending, very slender, wiry below, rooting from the lowest nodes, glabrous, many-noded. Leaf-sheaths quite glabrous and smooth or ciliate towards the mouth; ligule a narrow membranous ciliate rim; lamina narrowly linear, long-attenuated to a sharp point, 2-5 in. long, $\frac{1}{12}$ - $\frac{1}{8}$ in. broad. Panicles erect, ultimately long-exserted from the uppermost sheath, loose and open, 2 $\frac{1}{2}$ -5 in. long, 1-1 $\frac{1}{2}$ in. broad, or more or less contracted. Spikelets pale-olive-green with a marked bronzy lustre, very swollen, ovoid- or ellipsoid-globose, obtuse at the apex, $\frac{1}{16}$ - $\frac{1}{12}$ in. long.

Equatoria.



Fig. 128—*Panicum trichocladum* Hack. ex K. Schum.

A, ligule. B, spikelet and pedicel. C, lower glume. D, upper glume. E, lemma of lower floret. F, palea of lower floret. G, upper floret. H, lemma

P. anabaptistum Steud.

Perennial herb up to 6 ft. high from an oblique rhizome emitting very coarse root-fibres; culms erect or ascending, simple, up to 5- or 7-noded, firm, quite glabrous. Leaf-sheaths firm, usually quite glabrous, frequently slightly bearded at the mouth; ligule a short ciliate rim; lamina linear, tapering to an acute point, 6-9 in. long, $\frac{1}{3}$ - $\frac{1}{4}$ in. broad. Panicles oblong to oblanceolate in outline, 9-12 in. long. Spikelets pale-greenish, ovate-oblong or ovate-lanceolate and acutely acuminate at the apex at first, soon more or less gaping, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, glabrous. Glumes dissimilar.

Equatoria.

P. dregeanum Nees.

Compactly tufted perennial herb, coated below with persistent leaf-bases, 1-4 ft. high; culms erect, slender, up to $\frac{1}{2}$ in. in diameter, 1-2-noded, simple, very smooth, glabrous. Leaf-sheaths firm, the lowest ones long-persistent, appressed-silky-tomentose at the base, glabrous upwards with ciliate margins; ligule a ciliate rim; lamina sometimes flushed with red, linear, tapering to a slender point, up to 9 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad. Panicles oblong to ovoid-oblong, erect, 3-7 or rarely -12 in. long, 1 $\frac{1}{2}$ -3 in. broad, quite glabrous. Spikelets greenish, usually tinged with purple or almost wholly deep-purple, more or less gaping, $\frac{1}{2}$ - $\frac{1}{3}$ in. long. Glumes similar, membranous.

Equatoria.

P. aphanoneurum Stapf.

Densely tufted perennial herb, reed-like, 4-7 ft. high; culms erect, up to $\frac{1}{2}$ in. in diameter, 4-5-noded, simple. Leaf-sheaths firm, frequently flushed with purple, the basal ones more or less persistent; ligule a very narrow ciliate rim; lamina dull-green or flushed with red, linear, long-tapering to a slender point, $\frac{1}{2}$ -1 $\frac{1}{2}$ ft. long, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad. Panicles oblong to ovoid, or obovoid-oblong, $\frac{1}{2}$ -1 or more ft. long, 2-5 in. broad. Spikelets pale with a purple tip to deep-purple, early and often widely gaping, about $\frac{1}{2}$ in. long, glabrous. Glumes similar.

Equatoria.

P. callosum Hochst. ex A. Rich.

Annual herb up to 3 ft. high; culms erect or ascending, rather slender, simple, about 3-noded, glabrous. Leaf-sheaths ciliate along the outer margin; ligule rounded, membranous, $\frac{1}{4}$ in. long, ciliate; lamina linear from an attenuated base, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad. Panicles usually contracted, loose, narrow, over 1 ft. long, slightly nodding or erect, glabrous. Spikelets green or tinged with purple, broad- or elliptic-oblong, $\frac{1}{2}$ in. long.

Kassala: Gallabat.

P. kerstingii Mez.

Annual herb 2 ft. high, scantily tufted; culms slender, erect, glabrous, 4-5-noded. Leaf-sheaths glabrous below, more or less hirsute upwards with tubercle-based hairs, rigidly ciliate; ligule a membranous ciliate rim; lamina linear, tapering to a very acute point, 4-10 in. long, about $\frac{1}{4}$ in. broad, more or less finely hirsute with tubercle-based hairs. Panicles erect, with the base contracted and enclosed in the uppermost sheath, much opening out upwards and very loose, up to 1-1 $\frac{1}{2}$ ft. long, 4-10 in. broad. Spikelets pale-green, often tinged with purple, ovate-oblong, $\frac{1}{8}$ in. long, glabrous. Glumes dissimilar, rounded on the back.

Equatoria: Tambura.

P. sociale Stapf.

Annual herb up to nearly 1 ft. high, growing in dense stands; culms erect or ascending, thread-like, about 5-noded, simple or sparingly branched, more or less spreading-hirsute with long very fine tubercle-based hairs. Leaf-sheaths hirsute with short spreading tubercle-based hairs; ligule a fine ciliolate rim; lamina erect, linear, tapering to an acute point, 1 $\frac{1}{2}$ -1 in. long, about $\frac{1}{8}$ in. broad, densely and finely hirsute with tubercle-based hairs. Panicles erect, ovate in outline, 2-3 in. long, 1 $\frac{1}{2}$ in. broad, widely open, very loose. Spikelets pale or tinged with purple, ovate-oblong, about $\frac{1}{10}$ in. long, glabrous. Glumes dissimilar.

Kassala: Gallabat.

P. atrosanguineum Hochst. ex A. Rich.

Fig. 129.

Tufted annual herb from a few inches to over 1 ft. high; culms erect or ascending, very slender, 4-5-noded, glabrous or softly spreading-hirsute with tubercle-based hairs. Leaf-sheaths thin, hirsute like the culms; ligule a densely ciliolate rim; lamina linear-lanceolate to linear from a more or less rounded base, tapering to an acute point, 1-4 or rarely more in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad, more or less finely hirsute. Panicles erect, broad-oblong to broad-ovoid or obovoid, widely open and loose, somewhat stiff, 3-6 in. long, 1 $\frac{1}{2}$ -3 in. broad. Spikelets greenish, usually variegated with purple, oblong to elliptic-oblong, $\frac{1}{16}$ - $\frac{1}{12}$ or more in. long, glabrous. Glumes dissimilar.

Northern Sudan: Nubian Desert. Equatoria.

P. haplocaulos Pilg.

Annual herb about 1 ft. high, growing gregariously in close stands; culms almost thread-like, erect, simple, 4-5-noded, glabrous, sometimes rooting from the lowest node. Leaf-sheaths glabrous; ligule a membranous ciliate rim; lamina erect, inrolled, setaceous, 4-5 in. long, glabrous or with tubercle-based spreading marginal or submarginal hairs downwards. Panicles with a common axis and 1-3 distant branches each bearing 4-1 spikelets. Spikelets greenish to straw-coloured, about $\frac{1}{10}$ in. long, glabrous. Glumes unequal.

Equatoria.

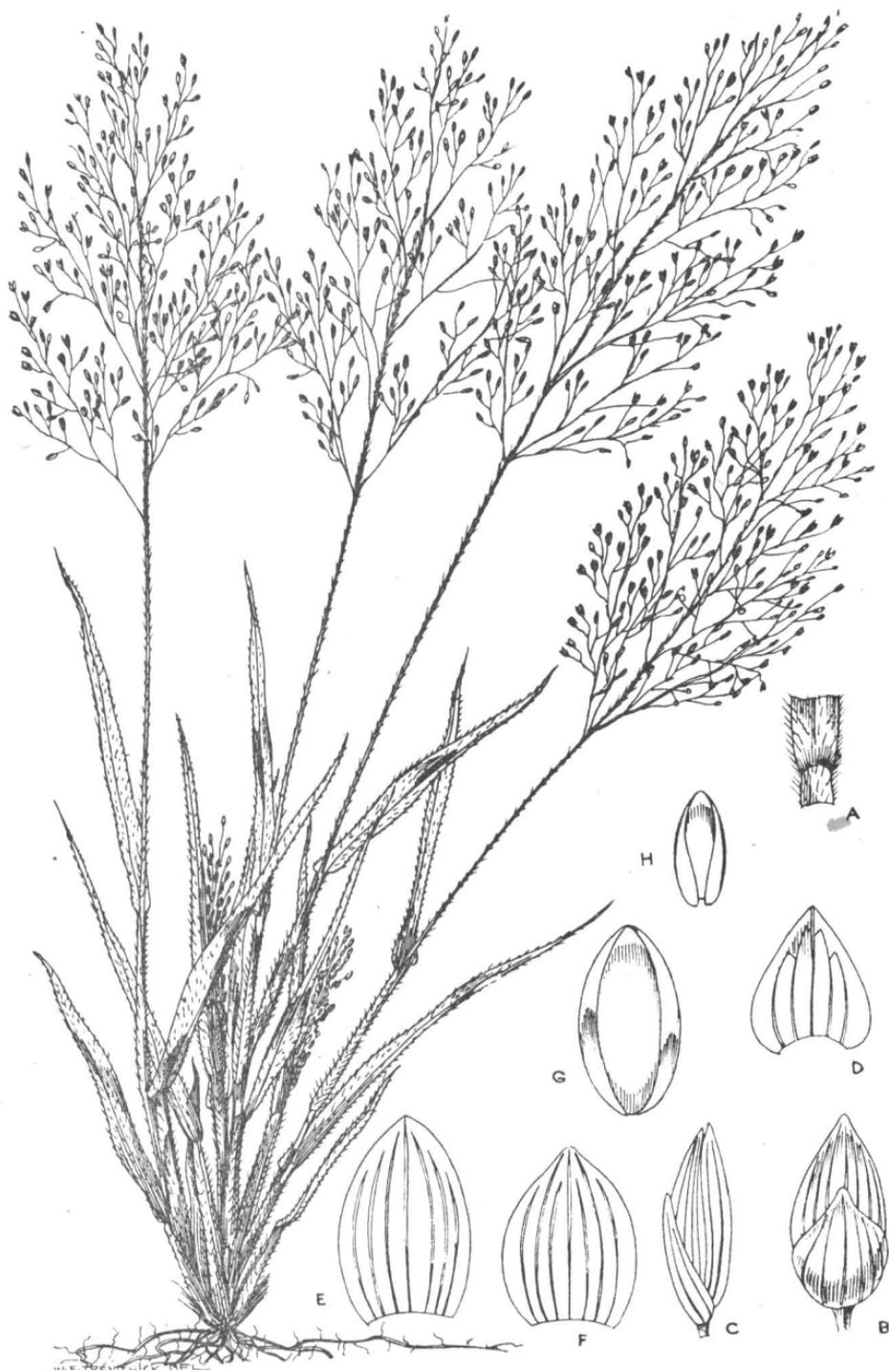


Fig. 129—*PANICUM ATROSANGUINEUM* Hochst. ex A. Rich.

A, ligule. B, C, spikelets. D, lower glume. E, upper glume. F, lemma of lower floret. G, upper floret. H, palea.

P. turgidum Forsk.

Shrubby herb up to 4 ft. high, the whole plant glaucous, with stout root-fibres over $\frac{1}{2}$ in. in diameter; culms woody, solid, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diameter, glabrous, many-noded and with very unequally long internodes, frequently producing clusters of numerous short or long branches from the nodes. Leaf-sheaths firm to coriaceous, 1-3 in. long, all glabrous; ligule a dense ciliate rim; lamina extremely variable in size, linear, tapering to a fine pungent point, up to 8 in. long, about $\frac{1}{2}$ in. broad, rigid, often reduced to a sharp point, glabrous but with distant very small spines along the margin. Panicles very variable in size, oblong or obovate-oblong in outline. Spikelets swollen, ovoid, about $\frac{1}{2}$ in. long, glabrous, soon more or less gaping. Glumes subequal.

Northern and Central Sudan.

P. repens L.

Perennial herb up to 2 or rarely 4 ft. high; rhizome long, creeping, often growing into long stolons; culms erect or ascending, glabrous, many-noded, the barren shoots densely and distichously leafy. Leaf-sheaths all ciliate along the margins; ligule a membranous ciliate rim; lamina glaucous, linear, shortly tapering to a callous point, 2 $\frac{1}{2}$ -6 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, very firm and rigid, spreading, the margin cartilaginous and smooth or appressedly spinulose and sparingly tuberculate near the base. Panicles usually contracted, erect and stiff, rarely slightly nodding, 3-8 in. long, glabrous. Spikelets ovate-oblong, acute to subacuminate at the apex, about $\frac{1}{2}$ in. long. Glumes very dissimilar.

Central and Southern Sudan: an important weed infesting the banks of the Gezira canals.

P. porphyrrhizos Steud.

Densely tufted perennial herb up to over 3 ft. high, with a short rhizome; culms erect or ascending, simple, 4-5-noded, quite glabrous and smooth. Leaves glabrous or very sparsely hirsute with tubercle-based hairs, particularly towards the base of the margin of the lamina; sheath tight; ligule very short, sparingly ciliolate; lamina linear-lanceolate, long-tapering to a hard slender point, 5-8 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, smaller in the lower leaves. Panicles widely open and very loose, 9-12 or more in. long, up to 6 or more in. broad, quite glabrous. Spikelets green or tinged with dull-purple, lanceolate-oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Glumes very dissimilar.

Central and Southern Sudan.

P. coloratum L.

Tufted perennial herb up to 4 ft. high; culms more or less stout, erect or ascending from a decumbent and branched base. Leaf-sheaths glabrous or more or less hirsute; ligule a membranous ciliolate or densely ciliate rim; lamina linear to lanceolate-linear from a usually slightly rounded and constricted base, 5-12 or more

in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad. Panicles erect or nodding, contracted or widely open, oblong or obovoid, 4-12 or more in. long, up to 6 in. broad. Spikelets green or tinged with purple, somewhat plump, oblong, $\frac{1}{2}$ - $\frac{1}{3}$ in. long. Glumes very dissimilar.

Kassala: Gash Delta.

Var. **minus** Stapf ex Chiov.

Culms slender, springing from short wiry stolons, the above-ground part usually starting with a bundle of branches or secondary culms, these not much over 1 ft. high, slender, 2-4-noded with the uppermost node below the middle. Leaves nearly always glabrous or nearly so; lamina rarely up to 6 in. long, not more than $\frac{1}{2}$ in. broad. Panicles erect, usually not much over 3 (rarely up to 9) in. long.

Equatoria: near Moru Yakipi.

P. hygrocharis Steud.

Fig. 130.

Tufted annual herb up to 2 or more ft. high; culms slender to somewhat stout, soft, erect or ascending, sometimes from a short decumbent base, few- to 6-noded. Leaf-sheaths rather loose or slightly inflated; ligule a minutely ciliolate or obscure rim; lamina pale to glaucous-green, linear from a slightly rounded to almost amplexicaul base, usually shortly tapering to a slightly callous point, 3-4 in. long and $\frac{1}{2}$ - $\frac{1}{3}$ in. broad but occasionally longer and broader, soft. Panicles erect or somewhat nodding, contracted or more or less open, 3-4 or rarely over 6 in. long. Spikelets pale-greenish, oblong, up to $\frac{1}{2}$ in. long. Glumes very dissimilar.

Northern and Central Sudan.

P. glabrescens Steud.

Perennial herb from a very short and early disintegrating rhizome, up to 4 or more ft. high, glabrous; culms stout, soft, sometimes spongy, erect or ascending, usually 3-4- or rarely 5-noded. Leaf-sheaths rather loose; ligule a narrow ciliolate membranous rim; lamina linear, long-tapering to an acute point, up to 1 ft. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad. Panicles erect or slightly nodding, usually contracted and narrow but sometimes widely open and very loose, 6-12 or more in. long. Spikelets pale-greenish, lanceolate to lanceolate-oblong, acutely acuminate at the apex, about $\frac{1}{10}$ in. long. Glumes very dissimilar.

Equatoria.

P. pusillum Hook. f.

Annual herb, growing in loosely tufted clumps, 3-6 or more in. high; culms ascending, thread-like, very weak, branched from most nodes, all branches ultimately flowering. Leaf-sheaths softly hairy; ligule a fine ciliate membranous rim; lamina linear-lanceolate, acute at the apex, $\frac{1}{2}$ -1 or more in. long, thin and soft, spreading more or less horizontally, loosely and softly hairy all over.

Panicles usually exserted, erect, broad-ovate in outline, up to 1 or more in. long and broad, rigidly open and loose. Spikelets green, lanceolate to oblong, acute to acuminate at the apex, $\frac{1}{2}$ in. long, glabrous to loosely pubescent. Glumes thinly membranous, dissimilar.

Equatoria: Imatong Mountains, Itobol, 6400 ft.



Fig. 130 — PANICUM HYGROCHARIS Steud.

A, ligule with portion of leaf-sheath and lamina. B, portion of inflorescence. C, spikelet opened out. D, spikelet dissected.

P. brevifolium L.

Annual herb, very loosely tufted on an often prostrate base or rambling among other vegetation, 2 or more (up to 7) ft. high; culms slender, weak, very many-noded, with aerial roots from the lower nodes. Leaf-sheaths densely long-ciliate on the margins; ligule a low membranous rim; lamina green, lanceolate to lanceolate-ovate from a broad rounded to subcordate and tightly constricted to subpetiolate base, 1-3 in. long, $\frac{3}{8}$ -1 in. broad, spreading, usually long-ciliate at the base. Panicles erect, delicate, widely open and loose, broad-oblong to ovate or obovate in outline, up to 6 or more in. long. Spikelets green, ovate-oblong to oblong, acute at the apex, oblique in profile, $\frac{1}{8}$ in. long. Glumes equal in length but different in shape and texture.

Equatoria.

81. **PASPALIDIUM** Stapf**Paspalidium geminatum** (Forsk.) Stapf.

Perennial herb, with creeping or floating more or less spongy many-noded stolons which give rise to solitary or somewhat clustered culms; culms ascending, 5-many-noded, usually stout, more or less spongy, the prostrate base copiously rooting from the nodes. Leaves pale-green to glaucous, glabrous; sheath very smooth; ligule a finely ciliate rim; lamina linear, tapering to an acute point, a few to 12 in. long, up to $\frac{1}{2}$ in. broad. Inflorescences slender, erect, a few to 12 in. high, of numerous appressed or subappressed spike-like racemes; racemes sessile, straight, slender, 2-rowed, $\frac{1}{2}$ -1 or more in. long. Spikelets very pale, numerous, slightly imbricate, ovate, $\frac{1}{12}$ in. long, glabrous and smooth. Glumes very dissimilar.

