

## MATERIALS TOWARDS A MONOCOT FLORA OF ASSAM—V\*

A. S. RAO AND D. M. VERMA\*\*

*Botanical Survey of India, Howrah*

## ABSTRACT

Further to earlier contributions in previous issues of this *Bulletin*, twelve more families of the monocotyledons of Assam: Flagellariaceae, Juncaceae, Typhaceae, Sparganiaceae, Araceae, Lemnaceae, Triuridaceae, Alismataceae, Butomaceae, Aponogetonaceae, Potamogetonaceae and Eriocaulaceae are presented here. The account includes keys to identification, description, distribution and notes for 36 Genera and 106 Species, as Materials towards a Monocot Flora of Assam.

**Flagellariaceae** Dumort. Anal. Fam. 59, 60. 1829.

*Perennials*, erect or climbing. *Leaves* alternate, distichous or spiral, subsessile or short-petioled; sheaths closed or split on the anterior side. *Flowers* subsessile, in terminal panicles, bisexual or unisexual (and then the plant dioecious), actinomorphic; tepals 6, free, biseriate, imbricate, calycine or somewhat petaloid, persistent; stamens 6, free or slightly adnate to the base of the tepals; anthers basifixed, 2-loculed, introrse, dehiscing by longitudinal slits; ovary superior, 3-loculed; style short with three linear stigmas; ovule solitary in each locule, spreading or pendulous from the central axis. *Fruit* a small drupe, subglobose; seeds with copious endosperm and a small embryo.

**Flagellaria** L. Sp. Pl. 333. 1753 et Gen. Pl. ed. 5. no. 156. 1754.

Shrubby climbers with long acuminate leaves ending in cirrhiform tips, and bisexual flowers.

**F. indica** L. Sp. Pl. 333. 1753.

Shrubby climbers up to 5 m high, rather woody at base and herbaceous upwards, the younger branches almost completely en-

closed within the leaf-sheaths. *Leaves* distichous, linear-lanceolate, (3-)15-25(-50) × (0.5-)1.5-2.5(-6.5) cm, closely many-nerved, rounded or subcordate at the base; sheaths closed, cylindric, 1-4(-7) cm long, closely ribbed, subtruncate and somewhat auricled at the mouth. *Panicle* irregularly branched, 5-20 cm long; bracts ca 1 mm long. *Flowers* subsessile, more crowded towards the tips of the panicle-branches, white or creamy; tepals 6, oblong-lanceolate, subscarious, 2-3 mm long; filaments ca 3 mm long, anthers ca 0.3 mm long; ovary globose, trigonous; stigmas ca 2 mm long. *Fruit* ca 6 mm long, red. (Fig. 1).

*Fls. & frts.*: Sept.-Oct.

ASSAM: Darrang.

**Juncaceae** A. L. de Jussieu, Gen. 43. 1789 ('*Junci*').

Usually perennial, sometimes annual, grass-like herbs. *Rhizomes*, if present, erect or horizontal. *Leaves* spiral, linear, sheathing, sometimes all reduced to bladeless sheaths; sheaths open or closed. *Flowers* in cymes, panicles or heads, actinomorphic, bisexual or unisexual (and then the plants dioecious); tepals usually 6, biseriate, rarely

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3, free, glumaceous; stamens free, inserted on the receptacle or on the base of the tepals; anthers basifixed, 2-loculed, introrse, opening by longitudinal slits; ovary superior, 1-loculed with parietal placenta or



Figs. 1-3 : 1. *Flagellaria indica* L. 2. *Typha elephantina* Roxb. 3. *Sparganium emersum* Rehm.

3-loculed with axile placentas, or incompletely septate; style long or short; stigmas 3; ovules three or numerous. *Fruit* a dry, 1- or 3-loculed capsule; seeds solitary or more, sometimes tailed, with a small straight embryo in the middle of the fleshy endosperm.

1a. Leaves flat or terete, glabrous, or all reduced to bladeless sheaths. Capsules many-seeded ...

*Juncus*-1

1b. Leaves flat, sparsely long ciliate. Capsules 1-3-seeded ...

*Luzula*-2

1. **Juncus** L. Sp. Pl. 325. 1753 et Gen. Pl. ed. 5. no. 396. 1754.

Perennial or annual, usually tufted, glab-

rous herbs. *Leaves* flat or terete, or all reduced to bladeless sheaths. *Inflorescence* terminal or pseudolateral; bracteoles membranaceous. *Flowers* small, sessile or pedicelled, bisexual; tepals 6; stamens 6 or 3, attached to the base of the tepals; anthers linear; ovary sessile, 1-3-loculed; placentas 3, parietal, sometimes cohering into a central column; ovules many in each locule. *Capsules* 3-valved; valves usually bearing the placentae in their middle but sometimes the three placentae becoming detached and remaining free or cohering into a central column; seeds minute, ovoid-oblong, obtuse, apiculate or tailed, faintly ribbed.

1a. Leaves all reduced to bladeless sheaths. Inflorescence pseudolateral because of the solitary stem-like erect bract appearing as though a continuation of the stem ...

*J. effusus*-2

1b. Leaves, atleast some, with well developed blades. Inflorescence terminal, its bract foliaceous, not continuous with the stem.

2a. Inflorescence a loosely branched panicle. Flowers mostly reduced to numerous, somewhat elongated clusters of golden yellow bracteoles and tepals with only a few intermingled perfect flowers, or perfect flowers absent ...

*J. ochraceus*-3

2b. Inflorescence various. Flowers all perfect, greenish, stramineous, whitish or brownish.

3a. Stamens longer than the tepals and distinctly exerted. Seeds long-tailed at both the ends.

4a. Leaves flat, 3-5 mm broad ...

*J. clarkei*-10

4b. Leaves terete or setaceous.

5a. Dwarf herbs, 2.5-4 cm tall. Capsules about twice as long as the tepals ...

*J. nematocaulon*-9

5b. Taller herbs, 15-50 cm tall. Capsules equal to/or slightly exceeding the tepals.

6a. Capsules oblong ca 8 × 2 mm ...

*J. grisebachii*-4

6b. Capsules linear, ca 6 × 0.8 mm ...

*J. khasiensis*-8

3b. Stamens shorter than the tepals and included. Seeds obtuse, acuminate or apiculate at both the ends.

7a. Leaves septate. Flowers few or several together, crowded into heads.

8a. Stamens 6 ...

*J. lampocarpus*-5

8b. Stamens 3

9a. Leaf-sheath auricles ca 0.3 mm long. Inflorescence lax, its branches rather slender and spreading. Flowers greenish or dirty brown ...

*J. prismatocarpus*-6

9b. Leaf-sheath auricles ca 1.5 mm long. Inflorescence rather dense, its branches stiff and erect. Flowers reddish ...

*J. leptospermus*-7

7b. Leaves not septate. Flowers solitary, scattered.

10a. Annuals. Stamens about half as long as the tepals. Seeds ellipsoid, ca 0.5 mm long ...

*J. bufonius*-1

10b. Perennials. Stamens about as long as the tepals. Seeds ovoid, ca 0.8 mm long

*J. ochraceus*-3

1. **J. bufonius** L. Sp. Pl. 328. 1753.

*Annuals*, tufted, 10-30 cm high. *Stems* erect or decumbent, slender, terete, sometimes branched. *Leaves* few, almost setaceous, up to 15 cm long, channelled; sheaths not auricled. *Inflorescence* terminal, branched. *Flowers* remote or sometimes almost crowded, each with a bract and two

bracteoles, subsessile, pale green, 3-7 mm long; tepals lanceolate, acute, outer usually longer than the inner, sometimes subequal; stamens shorter than the tepals, 6 or sometimes in the upper flowers only 3. *Capsules* oblong, trigonous, 3-5 mm long, mucronate, 3-loculed; placentae at length sometimes detached from the valves, either free or co-

hering into a central column; seeds numerous, ellipsoid, *ca* 0.5 mm long, obtuse at both ends.

*Fls. & frts.*: March. On mud, in the river-bed.

ARUNACHAL PRADESH: Siang: Pobomukh, *Burkill* 38234.

2. **J. effusus** L. Sp. Pl. 326. 1753.

*Perennials*, tufted, 4-12 dm high. *Rhizomes* short, sympodial, horizontal; roots *ca* 1 mm thick. Stems erect, terete, faintly- (*in vivo*) or prominently-ribbed (*in sicco*); pith continuous. *Leaves* all reduced to dull, light or dark brown sheaths, the inner sometimes with a deciduous awn. *Cyme* pseudolateral, solitary, sessile, dense or lax, 1-5(-10) cm long, usually somewhat pendulous; bract erect, continuous with and similar to the stem, 5-25 cm long, acute; bracteoles 2, ovate, nerveless, *ca* 0.8 mm long. *Flowers* subsessile or with up to 1 cm long pedicel, pale green or yellowish; tepals subequal, lanceolate, 2-2.8 mm long, acute; stamens usually 3, rarely 4-6, about half as long as the tepals; anthers *ca* 0.5 mm long; style minute; stigmas *ca* 0.8 mm long. *Capsules* oblong-obovoid, 2-2.5 mm long, subtruncate or rounded at the apex, 3-valved; placentas rather deeply intruded; seeds numerous, oblong, *ca* 0.5 mm long, obtuse, acuminate or apiculate (Fig. 5).

*Fls. & frts.*: March-Sept. Common in moist and swampy places, along ponds, lakes and river-banks; 300-1500 m.

ARUNACHAL PRADESH: Kameng; Subansiri. ASSAM: Sibsagar. MEGHALAYA: K. & J. Hills.

3. **J. ochraceus** Buchen. in Bremen, Abh. Nat. 3: 292. 1873.

*Perennials*, tufted, 15-60 cm high. *Root-stock* short. *Stems* erect, terete, channelled, *ca* 1 mm thick. *Leaves* filiform, 5-15 cm long, auricles *ca* 1 mm long. *Panicles* loosely branched, almost invariably consisting of elongate feathery clusters of golden yellow bracteoles and tepals with sometimes a

few intermingled perfect flowers; bracts filiform; bracteoles scarious, 3-5 mm long. *Flowers* on about 2 mm long pedicels; tepals lanceolate; the outer 4-5 mm long, mucronate, the inner 3-4 mm long, acute; stamens 6, included; filaments *ca* 1.5 mm long; anthers *ca* 1.5 mm long, linear; style *ca* 2.5 mm long; stigmas 2-3 mm long. *Capsules* oblong-obovoid, 3-celled, 4.5-5 mm long including *ca* 2 mm long beak which protrudes above the tepals; seeds ovoid, *ca* 0.8 × 0.5 mm, obtuse at both ends or acute at the apex.

*Fls. & frts.*: Nov.-March. Way side weed; 500-2000 m.

ARUNACHAL PRADESH: Lohit, Siang. ASSAM: Darrang.

4. **J. grisebachii** Buchen. in Bremen, Abh. Nat. 3: 295. 1873.

*Perennials*, stoloniferous, 20-50 cm high. *Stems* erect, terete, 1-2 mm thick, with basal leaf-sheaths and 3-4 leaves upwards. *Leaves* terete, septate, 10-25 cm long, the uppermost equal to or exceeding the stem; sheath-auricles obtuse, 3-4 mm long. *Heads* 2-6, hemispherical, 8-15 mm broad, 5-12-flowered; bracts foliaceous, bracteoles lanceolate. *Flowers* sessile or shortly pedicelled; tepals subequal, lanceolate, 5-6.5 mm long; stamens 6; filaments subequalling the tepals; anthers *ca* 2.5 mm long; style *ca* 2.5 mm long; stigmas *ca* 1.2 mm long. *Capsules* ovoid, beaked, including the beak *ca* 8 mm long, *ca* 2 mm broad, almost 3-loculed; beak 1-1.5 mm long; seeds fusiform, pale whitish, *ca* 3 mm long including *ca* 1 mm long tails at each end (Fig. 7).

*Fls. & frts.*: November; at about 2600 m.

ARUNACHAL PRADESH: Kameng.

5. **J. lampocarpus** Ehr. ex Davies in Trans. Linn. Soc. 10: 13. 1810.

*Perennials*, tufted, 15-30 cm high. *Rhizomes* short, creeping. *Stems* erect, terete or subcompressed, 0.5-1.5 mm thick with basal leaf-sheaths and 3-4 leaves upwards. *Leaves* terete or compressed, very prominent-

ly septate, 4-7 cm long; sheath-auricles obtuse, 2-4 mm long. *Heads* hemispherical, 3-9-flowered; bracts much shorter than the stem; bracteoles ovate, subcaudate, 2-3 mm long. *Flowers* subsessile, green or brown; tepals subequal, lanceolate, 3.5-5 mm long; stamens 6; filaments *ca* 1 mm long; anthers *ca* 1 mm long; style *ca* 0.3 mm long; stigmas *ca* 0.5 mm long. *Capsules* exceeding the tepals, acute or shortly beaked, brown, 1-loculed; seeds ellipsoid, apiculate, *ca* 0.7 mm long.

*Fls. & frts.*: June; in swamps and hill slopes; 1000-1500 m.

MEGHALAYA: K. & J. Hills.

6. **J. prismatocarpus** R. Br. Prodr. 259. 1810.

*Perennials*, tufted, 1-8 dm high. *Stems* erect or decumbent and rooting at the nodes, terete or compressed, with basal leaf-sheaths and a few leaves upwards. *Leaves* terete or compressed, 5-25 cm long. *Heads* hemispherical, 3-15 (or more)-flowered, sometimes bearing a few small foliaceous bracts in between; bracts much shorter than the inflorescence; bracteoles ovate, subcaudate, *ca* 2 mm long. *Flowers* subsessile; tepals subequal, lanceolate, 3-4 mm long; stamens 3 included filaments 1-1.5 mm long; anthers 0.7-1 mm long; ovary 1-locular; ovules parietal; style *ca* 0.3 mm long; stigmas longer. *Capsules* slightly shorter to considerably longer than the tepals, usually sharply angled, acute or apiculate at the tip, pale brown, 1-loculed; seeds elliptic-oblong, 0.5-0.8 mm long, acute or apiculate at each end (Fig. 8).

*Fls. & frts.*: Throughout the year; in swamps and shallow water; 600-1500 m.

ARUNACHAL PRADESH: Kameng, Subans'ri. ASSAM: Darrang, Kamrup, Lakhimpur. MANIPUR. MEGHALAYA: K. & J. Hills.

7. **J. leptospermus** Buchen. in Bot. Jahrb. 6: 203. 1885.

*Perennials*. *Rootstock* short. *Stems* terete or subterete, with basal leaf-sheaths and 3-5

leaves upwards, faintly grooved, 1-3 mm thick. *Leaves* terete, septate, 10-20 cm long, acuminate. *Heads* numerous, 3-5-flowered; bracts much shorter than the stem; bracteoles *ca* 2.5 mm long, shortly awned. *Flowers* subsessile; tepals lanceolate, 3.5-4 mm long, inner slightly longer; stamens 3; filaments *ca* 1.5 mm long; anthers *ca* 0.7 mm long; style *ca* 0.6 mm long. *Capsules* prismatic, exceeding the tepals, shortly beaked, 1-loculed; seeds ellipsoid, 0.5-0.7 mm long, obtuse at the base and acuminate or apiculate at the apex.

ASSAM: *s.l.* MEGHALAYA: K. & J. Hills.

8. **J. khasiensis** Buchen. in Bot. Jahrb. 12: 407. 1890.

*Perennial*, tufted, 15-45 cm high. *Rhizomes* short, slender. *Stems* suberect, terete, grooved, 0.4-0.7 mm thick, with basal leaf-sheaths and 1-2, rarely up to 4, leaves upwards. *Leaves* subequalling the stem, terete, channelled, 15-40 cm long; sheath-auricles 0.5 mm long. *Heads* 1-4, hemispherical, 2-10-flowered; bracts shorter than the inflorescence; bracteoles ovate, acuminate, *ca* 6 × 2.5 mm. *Flowers* sessile, whitish; tepals lanceolate, 5-7 mm long, the inner slightly longer; stamens 6; filaments 5-6 mm long; anthers *ca* 1.8 mm long; style *ca* 2 mm long; stigmas *ca* 1.5 mm long. *Capsules* acuminate, 1-loculed; seeds 2-2.5 mm long, including about 0.8 mm long tails at each end (Fig. 4).

*Fls. & frts.*: July-Oct.; 1000-1700 m.

MEGHALAYA: K. & J. Hills. NAGALAND.

9. **J. nematocaulon** Hook. f. Fl. Brit. Ind. 6: 400. 1892.

*Stems* tufted, capillary, grooved, 2.5-3.7 cm high. *Leaves* few or sometimes solitary, capillary, channelled; sheaths very short. *Inflorescence* usually of 1-3, distant, 1-3-flowered heads, sometimes reduced to a solitary terminal flower with a capillary bract; bracteoles about as long as the tepals. *Flowers* sessile, pale green; tepals lanceo-

late, acuminate, *ca* 4 mm long; stamens 6; anthers far exserted, much shorter than the filaments; style long; stigmas short. *Capsules* trigonous, acuminate, *ca* 8 mm long, 1-loculed; seeds with a long slender tail at one end and an equally long inflated one at the other end.

NAGALAND: Jakpho, 3200 m, *Clarke (n.v.)*.

10. **J. clarkei** Buchen. in Bot. Jahrb. 6: 210. 1885.

*Perennials*, tufted, 15-30 cm high. *Rhizomes* short, slender. *Stems* erect, terete, striate, *ca* 1 mm thick, with basal leaf-sheaths and several leaves upwards. *Leaves* grass-like, much exceeding the stem, 25-40 × 0.3-0.5 cm, not septate. *Heads* usually 2-3, sometimes 4-5, globose, 4-many-flowered; lower bract exceeding the inflorescence; bracteoles ovate-lanceolate, acuminate, 6-7 × 2-3 mm. *Flowers* on *ca* 2 mm long pedicels, stramineous; tepals subequal, linear lanceolate, 5-8 × 1.5 mm; stamens 6; filaments 7-8 mm long; anthers *ca* 4 mm long; style *ca* 3 mm long; stigmas *ca* 1 mm long. *Capsules* 8-12 mm long including *ca* 1 mm long beak, 1-loculed; seeds 2.5-3 mm long including the long tails at each end (Fig. 6).

*Fls. & frts.*: Sept.-Oct.; 1500-3200 m.

MANIPUR. NAGALAND.

2. **Luzula** A. P. DC. in Lamk. et DC. Fl. Fran. ed. 3. 3: 158. 1805; *nom. cons.*

*Perennials*, usually tufted. *Rhizomes* slender, horizontally creeping. *Leaves* mostly crowded at the base and a few upwards on the stem, flat, graminaceous, usually fringed with long hairs. *Flowers* sessile or pedicellate, either solitary and paniculate, or crowded into dense clusters which are again paniculately, racemosely or spicately arranged; tepals 6; stamens 6 (ours); ovary 1-loculed; stigmas linear; ovules 3, erect from a very short basal placenta. *Capsules* 3-valved; seeds 3 or fewer, oblong faintly reticulately ribbed, often with a basal or apical elaiosome.

1a. Flowers solitary, usually on long pedicels, sometimes sessile.

2a. Inflorescence rather dense, subumbellately branched, its bract longer than the inflorescence ...

*L. plumosa*-1

2b. Inflorescence very lax, paniculately branched, its bract much shorter than the inflorescence ...

*L. effusa*-2

1b. Flowers congested in head-like clusters, always sessile ...

*L. campestris*-3

1. **L. plumosa** E. Mey. in Linnaea 22: 387. 1849.

*Stems* erect or ascending, 15-45 cm high. *Leaves* shorter or longer than the stem, 10-35 × 0.3-0.7 cm, sparsely long ciliate. *Flowers* sessile or on up to 1 cm long pedicels; bracteoles ovate, hyaline, *ca* 2 mm long; tepals ovate-lanceolate, 3-5 mm long, brown with broad membranaceous margins, the outer slightly longer than the inner; filaments 1-1.5 mm long; anthers linear-oblong, *ca* 1 mm long; style *ca* 0.5 mm long; stigmas *ca* 1 mm long. *Capsules* subequalling the tepals, obtuse or apiculate (Fig. 9).

*Fls.*: April; on humus covered hill-tops; at about 3200 m.

ARUNACHAL PRADESH: Kameng. MEGHALAYA: K. & J. Hills, 1900 m (*n.v.*).

2. **L. effusa** Buchen. in Bot. Jahrb. 6: 196. 1885.

*Stems* erect or ascending, 20-70 cm high. *Leaves* shorter than the stem, 6-12 × 0.6-1.2 cm, sparsely long ciliate. *Panicles* lax, its branches often drooping or nodding. *Flowers* usually on 4-12 mm long pedicels, sometimes subsessile; tepals subequal, ovate-lanceolate, 2.5-3 mm long, membranaceous-margined, pale or dark brown; filaments 1-1.2 mm long; anthers 0.6-1 mm long; style *ca* 0.5 mm long; stigmas *ca* 1.5 mm long. *Capsules* subequalling the tepals, ellipsoid-obovoid, trigonous, usually crowned by the style-base; seeds usually 3, sometimes less, oblong-obovoid, 1-1.3 mm long with a minute pale elaiosome at the top.

*Fls. & frts.*: May; at about 1300 m.

ARUNACHAL PRADESH: Kameng.

3. *L. campestris* (L.) A. P. DC. in Lamk et DC. Fl. Fran. ed. 3. 3: 161. 1805.

*Juncus campestris* L. Sp. Pl. 329. 1753.  
Stems erect or ascending, 15-45 cm high.



Figs. 4-9 : 4. *Juncus khasiensis* Buchen. 5. *J. effusus* L. 6. *J. clarkei* Buchen. 7. *J. grisebachii* Buchen. 8. *J. prismatocarpus* R. Br. 9. *Luzula plumosa* E. Mey.

*Leaves* shorter than the stem,  $5.15 \times 0.3-0.6$  cm, sparsely long ciliate, the tips very obtuse and thickened. *Flowers* sessile, congested in head-like clusters, all, or for greater part, collected at the top of the stem into a short, dense or rather lax, 1-5 cm long inflorescence; bracteoles ovate, acute, pale, *ca* 2 mm long; tepals subequal, ovate-lanceolate, 2.5-3.5 mm long; stamens included; filaments *ca* 1 mm long; anthers *ca* 1.2 mm long, linear-oblong; style *ca* 0.7 mm long; stigmas 1-2 mm long. *Capsules* shorter than the tepals, obovoid, 1.5-2 mm long, obtuse; seeds 3 or less, oblong, *ca* 1 mm long, brown with a rather large white elaiosome at the base.

*Fls. & frts.*: April-Nov.; 1500-3100 m.

ARUNACHAL PRADESH: Kameng. MEGHALAYA: K. & J. Hills.

**Typhaceae** A. L. de Jussieu, Gen. 25. 1789 (*Typhae*).

*Perennial*, erect, marsh or aquatic herbs. *Rhizomes* creeping, scaly. *Stems* simple, terete, solid. *Leaves* distichous, several clustered at the base and a few scattered upwards, linear, rather thick and spongy, sheathing; sheaths long, open. *Inflorescence* terminal, of usually 2, sometimes 3, contiguous or distant superposed, cylindric, interrupted spikes, proterandrous; lower 1 or 2 spikes female, clothed with short stumps; terminal male, each subtended by a foliaceous caducous bract or sometimes also with a few additional bracts scattered in the spikes. *Flowers* many, unisexual; male flowers consisting of 3 slightly flattened hairs or perianth surrounding 2-5 stamens; filaments free or connate; anthers linear, basifixed; cells 2, back to back; female flowers fertile and sterile mixed together; fertile flowers with several perigonous hairs; ovary superior, on a long gynophore, 1-loculed; style slender; stigma filiform or clavate, ovule solitary; pistillode clavate. *Fruits* small, fusiform, 1-seeded follicle, ultimately

longitudinally splitting; seeds striate, with mealy endosperm.

**Typha** L. Sp. Pl. 971. 1753 *et* Gen. Pl. ed. 5. no. 418. 1754.

Characters of the family.

**T. elephantina** Roxb. Fl. Ind. 3: 566. 1832.

Robust, 2-4 m high. *Leaves* suberect, 1-2 m long, 1.5-4 cm broad, obtuse, with numerous small air chambers, concavo-convex and keeled at the base, flattening and becoming narrower upwards; margins usually undulate above the middle. *Male spikes* borne 5-8 cm above the female spike, 20-30 cm long, pale yellowish, with one basal and 2-4 smaller bracts scattered at different levels in the spike; male flowers with short, often 2-3-cleft, hairs; anthers *ca* 2.5 mm long, yellow with green tips. *Female spike* 15-30 cm long, 8-25 mm thick, ultimately deep brown; bract, when young, embracing both the female and the male spikes; female flowers with 4-5 mm long hairs and slightly longer bracteole with fasciate tips (Fig. 2).

*Fls. & frts.*: July-Aug.; 200-1600 m.

ASSAM: Kamrup. MEGHALAYA: K. & J. Hills.

**Sparganiaceae** Rudolphi, Syst. Orb. Veg. 27. 1830.

*Perennial*, monoecious, erect, rhizomatous, aquatic herbs. *Stems* simple or branched. *Leaves* distichous, mostly clustered at the base, a few upwards, linear, sheathing. *Inflorescence* of several, distinct, unisexual, globose clusters of minute flowers; clusters spicate, racemed or paniced, numerous-flowered, each subtended by a bract, lower female, upper male; lower bracts foliaceous, upper gradually smaller. *Male flowers*: tepals 3(-6); stamens 3 or more; filaments free or connate at the base; anthers oblong, basifixed. *Female flowers*: tepals 3(-6) ovary sessile, narrowed at the base, 1-loculed; style simple or forked, persistent; ovule



solitary, pendulous. *Fruit* obovoid-oblong or fusiform, with a narrowed stalk-like base, indehiscent; exocarp spongy, endocarp hard; seeds with membranaceous testa and mealy endosperm.