Upper Nile Province: Hillet Nuer, Bahr el Jebel.

P. desertorum (A. Rich.) Stapf.

Tufted (often densely) perennial herb from a hard creeping rhizome; culms usually ascending, sometimes trailing and if so generally not rooting from the more or less swollen nodes. Leaves very glaucous, glabrous; sheath tight, smooth, the lowest ones tough and often long-persistent; ligule a ciliolate rim; lamina narrowly linear, tapering to a fine point, 1-9 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Inflorescences usually solitary, terminal, erect, 1-6 or more in. long, of appressed or subappressed spike-like racemes; racemes sessile, straight, slender, 2-rowed, the lowest sometimes over 1 in. long. Spikelets glaucous or more often tinged with purple, numerous, laterally touching, ovate to ovate-oblong, up to $\frac{1}{2}$ in. long, glabrous, smooth. Glumes very dissimilar.

Northern and Central Sudan.

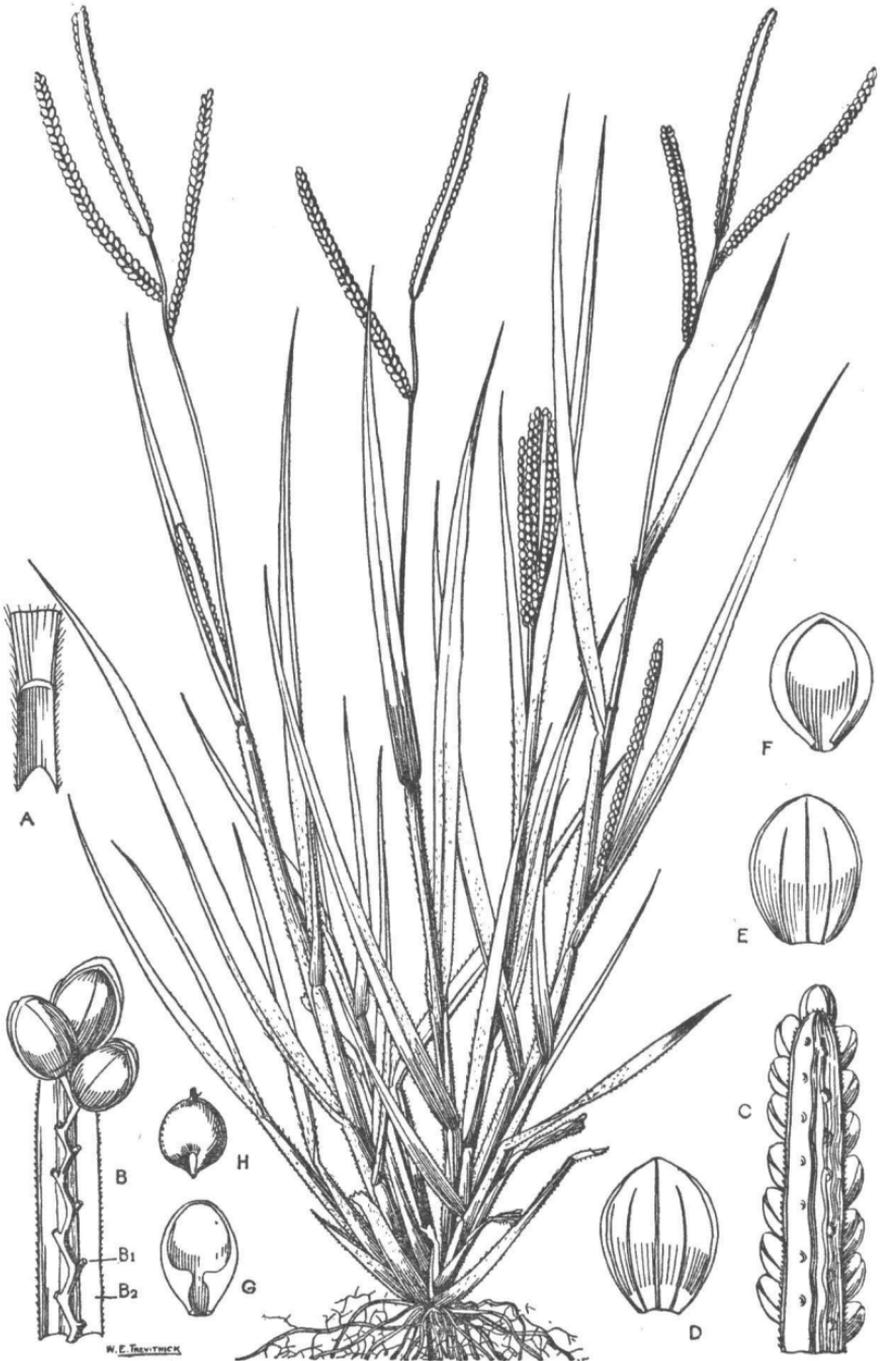


Fig. 131—*PASPALUM COMMERSONII* Lam.

A, ligule. B, portion of raceme, front view showing spikelets and pedicels (B₁), B₂, flattened axis. C, portion of raceme, back view. D, upper glume. E, lower lemma. F, upper lemma. G, palea. H, grain.

82. PASPALUM L.

Paspalum auriculatum Presl.

Herb, probably perennial, up to 1½ or more ft. high; culms erect, 4-5-noded, rather stout and spongy below, glabrous. Leaf-sheaths wide, loose, not keeled, smooth; ligule membranous, $\frac{1}{4}$ - $\frac{1}{8}$ in. long, truncate; lamina lanceolate-linear, tapering to a fine point, 6-8 in. long, $\frac{1}{3}$ - $\frac{1}{4}$ in. broad, usually glabrous. Inflorescences of 3 racemes on a slender peduncle, sometimes with an additional raceme near the base of the peduncle; racemes erect or spreading, stout, 1½-3 in. long. Spikelets chestnut-brown, normally in 2 rows, crowded, laterally touching, ovate- or orbicular-elliptic, sub-biconvex, $\frac{1}{2}$ in. long, glabrous.

Equatoria.

P. commersonii Lam.

Fig. 131.

P. scrobiculatum var. *commersonii* (Lam.) Stapf.

Herb 1-2 or more ft. high; culms erect or ascending, sometimes from a prostrate and rooting many-noded base, 5-noded, glabrous. Leaf-sheaths loosely clasping; ligule membranous, short, truncate or ovate-orbicular; lamina linear to linear-lanceolate, up to 9 in. long and $\frac{1}{4}$ - $\frac{1}{2}$ in. broad but usually shorter and narrower. Inflorescences of usually 2 (sometimes 1 or 3-4) spike-like racemes; racemes suberect or spreading, straight or arching, 1-3 in. long. Spikelets usually dull-brown, in 2 rows, mostly back to back, laterally touching or almost so, broad-elliptic to ovate or obovate-elliptic, rarely almost orbicular, usually about $\frac{1}{2}$ in. long.

Central and Southern Sudan.

P. polystachyum R. Br.

P. scrobiculatum var. *polystachyum* (R. Br.) Stapf.

Similar to *P. commersonii* but usually a taller and stouter plant up to 4 or more ft. high; culms 5-9- (mostly 6-) noded. Leaf-laminas up to 1 or more ft. long, about $\frac{1}{2}$ in. broad. Inflorescences of usually 4-7 or sometimes up to 10 or 18 racemes; racemes 2½-4 in. long.

Equatoria: often on the edges of watercourses or in swamps.

83. PENNISETUM Rich.¹

- A. Lemmas more or less alike or the lower sometimes much reduced and shorter than the upper; upper floret usually continuous with the rest of the spikelet:
- B. Spikelets usually solitary (rarely 2-3) in each involucre; bristles glabrous or rarely the inner ones with a few scattered hairs; styles free or connate:

¹The species of this genus cultivated in the Sudan are described by Stapf & Hubbard in the *Flora of Tropical Africa*, vol. 9, pp. 1029-1052 (1934).

- C. Culms with 2 or more inflorescences from the upper nodes
P. trachyphyllum.
- CC. Culms terminated by a solitary inflorescence:
- D. Upper glume $\frac{3}{4}$ to as long as the spikelet, 5-7-nerved:
- (a) Terminal bristle of the involucre up to $\frac{1}{2}$ in. long; perennial herb *P. mezianum.*
- (aa) Terminal bristle of the involucre more than $\frac{1}{2}$ in. long; annual or biennial herb with 4-5-noded culms
P. ramosum.
- DD. Upper glume up to $\frac{1}{2}$ the length of the spikelet, often much shorter, 1-3-nerved or nerveless:
- E. Tall herb 5-15 ft. high *P. giganteum.*
- EE. Mostly low herbs, rarely over 4 ft. high:
- F. Lower floret male or rarely barren; styles connate
P. stenorrhachis.
- FF. Lower floret barren and reduced to the lemma; styles free or connate for $\frac{1}{2}$ - $\frac{1}{3}$ their length:
- (b) Anther-tips usually glabrous or sometimes with a few minute hairs *P. glabrum.*
- (bb) Anther-tips conspicuously penicillate ... *P. adoense.*
- BB. Spikelets 1-5 in each involucre; all the bristles or at least the inner ones plumose or ciliate, very rarely glabrous; styles connate or more rarely free:
- G. Spikelets all alike in shape and usually in sex, not keeled:
- H. Anther-tips glabrous:
- (c) Spikelets solitary; involucre bristles loosely ciliate around the spikelet *P. gracilescens.*
- (cc) Spikelets usually clustered in the lower part of the panicle or throughout:
- (d) Involucre bristles flexuous, very sparingly ciliate with simple hairs or glabrous *P. erythraeum.*
- (dd) Involucre bristles usually straight, conspicuously ciliate around the spikelet with tubercle-based hairs *P. setaceum.*
- HH. Anther-tips conspicuously penicillate:
- I. Perennial very tall herb 6-25 ft. high ... *P. purpureum.*
- II. Annual herbs:
- J. Culms and branches usually robust, stiffly erect; leaves more or less glaucous, firm; clusters of spikelets not fluffy:
- (e) Lower lemma lanceolate-oblong, obtuse; inner involucre bristles unequal in length:
- (f) Spikelets $\frac{1}{2}$ - $\frac{1}{3}$ in. long; inner (8-14) bristles ciliate, up to $\frac{1}{4}$ in. long (excluding the terminal one) ...
P. fallax.
- (ff) Spikelets $\frac{1}{2}$ - $\frac{1}{3}$ in. long; inner (25-35) bristles densely plumose, up to $\frac{1}{4}$ in. long (excluding the terminal one) *P. darfuricum.*

- (ee) Lower lemma elliptic-oblong, truncate or emarginate; inner involucre bristles equal in length

P. ochrops.

- JJ. Culms and branches more or less oblique and kneed; leaves green, more or less flaccid; clusters of spikelets more or less fluffy owing to the abundance of hairs on the bristles *P. mollissimum.*

- GG. Spikelets of each cluster dissimilar, the external ones male, laterally compressed and keeled, the central one hermaphrodite *P. tetrastachyum.*

- AA. Lemmas very dissimilar, the lower thinly membranous and often 3-lobed; upper lemma shorter, chartaceous, smooth and shining, truncate or very obtuse; upper floret readily disarticulating from the rest of the spikelet:

- (g) Spikelets solitary and sessile within the involucre
P. polystachion.

- (gg) Spikelets solitary and pedicellate within the involucre or in clusters of 2-5 with 1 sessile and the others pedicellate
P. pedicellatum.

***Pennisetum trachyphyllum* Pilg.**

Perennial herb; culms usually ascending and rooting at the lower nodes, up to 6 ft. long, stout, compressible, up to 9- or more-noded, the nodes black. Leaf-sheaths broad, prominently striate; ligule a minutely ciliolate rim; lamina linear-lanceolate, tapering to a fine point, up to 1½ ft. long, ¼-1 in. broad. False spikes green or purplish, up to 10 in. long, ¼-½ in. broad excluding the bristles; involucre erect or slightly spreading, with a minute stalk; bristles purplish, 15-30 to each involucre, of unequal length, one stouter than the others and up to 1½ in. in length, the remainder up to ½ in. long. Spikelets pale-green or purplish, solitary or in clusters of 2-3, subsessile, up to ½ in. long.

Equatoria: Imatong Mountains.

***P. mezianum* Leek.**

Perennial herb, with a stout woody rhizome; culms erect or ascending from a prostrate base, 1-4 ft. high, rigid and woody, 4-many-noded, branched from some or all nodes, the branches solitary or clustered. Leaf-sheaths broad, loose; ligule a minutely ciliolate rim; lamina linear or narrowly linear, tapering to a callous or subacute tip, up to 6 in. long, ½-¾ in. broad. False spikes very dense, erect or nodding, cylindric, blunt, oblong or elliptic-oblong in outline, ½-1½ in. long, ¼-½ in. broad excluding the bristles; involucre subsessile, at length horizontally spreading; bristles 15-25 to each involucre, 1 or 2 stouter and ½-¾ in. long, the remainder shorter. Spikelets solitary, sessile, lanceolate to oblong, about ½ in. long.

Equatoria: west of Mount Tomadar, Abyssinian border.

P. ramosum (Hochst.) Aschers. & Schweinf.*P. ovale* Rupr. ex Steud.

Annual or biennial herb; culms erect or ascending, up to 6 ft. high, 4-5-noded with the nodes thickened, branched from most nodes, glabrous. Leaf-sheaths pale, keeled, loose, glabrous; ligule a densely ciliate rim; lamina glaucous, linear, tapering near the apex, up to 1 ft. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad. False spikes cylindric, dense, very bristly, 1 $\frac{1}{2}$ -4 in. long, about $\frac{1}{2}$ in. broad excluding the bristles; involucre sessile, at length spreading; bristles 12-24 to each involucre, unequal, pale or with purplish tips, connate at the base, one longer than the rest and $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long. Spikelets pallid, solitary, sessile, narrowly ovate to ovate, acuminate at the apex, about $\frac{1}{4}$ in. long, glabrous.

*Widespread.***P. giganteum** A. Rich.

Perennial herb, with a stout creeping rhizome; culms erect or ascending, 5-15 ft. high, stout and bamboo-like, up to $\frac{3}{4}$ in. in diameter, branched, up to 12- or more-noded, glabrous. Leaf-sheaths glabrous or loosely bearded at the mouth; ligule a ciliate rim; lamina linear, gradually passing into the sheath, up to 1 $\frac{1}{2}$ or more ft. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad. False spikes straw-coloured, greenish or tinged with purple, dense, cylindric, 3 $\frac{1}{2}$ -12 in. long, about $\frac{1}{2}$ in. broad excluding the bristles; involucre sessile, spreading; bristles 12-25 to each involucre, very slender, unequal, one up to $\frac{3}{4}$ in. long, the remainder much shorter and up to $\frac{1}{4}$ in. long. Spikelets solitary, sessile, lanceolate to narrowly ovate, up to $\frac{1}{4}$ in. long, glabrous.

*Equatoria: Imatong Mountains.***P. stenorrhachis** Stapf & Hubbard.

Perennial herb, with a branched rhizome and short stolons; culms ascending, about 3 ft. high, tough, much branched, up to 8-noded below the middle. Leaf-sheaths loosely bearded at the mouth or quite glabrous; ligule a densely ciliolate rim; lamina linear, tapering to an acute tip, up to 6 in. long, $\frac{1}{2}$ in. broad. False spikes pale-green, cylindric, rather loose, slender, straight, 3 $\frac{1}{2}$ -5 $\frac{1}{2}$ in. long, about $\frac{1}{2}$ in. broad excluding the bristles; involucre subsessile; bristles 24-30 to each involucre, free to the base, with purplish tips, unequal, one up to $\frac{1}{2}$ in. long. Spikelets solitary, subsessile, narrowly ovate and acutely acuminate in back view, usually gaping, about $\frac{1}{2}$ in. long, glabrous.

*Kassala: Gallabat. Darfur: Jebel Marra.***P. glabrum** Steud.

Perennial herb from a moderately slender rhizome; culms erect or ascending, $\frac{1}{2}$ -4 ft. high, branched at the base or simple, up to 8-noded. Leaf-sheaths compressed and keeled; ligule a densely ciliolate rim; lamina linear, gradually passing into the sheath

and tapering upwards to an almost pungent tip, $1\frac{1}{2}$ -12 in. long, up to $\frac{1}{2}$ in. broad, rather rigid. False spikes pallid or purplish, cylindric, dense, $\frac{3}{4}$ -4 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad excluding the bristles; involucre sessile, slightly spreading; bristles 5-10 to each involucre, unequal, free to the base, 1 or 2 up to $\frac{1}{2}$ in. long, the remainder up to $\frac{1}{4}$ in. long. Spikelets usually solitary, sessile, lanceolate or lanceolate-oblong, $\frac{1}{8}$ - $\frac{1}{2}$ in. long, glabrous.

Darfur: *Jebel Marra*, 9000-10,000 ft.

P. adoense Steud.

Perennial herb, with a slender creeping rhizome; culms ascending, $\frac{1}{2}$ -3 ft. high, slender, simple or loosely branched, 4-8-noded, pubescent just below the inflorescence. Leaf-sheaths slightly keeled; ligule a densely ciliolate rim; lamina linear, tapering to a finely acute tip, 5-12 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. False spikes pallid or yellowish-green, cylindric, dense, 1-2 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad excluding the bristles; involucre sessile, at length spreading horizontally; bristles up to 15 to each involucre, unequal, free to the base, one up to $\frac{1}{2}$ in. long, the remainder up to $\frac{1}{4}$ in. long. Spikelets solitary, sessile, lanceolate or oblong-lanceolate, $\frac{1}{8}$ - $\frac{1}{2}$ in. long, glabrous.

Equatoria: *Nagichot*, *Didinga Mountains*, 6600 ft.

P. gracilescens Hochst.

Tufted perennial herb, with a short rhizome; culms ascending and sometimes rooting at the lower nodes, about $1\frac{1}{2}$ -2 ft. high, rigid and woody below, up to 9-noded, repeatedly branched from most nodes, the branches solitary or clustered. Lower leaf-sheaths breaking up and exposing the culm; ligule a densely ciliate rim; lamina narrowly linear, tapering to a fine setaceous tip, up to 7 in. long and $\frac{1}{2}$ in. broad. False spikes pallid or purplish, dense, cylindric, $1\frac{1}{2}$ -3 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad excluding the bristles; involucre bearded at the base; bristles 15-30 to each involucre, loosely plumose with usually tubercle-based hairs for about $\frac{1}{2}$ - $\frac{1}{2}$ their length, unequal, one $\frac{1}{2}$ -1 in. long, the remainder shorter. Spikelets solitary, subsessile, lanceolate, $\frac{1}{8}$ - $\frac{1}{2}$ in. long, glabrous.