**Sparganium** L. Sp. Pl. 971. 1753 et Gen. Pl. ed. 5. no. 925. 1754.

Characters of the family.

**S. emersum** Rehmann, Verh. Naturf. Vereins Brünn 10: 80. 1871; Reveal in Taxon 19: 796-97. 1970. *S. simplex* Huds. Fl. Angl. ed. 2: 401. 1778, *nom. illegit.*; Hook. f. Fl. Brit. Ind. 6: 490. 1893.

*Rhizomes* creeping, 3-4 mm thick. *Stems* simple, 0.3-1 m long, usually strongly zigzag in the flowering part. *Leaves* suberect, linear, spongy, 0.4-1 m long, 5-15 mm broad, obtuse at the tip, somewhat contracted at the base; several-nerved with numerous prominent or obscure cross nervules. *Male flowers* in 3-20, sessile or subsessile, 5-8 mm broad clusters, upper clusters congested; tepals 3, spathulate, subentire, 2-2.5 mm long; stamens far exserted; filaments 4-5 mm long; anthers *ca* 1.3 mm long; flowers falling off after anthesis. *Female flowers* in 2-5 clusters which are usually inserted far above their subtending bracts; clusters sessile or the lower with up to 4 cm long peduncles, 10-12 mm dia. in flowers, enlarging to 25 mm dia. in fruits; tepals 3, spathulate, subentire, 5-6 × 1 mm; styles 3-5 mm long, usually entire, sometimes forked. *Fruits* fusiform, 4-6 mm long with *ca* 2 mm long stalks (Fig 3).

*Fls. & frts.*: April-Nov. In lakes and streams; 600-1650 m.

MEGHALAYA: K. & J. Hills.

**Araceae** A. L. de Jussieu, Gen. 23. 1789 ('*Aroideae*').

*Perennial*, rhizomatous or tuberous, usually terrestrial, sometimes epiphytic or aquatic, slender or robust herbs, stemless or with the rhizome continued above into a caudex, sometime with a well-developed leafy stem climbing or creeping with ad-

ventitious roots many, succulent with watery or milky juice with or without raphides. Leaves very variable, entire, perforated, lobed, tri- or pluri-foliate or pedate; including species many, cauline, alternate, distichous or spiral; in others radical, one-few, often peltate, or many, rosulate, appearing together with or after flowers; nerves pinnate or palmate, parallel or reticulate; petioles of the stemless species and peduncles embraced at the base by a few membranaceous, bladeless sheaths (*cataphylls*). *Inflorescence* a peduncled spadix usually subtended by a spathe, radical, or cauline in the axils of usually the upper leaves; spadices sessile or stipitate, bearing bisexual flowers of which a few apical ones may sometimes be reduced, or unisexual, monoecious with the female flowers below and male flowers above, the female and male floriferous zones being contiguous or separated by an interspace, or unisexual, dioecious; spadices bearing unisexual flowers sometimes produced above into a sterile appendage; spathes frequently large and brightly coloured, completely rolled round the spadix when young, partly or fully expanding in age, caducous from the base or in the unisexual spadices the lower part enclosing female flowers persistent and upper part caducous. *Flowers* minute, sessile or pedicelled, usually many, crowded, sometimes few; perianth in bisexual flowers absent, or of 4-6, inferior, free or connate scales, in unisexual flowers absent; stamens solitary, or two-several, free, or with connate filaments, or united into synandria which may again be free or connate; anthers opening by pores or by longitudinal slits; ovaries sometimes partly immersed, 1-several loculed, sometimes with discontinuous septa; ovules 1-numerous in each locule, basal, subbasal, apical, parietal or central; style short or absent; stigma discoid, globose or lobed; neuters sometimes present on various parts of the spadices. *Fruits*

berries or baccate, with membranaceous or fibrous walls; seeds solitary or few, rarely many, albuminous or exalbuminous, sometimes with a warty thickening at the tip (*strophium*).

Almost all the species are ornamental. Many are edible. Some contain irritating raphides, and some are poisonous.

Many exotic species of *Anthurium*, *Cala-*

*dium*, *Monstera*, *Philodendron* and others are commonly grown as ornamentals in Home-Gardens, and are not included here.

In addition to a general key to the identification of all the genera of this Family, two more keys have been provided, one for sterile material only, and another for fertile material only, for those Genera that are found in such separate stages.

- |  |     |                                     |
|--|-----|-------------------------------------|
| 1a. Free floating herbs. Leaves many, in a congested rosette, sessile, obovate-oblong                                    | ... | <i>Pistia</i> -3                    |
| 1b. Attached herbs or climbers. Leaves varied, not as above.   |     |                                     |
| 2a. Climbers.  |     |                                     |
| 3a. Leaves entire, petioles winged.  |     |                                     |
| 4a. Spathes large, 10-15 cm long; spadices sessile, elongate, subcylindric; perianth absent                              | ... | <i>Scindapsus</i> -17               |
| 4b. Spathes small, 0.5-2 cm long; spadices stipitate, short, subglobose-obovoid or ellipsoid; perianth present           | ... | <i>Pothos</i> -20                   |
| 3b. Leaves entire or pinnatifid; petioles wingless   | ... | <i>Rhaphidophora</i> -18            |
| 2b. Terrestrial, epiphytic or aquatic herbs.   |     |                                     |
| 5a. Plants prickly on the leaves and peduncles   | ... | <i>Lasia</i> -19                    |
| 5b. Plants smooth throughout.  |     |                                     |
| 6a. Leaves and spadices present during the same period.  |     |                                     |
| 7a. Leaves compound, pedatisect or 3-5-lobed.  |     |                                     |
| 8a. Monoecious, the male and the female floriferous zones separated by an interspace or neuters                          | ... | <i>Typhonium</i> -6                 |
| 8b. Dioecious, or if monoecious then the male and the female floriferous zones contiguous                                | ... | <i>Arisaema</i> -4                  |
| 7b. Leaves simple, with entire, cordate, hastate or sagittate base.  |     |                                     |
| 9a. Leaves linear-lanceolate or elliptic.  |     |                                     |
| 10a. Spadices on long, flat, leaf-like peduncles; spathes leaf-like  | ... | <i>Acorus</i> -21                   |
| 10b. Spadices on short, terete peduncles; spathes different, not leaf-like.  |     |                                     |
| 11a. Spathes subequalling the leaves, limbs linear-lanceolate. Ovaries in a single whorl                                 | ... | <i>Cryptocoryne</i> -1              |
| 11b. Spathes much shorter than the leaves, limbs ovate. Ovaries in 3-4 whorls  | ... | <i>Lagenandra</i> -2                |
| 9b. Leaves broadly ovate-oblong or suborbicular.   |     |                                     |
| 12a. Spadices appendaged.  |     |                                     |
| 13a. Neuters subulate and/or clavate   | ... | <i>Typhonium</i> -6                 |
| 13b. Neuters flat.   |     |                                     |
| 14a. Caudex absent. Ovules parietal  | ... | <i>Colocasia</i> -13                |
| 14b. Caudex present, particularly in adult plants. Ovules basal  | ... | <i>Alocasia</i> -14                 |
| 12b. Spadices not appendaged.  |     |                                     |
| 15a. Leaves epeltate; base entire  | ... | <i>Aglaonema</i> -15                |
| 15b. Leaves peltate; base entire, retuse, cordate, hastate or sagittate.   |     |                                     |
| 16a. Rhizomatous herbs.  |     |                                     |
| 17a. Leaf-base deeply cordate, hastate or sagittate. Stamens free  | ... | <i>Homalomena</i> -16               |
| 17b. Leaf-base entire, retuse or shallowly 2-lobed. Stamens connate  | ... | <i>Staudnera</i> -10                |
| 16b. Tuberous herbs.   |     |                                     |
| 18a. Leaves sagittate-cordate; bulbiferous shoots usually present; spathes fully or partly convolute                     | ... | <i>Gonatanthus</i> -12              |
| 18b. Leaves broadly ovate to suborbicular; bulbiferous shoots absent; spathes not convolute, but cymbiform or conch-like | ... | <i>Ariopsis</i> -9                  |
| 6b. Leaves and spadices appearing separately during different periods  | ... | see the following two separate keys |

#### KEY TO STERILE MATERIAL

- |   |     |                        |
|---|-----|------------------------|
| 19a. Leaves simple.   |     |                        |
| 20a. Leaves lanceolate, more than twice as long as broad                          | ... | <i>Gonatanthus</i> -12 |
| 20b. Leaves broadly ovate-oblong or suborbicular, twice or less as long as broad. |     |                        |
| 21a. Bulbiferous shoots present. Leaf-base cordate                                | ... | <i>Remusatia</i> -11   |
| 21b. Bulbiferous shoots absent. Leaf-base entire or retuse                        | ... | <i>Ariopsis</i> -9     |

- 19b. Leaves compound.  
 22a. Leaves pedatipartite ... *Sauromatum*-5  
 22b. Leaves tri-partite.  
 23a. Leaves bulbiliferous, with purple-margined leaflets ... *Amorphophallus*-7  
 23b. Leaves not bulbiliferous, with greenish-white-margined leaflets.  
 24a. Petioles warty ... *Amorphophallus*-7  
 24b. Petioles smooth ... *Thomsonia*-8

## KEY TO FERTILE MATERIAL

- 19a. Spadices appendaged.  
 20a. Spathe limbs linear-lanceolate. Male and female floriferous zones separated by an interspace ... *Sauromatum*-5  
 20b. Spathe limbs oblong or ovate-lanceolate. Male and female floriferous zones contiguous.  
 21a. Appendage smooth ... *Amorphophallus*-7  
 21b. Appendage tubercled ... *Thomsonia*-8  
 19b. Spadices not appendaged.  
 22a. Spathes convolute in the lower part forming a tube round the female floriferous zone, convolute of open in the upper part.  
 23a. Ovules basal ... *Gonatanthus*-12  
 23b. Ovules parietal ... *Remusatia*-11  
 22b. Spathes fully open from the base ... *Ariopsis*-9

1. **Cryptocoryne** Fisch. ex Reichb. Consp. 44. 1828.

**C. retrospiralis** (Roxb.) Wydler in Linnaea 5: 428. 1830; Kunth, Enum. Pl. 3: 12. 1841. *Ambrosinia retrospiralis* Roxb. Fl. Ind. 3: 492. 1832.

*Monoecious* herbs, usually aquatic, submersed, sometimes in marsh. *Rhizomes* oblique, 3-10 mm thick; roots stout. *Leaves* several, contemporaneous with the flowers, sessile or with 1-5 cm long petioles, linear-lanceolate, 7-45 × 0.3-1.8 cm, margins somewhat waved or crisped. *Peduncles* 1-2 cm long. *Spathes* somewhat shorter to equalling the leaves, greyish-green, streaked and mottled with purple, tubular below with connate margins, lower part of the tube enclosing the spadix *ca* 1 × 0.5 cm with a transverse septa in the mouth, upper part of the tube 2-4-times longer than the limb, *ca* 2 mm broad; limb linear-lanceolate, 3-7 mm broad, acute-acuminate, twisted. *Spadix* tip adhering to the septum of the tube; male and female floriferous parts *ca* 5 mm apart; perianth absent; male part cylindric, *ca* 2 mm long, dense-flowered; female part of 5-6 connate ovaries in a basal whorl with a few neuters; anthers 2-loculed, locules with conical perforated tips; ovaries 1-loculed; ovules 3-many; style short, curved; stigma sub-orbicular. *Fruits* subglobose-ovoid.

*Fls. & frts.*: Nov.-March. On river-banks; at about 1000 m.

ASSAM: Lakhimpur.

2. **Lagenandra** Dalz. in Hook. Kew Journ. Bot. 4. 289. 1852.

**L. undulata** A. R. K. Sastry in Bull. bot. Surv. Ind. 9: 294-296. 1968.

*Monoecious*, submersed herbs. *Rhizomes* creeping, usually simple, *ca* 5 mm thick; roots stout. *Leaves* white punctulate, contemporaneous with the flowers, with 1-7.5 cm long, strongly striate petioles, elliptic-lanceolate, acuminate, 1.5-9 × 0.5-1.5 cm, fleshy when fresh, becoming thin on drying, base cuneate, margins undulate. *Peduncles* *ca* 2 cm long, partly enclosed within the leaf-sheaths. *Spathes* *ca* 2 cm long, *ca* 7 mm broad at the base, tubular below, constricted in the middle; limb ovate-acuminate, slightly twisted, dark purple-blotched inside, obliquely septate at the base within. *Spadices* equalling the spathe-tubes, with the male and the female floriferous zones separated by *ca* 3 mm long naked interspace; perianth absent; male part cylindric, *ca* 3.5 × 2.5 mm; anthers sessile, crowded, cupular; female part globose, *ca* 3 mm across; ovaries many, in 3-4 whorls, 1-loculed; ovules 4 in each locule, basal, erect; stigma subsessile, discoid.