Darfur: *Jebel Marra*.

P. erythraeum Chiov.

Densely tufted perennial herb; culms erect or ascending, up to $3\frac{1}{2}$ ft. high, rigid and tough, many-noded, branched sometimes repeatedly. Leaf-sheaths ciliate on the margins with spreading hairs and loosely bearded at the mouth; ligule a densely ciliolate rim; lamina linear, tapering upwards to a fine setaceous tip, up to 12 or more in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. False spikes pallid or pale-brown, plumose, rather loose, 2-7 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad excluding the bristles; involucre at length spreading, with a short vil-

lous peduncle up to $\frac{1}{8}$ in. long; bristles up to 35 to each involucre, unequal, one flexuous and $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, the remainder up to $\frac{3}{4}$ in. long. Spikelets usually in clusters of 2-5 in the lower and middle parts of the spike and solitary towards its apex, sometimes solitary throughout, about $\frac{1}{4}$ in. long.

Red Sea Hills: near Rotala.

P. setaceum (Forsk.) Chiov.

P. orientale (non Rich.) Broun & Massey.

Densely tufted perennial herb; culms erect or ascending, $\frac{3}{4}$ -3 ft. high, rather rigid, simple or branched below, 3-8-noded. Leaf-sheaths firm, tight, ciliate on the margins and usually loosely bearded at the mouth, or glabrous; ligule a ciliate rim; lamina narrowly linear, tapering to a fine point, up to 1 or more ft. long, up to $\frac{1}{8}$ in. broad, erect, rigid, tough. False spikes pallid or purplish, moderately dense, plumose, 4-9 or more in. long, $\frac{1}{2}$ - $\frac{2}{3}$ in. broad excluding the bristles; involucres at length spreading, with a short villous peduncle up to $\frac{1}{8}$ in. long; bristles up to 25 to each involucre, free to the base, loosely plumose round the spikelet with long white tubercle-based hairs, unequal, one usually $\frac{3}{4}$ - $1\frac{1}{2}$ in. long, the remainder up to 1 in. long. Spikelets in clusters of 1-3, one sessile, the others, if present, pedicellate.

Red Sea District.

P. purpureum Schumach.

Fig. 132.

Robust perennial herb, often forming large bamboo-like clumps, sometimes spreading by long many-noded stolons; culms erect, 6-25 ft. high, up to 1 in. in diameter at the base, more or less hairy towards the inflorescence, up to 20-noded with the nodes glabrous or most of them or the uppermost with a ring of long stiff appressed hairs. Leaf-sheaths usually glabrous; ligule a densely ciliate rim with hairs up to $\frac{1}{8}$ in. long; lamina linear, tapering to a fine point; 1-4 ft. long, up to $1\frac{1}{2}$ or more in. broad, usually hairy towards the base with usually tubercle-based hairs. False spikes usually yellow or tinged with brown, less often purple or blackish-purple, dense, cylindric, erect, $\frac{1}{4}$ -1 ft. long, $\frac{1}{2}$ - $1\frac{1}{4}$ in. broad excluding the bristles; involucres sessile, at length becoming reflexed; bristles many to each involucre, unequal, often dark-yellow, brownish or purplish, one usually $\frac{1}{2}$ - $1\frac{1}{2}$ or more in. long, the remainder $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Spikelets solitary or in clusters of 2-5, about $\frac{1}{4}$ in. long, glabrous.

Equatoria.

P. fallax (Fig. & De Not.) Stapf & Hubbard.

Annual herb, rooting at the lower nodes, up to 5 or more ft. high; culms erect, branched upwards, up to 9-noded with the upper nodes bearded, pubescent towards the inflorescence. Leaf-sheaths glabrous or hirsute with stiff tubercle-based hairs; ligule very short, truncate, densely ciliate with hairs up to $\frac{1}{8}$ in. long; lamina

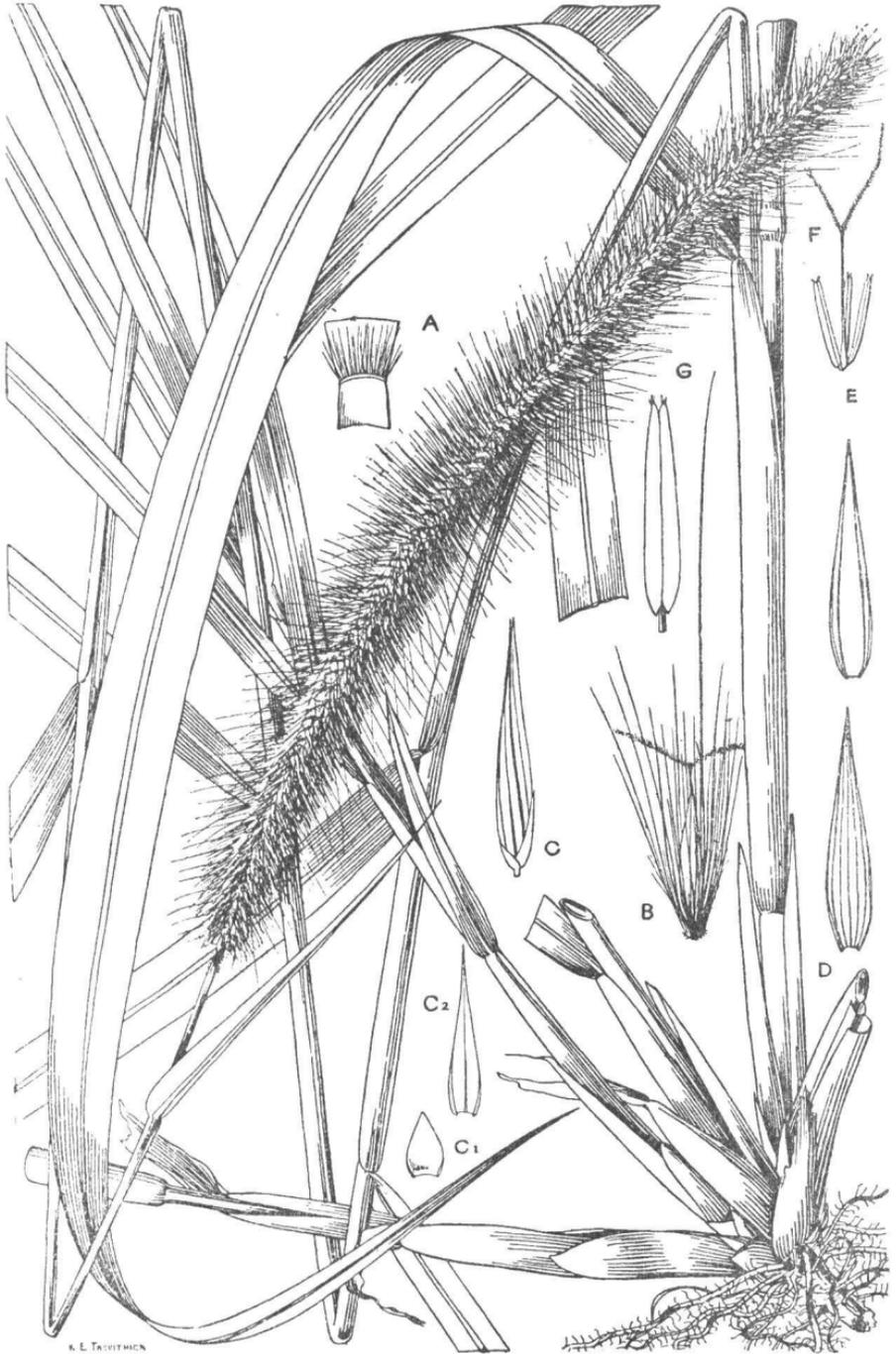


Fig. 132—*Pennisetum purpureum* Schumach.

A, ligule. B, spikelet surrounded by bristles. C, spikelets. C₁, lower glume. C₂, upper glume. D, lemma of upper floret. E, palea. F, stamens and pistil. G, stamen.

linear, contracted at the base, up to 1 or more ft. long, about $\frac{1}{2}$ in. broad. False spikes yellowish, dense, cylindric, $3\frac{1}{2}$ -5 in. long, about $\frac{1}{2}$ in. broad excluding the bristles; involucre sessile, at length horizontally spreading or deflexed; bristles up to 70 to each involucre, free to the base, unequal. Spikelets solitary or paired, pedicellate, about $\frac{1}{2}$ in. long, glabrous.

White Nile.

P. darfuricum Stapf & Hubbard.

Annual herb; culms stout, several ft. high, branched, densely pubescent below the inflorescence. Ligule a densely ciliate rim; lamina linear, up to 1 or more ft. long, $\frac{1}{2}$ -1 in. broad, flat, sparsely hairy. False spikes pallid, cylindric, moderately dense, about 6 in. long, $\frac{3}{4}$ in. broad excluding the bristles; rhachis densely pubescent; involucre sessile, at length horizontally spreading; bristles very numerous (70-90) to each involucre, free to the base, unequal, one up to 1 in. long. Spikelets solitary, pedicellate.

Darfur: Meidob Hills, in a clay valley below Jebel Kaboija.

P. ochrops Stapf & Hubbard.

Annual herb; culms erect, stout, up to 5 or more ft. high, more than 4-noded, branched from most nodes with the branches stiffly erect, densely pubescent towards the inflorescence and bearded at the upper nodes. Leaf-sheaths firm; ligule a densely ciliate rim, the hairs up to $\frac{1}{2}$ in. long; lamina linear, abruptly contracted at the base, tapering to an acute apex, up to 2 ft. long, $\frac{1}{3}$ -1 in. broad, firm, glaucous. False spikes whitish-green, cylindric, very dense, $3\frac{1}{2}$ -4 in. long, about $\frac{1}{2}$ in. broad excluding the bristles; involucre sessile, at length horizontally spreading or deflexed; bristles up to 80 to each involucre, free to the base. Spikelets solitary, minutely pedicellate.

Darfur: Kulme.

P. mollissimum Hochst.

Annual herb; culms 3 or more ft. high, branched from the upper nodes, several-noded, bearded at the upper nodes and densely pubescent or pilose towards the inflorescence. Leaf-sheaths compressed and keeled at least towards the lamina; ligule a densely ciliate rim with hairs up to $\frac{1}{4}$ in. long; lamina linear or linear-lanceolate, tapering to a finely acute apex, up to 1 ft. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad. False spikes pale-straw-coloured or purplish, dense, cylindric, soft and silky, 3-6 in. long, $\frac{1}{2}$ - $\frac{2}{3}$ in. broad excluding the bristles; involucre sessile, at length horizontally spreading; bristles up to 90 to each involucre, unequal. Spikelets solitary or rarely paired, shortly pedicellate, about $\frac{1}{2}$ in. long.

Central Sudan.

P. tetrastachyum K. Schum.*P. schweinfurthii* Pilg.

Herb, probably annual; culms 2 or more ft. high, sometimes branched, shortly and densely pilose or villous towards the inflorescence. Upper leaf-sheaths rather inflated; ligule a densely ciliate rim; lamina dull-green, lanceolate-linear, contracted and usually slightly rounded at the base, long-tapering to a fine acute apex, up to 2 ft. long, $\frac{3}{4}$ - $\frac{1}{2}$ in. broad, flat, firm. False spikes dense, cylindric, 4-8 in. long, $\frac{1}{2}$ -1 in. broad excluding the bristles; involucre subsessile; bristles pale or purplish, many to each involucre, free to the base, the terminal one up to $1\frac{1}{2}$ in. long, the remainder much shorter. Spikelets in clusters of 5, the external 4 male, the innermost one hermaphrodite, all very shortly pedicellate.

*Kassala: Gallabat. Nuba Mountains.***P. polystachion** (L.) Schult.

Fig. 133.

Tufted perennial or more rarely annual herb; culms erect or ascending, sometimes rooting at the lower nodes, $\frac{3}{4}$ -6 (rarely 10) ft. high, branched or rarely simple, up to 8-noded. Leaf-sheaths thin, keeled towards the lamina; ligule a densely ciliate rim; lamina green, linear or lanceolate-linear, up to $1\frac{1}{2}$ or more ft. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, flat. False spikes purple, reddish-brown or orange-brown, cylindric, very dense to somewhat lax, 1-10 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad excluding the bristles; involucre subsessile, at length horizontally spreading or deflexed; bristles up to 30 to each involucre, densely ciliate round the spikelet with long interwoven crinkled silky hairs, one bristle up to $1\frac{1}{2}$ in. long, the remainder up to about $\frac{1}{2}$ in. long. Spikelets solitary, sessile, about $\frac{1}{2}$ in. long, glabrous.

*Central and Southern Sudan.***P. pedicellatum** Trin.

Annual herb; culms erect or ascending and rooting at the lower nodes, $\frac{1}{2}$ - $3\frac{1}{2}$ ft. high, branched from most nodes with solitary or clustered branches, up to 6- or more-noded, scabrous just beneath the inflorescence. Leaf-sheaths loose; ligule a ciliate rim, or very narrowly membranous and ciliate; lamina green, linear to linear-lanceolate, finely long-acute at the apex, 2-10 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, flat. False spikes white, pallid, purplish or reddish, dense to moderately lax, cylindric, 2-6 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad excluding the bristles, woolly at maturity; involucre at length horizontally spreading, subsessile or with a short villous peduncle; bristles up to 25 to each involucre, free to the base, densely ciliate around the spikelet with long crinkled closely interwoven silken hairs, 1 or 2 up to $\frac{2}{3}$ - $1\frac{1}{2}$ in. long, the remainder shorter. Spikelets lanceolate, usually loosely to densely hairy at the base with long crinkled hairs.

Central and Southern Sudan.

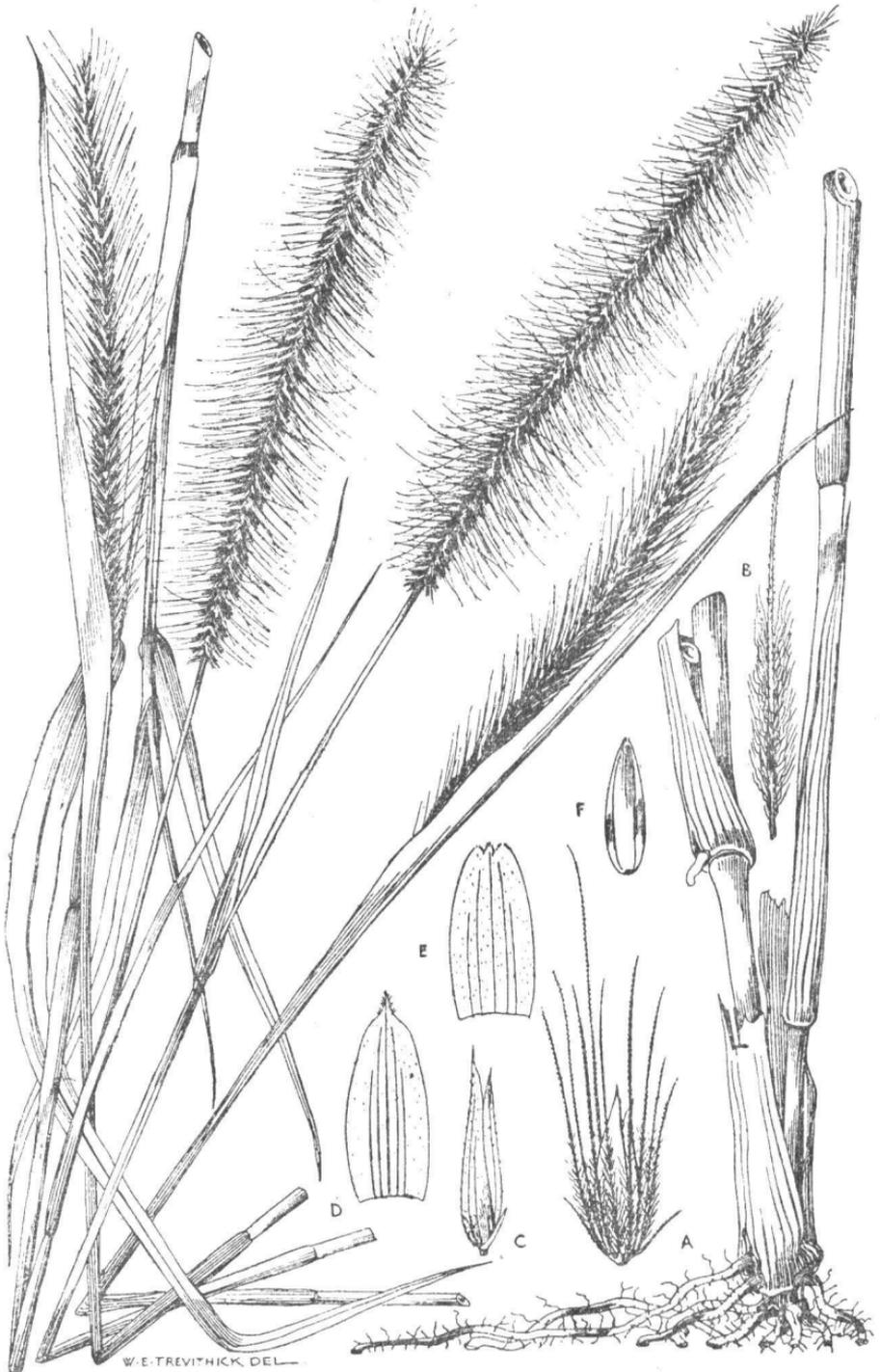


Fig. 133—*Pennisetum polystachion* (L.) Schult.

A, spikelet surrounded by bristles. B, bristle. C, spikelet with bristles removed. D, upper glume. E, lemma of lower floret. F, upper floret.

84. **PENTASCHISTIS** (Nees) Stapf**Pentaschistis imatongensis** C. E. Hubbard.