*Fls.*: May. Forming dense patches on

partly submerged rocks in a stream; at about 1220 m.

ARUNACHAL PRADESH: Subansiri.

3. *Pistia* L. Sp. Pl. 963. 1753 et Gen. Pl. ed: 5. no. 912. 1754.

*P. stratiotes* L. Sp. Pl. 963. 1753.

*Monoecious*, aquatic, floating, stoloniferous herbs. *Stems* scarcely any, bearing a rosette of leaves and several, up to 30 cm long adventitious roots which are clothed with plumosely spreading root-hairs. *Leaf-rosettes* 2-10 cm across; leaves spiral, sessile, spatulate or ovate-obovate, 2-10 cm long, flabellately nerved, densely farinose-papillose on either sides in the upper two-third part and white woolly in the lower part, base cuneate, apex rounded or retuse, or shallowly lobulate and undulate. *Peduncles* 10-15 mm long, pilose; spathes hidden among the leaves, slightly constricted above the tube, 10-15 mm long, greenish to pale yellowish-white in age, punctulate when dry, tomentose outside. *Spadices* subequalling the spathes, base adnate to the spathe tube; perianth absent; anthers 2-8, at or near the apex, sessile, whorled, with four pores in two superposed series, subtended by a collar; ovaries 1-loculed, ovules many, parietal; style conical, persistent; stigma discoid. *Fruits* baccate, ovoid, ca 2 mm long; green; seeds several, albuminous.

*Fls. & frts.*: June-Oct. In ponds and slow running streams; 90-1200 m.

Reported as a fish-fodder.

ARUNACHAL PRADESH: Kameng. ASSAM: Cachar; Darrang; Kamrup; Lakhimpur; North Cachar & Mikir Hills. TRIPURA.

4. *Arisaema* Mart. in Flora 14: 459. 1831.

*Monoecious* or *dioecious*, usually tuberous, sometimes rhizomatous herbs. *Leaves* 1-2, rarely 3; contemporaneous with the flowers, palmately or pedately compound; petioles green or variegated; leaflets 3, 5, or several; nerves usually anastomosing in loops 2-5 mm below the margin. *Peduncle* usually partly enclosed within petiole-sheaths, sometimes separate. *Spathes* deciduous, convolute below (tube), expanded above (limb), acute, acuminate or tailed at the tip. *Spadices* sessile or subsessile, included or exserted, male and female floriferous parts contiguous; appendage various; perianth absent; male part usually lax-flowered, anthers 2-5, sessile or shortly stipitate, distinct or confluent, dehiscing by pores or slits; female part dense-flowered, ovaries 1-loculed; ovules solitary or several, basal; style short or absent; stigma discoid; neuters absent or various on the appendage. *Berries* oblong-obovoid, red; seeds subglobose-ovoid, albuminous.

#### 1a. Leaflets 3.

##### 2a. Appendage flagelliform.

3a. Tuberous herbs. Leaflets green-margined. Appendage 8-20 cm long, slightly thickened and rugulose at the part just exserted from the spathe-tube, tapering into a thread in the upper part, slightly thickened towards the base and subtruncate at the base ...

*A. propinquum*-6

3b. Rhizomatous herbs. Leaflets purple-margined. Appendage 20-80 cm long, smooth throughout, filiform and hanging down in the upper part, thickened and curved in the lower part ...

*A. speciosum*-5

##### 2b. Appendage subcylindric.

##### 4a. Leaf solitary.

5a. Appendage clothed with subulate neuters ...

*A. album*-2

5b. Appendage smooth ...

*A. petiolulatum*-3

##### 4b. Leaves two.

6a. Appendage sessile, slender, ca 1.5 mm thick ...

*A. cuspidatum*-1

6b. Appendage stipitate, stout, 4-7 mm thick.

7a. Rhizomatous herbs ...

*A. rhizomatum*-14

7b. Tuberous herbs.

8a. Appendage almost uniformly thick, with a slight constriction in the middle ...

*A. nepenthoides*-10

8b. Appendage with a broader clavate tip, without any constriction ...

*A. wattii*-4

- 1b. Leaflets 5 or more.
- 9a. Leaves pedately compound.
- 10a. Peduncle arising separately from the petiole. Appendage topped with a bunch of long filaments ... *A. setosum*-15
- 10b. Peduncle embraced within petiole-sheaths. Appendage smooth or with small subulate processes.
- 11a. Monoecious herbs. Appendage sessile, clavate, 3-4 mm long ... *A. flavum*-9
- 11b. Dioecious (or sometimes monoecious in *A. tortuosum*) herbs. Appendage stipitate, various but never clavate, 3.8-25 cm long.
- 12a. Middle leaflet sessile ... *A. nepenthoides*-10
- 12b. Middle leaflet distinctly petiolulate.
- 13a. Leaflets 7-19. Appendage sigmoid at the base, gently tapering to a long tail ... *A. tortuosum*-7
- 13b. Leaflets 5-7. Appendage obtuse.
- 14a. Middle leaflet 20-30 cm long. Spathe dull purple ... *A. decipiens*-8
- 14b. Middle leaflet 8-13 cm long. Spathe pale green, generally black-dotted ... *A. rhizomatum*-14
- 9b. Leaves palmately compound.
- 15a. Leaves two. Spathe-limb auriculate at the base. Appendage distinctly stipitate.
- 16a. Appendage almost uniformly thick, with a slight constriction in the middle ... *A. nepenthoides*-10
- 16b. Appendage with a broad clavate tip, without any constriction ... *A. wattii*-4
- 15b. Leaf solitary. Spathe-limb not auriculate. Appendage sessile or subsessile.
- 17a. Spathe tip acute or shortly acuminate ... *A. fraterum*-13
- 17b. Spathe tip long-tailed.
- 18a. Leaflets 10-20, with filiform tips. Fruiting peduncles recurved. Spathes green or purple, not striped. Appendage somewhat narrowed at the tip ... *A. consanguineum*-11
- 18b. Leaflets 7-11, with acuminate tips. Fruiting peduncles erect. Spathes green or purple, with broad white stripes. Appendage somewhat broader at the tip ... *A. concinnum*-12

1. ***A. cuspidatum*** (Roxb.) Engl. in DC. Mon. Phan. 2: 536. 1879. *Arum cuspidatum* Roxb. Fl. Ind. 3: 506. 1832. *Arisaema roxburghii* Kunth, Enum. Pl. 3: 18. 1841. Dioecious herbs. Rhizomes oblique, ca 3 cm thick. Leaves two; petioles 20-25 cm long, green and pink-mottled; central petiolule 5-10 mm long; leaflets three, lanceolate, 10-30 × 2.5-7 cm long, acuminate, margins wavy, laterals subsessile, oblique. Peduncle 20-30 cm long. Spathe tube 2.5-4 cm long, white or pale yellowish-green; limb ovate, incurved, 2.5-4 × 1.5-2.5 cm, cuspidate, pale green or purplish in age(?). Male spadix: floriferous part ca 1.5 cm long; appendage slender, shortly stipitate, ca 2 cm long; anthers 4-5. Female spadix: floriferous part ca 1.5 cm long; appendage slender, ca 4.5 cm long. Neuters above the flowers subulate, few in males, several in females.

Fls.: April-May; at about 700 m.

NAGALAND.

2. ***A. album*** N. E. Brown in J. Linn. Soc. (Bot.) 18: 247. 1880.

Dioecious or monoecious herbs. Tubers

depressed-globose, 1.5-3 cm broad. Leaf solitary; petioles green, 15-50 cm long; central petiolule 15-20 mm, laterals 3-10 mm long; leaflets 3, ovate-elliptic, 8-26 × 3.5-15.5 cm, acuminate with a filiform tip, laterals oblique; nerves 12-15 pairs. Peduncles 20-38 cm long. Spathe tube 2-4 cm long, ca 1 cm broad, greenish-white; limb ovate-lanceolate with somewhat inflexed margins, 5-8 × 2-2.5 cm, greenish-white or violet tinged in age, tip filiform. Spadix: floriferous, part 2.5-3 cm long; appendage slender, 2.5-4 cm long, clothed with 1.5-5 mm long brown subulate processes; anthers 2-3, subsessile, deep brown or purple; ovaries globose, style short. (Fig. 11).

Fls.: May-June; 900-1500 m.

MEGHALAYA: K. & J. Hills.

3. ***A. petiolulatum*** Hook. f. Fl. Brit. Ind. 6: 498. 1893. *A. listerii* Prain ex Burkill in Rec. bot. Surv. India 10: 397. 1925.

Dioecious herb. Rhizomes 5-6 cm long, ca 1 cm thick. Leaf solitary; petioles 30-40 cm long; petiolules 1-3 cm long; leaflets 3, ovate, 15-25 × 5-10 cm, cuspidate, laterals oblique; nerves 8-12 pairs, anastomosing in

submarginal loops. *Peduncles* 25-35 cm long. *Spathe* tube ca 6 cm long, ca 1 cm broad; limb lanceolate, ca 6 × 2.5 cm, acuminate, purple. *Male spadix*: floriferous part ca 1.7 cm long; appendage slender, ca 3.5 cm long, ca 1.5 mm thick, obtuse; anthers 3-5, subsessile. *Female spadix*: floriferous part ca 2 cm long; appendage as in the male; ovaries obovoid, ca 2 mm long.

*Fls.*: March-April; 500-1400 m.

ARUNACHAL PRADESH: Siang; Subansiri. MANIPUR. MEGHALAYA: K. & J. Hills.

4. **A. wattii** Hook. f. Fl. Brit. Ind. 6: 498. 1893.

*Dioecious* herbs. *Tubers* depressed-subglobose, 2-3 cm broad. *Leaves* two; petioles 20-35 cm long; leaflets 3 (rarely 5), subsessile, elliptic-oblong, acuminate, glaucous beneath, margins wavy; central 16-18 × 4-4.5 cm, laterals equally long, oblique, 8-9 cm broad; nerves 14-16 pairs. *Peduncle* subequalling the petiole. *Spathe* tube ca 5 cm long, inflated above with recurved margins; limb broadly ovate, acuminate, 4.5 × 2.5-3.5 cm. *Male spadix*: floriferous part ca 2 cm long; appendage cylindric with clavate tip, ca 6 cm long, ca 6 mm thick, on ca 8 mm long stipe; anthers 2-3. *Female spadix*: floriferous part ca 2 cm long; appendage as in the male; ovaries ovoid, stigma sessile, capitate.

*Fls.*: April-Aug.; 1200-1500 m.

ARUNACHAL PRADESH: Kameng; Lohit. MANIPUR. NAGALAND.

5. **A. speciosum** (Wall.) Mart. in Flora 14: 458. 1831. *Arum speciosum* Wall. Tent. Fl. Nepal. 29. t. 20. 1824.

*Dioecious* herbs. *Rhizomes* oblique or horizontal, 5-10 cm long, 2-6 cm thick, white inside, sometimes forked. *Leaf* solitary; petioles 20-60 cm long, green or purple-brown mottled; petiolules 1-4.5 cm long; leaflets 3, oblong-lanceolate to broadly ovate, 15-30 × 6-18 cm, acuminate, purple-red-margined, laterals oblique; nerves 14-18 pairs, brownish. *Peduncles* 8-22 cm long.

*Spathe* tube 4-7 cm long, 2-3 cm broad, white with purple-brown stripes; limb, ovate, acuminate, incurved, 8-25 × 3-8 cm, long attenuate to the apex, white with purple stripes outside, violet inside. *Male spadix*: floriferous part ca 2.5 cm long; appendage stipitate, 20-80 cm long; filiform and hanging in the upper part, thickened and curved in the lower part; stipe 2.5-3 cm long; anthers 3-5, stipitate. *Female spadix*: floriferous part 2-3 cm long; appendage as in male; ovaries ovoid.

*Fls. & frts.*: May-July, at about 1500 m. ARUNACHAL PRADESH: Kameng.

6. **A. propinquum** Schott in Oesterr. Bot. Wochenbl. 7: 333. 1857; Hara, Fl. East. Himal. 333. 1971. *A. wallichianum* Hook. f. Fl. Brit. Ind 6: 500. 1893. *A. sikkimense* Stapf ex Chatterjee in Bull. bot. Soc. Bengal 3: 18. 1949 et *ibid.* 8: 135. 1955. *Dioecious* herbs. *Tubers* globose, subdepressed, 1-2-2.5 cm broad. *Leaf* solitary or two; petioles 13-50 cm long; leaflets 3, sessile or shortly petiolulate; central leaflet broadly ovate or rhombic, 3.5-20 × 2.5-15 cm, acuminate, laterals similar or slightly longer, oblique. *Peduncles* shorter or longer than the leaves. *Spathes* green or dark purple with white or yellowish stripes; tube 2-4 cm long, 1.5-2 cm broad, longitudinally ribbed inside, narrowly reflexed at the mouth; limb ovate-oblong, incurved, 6-13 × 2-6 cm, acuminate. *Male spadix*: floriferous part 1.2-2 cm long; appendage shortly stipitate, 8-20 cm long, slightly thickened and rugulose at the part just exerted from the spathe tube, tapering into a thread in the upper part, slightly thickened towards the base and subtruncate at the base; anthers 2-4, stipitate. *Female spadix*: floriferous part 1.5-2 cm long; appendage as in the male; ovaries obovoid, style ca 1 mm long, stigma minute.