Densely tufted perennial herb 2-2½ ft. high; culms erect, simple, 1-2-noded near the base, sheathed up to the middle. Lower leaves softly hairy with short spreading hairs, the upper ones glabrous or nearly so; sheath rather broad, in the lower leaves pallid and loose; ligule a densely ciliate rim; lamina linear, gradually narrowed to an obtuse apex, up to 8 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, flat, flaccid. Panicles erect, contracted, moderately dense, 3-5 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad; branches erect, finely thread-like, divided and densely furnished with spikelets above. Spikelets pallid when old, about $\frac{1}{2}$ in. long; awns kneed in the lower third, $\frac{1}{4}$ in. long, the column twisted and about $\frac{1}{10}$ in. long.

Equatoria: Imatong Mountains, Mount Kineti, rocky summit, 10,400 ft.

85. **PEROTIS** Ait.**Perotis patens** Gandog.

Fig. 134.

P. latifolia (non Ait.) Broun & Massey.

Annual herb; culms clustered, erect or ascending, a few inches to 1½ ft. long, many-noded, glabrous. Leaves rather numerous in the lower $\frac{3}{4}$ - $\frac{1}{2}$ of the culm; sheath thin; ligule very delicate, short, ciliate or absent; lamina linear lanceolate to ovate-lanceolate from a clasping broad base, acute or acuminate at the apex, $\frac{3}{4}$ -3 in. long, $\frac{1}{2}$ - $\frac{1}{2}$ in. broad, ciliate and serrulate on the margin. Spikes linear, 3-8 in. long, rather dense. Spikelets soon spreading, about $\frac{1}{2}$ in. long, linear-lanceolate; awns yellowish.

Equatoria.

86. **PHAENANTHOECIUM** C. E. Hubbard**Phaenanthoecium kostlini** (Hochst.) C. E. Hubbard.

Loosely tufted or trailing perennial herb; culms ascending, sometimes from a prostrate base, up to 1 ft. high, or trailing and up to 6 or 7 ft. long, very slender, many-noded, branched from most nodes or simple. Leaf-sheaths mostly overlapping, loosely hairy at the mouth; ligule obscure; lamina green, narrow-linear, acute at the apex, $\frac{1}{4}$ -1½ in. long, $\frac{1}{4}$ - $\frac{1}{8}$ in. broad, at length horizontally spreading, stiff. Racemes nodding, $\frac{3}{4}$ -1½ in. long, with 2-6 loosely arranged spikelets. Spikelets green, $\frac{1}{2}$ - $\frac{1}{2}$ in. long; florets loose; callus with hairs up to $\frac{1}{10}$ in. long.

Darfur: Jebel Marra, 8200 ft.

87. **PHRAGMITES** Adans.**Phragmites mauritianus** Kunth.

P. communis (non Trin.) Broun & Massey.

Perennial herb, with a stout creeping rhizome sometimes up to 30 or more ft. long; culms erect, 4-20 or more ft. high, slender to very robust, up to 1½ or more in. in diameter, often woody and bamboo-



Fig. 134—*PEROTIS PATENS* Gandog.
A, spikelet.

like, many-noded, simple or branched. Leaf-sheaths overlapping, finally disarticulating from the culm, tough; ligule a densely ciliate rim; lamina lanceolate-linear, long-tapering to a pungent apex, up to $2\frac{1}{2}$ ft. long, $\frac{1}{4}$ - $1\frac{3}{8}$ in. broad, often much shorter and narrower on sterile shoots. Panicles green or purplish, becoming yellowish-brown, oblong to ovoid, $\frac{1}{2}$ -2 or more ft. long, $\frac{1}{4}$ -1 ft. broad; branches usually clustered. Spikelets $\frac{1}{4}$ - $\frac{3}{8}$ in. long. Glumes usually equal or subequal.

Central and Southern Sudan.

88. POA L.

Poa leptoclada Hochst. ex A. Rich.

Rather tufted annual or perhaps perennial herb up to 2 ft. high; culms slender. Leaf-sheaths prominently keeled; ligule triangular, membranous, $\frac{1}{8}$ in. long; lamina narrowly linear, up to 6 in. long, $\frac{1}{8}$ in. broad, minutely scabrous on both surfaces. Panicles narrow, long. Spikelets $\frac{1}{8}$ - $\frac{1}{4}$ in. long.

Equatoria: Imatong Mountains, Itobol, 6400 ft.

89. POLYPOGON Desf.

Polygomon monspeliensis (L.) Desf.

Annual Beard-grass.

Loosely tufted annual herb; culms $\frac{1}{4}$ - $2\frac{1}{2}$ ft. long, erect or ascending, simple, 3-6-noded. Leaf-sheaths loose; ligule scarious, oblong, denticulate, $\frac{1}{8}$ - $\frac{1}{4}$ in. long; lamina linear, tapering to an acute apex, 2-6 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad, flat, scabrous. Panicles light-green, becoming straw-coloured, very dense, spike-like, usually more or less lobed, $\frac{1}{4}$ -6 in. long, $\frac{1}{4}$ -1 in. broad; branches closely divided from the base. Spikelets up to $\frac{1}{2}$ in. long, almost hidden by the awns; awns $\frac{1}{8}$ - $\frac{1}{4}$ in. long, 2-3 times the length of the scabrous glumes which are ciliate on the margin.

Northern Sudan. Darfur: Jebel Marra.

90. PSEUDOBROMUS K. Schum.

Pseudobromus silvaticus K. Schum.

Herb, probably perennial and often forming tussocks; culms 3-4 or more ft. high. Leaf-sheaths glabrous or sparsely hairy; ligule membranous, truncate, purplish, shortly pubescent, up to $\frac{1}{2}$ in. long; lamina dark-green, linear, gradually narrowed to an acute apex, up to 15 or more in. long and $\frac{1}{2}$ in. broad, somewhat scabrous on the margin. Panicles very spreading when mature, 10-12 or more in. long. Spikelets linear, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, on slender pedicels; awn $\frac{1}{4}$ - $\frac{1}{2}$ in. long.

Equatoria: Didinga Mountains, Mount Lotuke, 7000-8000 ft.; Imatong Mountains, Itobol, 6100 ft.

91. **RHYNCHELYTRUM** Nees**Rhynchelytrum grandiflorum** Hochst.

Tricholaena rosea (non Nees) Broun & Massey p.p.

Annual herb; culms erect or ascending and rooting at the lower nodes, $1\frac{1}{2}$ - $2\frac{1}{2}$ ft. high, slender, usually branched, 4-many-noded, densely pubescent to glabrous. Leaf-sheaths loose, the lower ones pubescent to pilose from minute tubercles; ligule a densely ciliate rim; lamina linear from a narrow base, finely long-acute at the apex, 2-6 in. long, $\frac{1}{2}$ - $\frac{1}{4}$ in. broad, flat. Panicles lanceolate to ovoid, 3-5 in. long, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. broad, lax. Spikelets oblong, pale-straw-coloured, with gaping slightly recurved pale-brown beaks, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. broad, strongly compressed and keeled, densely bearded at the base. Glumes distant by $\frac{1}{16}$ - $\frac{1}{12}$ in., the upper prominently ribbed.

Northern Sudan: Berber; Tokar.

R. villosum (Parl.) Chiov.

Annual or sometimes perennial herb; culms erect or ascending, up to $1\frac{1}{2}$ - $3\frac{1}{2}$ ft. high, slender, 2-5-noded, simple or branched, usually sparsely to densely pilose. Leaves often pilose and sometimes tuberculate; ligule a densely ciliate rim up to $\frac{1}{4}$ in. long; lamina linear, finely long-acute at the apex, 2-6 in. long, $\frac{1}{2}$ - $\frac{1}{4}$ in. broad, flat. Panicles lanceolate to broadly ovoid, 3-6 in. long, $\frac{3}{4}$ - $2\frac{1}{4}$ in. broad, lax or more or less contracted. Spikelets oblong, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, $\frac{1}{8}$ - $\frac{1}{8}$ in. broad, pale-straw-coloured, brown or rarely greyish, usually with brown beaks, silky-pilose or villous with white or crimson-purple hairs, sometimes densely tuberculate. Glumes distant by $\frac{1}{32}$ - $\frac{1}{16}$ in., the upper not prominently ribbed.

Darfur: near Jebel Nessup, on rocky ground.

R. repens (Willd.) C. E. Hubbard.

Tricholaena rosea Nees; *T. sphacelata* Benth.

Annual or tufted perennial herb; culms erect or ascending and often rooting at the lower nodes, 1-4 ft. long, simple or branched, 3-many-noded. Leaf-sheaths tight or loose and exposing the culm; ligule a minutely ciliate rim up to $\frac{1}{12}$ in. long; lamina narrowly linear to linear, finely long-acute at the apex, 2-12 in. long, $\frac{1}{12}$ - $\frac{1}{2}$ in. broad. Panicles oblong, ovoid or pyramidal, 2-8 in. long, $\frac{1}{2}$ -4 in. broad, silvery-white, cream or purplish, silky-hairy. Spikelets ovate to broadly oblong, pallid, greyish-brown or dark-brown, usually with dark-brown beaks, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, silky-pilose to villous with at first appressed eventually spreading long silky white to purple hairs, smooth or densely tuberculate. Glumes distant by up to $\frac{1}{8}$ in.

Widespread.

92. **RHYTACHNE** Desv.**Rhytachne rottboellioides** Desv.

Densely tufted perennial herb; culms slender, 1-2½ ft. high, 2-3-noded, compressed. Leaf-sheaths tight; ligule very short, membranous, ciliolate, forming small auricles at the mouth of the sheath; lamina folded upon itself, setaceous to narrowly linear, in the basal leaves nearly 1 ft. long, in the upper leaves much shorter. Racemes solitary, very slender, fragile, 3-6 in. long, erect, sometimes purplish; joints $\frac{1}{8}$ - $\frac{1}{2}$ in. long, more or less club-shaped and hollowed above, concave on the inner face, more or less rounded on the back, disarticulating horizontally. Sessile spikelets straw-coloured or purplish, linear-lanceolate, acute at the apex, $\frac{1}{8}$ in. long; pedicellate spikelets reduced to a minute mucro or a short fine bristle or rarely to 1-2 minute glumes.

Equatoria.

R. triaristata (Steud.) Stapf.

Annual herb; culms clustered in small tufts, up to 1½ ft. high, slender, 3-4-noded. Leaf-sheaths tight; ligule very short, membranous, ciliolate, forming small auricles at the mouth of the sheath; lamina rolled, setaceous or very narrowly linear. Racemes solitary, usually pale-greenish, fragile, erect, straight; joints linear, $\frac{1}{8}$ - $\frac{1}{2}$ or more in. long, more or less club-shaped or hollow upwards, disarticulating horizontally, with a ciliolate rim round the scar. Sessile spikelets linear-oblong, shortly acuminate at the apex, $\frac{1}{2}$ in. long excluding the bristle-like awns; pedicellate spikelets usually represented by 2 fine stiff unequal scabrous awns, one of which may be up to $\frac{1}{8}$ or more in. long.

Equatoria.

93. **ROTTBOELLIA** L. f.**Rottboellia exaltata** L. f.

Fig. 135.

Coarse annual herb, often with stilt-like roots from the lowest nodes; culms erect, up to 12 ft. high, branched. Leaf-sheaths tight or widened upwards, usually more or less hirsute with tubercle-based hairs, sometimes glabrous; ligule membranous, brown, short, rounded, ciliolate; lamina glaucescent, linear-lanceolate, tapering to a long fine point, 1-1½ ft. long, $\frac{1}{2}$ -1 in. broad, scabrous with minute stiff hairs above, very rough on the margin. Racemes pale-yellowish-green, 3-6 in. long, $\frac{1}{2}$ - $\frac{1}{4}$ in. in diameter, stiff; joints $\frac{1}{8}$ - $\frac{1}{2}$ in. long, rounded on the back, concave on the inner face, disarticulating with an orbicular scar. Sessile spikelets $\frac{1}{2}$ - $\frac{3}{4}$ in. long including the short broad smooth callus, ovate-lanceolate, glabrous; glumes about equal: pedicellate spikelets about the size of the sessile but more compressed and (particularly the upper ones) more or less acuminate.

Central and Southern Sudan.

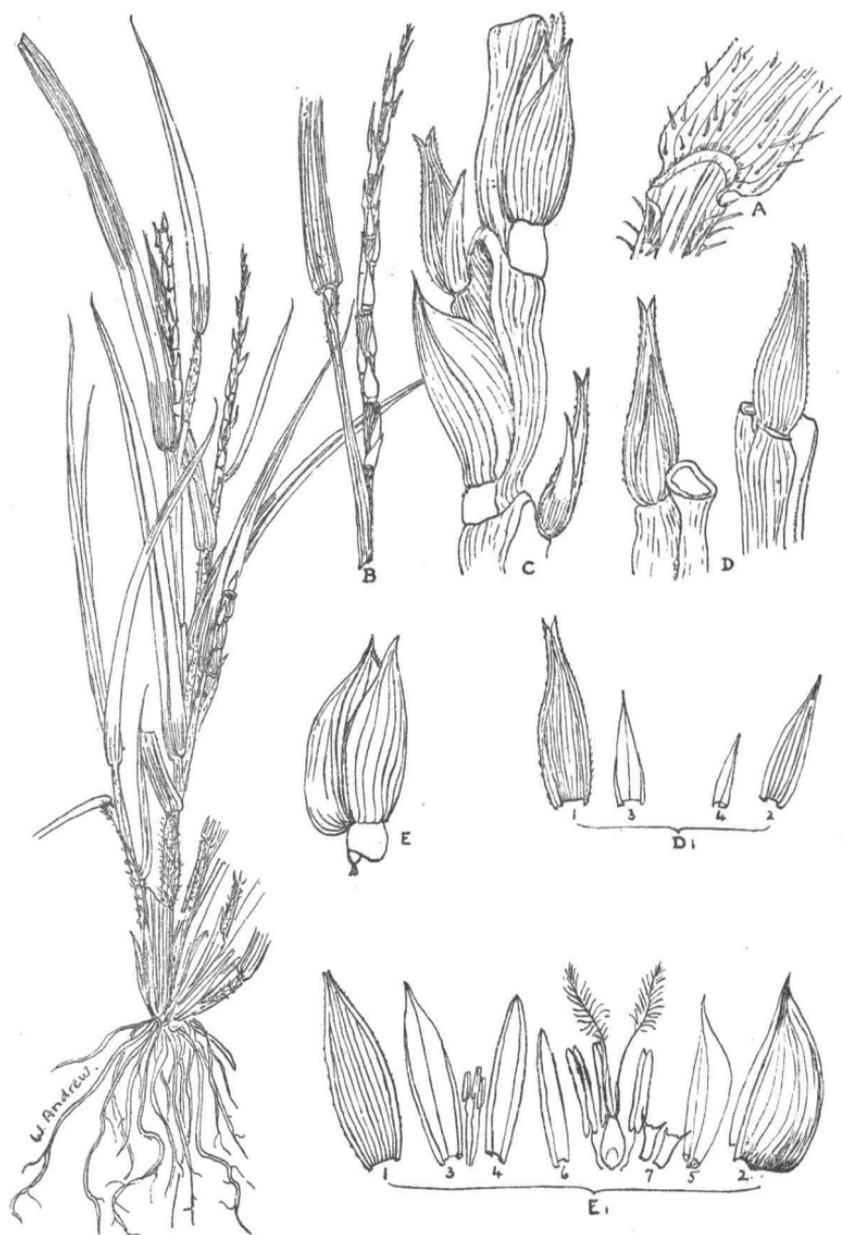


Fig. 135—*ROTTBOELLIA EXALTATA* L. f.

A, ligule with portion of leaf-sheath and lamina. B, raceme. C, two nodes of raceme, one sessile pulled out to show fused pedicel of pedicellate spikelet. D, pedicellate spikelets. D₁, pedicellate spikelet dissected. E, sessile spikelet. E₁, sessile spikelet dissected.

94. **SACCHARUM** L.

Saccharum spontaneum subsp. **aegyptiacum** (Willd.) Hack.

S. spontaneum var. *aegyptiacum* (Willd.) Hack.

Perennial herb; culms up to 12 or more ft. high, many-noded, silky below the panicle, coated with wax below the nodes. Leaf-sheaths tight; ligule brown, short, membranous, long-ciliate from the back; lamina glaucous, linear, tapering to a long and fine point, in the upper leaves $\frac{1}{2}$ - $\frac{2}{3}$ in. broad. Panicles oblong, up to $1\frac{1}{2}$ or more ft. long, up to 5 in. broad, dense and rather contracted, silvery; racemes up to 4 in. long, very fragile. Spikelets lanceolate, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, surrounded from the callus by a tuft of long silky hairs about $\frac{1}{2}$ in. long. Glumes subequal.

Central and Southern Sudan.

95. **SACCIOLEPIS** Nash

Sacciolepis ciliocincta (Pilg.) Stapf.

Gregarious annual herb up to $1\frac{1}{2}$ ft. high; culms erect, spongy, up to $\frac{1}{2}$ in. in diameter near the base, 5-6-noded, the lower nodes emitting stilt-roots. Leaf-sheaths pale; ligule membranous, rounded, up to $\frac{1}{2}$ in. long; lamina erect, usually overtopping the spike, linear, tapering to a callous apex, 3-9 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, densely whitish-papillose above on the nerves. False spikes erect, subcylindric, about 1 in. long, very compact, bearded, the axis fused with the branches. Spikelets straw-coloured, laterally much compressed, broadly ovate-elliptic in side view, acutely acuminate at the apex, $\frac{1}{2}$ in. long, bearded.

Equatoria.

S. micrococcus Mez.

Tufted annual herb up to $2\frac{1}{2}$ ft. high; culms erect, very slender, thread-like upwards. Basal leaf-sheaths glaucous-green, loose, wide, spongy, up to 1-3 in. long, collapsing when dry; ligule hyaline, very short, truncate; lamina thread-like, folded, up to 6 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad (while folded), soft, flexuous. False spikes long-exserted, erect, cylindric, $2\frac{1}{2}$ -5 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, dense or more or less interrupted, the axis not or imperfectly fused with the branches. Spikelets olive-green, brown or lurid, elliptic-oblong, swollen, symmetrical, up to $\frac{1}{4}$ in. long.

Equatoria.

S. chevalieri Stapf.

Densely tufted perennial herb from a short oblique rhizome, up to 2 ft. high; culms erect, very slender, 2-3-noded. Basal leaf-sheaths brownish or grey or suffused with livid-purple, loose, wide, more or less spongy, up to 3 in. long; ligule short, truncate, ciliolate; lamina erect, thread-like, up to 6 in. long, spongy. False spikes

erect, cylindric, $1\frac{1}{2}$ -5 in. long, $\frac{1}{8}$ - $\frac{1}{6}$ in. broad, more or less dense, the axis not or imperfectly fused with the branches. Spikelets pale-greyish-green to straw-coloured, ovate in outline, up to $\frac{1}{2}$ in. long, loosely puberulous with tubercle-based hairs.

Equatoria.

S. africana Hubbard & Snowden.

S. interrupta Stapf p.p.

Perennial herb from a short creeping rhizome, up to 5 ft. high; culms slender or more often stout and spongy, erect or ascending or with a prostrate base and then often copiously rooting from the nodes. Leaf-sheaths loose; ligule whitish, membranous, truncate, up to over $\frac{1}{4}$ in. long; lamina linear, tapering to a long slender point, 4-12 or more in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, flat, soft, somewhat plump. False spikes cylindric, from a few inches to 1 ft. or more long, $\frac{1}{4}$ - $\frac{1}{3}$ in. broad, dense, the axis not or imperfectly fused with the branches. Spikelets green, often brownish or livid-purple upwards, oblong, up to $\frac{1}{3}$ in. or more long.

Southern Sudan.

S. typhura (Stapf) Stapf.

Tufted perennial herb from a short rhizome, up to 3 ft. high; culms erect, slender, simple, 3-4-noded. Leaf-sheaths tight; ligule membranous, truncate, very short, minutely ciliolate; lamina linear, tapering to a slender point, 6-12 in. long, $\frac{1}{8}$ - $\frac{5}{12}$ in. broad, erect, more or less rigid. False spikes erect, 5-10 in. long, $\frac{1}{4}$ in. broad, usually very dense, the axis not or imperfectly fused with the branches. Spikelets purplish or blackish-grey, ovate to ovate-oblong or ovate-lanceolate in outline, more or less swollen, $\frac{1}{2}$ in. long, more or less finely hirsute with white hairs.

Equatoria.

S. auriculata Stapf.

Probably perennial herb up to 3 ft. high; culms slender, easily compressible, ascending from a decumbent and rambling base and emitting aerial roots 6 or more in. long from its nodes. Leaf-sheaths herbaceous, more or less compressed and keeled upwards, produced at the mouth into acute or subacute auricles up to $\frac{1}{2}$ in. long; ligule thinly membranous, laterally adnate to the auricles; lamina linear, tapering upwards to a fine point, 6 or more in. long, $\frac{3}{8}$ - $\frac{1}{2}$ in. broad. False spikes erect on a long-exserted peduncle, $\frac{1}{2}$ in. long, about $\frac{1}{4}$ in. broad, dense, the axis not or imperfectly fused with the branches. Spikelets pale-greyish-green to warm-straw-coloured, ovate, subacute to acutely acuminate at the apex, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, glabrous or more or less hairy with short fine tubercle-based hairs.

Equatoria.

96. **SCHIZACHYRIUM** Nees**Schizachyrium brevifolium** (Sw.) Nees ex Miq.

Annual herb; culms weak, up to 2 ft. long, usually ascending from a decumbent base, many-noded, much branched from most of the nodes especially below; branches almost thread-like. Leaf-sheaths compressed, the lower ones keeled, the uppermost spathe-like; ligule membranous, very short, ciliolate; lamina linear, constricted at the junction with the sheath, obtuse or suddenly narrowed to a sharp point, 1-1½ in. long, ⅓-¼ in. broad, ultimately turning reddish like the spathes. Spathes very narrow, ¾-1½ in. long; racemes on thread-like upwards club-shaped peduncles, slender, up to 1 or more in. long, 5-11-jointed. Sessile spikelets pale-green, linear-lanceolate, acuminate at the apex, more or less convex on the back, about ⅓ in. long; awn ⅓-½ in. long; upper lemma 2-fid beyond the middle: pedicellate spikelets reduced to a minute glume often produced into a bristle-like awn.

Equatoria.

Var. **flaccidum** (A. Rich.) Stapf.

Joints and pedicels ciliate. Lower glume of sessile spikelets more or less hairy on the back, the hairs white.

Equatoria: Imatong Mountains, Katire, 4700 ft.

S. platyphyllum (Franch.) Stapf.

Probably annual herb; culms ascending or erect, many-noded, 3-5 or more ft. high including the panicle. Leaf-sheaths brown, compressed-keeled; ligule membranous, very short, truncate, ciliolate; lamina linear from a suddenly much-contracted round base, very shortly acute, 1½-3½ in. long, ⅓-¼ in. broad. Inflorescences up to 1 ft. long, lax; spathes very narrowly lanceolate to linear, the ultimate ones ½-1 in. long; racemes 2½-3 in. long, very slender, 7-9-jointed. Sessile spikelets lanceolate-linear, about ⅓ in. long; upper lemma 2-fid almost to the base: pedicellate spikelets reduced to an oblong glume ¼ in. long ending in a bristle up to ½ in. long.

Equatoria.

S. urceolatum (Hack.) Stapf.

Annual herb; culms erect, up to 1 ft. high, slender, slightly branched above. Leaf-sheaths glabrous, the uppermost spathe-like; ligule membranous, truncate; lamina reddish, linear, long-acuminate at the apex, in the intermediate leaves up to 2 in. long and ¼ in. broad. Spathes reddish, narrow, inflated above, 1-1½ in. long; racemes purplish, 1-1½ in. long, 6-8-jointed.



Fig. 136—SCHIZACHRIUM EXILE (Hochst.) Stapf.

A, ligule with portion of leaf-sheath and lamina. B, tip of raceme and spathe. B₁, terminal spikelet of raceme dissected. C, pair of spikelets with joint of axis. D, pedicellate spikelet. D₁, pedicellate spikelet dissected. E, sessile spikelet. E₁, sessile spikelet dissected. F, anther.

Sessile spikelets linear-subulate, about $\frac{1}{2}$ in. long; upper lemma 2-fid for $\frac{2}{3}$ of its length; awn $\frac{1}{2}$ - $\frac{2}{3}$ in. long, with a dark column: pedicellate spikelets reddish, barren, lanceolate, $\frac{1}{3}$ - $\frac{1}{2}$ in. long.

Kassala: Gallabat.

S. exile (Hochst.) Stapf.

Fig. 136.

Annual herb; culms clustered, few to many, erect, many-noded, $\frac{1}{2}$ -2 or more ft. high, branched. Leaf-sheaths somewhat loose, the uppermost spathaceous; ligule membranous, short, rounded; lamina green, soon turning red, linear, tapering to an acute point, up to 6 in. long. Spathes narrowly linear-lanceolate, acute, 1-1 $\frac{1}{2}$ or more in. long, at length often turning brilliant-red; racemes sessile in the spathes or on distinct but very short peduncles, 8-12-jointed. Sessile spikelets convex on the back, up to $\frac{1}{2}$ in. long; upper lemma 2-fid for $\frac{2}{3}$ of its length; awn $\frac{1}{2}$ -1 in. long, the column brown, the bristle white: pedicellate spikelets reduced to a lanceolate-subulate glume produced into a bristle-like awn.

Central and Southern Sudan.

S. schweinfurthii (Hack.) Stapf.

Herb; culms 2 or more ft. high, branched above. Leaf-sheaths glabrous; lamina pale-green, narrowly linear, tapering to a long fine point, up to 8 in. long. Inflorescences of few to many branches rising singly or in pairs from the upper nodes; spathes very narrow, up to 2 in. long; racemes green, tinged with purple-brown, 1 $\frac{1}{2}$ -2 or more in. long, up to $\frac{1}{2}$ in. broad, very dense, 16-20-jointed. Sessile spikelets greenish up to the middle, then purplish-brown, lanceolate, acuminate at the apex; upper lemma shortly 2-fid; awn $\frac{2}{3}$ -1 in. long, kneed and loosely twisted below the middle, the bristle whitish: pedicellate spikelets similar to the sessile but slightly broader and purplish all over.

Equatoria.

97. **SCHMIDTIA** Steud.

Schmidtia pappophoroides Steud.

Pilose annual herb; culms ascending, sometimes rooting from the lower nodes. Leaf-sheaths softly pilose; ligule a rim of dense hairs; lamina tapered from a broad base to a long fine point, 4-4 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad, softly pubescent. Panicles narrow, 2 $\frac{1}{2}$ -4 $\frac{1}{2}$ in. long, softly pubescent all over. Spikelets about $\frac{1}{2}$ in. long. Glumes pubescent with some gland-tipped hairs. Lemma broadly obovate, with 5 longish bristles alternating with 4 membranous very acute lobes.

Darfur. Kordofan.

98. **SCHOENEFELDIA** Kunth**Schoenefeldia gracilis** Kunth.

Fig. 137.

Annual herb up to 3 ft. high; culms tufted. Leaf-sheaths loose, glabrous; ligule very short, ciliate; lamina linear, up to 8 in. long, tapered to a fine point, thinly pilose on the upper surface towards the base. Spikes pale-green or golden, solitary or 2-4 together, digitately arranged, slender, up to 6 in. long. Spikelets densely 2-rowed on one side of the flattened rhachis, 1-flowered. Lemma shortly 2-fid, ending in a minutely scabrous slender curved awn about $1\frac{1}{4}$ in. long.

Northern and Central Sudan.



Fig. 137—**SCHOENEFELDIA GRACILIS** Kunth.

A, ligule with portion of leaf-sheath and lamina. B, part of spike from front. C, same from back. D, spikes from front after fall of florets. E, spikelet. F, floret which falls entire. G, spikelet dissected.

99. **SEHIMA** Forsk.**Sehima ischaemoides** Forsk.

Annual herb; culms usually in small clusters, rarely over 1½ ft. high, slender, simple, 2-3-noded. Leaves glaucous; ligule a fringe of stiff hairs; lamina linear, tapering to a long fine point, up to 5 in. long, ½-⅓ in. broad. Racemes usually solitary, 1-3 in. long; joints and pedicels very densely ciliate with white hairs. Sessile spikelets pale-green, linear, ⅓-⅔ in. long; lower glume with an unequally 2-toothed flat and membranous long beak produced into 2 mucros, deeply grooved, acutely 2-keeled; upper glume passing into a fine bristle ½-⅔ in. long; awn up to 1¼ in. long, with a brown spirally twisted column ciliate along the spiral, the bristle whitish.

Northern and Central Sudan.

S. nervosum (Rottl.) Stapf.

Perennial herb, forming dense tufts; culms erect, 2 to over 3 ft. high, slender, terete, about 4-noded, glabrous. Leaf-sheaths glabrous or sparingly hirsute with tubercle-based hairs; ligule a line of short stiff hairs; lamina linear, long-attenuated to a setaceous point, up to over 1 ft. long and ¼ in. broad, more or less scabrous. Racemes solitary, 3-4½ in. long. Sessile spikelets lanceolate-linear to linear, acuminate at the apex, about ½ in. long; awn up to 1¼ in. long, slender, the column spirally twisted: lower glume of pedicellate spikelets slightly 2-toothed.

Equatoria: Kapaeta.

100. **SETARIA** Beauv.

- A. Spikelets usually in clusters or rarely solitary; each cluster or each spikelet if solitary surrounded by an involucre of 1 to many bristles; inflorescence a cylindrical and dense or sometimes lobed spike-like panicle:
- B. Perennial herbs:
- C. Lower floret male with a well-developed palea:
- D. Upper glume 7-9- or rarely 11-nerved *S. lynesii*.
- DD. Upper glume 5-nerved:
- (a) Basal leaf-sheaths flabellate-imbricate
S. anceps var. *sericea*.
- (aa) Basal leaf-sheaths not flabellate-imbricate:
- (b) Culms ⅓-¼ in. in diameter at the base ... *S. sphacelata*.
- (bb) Culms ¼-⅓ in. in diameter at the base *S. splendida*.
- DDD. Upper glume 3-nerved *S. trinervia*.
- CC. Lower floret barren and reduced to its lemma:
- (c) False spikes pale to reddish-fulvous; bristles scabrous but not ciliate:
- (d) Leaf-lamina usually over 1 ft. long, very rigid; culms stiff, up to ½ in. in diameter *S. schweinfurthii*.
- (dd) Leaf-lamina up to 9 in. long, flexuous; culms up to ⅓ in. in diameter *S. restioidea*.

- (cc) False spikes almost black or variegated with black; bristles scabrous and ciliate *S. atrata*.
- BB. Annual herbs:
- E. Upper glume much shorter than the spikelet; bristles yellow to rusty-yellow *S. pallide-fusca*.
- EE. Upper glume as long as or nearly as long as the spikelet:
- F. Bristles upwardly barbed:
- (e) False spikes cylindric, not lobed or interrupted; clusters of spikelets much contracted *S. viridis*.
- (ee) False spikes interrupted or lobed; at least the lower clusters of spikelets elongated *S. ambigua*.
- FF. Bristles downwardly barbed *S. verticillata*.
- AA. Spikelets typically solitary, very rarely paired, each subtended by a single bristle on the elongated branches of a more or less open panicle or with only the upper or uppermost spikelets of a branch so subtended:
- G. Spikelets more or less swollen, frequently brightly coloured or green; leaf-lamina not folded between the primary nerves, up to $\frac{1}{2}$ in. broad:
- (f) Axis of panicle and bristles glabrous *S. longisetata*.
- (ff) Axis of panicle and bristles with long hairs ... *S. lasiothyrsa*.
- GG. Spikelets not swollen, pale-green or -brown or rarely purplish; leaf-lamina folded fan-fashion between the primary nerves where tapering downwards:
- (g) Culms 3-12 ft. high, up to $\frac{1}{2}$ or more in. in diameter at the base; leaf-lamina 1-3 or more ft. long, 1-4 in. broad:
- (h) Spikelets about $\frac{1}{2}$ in. long:
- (i) Inflorescences dense, erect *S. megaphylla*.
- (ii) Inflorescences lax, frequently more or less drooping
S. chevalieri.
- (hh) Spikelets more than $\frac{1}{2}$ in. long *S. caudula*.
- (gg) Culms up to 5 ft. high, relatively slender; leaf-lamina up to 12 in. long and 1 in. broad:
- (j) Upper glume about $\frac{2}{3}$ the length of the spikelet; branches of the panicle divided from the base and bearing short racemes *S. barbata*.
- (ii) Upper glume as long as or almost as long as the spikelet; branches of the panicle mostly simple from the base
S. lancea.

***Setaria lynesii* Stapf & Hubbard.**

Perennial herb; culms erect, up to 5 ft. high, stout, simple, 6-noded. Leaf-sheaths straw-coloured, tough; ligule minute, with a dense fringe of hairs; lamina linear, 7 or more in. long, $\frac{1}{2}$ or more in. broad, firm and rigid. Panicles spike-like, dense, continuous, cylindric, 7-8 in. long, $\frac{1}{2}$ in. broad excluding the bristles; bristles up to 8 or more to each involucre, stiff, rigid, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Spikelets elliptic-oblong, about $\frac{1}{2}$ in. long, $\frac{1}{12}$ in. broad.

Upper Nile Province: opposite Kaka; R. Sobat.

S. anceps var. **sericea** Stapf.

Perennial herb up to 3 or more ft. high, densely tufted on a short rhizome; culms erect or ascending, simple, usually 5-6-noded. Leaf-sheaths firm, laterally compressed and keeled, more or less (often conspicuously) flabellate-imbricate, 1-6 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad; ligule a densely ciliolate rim; lamina linear, tightly folded and acutely keeled, usually unfolding and quite flat in the upper leaves, 4-10 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Panicles spike-like, continuous and usually very dense, bright-yellowish-brown, cylindric, 4-10 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad excluding the bristles; bristles very fine and silky, 7-10 to each involucre, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Spikelets pale or almost white or suffused with livid-purple, elliptic-oblong, $\frac{1}{2}$ in. long.

Equatoria.

S. sphacelata (Schumach.) Stapf & Hubbard.

S. aurea Hochst. ex A. Braun.

Perennial herb 1½-6 ft. high, densely to compactly tufted on a short or rarely elongated and creeping oblique rhizome; culms erect or ascending, 3-5-noded, simple or branched. Leaf-sheaths rather firm, more or less laterally compressed and acutely keeled but not flabellate-imbricate, 3-6 in. long; ligule very short, densely ciliate; lamina linear, tapering to a slender point, $\frac{1}{2}$ -1 or more ft. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Panicles spike-like, erect, dense, continuous, cylindric, mostly brightly coloured, yellow to orange or tawny variegated with pale-green or purple; bristles 6-10 to each involucre, fine, rigid, $\frac{1}{8}$ - $\frac{1}{4}$ in. long. Spikelets pale or more often tinged with livid-purple or violet, elliptic-oblong, up to $\frac{1}{2}$ in. long.

Equatoria.

S. splendida Stapf.

Perennial herb up to 12 or more ft. high, with a stout fibrous rhizome; culms erect, simple or branched below, 6-9-noded. Leaf-sheaths somewhat firm, the lowest ones laterally compressed and acutely keeled but not flabellate-imbricate, the basal and intermediate ones 9-10 in. long; ligule a firm scariosus rim, over $\frac{1}{4}$ in. long, minutely ciliolate; lamina linear, long-tapering upwards, up to 2½ or more ft. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad. Panicles spike-like, dense, continuous, erect, cylindric, tawny-yellow, up to 1 or more ft. long, $\frac{1}{2}$ in. broad excluding the bristles; bristles 7-15 to each involucre, fine, rigid, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Spikelets pale or dull-purple, oblong, up to $\frac{1}{2}$ in. long.

Equatoria.

S. trinervia Stapf.

Densely tufted perennial herb up to over 3 ft. high, densely coated at the base with fibrous-persistent remains of leaf-sheaths; culms erect or ascending, slender, 2-3-noded. Leaf-sheaths more or less compressed and keeled at least upwards, loosely and stiffly hairy

or quite glabrous; ligule very short, ciliate; lamina linear from an equally wide base, tapering to an acute slightly callous point, usually $2\frac{1}{2}$ -6 in. long and $\frac{1}{8}$ - $\frac{1}{4}$ in. broad but sometimes longer. Panicles spike-like, very dense, continuous, cylindric, 2-8 in. long, $\frac{1}{2}$ in. broad excluding the bristles; bristles 8-12 to each involucre, fine, $\frac{1}{8}$ - $\frac{1}{4}$ in. long, bright-fulvous to purplish-brown. Spikelets pale or variously tinged with greyish-purple, elliptic-oblong, about $\frac{1}{2}$ in. long.

Equatoria.