*Fls.*: June; 1300-2000 m.

ARUNACHAL PRADESH: Kameng.

7. **A. tortuosum** (Wall.) Schott in Schott &

Endl. Melet. Bot. 17. 1832. *Arum tortuosum* Wall. Pl. Asiat. Rar. 2: 10. t. 111. 1830. *Arisaema helleborifolium* Schott, Syn. Ar. 29. 1856. *Arum curvatum* Roxb. Fl. Ind. 3: 506. 1832.

*Monoecious* or sometimes *male* herbs.

*Tubers* globose, sometimes depressed, 1.5-6 cm broad, white inside. *Leaves* usually two, sometimes solitary or three, pedately compound; petioles 15-80 cm long, glaucous green or sometimes variegated with deeper green blotches, clasping the peduncle and flattened or auriculate where it leaves the peduncle; median petiolule up to 3.5 cm long, laterals shorter or even absent; leaflets (5-)7-19(-23), ovate or oblong-elliptic, acute or acuminate; median 5-17(-30) × 1.4-5 (-7) cm, others smaller, subequal. *Peduncles* 18-85 (-100) cm long. *Spathes* glaucous green (sometimes dark purple, in age?); tube 2-5(-7) cm long, 1-2(-3) cm wide, limb erect, ovate-lanceolate, incurved, 3-6(-12) × 2-30.5(-5) cm, acute or acuminate. *Spadix*: floriferous part 2-4 cm long; appendage shortly stipitate, (7-)15-25 cm long, green (or sometimes purple); sigmoidly curved at the base and almost upright in the upper part, gently tapering to a slender tip; anthers 2-3, stipitate; ovaries ovoid, ovules 3-5; style short, stigma discoid.

*Fls. & frts.*: May-Sept.; 700-1500 m.

ARUNACHAL PRADESH: Kameng, Siang. MEGHALAYA: K. & J. Hills.

8. *A. decipiens* Schott in Oesterr. Bot. Wochenbl. 7: 373. 1857.

*Dioecious* herbs. *Rhizomes* horizontal, somewhat compressed, jointed, 8-10 cm long, 2-3 cm thick, creamy with bluish-violet on the joints. *Leaves* 2, pedately compound; petioles 30-40 cm long, mottled; median and common petiolules of the lateral pairs of leaflets 2-4 cm long; leaflets 5-7, elliptic-lanceolate, caudate-acuminate; median 20-30 × 5-7.5 cm, laterals slightly shorter, sessile; nerves 18-22 pairs. *Peduncles* much shorter than the petioles. *Spathe* dull

purple; tube 5-6 cm long, *ca* 1 cm wide; limb ovate-lanceolate, incurved, *ca* 7 × 2.5 cm, tapering to a 6-13 cm long tail. *Male spadix*: floriferous part *ca* 3 cm long; appendage stipitate, scarcely exceeding the spathe tube, cylindric, *ca* 4 cm long, subtruncate; anthers 3, stipitate. *Female spadix*: floriferous part *ca* 3 cm long; appendage as in the male; ovaries subglobose.

*Fls.*: Aug.-Sept. *Frts.*: Oct.-April; 1000-1500 m.

ARUNACHAL PRADESH: Kameng, Lohit, Tirap. MEGHALAYA: K. & J. Hills.

9. *A. flavum* (Forssk.) Schott, Prodr. 40. 1860. *Arum flavum* Forssk. Fl. Aeg.-Arab. 157. 1775.

*Monoecious* herbs. *Tubers* subglobose, 1.5-2.5 cm broad. *Leaves* two, or sometimes solitary, pedately compound, hispidulous when young; petioles 13-25 cm long; leaflets 5-11, oblong-lanceolate or oblong-obovate, acute, median sessile or petiolulate, 3.5-11 × 1.2-3 cm, laterals sessile on common petiolules, subequal to, or smaller than the median; nerves 6-8 pairs. *Peduncles* 20-50 cm long, green. *Spathe* tube ovoid-globose, 1-1.5 cm long, yellowish green or purplish in the upper part; limb ovate, 1.5-3 × 1-2 cm, acute or acuminate, greenish-yellow, or purplish inside near the base. *Spadix*: floriferous part conical, 1.5-2 cm long, male and female floriferous zones equally long, contiguous; appendage clavate, 3-4 × 1.5 mm, rugose when dry; anthers 2, subsessile; ovaries obovoid, ovules 3-5; stigma discoid. (Fig. 10).

*Fls.*: May.

ARUNACHAL PRADESH: Kameng.

So far known in the North-Western part, the occurrence of this species here indicates its extension in the North-Eastern parts of India also.

10. *A. nepenthoides* (Wall.) Mart. in Flora 14: 458. 1831. *Arum nepenthoides* Wall. Tent. Fl. Nepal. 26. t. 18. 1824.

*Dioecious* herbs. *Tubers* depressed-glo-

bose, 3-6 cm broad. Leaves 2 ; petioles 20-40 cm long, yellowish green with brown streaks, auriculate at the junction of the peduncle ; leaflets usually 5, sometimes 3 or



Figs. 10-12 : 10. *Arisaema flavum* (Forssk.) Schott 11. *A. album* N. E. Brown 12. *A. consanguineum* Schott



7, usually whorled, sometimes tending to become pedate, sessile, elliptic or oblanceolate, acuminate, glaucous beneath; median  $6.20 \times 1.7-6$  cm, laterals smaller; nerves 6-12 pairs. *Peduncles* 30-40 cm long. *Spathe* tube infundibuliform, 3-8 cm long, 1.5-2.5 cm broad above, auriculate at the mouth with reflexed lobes, yellowish-green with dull streaks, lobes subreniform,  $ca\ 2 \times 1$  cm, green with brown spots and broad purplish brown margins; limb ovate-oblong,  $3.10 \times 2.5$  cm, acute, greenish white or yellowish (or brownish) with 3-7 broad white stripes. *Male spadix*: floriferous part 2-3 cm long; appendage on 5-10 mm long slender stipe, subcylindric, truncate at the base, slightly contracted in the middle, obtuse at the tip, 3-7 cm long, 4-7 mm thick; anthers 3-4. *Female spadix*: floriferous part 2-3 cm long; appendage as in the male; ovaries obovoid, ovules 2-3; style short, stigma discoid.

*Fls.*: March; 1200-1400 m.

MEGHALAYA: K. & J. Hills.

11. **A. consanguineum** Schott in Bonplandia 7: 27. 1859.

*Dioecious* herbs. *Tubers* subglobose, 1.5-8 cm broad, white, mucilaginous. *Leaf* solitary; petioles 25-120 cm long, together with the peduncle, mauve at the base, greenish upwards with paler stripes or mottled with green, pink, purple and brownish black; leaflets 10-20, though usually 15-17, whorled, sessile, linear, lanceolate or oblanceolate, 7-25 cm long excluding the 2-10 cm long filiform tip, 0.5-5 cm broad, glaucous beneath, the central leaflet usually erect and others spreading; nerves 12-14 pairs. *Peduncles* 20-60 cm long. *Spathe* glaucous green becoming yellow to deep purple on drying, tube 4-7 cm long, 1.5-2.2 cm wide, auricled at the mouth; limb ovate-lanceolate,  $4.7 \times 3.5-4.7$  cm, terminating into 7-20 cm long filiform tip. *Male spadix*: floriferous part 2-4.5 cm long; appendage subcylindric, obtuse, narrowed at both the ends, 3-5 cm

long, 3-4 mm thick, green, with few to several 2-5 mm long subulate processes at the base; anthers 2-4. *Female spadix*: appendage as in the male; ovaries ovoid; stigma sessile. (Fig. 12).

*Fls.*: May-July. *Frts.*: June-Sept.; 1500-2000 m.

ARUNACHAL PRADESH: Kameng; Tirap. MANIPUR. MEGHALAYA: K. & J. Hills. NAGALAND.

Roots and seeds are said to be highly poisonous.

12. **A. concinnum** Schott in Bonplandia 7: 27. 1859.

*Dioecious* herbs or sometimes *monoecious*. *Tubers* depressed-globose, 2-5 cm broad. *Leaf* solitary; petioles 30-60 cm long, together with the peduncle, green or purplish brown; leaflets 7-11, whorled, subsessile, lanceolate or oblanceolate,  $7.30 \times 2.5$  cm, acuminate, slightly lustrous beneath. *Peduncle* 20-40 cm long. *Spathe* green, or purplish in age, with five broad longitudinal white stripes; tube 4-7 cm long,  $ca\ 1.5$  cm wide, not or slightly auriculate at the mouth; limb ovate-lanceolate, incurved,  $3.6 \times 2.4$  cm, terminating into 2-10 cm long tail. *Male spadix*: floriferous part 2-2.5 cm long; appendage cylindric, tip slightly broader, obtuse, rugulose, 2.5-4.5 cm long, 2-4 mm thick, green or purple, sometimes with a few subulate processes at the base; anthers 3-4(-6), stipitate. *Female spadix*: floriferous part  $ca\ 2.5$  cm long; appendage as in the male; ovaries subglobose; stigma discoid.

*Fls.*: March-May; 1500-2000 m.

ARUNACHAL PRADESH: Kameng, Siang, Subansiri. MEGHALAYA: K. & J. Hills.

13. **A. fraternum** Schott in Bonplandia 7: 26. 1857.

*Dioecious* herbs. *Tubers* depressed globose, 2-3 cm broad. *Leaf* solitary; petioles 15-50 cm long, purple-blotched; leaflets 7-9, whorled, sessile, lanceolate or oblong-lanceolate,  $8.16 \times 2.4$  cm, acute-acuminate; nerves 16-18 pairs. *Peduncle* 10-20 cm long.

*Spathe* green; tube 4.5 cm long, *ca* 1 cm wide, auriculate at the mouth; limb ovate-lanceolate, 4.8 × 2.5–5 cm, acute-acuminate. *Male spadix*: floriferous part 2–3 cm long; appendage subsessile, clavate, 4–4.5 cm long, naked or with a few subulate processes at the base; anthers 3–4. *Female spadix*: floriferous part 2–3 cm long; appendage as in the male; ovaries obovoid; stigma sessile.

*Fls.*: April–May, at about 1500 m.

MEGHALAYA: K. & J. Hills.

14. **A. rhizomatum** Fischer in Kew Bull. 1936: 283. 1936.

*Dioecious* herbs. *Rhizome* conical, 4–5 cm long. *Leaf* solitary, pedately compound; petiole 33 cm long, greenish brown with whitish marks, purplish at the base; median petiolule 5 mm long, lateral petiolules smaller; leaflets 5, oblong-lanceolate, acuminate, median 13 × 4.5 cm, laterals smaller. *Peduncle* shorter than the petiole. *Spathe* pale green with black dots all over; tube 4–6 cm long, slightly revolute at the mouth; limb lanceolate or ovate-lanceolate, 6–9.5 × 3–3.5 cm, terminating into a *ca* 6 cm long filiform tip. *Male spadix*: slightly exceeding the tube; floriferous part 2–2.5 cm long; appendage cylindric, *ca* 4 cm long, *ca* 7 mm thick, on *ca* 1 cm long slender stipe, apex slightly broader, obtuse, clothed with many *ca* 1 mm long, fleshy subulate processes; anthers 2–3, stipitate. *Female spadix*: floriferous part *ca* 1 cm long; ovaries subglobose, stigma stipitate, subpeltate.

*Fls.*: Sept.; 3000–3500 m.

ARUNACHAL PRADESH: Lohit; De'ei valley.

The following two varieties, collected at the same time, and in the same locality, as the type variety, may not be distinct and need further study.

var. **nudum** Fischer, l.c. 285.

*Plants* smaller in all parts. *Leaves* two, pedately 5-foliolate, or 3-foliolate; petioles 8–16 cm long, greenish brown with whitish marks; median petiolule 6–11 mm long;

median leaflet 7–11 × 2.3–3 cm, laterals smaller, and in the 3-foliolate leaves sessile or subsessile. *Peduncle* 7–12 cm long. *Spathe* tube 3.5–4.6 cm long; limb 3–4 × 2 cm. *Appendage* more slender, *ca* 3.8 cm long, *ca* 5 mm thick, apex subacute, devoid of any processes.

var. **viride** Fischer, l.c. 285.

*Leaves* 2, pedately 5-foliolate, or 3-foliolate; petiole up to 21 cm long, unspotted; median leaflet 8.5–10.5 × 3.8–5 cm, laterals smaller and narrower, sessile in 3-foliolate leaves. *Peduncle* up to 15 cm long. *Spathe* pale green, unspotted; tube 4–5 cm long; limb 4–4.5 cm long with a filiform tail 1–2.5 cm long; appendage as in var. *nudum*.