S. schweinfurthii W. Herrm.

Probably perennial herb; culms stiffly erect, up to 4 ft. high, $\frac{1}{2}$ in. in diameter, simple, 4-5- or more-noded, densely silky-villous towards the inflorescence. Leaf-sheaths rather firm, densely long-ciliate along the margins and the mouth; ligule a densely long-ciliate rim; lamina linear, tapering to a long setaceous point, up to 2 or more ft. long, $\frac{1}{2}$ in. broad, firm, rigid, densely long-ciliate towards the base with white hairs. Panicles spike-like, erect, stiff, tawny-yellow, very dense, continuous, cylindric, 5-6 in. long, $\frac{1}{2}$ in. broad excluding the bristles; bristles up to 12 to each involucre, very fine, unequal, up to $\frac{1}{2}$ in. long. Spikelets pale, oblong, $\frac{1}{2}$ in. long.

Equatoria.

S. restioides (Franch.) Stapf.

Tufted perennial herb up to 4 or more ft. high; culms erect, simple, 2-3- or more-noded, silky-villous close to the inflorescence. Leaf-sheaths tight, $2\frac{1}{2}$ - $3\frac{1}{2}$ in. long, the lower ones appressed-pilose to villous with long white hairs; ligule a densely long-ciliate rim; lamina linear, long-attenuated to a very slender point, $2\frac{1}{2}$ -7 or more in. long. Panicles spike-like, yellowish to tawny-yellow, erect, very dense, continuous, cylindric, 3-5 in. long, $\frac{1}{2}$ - $\frac{1}{4}$ in. broad excluding the bristles; bristles yellowish to tawny upwards, whitish below, up to 12 to each involucre, unequal, up to $\frac{1}{2}$ in. long. Spikelets pale, oblong, $\frac{1}{2}$ in. long.

Equatoria.

S. atrata Hack.

Perennial herb up to $4\frac{1}{2}$ ft. high, compactly tufted on a short rhizome; culms erect or suberect, simple, 3-noded. Leaf-sheaths terete, tight, very firm, strongly and closely striate, the basal ones persistent; ligule a densely ciliolate rim; lamina narrowly linear, long-tapering to a slender almost pungent point, $\frac{1}{2}$ -1 ft. or more long, up to $\frac{1}{2}$ in. broad. Panicles spike-like, erect, very dense, continuous or downwards interrupted, cylindric, 3-11 in. long, $\frac{1}{2}$ - $\frac{1}{3}$ in. broad excluding the bristles; bristles subflexuous, rather blunt, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, scabrous and ciliate. Spikelets variegated with purplish-black or brown, slate-colour and white, oblong to broadly lanceolate-oblong, $\frac{1}{2}$ - $\frac{1}{3}$ in. long.

Equatoria.

S. pallide-fusca (Schumach.) Stapf & Hubbard.*S. rubiginosa* (Steud.) Miq.

Tufted annual herb up to 1-2 ft. high, rarely up to 4½ ft. high; culms slender, 3-5-noded, branched from the lower nodes. Leaf-sheaths thin; ligule hyaline, truncate, lacerate-ciliate, often $\frac{1}{4}$ in. long excluding the cilia; lamina linear, long-tapering to a slender point, 2-10 or more in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad. Panicles spike-like, erect, dense, continuous, linear-cylindric, usually tawny or more rarely yellowish or purplish, $\frac{1}{2}$ -3 (or rarely $-.8\frac{1}{2}$) in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad excluding the bristles; bristles about 8 to each involucre, fine, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, pale at the base, mostly tawny or yellowish to orange-red upwards. Spikelets ovate- to elliptic-oblong, $\frac{1}{2}$ in. long, pale-green in flower.

*Widespread.***S. viridis** (L.) Beauv.

Loosely tufted annual herb from a few inches to 12 in. high; culms slender, weak, erect or ascending, mostly 4-5-noded, branching from the base and lower nodes. Leaf-sheaths not keeled or only slightly so upwards, deciduous; ligule reduced to a ciliate rim; lamina pale or dull-green, lanceolate-linear, long-tapering to a very slender point, 1-9 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad, glabrous. Panicles spike-like, greenish, erect, oblong or linear-cylindric, dense, continuous, usually $\frac{1}{2}$ -2 in. long excluding the bristles; bristles pale-greenish, up to 14 to each involucre, up to $\frac{1}{2}$ in. long. Spikelets oblong, $\frac{1}{16}$ - $\frac{1}{12}$ in. long.

*Red Sea Hills. Darfur. Kordofan.***S. ambigua** (Guss.) Guss.

Loosely tufted annual herb up to 1 or more ft. high; culms slender, weak, ascending, about 4-noded, branched from the base and lower nodes. Leaf-sheaths not or only slightly keeled; ligule a ciliate rim; lamina linear-lanceolate, long-tapering to a setaceous point, 2½-6 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. or more broad. Panicles spike-like, erect, interrupted or lobed, 1-3 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad excluding the bristles, greenish; bristles angular downwards, the barbs directed upwards, up to $\frac{1}{2}$ in. long. Spikelets pale-green, oblong, up to $\frac{1}{12}$ in. long.

*Red Sea Hills. Khartoum.***S. verticillata** (L.) Beauv.

Usually loosely tufted annual herb from a few inches to 5 or more ft. high; culms ascending, branched from the base or higher, 4-9-noded. Leaf-sheaths thin; ligule very short, truncate, ciliate; lamina green, linear or lanceolate-linear, long-tapering to an acute point, 2-12 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, thin, usually loosely pilose with tubercle-based hairs. Panicles spike-like, erect, lobed or continuous, straight or twisted, greenish, 1-5 in. long, $\frac{1}{4}$ -1 in.

broad excluding the bristles; bristles rather coarse, the barbs directed downwards, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Spikelets pale-green, oblong, $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. broad.

Northern and Central Sudan.

S. longiseta Beauv.

Perennial herb from a slender short rhizome, up to 5 ft. high; culms erect or ascending, 3-9-noded. Leaf-sheaths moderately firm, more or less ciliate along the margins or towards the mouth only; ligule a ciliate rim; lamina green or somewhat glaucous, linear, from less than 6 in. to 1 or more ft. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad. Panicles contracted and narrow or more or less open, linear to broadly lanceolate, 3-10 in. long, $\frac{1}{2}$ -2 in. broad; bristles pale or purplish upwards, flexuous, up to $\frac{1}{2}$ in. long but mostly much shorter. Spikelets pale or variously tinged with purple, ovate-oblong, more or less oblique and often gaping in profile.

Equatoria.

S. lasiothyrsa Stapf ex Massey.

Perennial herb up to 4 ft. high from a short oblique rhizome; culms erect, slender, simple, about 5-noded, sometimes very loosely and spreading-villous below the nodes. Leaf-sheaths moderately firm, the lower ones much compressed and sharply keeled, ciliate and hirsute upwards with tubercle-based more or less deciduous hairs; ligule a narrow ciliolate rim; lamina linear, long-tapering to a long setaceous point, up to 1 or more ft. long, $\frac{1}{2}$ in. broad, flexuous, finely hirsute on both surfaces. Panicles erect, linear to linear-lanceolate, contracted or open, $\frac{1}{2}$ - $\frac{3}{4}$ ft. long, $\frac{3}{4}$ -2 in. broad. Spikelets pale, faintly tinged with dull-purple, ovate-oblong, $\frac{1}{2}$ in. long.

Equatoria.

S. megaphylla (Steud.) Dur. & Schinz.

S. sulcata (non Raddi) Broun & Massey p.p.

Coarse perennial herb 4-12 ft. high; culms erect or ascending from a stout rhizome, up to $\frac{1}{2}$ in. in diameter at the base, simple or branched, 4- or more-noded. Leaf-sheaths terete, striate, glabrous or more or less hirsute with tubercle-based deciduous hairs; ligule a dense fringe of hairs; lamina linear to lanceolate-linear from a long and gradually attenuated base, tapering to an acute point, up to 3 or more ft. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, rather rigid, closely pleated and often crinkled downwards. Panicles linear to linear-lanceolate, more or less dense and contracted, rarely open, mostly stiff and rigid, up to 2 or more ft. long, 1-5 in. broad; bristles fine, $\frac{1}{2}$ -1 in. long, rough. Spikelets greenish, oblong to lanceolate- or ovate-oblong, mostly $\frac{1}{2}$ in. long.

Equatoria.

S. chevalieri Stapf.

S. sulcata (non Raddi) Broun & Massey p.p.

Coarse perennial herb from a short stout rhizome, 3-10 ft. high; culms erect or ascending from a prostrate base and then rooting from the lower nodes, simple or branched, stout, up to $\frac{1}{2}$ or more in. in diameter, 5- or more-noded. Leaf-sheaths rather tight, more or less appressed-hirsute with tubercle-based deciduous hairs, often with a dense fringe of hairs at the junction with the lamina; lamina green, lanceolate to linear-lanceolate, tapering to a slender point, $1\frac{1}{2}$ -3 or more ft. long, 1-4 in. broad, closely pleated. Panicles linear, linear-oblong or lanceolate, frequently more or less open and lax, up to 1-2 or more ft. long; bristles slender, flexuous, up to 1 in. long, sometimes much reduced. Spikelets green or turning brownish, rarely purplish, oblong to oblong-lanceolate, acute and often apiculate at the apex, usually about $\frac{1}{3}$ in. long.

Equatoria.

S. caudula Stapf.

Coarse perennial herb up to 10 ft. high from a short oblique rhizome; culms erect or ascending, sparingly branched, stout, up to $\frac{1}{2}$ in. in diameter at the base, 6- or more-noded. Leaf-sheaths long, very firm, strongly and closely striate, glabrous or sparingly hirsute with tubercle-based deciduous hairs, rigidly ciliate along the margins; ligule a densely ciliate rim; lamina lanceolate to linear-lanceolate, tapering to a slender point, up to 2 in. broad, closely pleated downwards. Panicles large, contracted or downwards interrupted, up to over 2 ft. long; bristles fine, flexuous, up to $\frac{1}{2}$ in. long. Spikelets pale-olive-brown, lanceolate, over $\frac{1}{3}$ in. long.

Equatoria.

S. barbata (Lam.) Kunth.

Annual herb up to 6 ft. high; culms erect or ascending, sometimes from a long prostrate and rooting base, in tall specimens up to $\frac{1}{2}$ in. diameter, 3-4- to many-noded, more or less branched. Leaf-sheaths finely keeled, ciliate, the node finely pubescent or glabrous; ligule a densely ciliate rim; lamina lanceolate to linear, tapering to a fine setaceous point, 3-12 in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad, closely pleated when young. Panicles linear to linear-oblong, usually rather loose and often irregularly interrupted, usually 5-9 in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. broad; bristles greenish, rarely purplish, very slender, very unequal, up to $\frac{1}{2}$ or more in. long. Spikelets plump, pale-green or sometimes tinged with dull-purple, broadly oblong or ovate or elliptic-oblong, about $\frac{1}{3}$ in. long.

Kordofan. Equatoria.

S. lancea Stapf ex Massey.

Annual herb; culms slender, $1\frac{1}{2}$ or more ft. high, ascending, loosely branched, up to 4- or more-noded. Leaf-sheaths much compressed, thin, 3-4 in. long, ciliate upwards, usually bearded at the node, more or less beset with tubercle-based hairs; ligule a densely ciliate rim; lamina lanceolate from a contracted base, finely long-acuminate at the apex, 5-10 in. long, $\frac{1}{4}$ -1 in. broad, pleated fan-fashion but eventually flattening out. Panicles erect, lanceolate or oblong, about 5 in. long, 1 in. broad; bristles pale-green or purplish, very unequal, $\frac{1}{2}$ - $\frac{1}{4}$ in. long. Spikelets greenish, lanceolate-oblong, dorsally compressed, up to $\frac{1}{8}$ in. long.
Upper Nile Province.

101. **SNOWDENIA** C. E. Hubbard**Snowdenia polystachya** (Fresen.) Pilg.

Annual or perennial herb; culms 5 or more ft. high. Leaf-sheaths with tubercle-based hairs on the margins; ligule membranous, truncate; lamina linear, flat, narrowed at both ends, up to 10 in. long and $\frac{1}{2}$ in. broad. Inflorescences cylindric, spike-like, up to 2 in. long. Spikelets oblong, the lower lemma hairy at the apex and produced into an awn about as long as itself.
Fung District.

102. **SORGHASTRUM** Nash**Sorghastrum bipennatum** (Hack.) Pilg.

Sorghum bipennatum (Hack.) Kuntze.

Annual herb up to 4 ft. high; culms erect or ascending, slender, often rooting from the lowest nodes, sparingly branched below or simple. Leaf-sheaths produced into auricles along the ligule; ligule short, truncate, scarious, up to $\frac{1}{2}$ in. long; lamina linear, long-attenuated to a fine point, narrowed towards the base, up to 1 ft. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Panicles linear-oblong, up to 7 in. long, rather lax; racemes reduced to a solitary spikelet accompanied by 2 slender ciliate pedicels $\frac{1}{2}$ in. long. Spikelets broad-lanceolate, $\frac{1}{2}$ in. long.

Equatoria.

103. **SORGHUM** Moench¹

A. Annual herbs:

B. Primary branches of panicle divided; sheath-nodes finely appressed-pubescent, not bearded:

C. Panicles very narrow and long; branches erect or suberect, the lowest often up to 6 in. long; culms slender

S. virgatum.

¹For an account of the cultivated Sorghums, many of which are grown in the Sudan, see *The Cultivated Races of Sorghum*, by J. D. Snowden: London (1936). Hybrids between wild and cultivated species may occur.

- CC. Panicles usually wide and loose, pyramidal when fully expanded or rarely narrow and linear-oblong; culms mostly stout:
- D. Sessile spikelets lanceolate, acutely acuminate at the apex *S. lanceolatum*.
- DD. Sessile spikelets oblong- to elliptic- or ovate-lanceolate or ovate:
- E. Panicles more or less pyramidal, very large; sessile spikelets not white-silky:
- F. Leaf-lamina up to $\frac{1}{2}$ in. broad, long-attenuated towards the base; pedicellate spikelets persistent
S. sudanense.
- FF. Leaf-lamina often over $\frac{1}{2}$ in. and up to 2 in. broad, rather broad and often rounded at the base; pedicellate spikelets deciduous:
- (a) Sessile spikelets elliptic-ovate to elliptic-orbicular; racemes tough *S. niloticum*.
- (aa) Sessile spikelets elliptic-lanceolate; racemes fragile ...
S. verticilliflorum.
- EE. Panicles obovate-oblong to oblong or linear-oblong in outline:
- (b) Panicles obovate-oblong in outline, large
S. macrochaeta.
- (bb) Panicles oblong to linear-oblong, narrow
S. aethiopicum.
- BB. Primary branches of panicle simple; sheath-nodes (especially the upper ones) with long spreading hairs:
- (c) Lower glume of sessile spikelets wholly coriaceous, at length black excepting the very base and the tip
S. purpureosericeum.
- (cc) Lower glume of sessile spikelets firmly coriaceous and usually dark-brown or almost black up to the middle, then abruptly thinner, chartaceous and green
S. dimidiatum.
- AA. Perennial herb with a stout underground rhizome ... *S. halepense*.

Sorghum virgatum (Hack.) Stapf.

Tunis Grass.

Annual herb; culms slender, few-noded, 1-6 or more ft. high, $\frac{1}{8}$ - $\frac{1}{4}$ (or rarely $\frac{3}{8}$) in. in diameter. Leaf-sheaths finely and densely silky-pubescent at the node; ligule $\frac{1}{2}$ in. long, thin; lamina green, sometimes tinged with red, narrowly linear, gradually attenuated to the base, 6-18 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ (rarely $\frac{3}{8}$) in. broad. Panicles very narrow, $\frac{1}{2}$ -2 or more ft. long; racemes fragile, few- to 7-noded, up to $1\frac{1}{2}$ in. long; joints white-ciliate. Sessile spikelets pale-straw-coloured, greenish in the upper half, narrowly lanceolate, acute at the apex, finely awned.

Northern and Central Sudan.

S. lanceolatum Stapf.

Annual herb; culms rather slender, up to 10 ft. high. Leaf-sheaths delicately pubescent at the node; ligule very short; lamina pale-green, flushed with purple, linear to linear-lanceolate from a rather broad and often rounded base, up to 15 in. long and 1 in. broad, glabrous except for a zone of hairs behind the ligule. Panicles ovate-oblong to lanceolate in outline, loose, 9-15 in. long; racemes fragile, 2-4-noded, up to 1 in. long. Sessile spikelets straw-coloured, lanceolate, acutely acuminate at the apex, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{12}$ - $\frac{1}{10}$ in. broad, on maturity turning bright-red or brownish-red below the middle or upper third, finely awned. *Kassala: Gash Delta. Southern Sudan.*

S. sudanense (Piper) Stapf.

Sudan Grass.

Annual herb; culms rather slender, 6-10 ft. high, about 9-noded, glabrous. Leaf-sheaths very finely and densely silky-pubescent at the node; ligule membranous, $\frac{1}{12}$ in. long; lamina dull-green, flushed or mottled with purple, linear, in the lower leaves long-attenuated towards the base, 6-12 in. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Panicles ovoid-pyramidal, erect, 6-12 in. long, up to 6 in. broad; racemes fragile, few- to 5-noded, up to 1 in. long. Sessile spikelets pale-straw-coloured to pale-yellow with a greenish striate tip, lanceolate to elliptic-oblong when young, $\frac{1}{4}$ in. long, $\frac{1}{10}$ in. broad, awned.

Northern Sudan. Khartoum.

S. niloticum (Stapf) Snowden.

S. verticilliflorum (non Stapf) Broun & Massey.

Annual herb; culms about 8 ft. high, rather stout. Leaves many; lamina linear, tapering gradually to a subacuminate apex, somewhat narrowed towards the base, in the uppermost leaves 6-14 in. long and up to $1\frac{1}{4}$ in. broad, the margin spinulously scabrid upwards. Panicles oblong or elliptic-oblong, loose, 6-16 in. long, 3-6 in. broad; racemes tough, 2-6-noded, up to 1 in. long. Sessile spikelets straw-yellow to deep-cream or tawny, at length often mahogany-red to almost black, awned or with a short bristle.

Southern Sudan.

S. verticilliflorum (Steud.) Stapf.

Fig. 138.

Annual herb; culms 4-8 ft. high. Leaf-sheaths delicately pubescent at the node; ligule up to over $\frac{1}{12}$ in. long, scarious, hairy on the back; lamina linear from a broad rounded and often clasping base, long-attenuated upwards, up to $1\frac{1}{2}$ ft. long, rarely much over 1 in. broad. Panicles oblong to ovoid-oblong, often rather contracted and more or less nodding at first, then spreading out and more erect, up to 15 in. long and ultimately 6-9 in. broad; racemes fragile, up to 5- but mostly 2-3-noded, rarely over $\frac{3}{4}$ in. long. Sessile spikelets straw-coloured, greenish towards the tip, ultimately turning bright-blackish-red particularly below, $\frac{1}{2}$ in. long, up to $\frac{1}{4}$ in. broad, with an awn $\frac{1}{2}$ - $\frac{3}{4}$ in. long.

Equatoria.



Fig. 138—SORGHUM VERTICILLIFLORUM (Stued.) Stapf.

A, pedicellate and sessile spikelets. B, lower glume of sessile spikelet.
C, upper glume of sessile spikelet. D, grain.

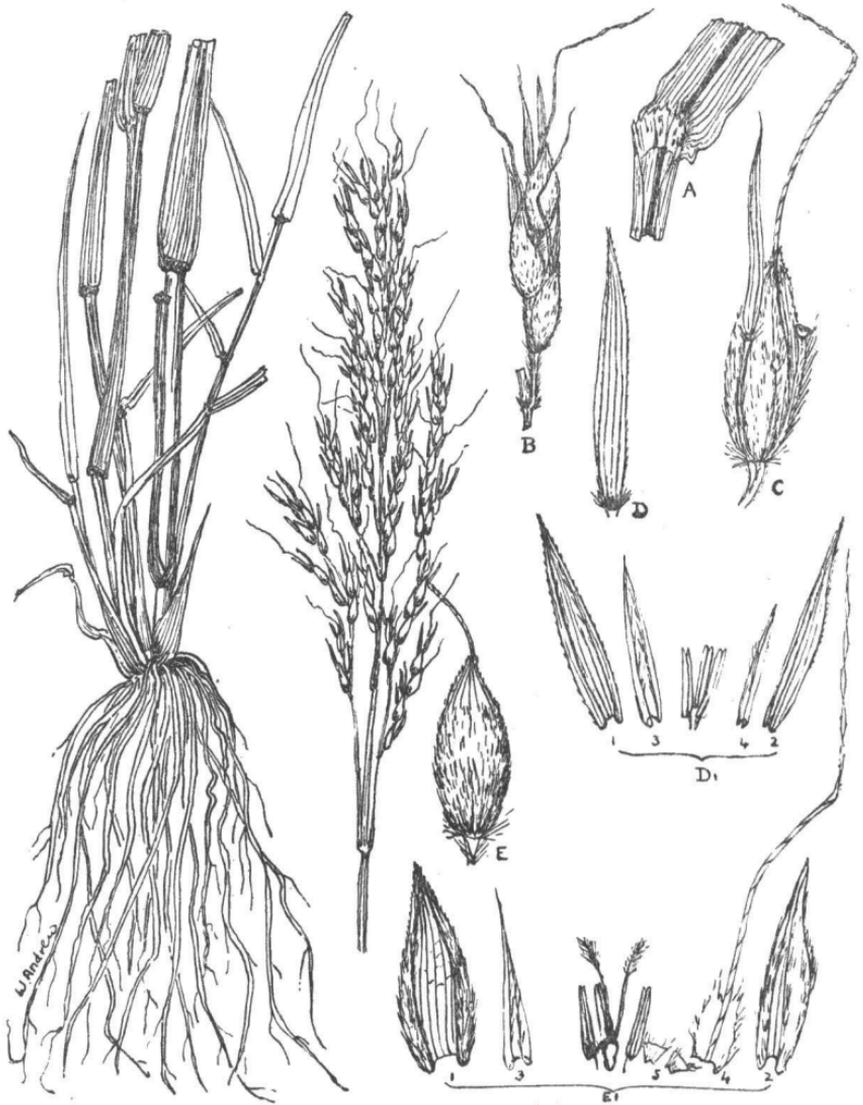


Fig. 139—SORGHUM AETHIOPICUM (Hack.) Rupr. ex Stapf.

A, ligule with portion of leaf-sheath and lamina. B, raceme. C, pedicellate and sessile spikelets with joint of axis. D, pedicellate spikelet. D₁, pedicellate spikelet dissected. E, sessile spikelet. E₁, sessile spikelet dissected.

S. macrochaeta Snowden.

S. abyssinicum (Piper) Stapf, non Kuntze; *S. arundinaceum* (non Stapf) Broun & Massey.

Annual herb; culms tall, stout. Leaf-sheaths delicately silky-pubescent at the node; ligule very short, scarious, dark-brown, pubescent on the back; lamina in the upper leaves lanceolate-linear, long-attenuate to a fine point, up to 2 ft. long and $2\frac{1}{2}$ in. broad, pubescent to tomentose at the base of the ligule, the midrib very stout. Panicles obovate-oblancheolate in outline, over 1 ft. long and 3 in. broad, contracted, erect; racemes 1-3-noded, almost up to 1 in. long. Sessile spikelets ovate-lanceolate to elliptic-oblong, about $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, awned.

Kassala. Equatoria.

S. aethiopicum (Hack.) Rupr. ex Stapf.

Fig. 139.

Annual herb; culms slender, up to 10 in. high. Leaf-sheaths delicately silky-pubescent at the nodes; ligule scarious, up to $\frac{1}{2}$ in. long, more or less pubescent on the back; lamina pale-green, usually strongly flushed with red or purple, linear to linear-lanceolate from a broad rounded or almost subcordate base, long or shortly tapering to an acute apex, up to over 1 ft. long and over 1 in. broad, with a tomentose zone behind the ligule, the midrib rather slender. Panicles narrow, linear to linear-oblong, up to over 1 ft. long, contracted or loose below, often secund; racemes fragile, 1-3- (rarely 4-) noded, up to $\frac{3}{4}$ in. long. Sessile spikelets clay-coloured, finally often reddish below, ovate to elliptic-lanceolate, acute or subacute at the apex, $\frac{1}{4}$ in. long, $\frac{1}{2}$ in. broad, awned.

Northern and Central Sudan.

S. purpureosericeum (Hochst.) Aschers. & Schweinf.

Fig. 140.

Annual herb, erect, up to 3 or more ft. high; culms somewhat stout, simple or almost so, appressed-silky below the nodes, 3-4-noded. Leaf-sheaths scarious, the lower ones more or less softly hirsute upwards, all with a dense beard $\frac{1}{2}$ in. long at the node and a short dorsal transverse one at the junction with the lamina; ligule very short, truncate, ciliate and with long hairs from the back; lamina linear, attenuated to a fine point, up to 9 in. long and $\frac{1}{2}$ in. or more broad, softly hirsute on both surfaces, the midrib prominent and white below. Panicles oblong, about 4 in. long, rather loose; racemes rather stout, rather tough, 4-noded, bearded at the nodes, up to 1 in. long. Sessile spikelets lanceolate, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad; glumes pale-straw-coloured or dark-brown or at length deep-glossy-black; awn up to 2 in. long, twisted in the middle, with a dark-brown column minutely ciliate along the spiral, the bristle pale.

Central Sudan.



Fig. 140—SORGHUM PURPUREOSERICUM (Hochst.) Aschers. & Schweinf.
 A, raceme. B, pedicellate and sessile spikelets. C, ligule with portion of leaf-sheath and lamina. D, pedicellate spikelet. D₁, pedicellate spikelet dissected.
 E, sessile spikelets. E₁, sessile spikelet dissected.

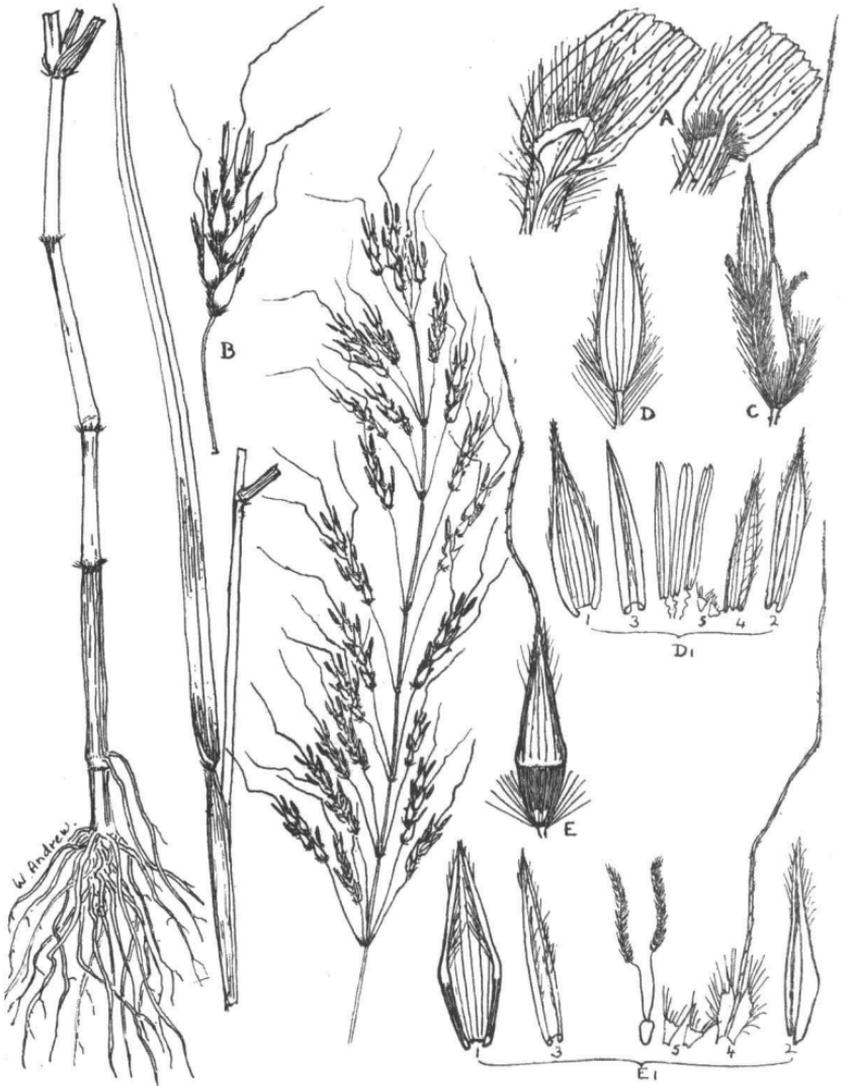


Fig. 141—SORGHUM DIMIDIATUM Stapf.

A, ligule with portion of leaf-sheath and lamina. B, raceme. C, pedicellate and sessile spikelets with joint of axis. D, pedicellate spikelet. D, pedicellate spikelet dissected. E, sessile spikelet. E₁, sessile spikelet dissected.

- (ff) Panicles broader, oblong; racemes $1\frac{1}{2}$ - $2\frac{1}{4}$ in. long; leaves not very glaucous and rigid *S. robustus*.
- (ee) Glumes much shorter than the spikelet *S. pyramidalis*.
- DD. Panicles very delicate and lax with thread-like branches and often thread-like pedicels:
- (g) Spikelets $\frac{1}{2}$ in. long, very acute at the apex; lower glume $\frac{1}{3}$ as long as the spikelet; perennial herb
S. stapfianus.
- (gg) Spikelets less than $\frac{1}{2}$ in. long, at most subacute:
- (h) Perennial herb; upper glume about $\frac{1}{2}$ as long as the spikelet *S. festivus*.
- (hh) Annual herb; upper glume less than $\frac{1}{2}$ as long as the spikelet *S. pectinellus*.

Sporobolus spicatus (Vahl) Kunth.

Perennial herb; culms rigid, jointed, $\frac{1}{2}$ - $1\frac{1}{2}$ ft. high, growing in small tufts on long runners. Leaves mostly basal; lamina rigid, wiry, subulate. Panicles cylindrical, 2-3 in. long. Spikelets not pedicellate, glossy.

Red Sea District. Upper Nile Province.

S. marginatus Hochst. ex A. Rich.

Perennial herb, with long runners; culms about 1 ft. high. Leaf-laminas narrow-lanceolate, tapered to an acute point, about $2\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad. Panicles about 4 in. long, $1\frac{3}{4}$ in. broad; racemes up to 1 in. long. Spikelets linear-lanceolate, up to $\frac{1}{2}$ in. long.

Blue Nile Province.

S. schweinfurthii Stapf.

Perennial herb; culms erect, 1 or more ft. high, 4-noded. Leaf-sheaths glabrous; ligule a ciliate line; lamina glaucous, linear, long-attenuate at the apex, up to 10 in. long, $\frac{1}{2}$ in. broad, serrulate on the margin. Panicles oblong, erect, 12 in. long, $\frac{3}{4}$ - 1 in. broad. Spikelets purple, lanceolate-oblong, $\frac{1}{2}$ - $\frac{1}{3}$ in. long.

Equatoria.

S. scabriflorus Stapf ex Massey.

Annual herb 6-18 in. high; culms frequently branched. Leaf-sheaths glabrous; ligule a densely ciliolate rim; lamina linear-lanceolate, long-attenuate at the apex, almost rounded at the base, 1-5 in. long, $\frac{1}{2}$ in. broad, spinulose on the margin. Panicles up to 4 in. long, 2 in. broad, lax, open. Spikelets $\frac{1}{2}$ - $\frac{1}{3}$ in. long.

Equatoria.

S. humifusus var. **cordofanus** Stapf ex Massey.

Tufted annual herb; culms up to 1 or more ft. high, slender, jointed. Leaf-laminas narrowly lanceolate, about 1 in. long, bordered with fine scattered white tubercle-based hairs. Panicles 2 in. long, 1 in. broad, fairly compact; racemes fine, about $\frac{3}{4}$ in. long. Spikelets up to $\frac{1}{2}$ in. long.

Central Sudan.

S. centrifugus Nees.

Herb, often arising after bush fires; culms up to 15 in. high. Leaf-laminas setaceous. Panicles 1½-2 in. long, about ¼ in. broad; racemes very small, with 3-4 spikelets. Spikelets elliptic-oblong, acuminate.

Equatoria.

S. panicoides A. Rich.

Annual herb; culms up to 18 in. high. Leaf-laminas narrowly lanceolate, finely acuminate at the apex, up to 4 in. long, ½ in. broad. Panicles about 3 in. long, somewhat triangular in outline; racemes 3 in. long. Spikelets linear-lanceolate, up to ½ in. long.

Darfur: Jebel Marra.

S. helvolus (Trin.) Dur. & Schinz.

S. glaucifolius (Steud.) Hochst. ex Dur. & Schinz.

Densely tufted perennial herb, grey-green and covered with a waxy bloom; culms 12-18 in. high, many-jointed, woody and bent below. Leaf-laminas about 4 in. long, ½ in. broad. Panicles interrupted, 3-5 in. long, very pale. Spikelets up to ⅙ in. long, very shortly stalked.

Widespread.

S. robustus Kunth.

Stout perennial herb; culms 3-8 ft. long from an often prostrate and rooting base. Leaf-laminas ½-1½ ft. long, ¼-½ in. broad, covered with weak white hairs. Panicles erect, diffuse, 9-10 in. long, subpyramidal; racemes 1½-2½ in. long. Spikelets pedicellate, ⅙ in. long, appressed.

Red Sea District. Darfur.

S. pyramidalis Beauv.

Large robust herb 3-6 ft. high; culms glabrous, unbranched. Leaf-laminas narrowly linear, up to 18 in. long, strongly ribbed. Panicles ½-1½ ft. long, 1-2 in. broad; branches fine, 1-2 in. long. Spikelets about ⅙ in. long, very shortly stalked, crowded on the branches of the panicle.

Central and Southern Sudan.

S. stapfianus Gandog.

S. festivus var. *stuppeus* Stapf.

Tufted perennial herb ½-1 ft. high, with persistent leaf-sheaths at the base. Leaf-laminas up to 6 in. long, setaceous. Panicles short, ovate in outline, up to 3½ in. long; racemes up to 1½ in. long. Spikelets ⅙ in. long. Lower glume ½ as long as the spikelet.

Equatoria.

S. festivus Hochst. ex A. Rich.*S. festivus* var. *fibrosus* Stapf ex Massey.

Tufted perennial herb $\frac{1}{2}$ -1 or more ft. high. Leaves mostly basal, the sheaths persisting; lamina up to 3 in. long, narrowly linear-lanceolate, almost setaceous. Panicles 2-6 or more in. long, $1\frac{1}{2}$ or more in. broad, very loose and spreading, erect. Spikelets $\frac{1}{2}$ in. long, on very slender pedicels.

*Central and Southern Sudan.***S. pectinellus** Mez.

Annual herb; culms erect, up to 15 in. high but usually smaller. Leaf-laminas narrowly lanceolate, up to $1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad. Panicles oblong, 4 in. long, 2 in. broad; racemes about 1 in. long. Spikelets about $\frac{1}{4}$ in. long.

*Equatoria.*105. **STREPTOGYNA** Beauv.**Streptogyna crinita** Beauv.

Perennial herb; culms erect. Leaf-sheaths ciliate upwards, closely nerved; ligule triangular, brownish; lamina lanceolate, tapered to a fine point, up to 10 in. long, $1\frac{1}{4}$ in. broad, narrowed at the base into a petiole up to $\frac{2}{3}$ in. long. Spikelets about 1 in. long, narrow, 1-4-flowered, erect, overlapping in erect unilateral spikes with a puberulous rhachis flattened on one side. Styles long-exserted, with scabrous branches.

*Equatoria.*106. **TETRAPOGON** Desf.**Tetrapogon spathaceus** (Hochst.) Hack.*Chloris spathacea* Hochst. ex Steud.

Densely tufted perennial herb up to 1 ft. high; culms suberect, simple or branched. Leaf-sheaths pilose at the mouth; ligule very shortly ciliate; lamina narrowly linear, 1-3 in. long, ciliate with long hairs towards the base. Spikes purplish, up to $2\frac{1}{2}$ in. long, solitary or rarely in pairs, wholly or partly enclosed in spathe-like finally deciduous leaf-sheaths. Spikelets alternate, turgid, 4-5-flowered. Awns up to $\frac{3}{8}$ in. long.

*Northern and Central Sudan.***T. villosus** Desf.*Chloris villosa* (Desf.) Pers.

Somewhat tufted perennial herb up to 2 or more ft. high; culms slender. Leaf-laminas very narrow, 1-3 in. long. Spikes solitary, up to 3 in. long. Spikelets very dense on the rhachis, about $\frac{1}{2}$ in. long, 4-awned. Glumes very hairy. Awns up to $\frac{1}{2}$ in. long.