15. **A. setosum** A. S. Rao & D. M. Verma in Bull. bot. Surv. India 11: 196–97. 1971.

*Dioecious* herbs. *Rhizome* creeping, *ca* 1 cm thick. *Leaf* solitary, pedately compound; petiole *ca* 33 cm long; petiolules 6–15 mm long; leaflets 5, lanceolate or oblanceolate, 12–20 × 4–6 cm, caudate acuminate, margins slightly undulate. *Peduncle* arising separately from the petiole, 4.5–7 cm long. *Spathe* tube 3.2–3.5 cm long, *ca* 1.5 cm wide, auriculate at the mouth, auricles reniform, *ca* 10 × 5 mm; limb ovate-lanceolate, 3.6–5.2 × 2 cm with *ca* 5 mm long filiform tip. *Male spadix*: floriferous part *ca* 2 cm long; appendage shorter than the floriferous part, *ca* 2.5 mm thick at the base, topped with a tassel of filaments; filaments numerous, 3–5 cm long, pinkish green; anthers 4–5, stipitate. *Female spadix*: floriferous part *ca* 2 cm long; ovaries ovoid; style short; stigma capitate.

*Fls.*: November.

ARUNACHAL PRADESH: Siang.

5. **Sauromatum** Schott in Schott & Endl. Melet. Bot. 17. 1832.

**S. venosum** (Ait.) Kunth, Enum. Pl. 3: 281. 1841. *Arum venosum* Ait. Hort. Kew. 3:

315. 1789. *S. guttatum* (Wall.) Schott, l.c.  
*A. guttatum* Wall. Pl. Asiat. Rar. 2: 10.  
 t. 115. 1830.

*Monoecious* herbs. *Tubers* depressed globose, 4-6(-15) cm broad, brown, warty. *Leaf* solitary (or rarely two), pedatisect, 15-60 cm broad, appearing after the flowers; petiole stout, 25-80 cm long, pale green with blackish green blotches; lobes 7-15, elliptic or oblong-lanceolate, acuminate, unequal, the largest lobe in the middle up to 55 × 22 cm, the lateral lobes outwardly decreasing in size. *Peduncle* 2-6 cm long, elongating in fruit to 7-15 cm, spotted like the petiole. *Spathe* tube ovoid, 4-10 × 2-2.5 cm, margins connate below; limb coriaceous, linear-lanceolate, 15-70 × 5-10 cm, purple with yellow green blotches in the centre, ultimately reflexed, margins wavy, tip shortly acuminate, rolled. *Spadix* slender, sessile, cylindric, male and female floriferous zones each ca 1.2 cm long, separated by 3.5-6 cm long purple space; appendage subcylindric, 5-30 × 0.5-1 cm, acute or obtuse, purple; perianth absent; anthers crowded, subsessile, 4 (or sometimes 2), contiguous, dehiscing by terminal pores; ovaries 1-loculed; placenta basal; ovules 1-2, orthotropous; stigma sessile; neuters few to several above the female zone, slender, clavate, 5-10 mm long, yellow. *Berries* red; seed solitary, yellow, albuminous.

*Fls.*: April, at about 1500 m.

MEGHALAYA: K. & J. Hills, Shillong.

6. **Typhonium** Schott, Wiener Zeitschr. 3: 732. 1829.

*Monoecious* herbs. *Tubers* depressed globose. *Leaves* contemporaneous with the flowers, either simple, entire, sagittate, hastate or 3-5-lobed, or compound, 3-sect or pedatisect, reticulately nerved; petiole long. *Peduncle* usually short. *Spathe* tube slightly constricted at the mouth, persistent; limb ovate-lanceolate, deciduous. *Spadix*: male and female floriferous zones distinct; appendage various, naked, smooth or some-

times muricate; perianth absent; male flowers consisting of 1-3, sessile, 2-loculed anthers; ovaries congested, ovoid-oblong, 1-loculed, placenta basal, ovules 1-2, orthotropous; stigma sessile; neuters sometimes above the female and sometimes below the male zone. *Berries* 1-2-seeded; seeds subglobose, albuminous.

- |  |     |                          |
|--|-----|--------------------------|
| 1a. Spathe limb 4-10 cm broad, acuminate   | ... | <i>T. trilobatum</i> -1  |
| 1b. Spathe limb 2-3 cm broad, narrowed into a long filiform tail.  |     |                          |
| 2a. Neuters all over the bare space between the male and the female floriferous zones, the lower clavate, upper subulate | ... | <i>T. divaricatum</i> -2 |
| 2b. Neuters only above the female floriferous zone, all filiform   | ... | <i>T. gracile</i> -3     |

1. **T. trilobatum** (L.) Schott in Wien. Zeitschr. 3: 72. 1829. *Arum trilobatum* L. Sp. Pl. 965. 1753.

*Herbs* with tubers 1-4 cm broad. *Leaves* solitary or two; petioles 10-50 cm long; lamina deeply 3-lobed, hastate, sometimes almost tripartite; middle lobe ovate, 6-20 × 3-10 cm, acute, laterals slightly shorter, oblique, sometimes again lobed on its outer sides. *Peduncle* slender, 2-5(-10) cm long. *Spathe* tube oblong, 2-3 cm long, 1-1.5 cm wide; limb oblong or ovate-lanceolate, 10-20 × 4-10 cm, acuminate, pale green outside, red-brown inside. *Spadix*: male and female floriferous zones ca 2.5 cm apart, male ca 1.5 cm long, female ca 0.7 cm long; appendage shortly stipitate, elongate-conoid, 4-12 cm long, red-purple, base expanded to 4-7 mm and intruded over the stipe; neuters numerous, for 5-10 mm above the female zone, filiform, curved, ca 1 cm long.

*Fls.*: May-June, 100-900 m.

ARUNACHAL PRADESH: Kameng. ASSAM: Kamrup. TRIPURA.

2. **T. divaricatum** (L.) Decne in Ann. Nat. Hist. Mus. Paris 3: 367. 1834; non Hook. f. Fl. Brit. Ind. 6: 510. 1893. *Arum divaricatum* L. Sp. Pl. ed. 2. 1369. 1762. *T. cuspidatum* Decne, l.c. 39; Hook. f. in Fl. Brit. Ind. 6: 511. 1893. *A. cuspidatum*

Blume, Cat. Gew. Buitenzorg 101. 1823.  
*A. flagelliforme* Lodd. Bot. Cab. t. 396.  
 1819. *T. flagelliforme* Blume in Wall. Cat.  
 no. 8931. 1832.

*Herbs* with tubers 1-2 cm broad. *Leaves* several; petioles 10-30 cm long; lamina 5-25 cm long, ovate, oblong or lanceolate, with sagittate, hastate or cordate base, sometimes almost tripartite. *Peduncle* solitary, slender, ca 5 cm long. *Spathe* tube ovoid-oblong, 1.5-2 cm long, green; limb with a short lanceolate base narrowed to a filiform tail, white, 7.5-25 cm long, 2-3 cm broad at the base. *Spadix*: male and female floriferous zones ca 1 cm apart; male zone cylindric, 3-5 mm long; female zone subglobose, ca 5 mm across; appendage shortly stipitate, ca 1.5 mm broad at the base, narrowed to a slender tail, subequalling the spathe.

*Fls.*: September; at about 150 m.

ASSAM: Sibsaigar.

3. ***T. gracile*** (Roxb.) Schott, Aroid. 1: 121.  
 1855. *Arum gracile* Roxb. Fl. Ind. 3: 505.  
 1832.

*Herbs* with tubers ca 2 cm broad. *Leaves* solitary or few; petioles 10-25 cm long; lamina palmately 3-lobed or pedately 4-5-lobed; leaflets sessile or petiolulate, elliptic-oblong, acuminate, 5-10 × 2-5 cm. *Peduncle* solitary slender, 2-4 cm long. *Spathe* tube ovoid-oblong, 2-3 cm long, 1-1.5 cm wide; limb with a short lanceolate base narrowed to a filiform tail, 15-20 cm long, 2-3 cm broad at the base. *Spadix*: male and female floriferous zones ca 2 cm apart; male zone cylindric, 5-10 mm long; female zone subglobose, ca 5 mm dia.; appendage sessile or subsessile, 3-5 mm broad at the base, narrowed to a filiform tip, subequalling the spathe.

*Fls.*: March-April, at about 600 m.

MEGHALAYA: K. & J. Hills.

7. ***Amorphophallus*** Blume ex Decne, Herb. Timor 38. 1835; *nom. cons.*

*Monoecious* herbs. *Corms* depressed globose. *Leaf* solitary or few, appearing after

flowers; petiole long; lamina tripartite, each part again multifid with decurrent lobes. *Peduncle* solitary. *Spathe* more or less convolute with overlapping margins towards the base, partly or fully opening above, ultimately withering or caducous. *Spadix* included or exerted; male and female floriferous zones contiguous, dense-flowered; appendage various, smooth; the male zone and the appendage ultimately caducous and the female zone elongating in fruits; perianth and neuters absent; stamens numerous, anthers subsessile, 2-loculed, locules oblong, dehiscing by apical pores; ovaries numerous, 1-4-loculed, ovule solitary, subbasilar, anatropous; style present or absent; stigma capitate, entire or lobed. *Berries* subglobose or obovoid, 1-3-seeded, the upper maturing first; seeds ellipsoid, exalbuminous.

- 1a. Leaves usually with a bulbil at the initial fork of the lamina, sometimes at the other forks also, margins purple. Appendage at the base about half or less as broad as long. Style absent or almost so ...

*A. bulbifer*-2

- 1b. Leaves without bulbils, margins green. Appendage at the base about as broad as long. Style distinct ...

*A. campanulatus*-1

1. ***A. campanulatus*** (Roxb.) Blume ex Decne, Nouv. Ann. Mus. Paris 3: 366. 1834; Herb. Timor 38. 1835. *Arum campanulatus* Roxb. Pl. Corom. 3: 68. t. 272. 1820. *Amorphophallus rex* Prain ex Hook. f. Fl. Brit. Ind. 6: 514. 1893.

*Corms* 15-25 cm broad, brown outside, creamy white inside, red tinged on exposure. *Leaf* solitary; petiole stout, 30-90(-140) cm long, warty or smooth, pale green with deep green blotches; lamina 30-90(-250) cm across tripartite, the lateral parts again bifurcating, and ultimately divided into oblong, acuminate, 10-20 cm long decurrent lobes. *Peduncle* 5-10(-25) cm long, warty or smooth, elongating to 10-25(-120) cm in fruits, blotched like the petiole. *Spathe* convolute at the base, spreading above into an irregularly ovate, plicate limb, 15-30 cm long, 10-22 cm

broad, outside purple or partly yellow-green pale yellow just below and with numerous  
with pale blotches, inside purple at apex, red papillae in the lower half, ultimately re-



Figs. 13-16 : 13. *Pothos scandens* L. 14. and 14a. *Rhapsidophara glauca* (Wall.) Schott 15. *Amorphophallus bulbifer* (Roxb.) Blume 16. *Remusatia vivipara* (Lodd.) Schott

flexed. *Spadix*: male floriferous zone obconoid, 4.8 × 4.5 cm; female floriferous zone cylindric, 5.10(-22) cm long; appendage roughly conoid, with several folds and lobes, 5.15(-30) cm long and almost equally broad at the base, dark purple; anthers sessile, crowded, 3-4 mm, yellow; ovaries 2-3-loculed; style 8-15 mm, purple; stigma 2-3-lobed, orange-yellow.

*Fls.*: May-June; 100-800 m. Sometimes cultivated for its edible corms.

MEGHALAYA: K. & J. Hills. NAGALAND.

2. **A. bulbifer** (Roxb.) Blume in Rumphia 1: 148. 1837. *Arum bulbiferum* Roxb. Fl. Ind. 3: 510. 1832.

*Corms* 5-10 cm broad, brown, warty. *Leaf* solitary; petiole 30-120 cm long, smooth, greenish or pinkish white or mauve, with deep green or greenish brown stripes or blotches; lamina 30-50 cm dia., tripartite, the lateral parts sometimes again bifurcating, all ultimately divided into oblong-obovate, acuminate, 5-15 cm long decurrent lobes. *Peduncle* 13-30 cm long, coloured like the petiole. *Spathæ* convolute at the base, spreading above into an ovate obtuse limb, 8-30 cm long, 5-22 cm broad, outside pale pink-mauve with green blotches, inside pale pink-mauve with numerous red papillae towards the base, ultimately reflexed. *Spadix* sessile; male floriferous zone cylindric, 2.5-7 × 1.5-2.5 cm; female floriferous zone 1.5-5 × 1.2-2 cm; appendage oblong or narrowly conoid, obtuse, 4-13 × 2-3.5 cm, flesh-coloured; anthers sessile, crowded, pinkish; ovaries depressed globose ca 2 mm, scarlet; stigma sessile or subsessile, discoid, 2-3-lobed, yellow (Fig. 15).

*Fls.*: May-June; 100-1400 m.

ARUNACHAL PRADESH: Kameng. ASSAM: Kamrup; Lakhimpur; Sibsagar. MEGHALAYA: Garo Hills; K. & J. Hills.

8. **Thomsonia** Wall. Pl. Asiat. Rar. 83. t. 99. 1830.

**T. nepalensis** Wall., l.c.

*Monoecious* herbs. *Tubers* depressed globose, 8-12 cm broad. *Leaf* solitary, appearing after the flowers; petioles 40-50 cm long, 2.5-4 cm thick, pale green with deep green blotches; lamina 35-50 cm broad, tripartite, each part again many-lobed; lobes ovate or oblong-lanceolate, caudate-acuminate, base decurrent, margins waved, the largest lobe 10-15 × 3-5 cm. *Peduncle* solitary, stout, 50-90 cm long, blotched like the petiole. *Spathæ* coriaceous, oblong-cymbiform, 15-50 × 6-15 cm, light green outside, still lighter green inside, obtuse or 2-lobed at the tip, convolute for 5-12 cm at the base. *Spadix*: male and female floriferous zones contiguous; male zone 7-18 cm long, 1.2-2 cm thick; female zone 2-5 cm long, ca 2 cm thick; appendage cylindric, 8-14 cm long, 1.5-2.5 cm thick, yellowish green, with a few yellowish white depressed neuters at the base and tubercles in the remaining part; perianth absent; anthers 3-5, subsessile, pale orange-yellow; ovaries globose, 2-loculed; ovule solitary, basal, anatropous; style ca 1.5 mm long; stigma capitate, faintly 3-lobed.

*Fls.*: April-July; 900-1600 m.

ASSAM: North Cachar & Mikir Hills. MEGHALAYA: K. & J. Hills.

9. **Ariopsis** Nimmo in Grah. Cat. Pl. Bombay 252. 1839.

**A. peltata** Nimmo in Grah., l.c.

*Monoecious* herbs. *Tubers* clustered, ovoid-subglobose, 2-4 cm broad, greenish. *Leaves* simple, peltate, appearing together with or after flowers; petiole slender, 7-20 cm long; lamina broadly ovate or suborbicular, 3-20 cm long, entire or retuse at the base, acute or rounded at the apex. *Peduncle* slender, 4-10 cm long. *Spathæ* cymbiform, open from the base, 1.5-2 × 1-1.25 cm, apiculate, violet with a green dorsal ridge, paler within, persistent. *Spadix* ca 1 cm long, decurved; appendage and perianth

absent; male flowers imbedded in the tissue of the spadix, of 2-loculed purple anthers connate in groups of threes; ovaries few, oblong, 1-loculed; placentae 4-6, parietal; ovules many, orthotropous; stigma sessile, stellately 4-6-lobed, yellow. *Berries* 3-6 angled; seeds many, albuminous.

ARUNACHAL PRADESH: Kameng.

10. **Steudnera** C. Koch in C. Koch & Fint. Bot. Wochenschr. 114. 1862.

*Monoecious* herbs. *Rhizome* continued above the ground into a short caudex. *Leaves* simple, peltate, contemporaneous with the flowers, suborbicular or ovate-oblong; base entire, retuse or 2-lobed. *Spathe* convolute at the base forming a short tube, open above forming an ovate or lanceolate, me crescent limb. *Spadix* shorter than the spathe; male and female floriferous zones, contiguous, male zone obovoid or clavate, female zone cylindric, adnate to the spathe at its base; appendage and perianth absent; synandria of 3-6 stamens connate into a peltate body with a flat crenulate crown; locules oblong-globose; dehiscing by apical pores; ovaries mixed with a few clavate staminodes, subglobose, 1-loculed; placenta parietal; ovules many, orthotropous; stigma sessile, 2-5-lobed. *Berries* ovoid, 4-6-seeded; seeds ovoid, albuminous.

- |   |                           |
|---|---------------------------|
| 1a. Leaves 25-60 cm long. Spathe limb narrowly lanceolate, 12-20 cm long ca 3 cm broad, yellow, with some brownish blotches within towards the base ... | <i>S. colocasiodes</i> -3 |
| 1b. Leaves 12-30 cm long. Spathe limb ovate or ovate-lanceolate, 4-10 cm long, 3-5 cm broad, yellowish-green or red-purple.                             |                           |
| 2a. Spathe limb yellowish-green with a purple-brown blotch within at the base ...   | <i>S. griffithii</i> -2   |
| 2b. Spathe limb red-purple.   |                           |
| 3a. Leaves ovate-oblong, 20-30 × 12-18 cm ...   | <i>S. assamica</i> -1     |
| 3b. Leaves broadly ovate or suborbicular, 12-16 cm long and about equally broad ...   | <i>S. gagei</i> -4        |

1. **S. assamica** Hook. f. Fl. Brit. Ind. 6: 520. 1893.

*Caudex* ca 2 cm thick, fibrous above. *Leaves* entire at the base, acute at the apex, bright green above, paler beneath, with 6-10 nerves on either side of the midrib; petiole 15-20 cm long. *Peduncle* slender, 7-12 cm long. *Spathe* lanceolate, 4-10 × 3-3.5 cm, caudate-acuminate, red-purple on both the surfaces. *Spadix* cylindric, slightly shorter than the spathe.

*Fls.*: March-April, 1200-1600 m.

ARUNACHAL PRADESH: Kameng; Subansiri. ASSAM: North Cachar & Mikir Hills. MIZORAM.

2. **S. griffithii** Schott in Bonplandia 10: 222. 1862.

*Caudex* ca 2 cm thick, fibrous above. *Leaves* thinly coriaceous, ovate-oblong, 10-27 × 6-16 cm, acute or cuspidate at the apex, retuse or shortly 2-lobed at the base, dark green above, glaucous beneath, with 4-5 nerves on either side of the midrib; petiole 25-40 cm long. *Peduncle* slender, 10-15 cm long. *Spathe* ovate-lanceolate, 5-7 × 4 cm, acuminate. *Spadix* cylindric, ca 2 cm long.

*Fls.*: March, 600-800 m.

ARUNACHAL PRADESH: Lohit. ASSAM: Lakhimpur.

3. **S. colocasiodes** Hook. f. Fl. Brit. Ind. 6: 520. 1893.

*Caudex* ca 3.5 cm thick, fibrous above, yellow inside. *Leaves* thinly coriaceous, broadly ovate, 25-60 × 15-50 cm, acute at the apex, emarginate or broadly retuse at the base, pale green above, glaucous beneath, purplish when young; nerves in the apical lobes 5-8 on either side of the midrib, posterior nerves forming an acute angle of 20°-30°; petiole 30-45 cm long. *Peduncle* 12-18 cm long, 4-5 mm thick. *Spathe* tube ovoid, 2-2.5 cm long, ca 8 mm wide, green; limb narrowly lanceolate, acuminate. *Spadix* cylindric, ca 5 cm long, yellowish white; male and female floriferous zones equally long, female zone fused with the spathe towards the base for about half way up.



*Fls.*: May; at about 700 m.

ASSAM: Lakhimpur.

4. **S. gagei** Krause in Engl. Pflanzenrch. heft 71: 15. 1920.

*Caudex* 5-6 cm long, 2-2.5 cm thick. *Leaves* thinly coriaceous, entire or emarginate at the base; nerves in the apical lobe 4-5 on either side of the midrib, posterior nerves forming an acute angle of *ca* 30°; petiole *ca* 20 cm long. *Peduncle* *ca* 10 cm long, *ca* 3 mm thick. *Spathe* ovate-lanceolate, *ca* 10 × 5 cm, caudate-acuminate, purple-red inside. *Spadix* shorter than the spathe; male floriferous zone clavate, white; female floriferous zone cylindric, *ca* 3 cm long, *ca* 4 mm thick, pale yellow, slightly longer and narrower than the male.

*Fls.*: April.

MIZORAM.

11. **Remusatia** Schott in Schott & Endl. Melet. Bot. 18. 1832.

*Monoecious* herbs. *Tubers* depressed globose, bearing long, stolon-like bulbiliferous shoots (*turions*); bulbils scaly, scales with hooked awns. *Leaves* solitary, simple, appearing after the flowers, coriaceous, long petiolate, peltate, cordate with partially connate basal lobes, pinnately nerved. *Peduncle* solitary. *Spathe* coriaceous; tube ovoid, accrescent over the fruit; limb ultimately caducous. *Spadix* subsessile, male and female floriferous zones separated by neuters; male zone ellipsoid, obtuse, female zone subcylindric; appendage and perianth absent; synandria closely packed, shortly stipitate with a flat angular fleshy top bearing 4-8 anther cells along its sides, cells opening by terminal pores; ovaries ovoid; placentae 2-4, parietal; ovules many, orthotropous; stigma sessile, discoid. *Berries* obovoid; seeds albuminous.

- 1a. Bulbiliferous shoots usually stout, simple, erect, sometimes rather slender and spreading, or shortly branched. Spathe limb trapezoid, cuspidate, 6-12 × 4-6.5 cm ...

*R. vivipara*-1

- 1b. Bulbiliferous shoots slender, much branched, pendulous. Spathe limb oblong-lanceolate, acuminate, 2-4.5 × 1-1.5 cm ...

*R. hookeriana*-2

1. **R. vivipara** (Lodd.) Schott in Schott & Endl. Melet. Bot. 18. 1832; Santapau in Rec. bot. Surv. India 16: 292. 1967. *Arum viviparum* Roxb. Hort. Beng. 65. 1814; *nomen*. *Caladium viviparum* Lodd. Bot. Cab. t. 281. 1820.

*Tubers* 3-7 cm<sup>2</sup> broad, pink-red without, pinkish-white within. *Bulbiliferous* shoots appearing in the vegetative phase but persisting in a more or less decayed state till the next flowering phase, 10-30 cm long, 5-7 mm thick; bulbils clustered, 4-5 mm long. *Leaves* broadly ovate, 12-42 × 8-30 cm, acuminate, cordate; nerves 3-4 on either side of the midrib and 2-3 from the basal costae. *Peduncle* 6-15 cm long, cataphylls exceeding the peduncle. *Spathe* tube ovoid, 2.5-4.5 cm long, 0.8-1.2 cm wide, green; limb at first erect, later reflexed and ultimately caducous, coriaceous, greenish outside, yellow inside. *Spadix* slightly exceeding the spathe tube, 4-4.5 cm long; male and female floriferous zones separated by *ca* 5-15 mm long neuter zone; male zone *ca* 1.5 cm long; female zone *ca* 2 cm long. (Fig. 16).

*Fls.*: April, 900-1800 m.

ARUNACHAL PRADESH: Kameng, Subansiri, Tirap. MEGHALAYA: K. & J. Hills.

2. **R. hookeriana** Schott. in Oesterr. Bot. Wochenbl. 133. 1858.

*Tubers* 2-3 cm broad, brown. *Leaves* ovate-oblong, *ca* 10 × 5 cm, acuminate, cordate; nerves 2-4 on either side of the midrib and 2-3 from the basal costae. *Peduncle* 3-10 cm long. *Spathe* tube 1.5-2.5 cm long, *ca* 1 cm wide. *Spadix* slightly exceeding the spathe tube; male and female floriferous zones separated by *ca* 7 mm long neuter zone; male zone *ca* 7 mm long; female zone *ca* 1 cm long.

*Fls.*: May.

MEGHALAYA: K. & J. Hills.



12. **Gonatanthus** Klotz. in Link, Klotzsch & Otto, Icon. Pl. Rar. Hort. Berol. 1: 33. t. 14. 1841; A. S. Rao & D. M. Verma in Bull. bot. Surv. India 10: 353-57. 1969.

*Terrestrial* or epiphytic, monoecious herbs. *Tubers* depressed globose, bearing long, stolon-like bulbiferous shoots (turions) during the vegetative phase which may persist during the next flowering phase in a decayed state; bulbils ovoid, scaly; scales ending in filiform tips. *Leaves* few, simple, appearing along with or after flowers, peltate, sagittate-cordate at the base; petiole long, slender. *Peduncles* few, sheathed. *Spathe* coriaceous, young fully convolute, mature partly opening; limb caducous; tube accrescent over the infructescence. *Spadix* subsessile, shorter than the spathe, male and female floriferous zones widely separated by a neuter zone; male subcylindric or clavate; female subcylindric; appendage and perianth absent; synandria crowded, shortly stipitate, irregularly obconoid; stamens 2-3; ovaries obovoid-subglobose, 1-loculed (sometimes 2-3-loculed at apex); placenta basal, ovules few to many; stigma sessile, capitate; neuters between male and female many, contiguous, narrow, compressed. *Berries* obovoid-subglobose.

- 1a. *Leaves* ovate or ovate-oblong, cuspidate-acute, glaucous beneath, Spadices appearing with the leaves. Spathe limb linear-lanceolate, 12-20 cm long, open like a dome only at the base ...  
1b. *Leaves* narrowly lanceolate, caudate-acuninate, bright purple beneath. Spadices appearing before leaves. Spathe limb ovate, 2.7-5 cm long, unrolled almost all along its length ...