Red Sea District.



Fig. 142—THELEPOGON ELEGANS Roth.
A and B, spikelets with joints of axis.

107. **THELEPOGON** Roth**Thelepogon elegans** Roth.

Fig. 142.

Annual herb; culms erect from a frequently rooting base, up to 2 or more ft. high, 6-9-noded. Leaf-sheaths loose; ligule ciliolate; lamina lanceolate or linear-lanceolate from a broad and often amplexicaul cordate base, up to 10 in. long, 1 or more in. broad. Racemes pale-green, 2-6 in. long, 2-12 or more together, digitately or subcorymbosely arranged, all with scabrous or hispidulous peduncles. Spikelets with a short annuliform ciliate callus, about $\frac{1}{2}$ in. long, ovate-oblong; glumes subequal, the lower minutely 2-toothed and transversely rugose most prominently towards the margin. Awn up to 1 in. long, slender, kneed and twisted below the middle; column dark-brown; bristle yellowish.

Central Sudan.

108. **THEMEDA** Forsk.**Themeda triandra** var. **hispida** Stapf.

Fig. 143.

Densely tufted perennial herb up to 5 ft. high; culms glabrous, erect or ascending, often bearing short barren branches. Leaf-sheaths keeled; ligule scarious, truncate, ciliolate; lamina linear from a broad base, tapered to a slender point, up to 8 in. long. Spatheate panicles narrow, erect, the branches very slender; spatheoles compressed, boat-shaped, up to 2 in. long, with tubercle-based hairs; racemes with a single awned fertile spikelet.

Darfur. Equatoria.

109. **TRACHYNIA** Link**Trachynia distachya** (L.) Link.

Annual herb $\frac{1}{2}$ -2 ft. high; culms ascending, leafy to or below the middle. Leaves linear, 2-2 $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, hairy. Spikelets 1-6 to a raceme, oblong-linear, 1-1 $\frac{1}{2}$ in. long, 6-16-flowered, glabrous or puberulous. Glumes acute. Lemma linear-lanceolate, prominently 5-7-nerved, ciliate towards the apex, ending in a straight awn.

Red Sea Hills.

110. **TRAGUS** Haller**Tragus paucispina** Hack.

Small tufted annual herb up to 8 in. high but usually smaller. Leaf-sheaths glabrous; lamina up to 1 $\frac{1}{2}$ in. long, glabrous, spinose on the margin. Panicles spike-like, dense, 1-2 in. long. Spikelets about $\frac{1}{2}$ in. long. Lower glume minute or suppressed; upper glume with rows of strong hooked spines along the prominent ribs.

Northern Sudan: between Suakin and Berber. Khartoum.



Fig. 143—THEMEDA TRIANDRA var. HISPIDA Stapf.

A, ligule. B, cluster of spikelets projecting from spathe (partly cut off); B₁, sessile sterile spikelets; B₂, sessile perfect spikelet with awn; B₃, pedicellate sterile spikelet. C, enlargement of B₂ (C₁) and B₃ (C₂).

T. racemosus (L.) All.

Annual herb; culms ascending. Leaf-sheaths loose, increasing in length upwards, the top one embracing the inflorescence and with a much-reduced lamina; ligule a delicate ciliate rim; lamina linear to narrowly lanceolate from a broadish base, glaucous-green, setose-ciliate. Panicles spike-like, cylindric, 2½-6 in. long. Spikelets crowded. Lower glume minute or suppressed; upper glume completely enveloping the floret, 5-ribbed, the ribs covered with rows of stout curved bristles.

Kordofan.

T. berteronianus Schult.

T. racemosus (non All.) Broun & Massey p.p.

Tufted herb; culms ascending, about 1 ft. long, leafy, glabrous. Ligules pilose; lamina lanceolate, undulate, up to 1½ in. long, ¼ in. broad, ciliate at the base, spinose on the margin. Panicles spike-like, cylindric, 2-3 in. long. Lower glume minute or suppressed; upper glume covered with rows of stout curved bristles. *Northern and Central Sudan.*

111. **TRICHOLAENA** Schrad.**Tricholaena leucantha** (A. Rich.) Hochst. ex Aschers. & Schweinf.

Perennial herb; culms erect or ascending, loosely tufted, up to 3½ ft. high, many-noded, usually branched. Leaf-sheaths tight or loose; ligule a densely ciliate rim; lamina linear, tapering to a fine callous apex, 1½-7 in. long, up to ½ in. broad. Panicles linear, lanceolate or ovate in outline, dense to very loose, 3-6½ in. long, ½-1½ in. broad, silky-hairy. Spikelets lanceolate-oblong to oblong, about ½ in. long, loosely pilose, pale to purplish.

Red Sea District.

T. teneriffae (L. f.) Parl.

T. micrantha Schrad.

Perennial herb; culms erect or ascending from a woody rootstock, ¾-2 ft. high, slender, many-noded. Leaf-sheaths firm, silky-hairy at the base; ligule a ciliate rim; lamina linear, tapering to a callous point. Panicles linear to oblong or ovate in outline, contracted or loose, 1-4½ in. long, ¼-1½ in. broad. Spikelets pale-green or purplish, ovate to oblong, ¼ or more in. long, long and loosely silky-pilose.

Red Sea District. White Nile.

112. **TRICHONEURA** Anderss.**Trichoneura arenaria** (Steud.) Ekman.

Laxly tufted annual herb; culms ascending, up to 8 in. long. Leaf-laminas linear, acuminate at the apex, ¾-1½ in. long, ¼ in. broad, glabrous. Panicles exserted, narrowly oblong-lanceolate, 2¾-3½ in. long, ¼ in. broad, contracted, dense. Spikelets ¼-½ in. long. Glumes long-pilose.

Red Sea District: Soturba. Darfur.

113. **TRIPOGON** Roth**Tripogon snowdenii** C. E. Hubbard.

Densely tufted perennial herb $\frac{1}{2}$ -2 ft. high; culms erect, slender, simple, 1-2-noded. Leaves generally basal; sheath up to 4 in. long, pallid; ligule a minute ciliate rim; lamina green, thread-like, $2\frac{1}{2}$ -10 in. long, rigid. Spikes solitary, slender, 2-7 $\frac{1}{2}$ in. long. Spikelets grey-olive, subsessile, alternate, laxly arranged, oblong or narrowly oblong, $\frac{2}{3}$ - $\frac{3}{4}$ in. long. Glumes lanceolate, acute, 1-nerved.

Equatoria: Imatong Mountains.

T. minimus (A. Rich.) Hochst. ex Steud.

Densely tufted herb up to 6 in. high. Leaf-laminas very narrow, $1\frac{1}{4}$ - $1\frac{1}{2}$ in. long, glabrous or thinly pilose. Spikes very slender and delicate, 2-3 times as long as the leaves, on slender peduncles. Spikelets loosely overlapping, about $\frac{1}{6}$ in. long. Glumes narrowly lanceolate, acute.

Kassala: Gallabat. Darfur: Wadi Afiru.

114. **TRIRAPHIS** R. Br.**Triraphis pumilio** R. Br.

T. nana (non Hack.) Broun & Massey.

Annual herb about $3\frac{1}{2}$ in. high, branched from the base. Leaf-sheaths pilose with long bulbous-based hairs; lamina tapered to a fine setaceous point, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long. Spikelets pedicellate in dense spike-like panicles $\frac{3}{4}$ -1 in. long and up to $\frac{2}{3}$ in. broad. Lemma lobed, 3-awned, long-ciliate; awns fine, bristle-like.

Red Sea District: between sea-level and 4000 ft.

115. **URELYTRUM** Hack.**Urelytrum thysioides** Stapf.

Perennial herb up to 8 or more ft. high; culms erect, up to $\frac{1}{2}$ in. in diameter, glabrous, 5- or more-noded. Leaf-sheaths firm; ligule about $\frac{1}{2}$ in. long, ciliate with long hairs from the back; lamina linear, long-tapering to a fine point, up to 3 ft. long and over 1 in. broad. Racemes numerous on a common axis up to more than 10 in. long, slender, in whorls except the lowermost which are solitary or opposite, up to 6 in. long. Lower glume of pedicellate spikelets with or without a pubescent bristle-like awn up to $\frac{1}{2}$ in. long.

Equatoria.

116. **UROCHLOA** Beauv.***Urochloa trichopus*** (Hochst.) Stapf.

Annual herb, forming small tufts, 1-3 ft. high; culms erect or ascending, simple or rarely branched, 4-8-noded. Leaf-sheaths ciliate along the outer margins, silky-pubescent at the node; ligule a densely ciliate rim; lamina linear-lanceolate to lanceolate from a broad often amplexicaul base, tapering to an acute point, $2\frac{1}{2}$ -6 or more in. long, $\frac{1}{3}$ -1 in. broad. Inflorescences of 4-9 sessile or subsessile spike-like secund racemes; racemes very dense, 2-rowed, up to $2\frac{1}{2}$ in. long, solitary. Spikelets very close, imbricate, broad-ovate, $\frac{1}{3}$ - $\frac{1}{2}$ in. long. Lower glume almost as long as the upper.

Red Sea District. Kordofan.

U. holbodes (Hochst.) Stapf.

Perennial herb, forming dense tufts from a short usually tomentose rhizome, 1-2 or more ft. high; culms about 3-noded. Leaf-sheaths usually tight, more or less densely tomentose; ligule a dense ciliate fringe; lamina linear, 6-9 in. long, about $\frac{1}{4}$ in. broad, finely grey-pubescent. Inflorescences terminal, of few to many sessile or subsessile spike-like secund racemes; racemes dense, 2-4-rowed, $\frac{1}{3}$ - $2\frac{1}{2}$ or more in. long. Spikelets pale-green or fringed with purple, usually crowded, lanceolate-ovate to lanceolate, acutely acuminate at the apex, about $\frac{1}{2}$ in. long. Lower glume over $\frac{1}{2}$ the length of the spikelet; upper glume 7-nerved.

Blue Nile Province.

U. panicoides Beauv.***U. helopus*** (Trin.) Stapf.

Tufted annual herb 1-2 ft. high; culms erect or ascending, frequently sparingly branched from the lower nodes, 4-10-noded. Leaf-sheaths pale, densely ciliate upwards, more or less shortly hirsute with tubercle-based hairs; ligule a densely ciliate rim; lamina lanceolate to linear-lanceolate from a wider and semi-amplexicaul base, $1\frac{1}{2}$ -6 or more in. long, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad. Inflorescences mostly of 4-7 sessile or subsessile spike-like secund racemes; racemes moderately dense, 2-rowed, 1-2 in. long. Spikelets greenish, laterally contiguous or subcontiguous, ovate- to elliptic-oblong, very acute, about $\frac{1}{2}$ in. long. Lower glume less than $\frac{1}{2}$ the length of the spikelet.

Northern Sudan. Equatoria: near Kapoeta.

117. **UROCHONDRA** C. E. Hubbard***Urochondra setulosa*** (Trin.) C. E. Hubbard.

Densely tufted perennial herb $\frac{1}{2}$ -3 ft. high, with a short rhizome; culms rigid, 1-3-noded, simple. Leaf-sheaths with persistent bases; lamina linear, rolled, pungent at the apex, up to 12 in. long, $\frac{1}{4}$ in. broad when flattened out, the nerves densely and very shortly



Fig. 144—*VETIVERIA NIGRITANA* (Benth.) Stapf.

A, ligule. B, raceme. C, pedicellate and sessile spikelets with joint of axis.
 D, pedicellate spikelet. D₁, pedicellate spikelet dissected. E, sessile spikelet.
 E₁, sessile spikelet dissected.

pilose. Panicles yellow or purple-tinged, exerted, dense and spike-like, cylindrical, $1\frac{3}{4}$ - $6\frac{1}{2}$ in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. in diameter. Spikelets $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Grain about $\frac{1}{12}$ in. long, with a prominent beak at the apex.

Red Sea District.

118. **VETIVERIA** Lem.-Lisanc.

Vetiveria nigritana (Benth.) Stapf.

Fig. 144.

Perennial herb, with an aromatic rhizome; culms stout, up to 6 or more ft. high, usually sheathed all along. Leaf-sheaths (particularly the lower ones) sharply keeled and flabellately imbricate; ligule reduced to a rim; lamina pale-green, linear, 1-3 ft. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. broad. Panicles oblong, up to 1 or more ft. long; whorls 8-10 with up to 15 rays; racemes up to 6 in. long, very slender; joints filiform, as long as to twice as long as the sessile spikelets. Sessile spikelets dull-green or somewhat purplish, very narrowly linear-lanceolate to linear, acuminate at the apex, about $\frac{1}{4}$ in. long; upper lemma with a bristle-like awn $\frac{1}{12}$ - $\frac{1}{2}$ in. long.

Southern Sudan.

119. **VOSSIA** Wall. & Griff.

Vossia cuspidata (Roxb.) W. Griff.

Fig. 145.

Perennial herb; culms submerged or floating, copiously rooting from submerged nodes, very many-noded, the aerial part up to over 3 ft. high. Leaf-sheaths usually tight; ligule very short, truncate; lamina linear, long-tapering to a fine point, up to 3 ft. long and 1 in. broad. Racemes pale-green or straw-coloured, solitary or 2-6 together on a short common axis, 6-9 in. long, stout; joints about $\frac{1}{2}$ in. long, disarticulating horizontally. Sessile spikelets ovate-oblong, $\frac{3}{4}$ - $\frac{1}{2}$ in. long excluding the tail; lower glume ovate-oblong, with a straight subulate tail up to 1 in. long, $\frac{1}{4}$ in. broad at the base, smooth and shining on the back.

Central and Southern Sudan: a troublesome weed of the Gezira canals and one of the principal constituents of the Sudd.

120. **VULPIA** C. C. Gmel.

Vulpia bromoides (L.) Gray.

Barren Fescue.

Annual herb; culms very slender, glabrous, 2-3-noded, up to 12 or more in. high. Leaf-sheaths glabrous; ligule very short; lamina linear, tapering to a very acute point, up to 6 in. long, scabrous or puberulous above. Panicles erect and narrow, more or less secund, 1-2 $\frac{3}{4}$ in. long. Spikelets $\frac{1}{2}$ - $\frac{2}{3}$ in. long, 4-7-flowered. Glumes subulate-lanceolate; lower 1-nerved; upper 3-nerved. Awn as long as or longer than the lemma, very slender.

Red Sea Hills. Darfur: Jebel Marra, 10,000 ft.

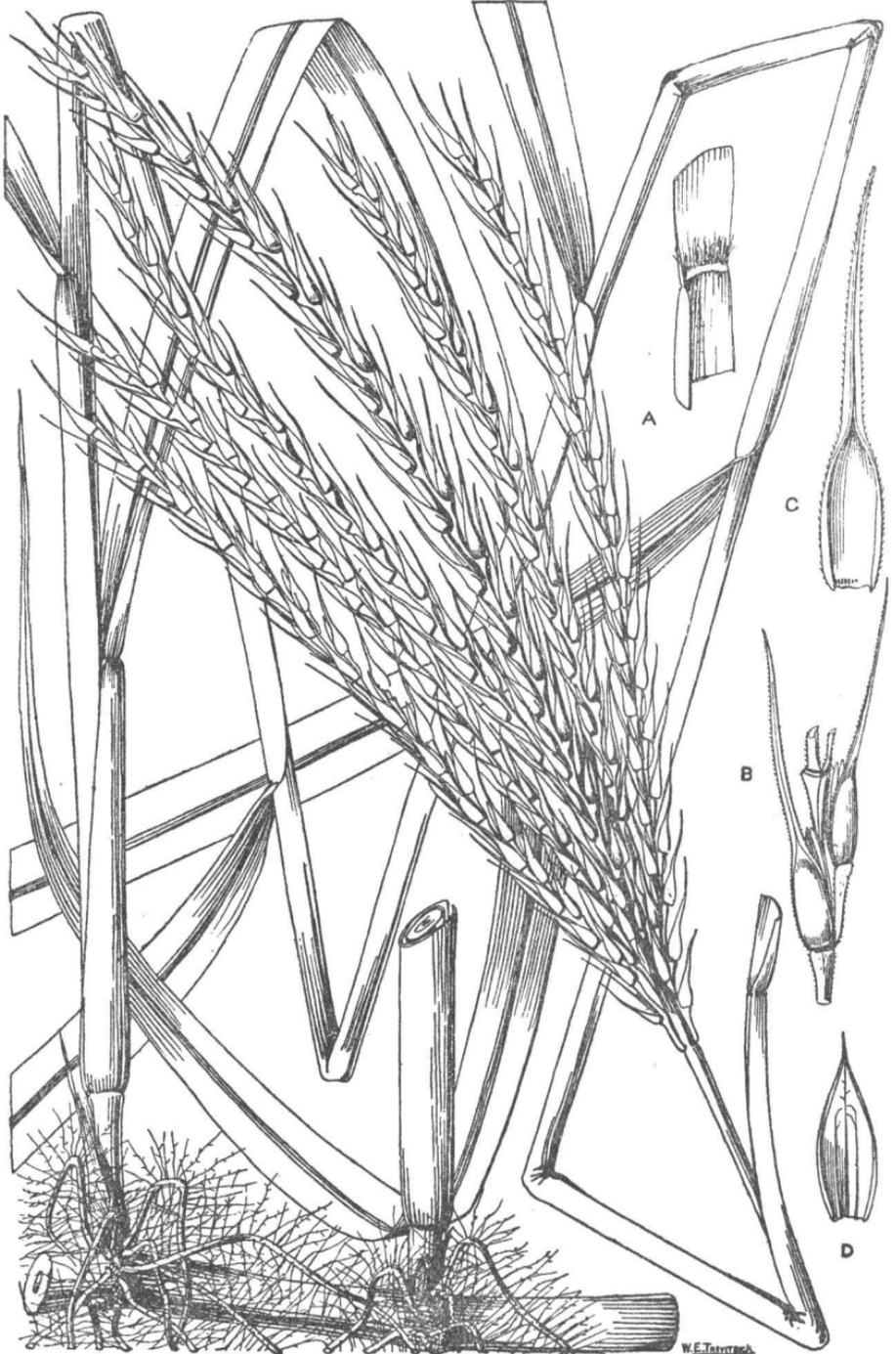


Fig. 145—*VOSSIA CUSPIDATA* (Roxb.) W. Griff.

A, ligule. B, pedicellate and sessile spikelets with joint of axis. C, lower glume. D, upper glume of sessile spikelet.

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