*G. pumilus*-1

*G. ornatus*-2

1. **G. pumilus** (D. Don) Engl. et Krause in Engl. Pflanzenrch. heft 71: 19. 1920. *Caladium pumilum* D. Don, Prodr. Fl. Nepal. 21. 1825. **G. sarmentosus** Klotz. in Link, Klotzsch & Otto, Icon. Pl. Rar. Berol. 1: 33. 1841.

*Tubers* 0.5-3 cm broad, pale brown; bulbi-

ferous shoots several, branched, more profusely in the terminal part, 20-40 cm long, ca 2 mm thick, reddish brown, bearing few to clusters of bulbils at the nodes; bulbils 1-2 mm long, its scales ending in 3-12 mm long filiform processes. *Leaves* 1-4, ovate or ovate-oblong, cordate, rarely lanceolate, 6-26 × 4-15 cm, undersurface usually glaucous but sometimes purplish when young; petioles 6-43 cm long. *Peduncles* 1-2, suberect, curving in fruit, 3-11 cm long. *Spathe* tube globose-ovoid, 0.8-1.5 cm long, 5-10 mm wide, elongating to 2-4 cm in fruit, green; limb linear-lanceolate, flexuous, green when young, yellow afterwards, with a basal swelling enclosing the male floriferous zone which flares open on maturity, the rest completely rolled; swelling globose-ovoid, 1.2-2.5 cm long. *Spadix* 2.5-4 cm long, male and female floriferous zones separated by a 7-12 mm long neuter zone; male zone cylindric, 1-2 cm long, 3-5 mm thick; female zone 0.5-1 cm long; synandria 1-2 mm long; ovaries ca 1 mm long; ovules many; neuters many, 1-2.5 mm long, white.

*Fls.*: May-July, terrestrial or epiphytic in partly shady places, 700-2100 m.

ARUNACHAL PRADESH: Subansiri. MEGHALAYA; K. & J. Hills. NAGALAND.

2. **G. ornatus** Schott in Oesterr. Bot. Zeitschr. 8: 121. 1858.

*Tubers* 1.5-3.5 cm broad, pale brown or sometimes purple-green tinged; bulbiferous shoots simple or rarely branched, 5-50 cm long, 1-2.5 mm thick, pale brown, some swelling at the tips to produce ultimately new tubers, others (particularly in epiphytic plants) winding and terminating in pendulous or more often upright, much branched shoots; bulbils profuse, tiny, ovoid, greenish-white, scales with filiferous tips. *Leaves* 2-3, narrowly lanceolate, cordate, 15-40 × 3.5-14.5 cm, undersurface green in very young leaves otherwise persistently bright purple, sometimes fading in age near the margins;

petioles 17-50 cm long. *Peduncles* 1-3, reclining in fruits, 7-15 cm long. *Spathe* tube oblong, 1-2.5 cm long, 7-10 mm wide, elongating to 2.5-3.5 cm in fruits, greenish without, deep purple black within; limb fully convolute when young, unfolding on maturity with one side more inflexed, 2.7-5 × 2-3 cm, cuspidate, yellow on both the surfaces with greenish margins and base. *Spadix* 1.7-3 cm long, male and female floriferous zones separated by 4-6 mm long neuter zone; male zone clavate, 5-7 × 2.5-4 mm, creamy; female zone 8-13 × 3-5 mm, green; synandria 1-1.5 mm long; ovaries 1-1.5 mm long, ovules few; neuters white, those between male and female zones many, elongate, 1.5-3 mm long, those at the base of the female few, roundish, ca 1 mm.

*Fls.*: April-May, terrestrial or epiphytic, in shady places, 900-1900 m.

MEGHALAYA: K. & J. Hills.

13. ***Colocasia*** Schott in Schott & Endl., Melet. Bot. 18. 1832. *nom. cons.*

*Monoecious* herbs with a tuberous subterranean rhizome, the rhizome sometimes bearing stolons. *Leaves* solitary or few, simple, contemporaneous with the flowers, peltate, ovate, cordate or sagittate, pinnately nerved. *Peduncles* solitary or few. *Spathe* tube accrescent, persistent, contracted in the mouth; limb first fully convolute, later cymbiform, ultimately withering or decaying. *Spadix* sessile, shorter than the spathe; male and female floriferous zones usually separated by flat elongate neuters; appendage cylindric, constricted at the base, or absent; perianth absent; synandria obpyramidal, with a flattened angular top consisting of 2-6 sessile stamens; anther-locules linear, dehiscing by a terminal pore; ovaries ovoid-oblong, 1-loculed; placenta 2-4, parietal; ovules many, orthotropous; stigma depressed globose, shallowly lobed, sessile or with a minute style. *Berries* many-seeded; seeds ovoid-oblong, albuminous.

1a. Appendage present.

2a. Leaves pale green or purple-violet beneath, rarely glaucous; basal lobes connate for about half to two-third their length. *Spathe* 15-35 cm long ...

*C. esculenta*-1

2b. Leaves glaucous beneath; basal lobes almost totally connate. *Spathe* 6-10 cm long ...

*C. affinis*-2

1a. Appendage absent ...

*C. mannii*-3

1. ***C. esculenta*** (L.) Schott in Schott & Endl. Melet. Bot. 18. 1832. *Arum esculentum* L. Sp. Pl. 965. 1753. *C. antiquorum* Schott, l.c. *C. esculenta* var. *antiquorum* (Schott) Hubb. & Rehder.

*Herbs*; hard, tapering, or tuberous in cultivated varieties, suckers or stolons sometimes present. *Leaves* thinly coriaceous, ovate or subtriangular, 20-55 × 10-35 cm; apical lobe subacute-cuspidate with 3-5 pairs of lateral nerves; basal lobes with 3-6 lateral nerves; petioles 30-150 cm long, green, yellowish green, purple or reddish. *Peduncle* solitary, or few clustered and connate, much shorter than the petiole. *Spathe* slightly curved in flowers; tube oblong, greenish, 4-5 cm long; limb narrowly lanceolate, acuminate, 2-3 cm broad, yellow or orange-yellow; male and female floriferous zones separated by 2.5-5 cm space covered with neuters; male zone cylindric, 5-7 cm long; female zone cylindric, 3-5 cm long; appendage slender, cylindric, 3-6 cm long; synandria ca 1 mm long; stigma subsessile.

*Fls.*: May-Sept., wild and commonly cultivated for its edible underground parts and leaves; near water, from 100-2000 m.

Several varieties are recognised by Engler (in *Pflanzenrch. heft* 17: 65. 1920). We lack sufficient data to say clearly as to what varieties occur in our area.

2. ***C. affinis*** Schott in Bonplandia 7: 28. 1859.

*Herbs* with tubers subglobose, 1-2.5 cm broad. *Leaves* 1-3, ovate or orbicular-ovate, 5-20 × 4-13 cm, green with dark blotches between the nerves above, cuspidate, acute or obtuse, nerves very slender; petiole slender, 10-35 cm long, 3-6 mm thick.

*Peduncles* 1-3, slender, 5-12 cm long. *Spathe* tube subcylindric, *ca* 1.5 cm long, tumid green; limb linear-lanceolate, *ca* 1 cm broad, yellow; male and female floriferous zones separated by *ca* 5 mm long space covered with flat neuters; male zone *ca* 1 cm long; female zone *ca* 5 mm long; appendage slender, acute, 3-4 cm long, 2-3 mm thick at the base, golden yellow.

*Fls.*: May-July, 150-1000 m.

It is doubtful if *C. fallax* Schott (in Bonplandia 7: 28. 1859) distinguished from the above on the basis of thicker leaves with stronger nerves and with fewer neuters between the male and the female zones would prove distinct. However, a study of the living plants with reference to protologue is essential to reach any conclusive opinion.

ARUNACHAL PRADESH: Subansiri, Tirap. ASSAM: Sibsagar. MEGHALAYA: K. & J. Hills.

3. *C. mannii* Hook. f. Fl. Brit. Ind. 6: 524. 1893.

*Herbs.* *Leaves* oblong-ovate, 20-30 × 10-18 cm, sagittate with a broad sinus; nerves slender, 6-7 pairs, basal lobes *ca* 10 cm long, obtuse; petioles 30-90 cm long. *Peduncles* rather slender. *Spathe* tube *ca* 2.5 cm long, limb narrowly oblong-cymbiform, 15-18 cm long. *Spadix* 4-10 cm long, male and female zones separated by *ca* 1.2 cm; male zone 2.5-4 cm long; anthers stellately crenate; female zone *ca* 2 cm long; ovaries globose; stigma a discoid area.

ASSAM: Sibsagar, Makum (*n. v.*).

14. *Alocasia* (Schott) G. Don in Sweet, Hort. Brit. ed. 3: 631. 1839; *nom. cons.*

*Monoecious* herbs. *Rhizome* continued above into a caudex. *Leaves* few, simple, petiolate, contemporaneous with the flowers, peltate or epeltate, ovate-orbicular, base various. *Peduncles* solitary or several. *Spathe* tube accrescent, persistent, contracted in mouth; limb first wholly convolute, later expanded, cymbiform, ultimately caducous. *Spadix* sessile, rather shorter than the

spathe; male and female floriferous zones usually separated by flat neuters; appendage various; perianth absent; synandria with a flattened angular top, consisting of 3-8 stamens; anther locules dehiscing by terminal pores; ovaries ovoid, 1-loculed; placenta basal; ovules few to several, orthotropous; style minute; stigma discoid-globose or stellately 3-4-lobed. *Berries* suborbicular, few-seeded; seeds roundish, albuminous.

The genus needs a critical revision with a study of live populations together with protologue.

- |   |                          |
|---|--------------------------|
| 1a. Lateral nerves, except the uppermost two, all congested at the base and somewhat palmately arranged, the uppermost two arising above... | <i>A. cucullata</i> -1   |
| 1b. Lateral nerves almost equidistant, pinnately arranged.  |                          |
| 2a. Basal lobes of the leaves free up to the insertion of the petiole ...   | <i>A. indica</i> -2      |
| 2b. Basal lobes of the leaves connate for some distance.  |                          |
| 3a. Basal lobes of the leaves broadly ovate, very much rounded in outline and thus, without a distinct tip ...                              | <i>A. odora</i> -3       |
| 3b. Basal lobes of the leaves triangular, only slightly curving in outline and with a distinct tip.   |                          |
| 4a. Apical lobe of the leaves with 3-4 pairs of lateral nerves. Appendage sinuously sulcate ...   | <i>A. navicularis</i> -5 |
| 4b. Apical lobes of the leaves with 5-9 pairs of lateral nerves. Appendage uniformly thick.   |                          |
| 5a. Leaves ovate-lanceolate, 20-45 × 10-25 cm ...   | <i>A. fornicata</i> -4   |
| 5b. Leaves broadly ovate or suborbicular, 30-50 × 24-30 cm ...  | <i>A. fallax</i> -6      |

1. *A. cucullata* (Lour.) Schott in Oesterr. Bot. Wochenbl. 410. 1854. *Arum cucullatum* Lour. Fl. Cochinchina, 656. 1793. *Herbs.* *Rootstock* 30-60 cm long with many suckers, branched, inclined. *Leaves* broadly ovate, cordate, 15-30 × 10-18 cm, nerves stout, 5-7 pairs, all except the uppermost pair, approximate at the base, flabel-

lately spreading; petioles 30-90 cm long, green. *Peduncles* solitary or few, shorter than the petiole. *Spathes* fleshy, convolute, 15-30 cm long; tube 5-10 cm long; limb narrowly cymbiform. *Spadix* shorter than the spathe; appendage short.

MEGHALAYA: K. & J. Hills, 1300 m, Hook. f. & Thom. (*n. v.*).

2. **A. indica** (Lour.) Koch in Ind. Sem. Hort. Berol. App. p. 5. 1854. *Arum indicum* Lour. Fl. Cochinch. 536. 1793.

*Herbs.* *Rhizomes* with numerous roots ending in small tubers. *Caudex* stout, 0.8-2.7 m high, 7-20 cm thick. *Leaves* coriaceous, not or hardly peltate, ovate, deeply sagittate-cordate, 60-90 cm long, bright green, undulate; apical lobe acute with a stout midrib and 6-8 pairs of lateral nerves; basal lobes not or sometimes slightly connate; petioles stout, 0.5-1 m long, green. *Peduncles* several, 10-20 cm long. *Spathes* 20-30 cm long, pale yellowish green, faintly foetid smelling; tube ovoid, 4-5 cm long; limb narrowly oblong, cuspidate, 5-6.5 cm broad. *Spadix*: male zone 4-5 cm long, white; female zone *ca* 2.5 cm long, yellow; appendage 10-20 × 0.8 cm, rugulose; ovaries obovoid, *ca* 5 mm long; stigma sessile, 3-4-lobed. *Berries* 8-10 mm long, red.

*Fls.*: April-May; 100-1300 m; sometimes cultivated for its edible caudex and root-tubers.

ARUNACHAL PRADESH: Tirap. ASSAM: Lakhimpur.

3. **A. odora** (Roxb.) Koch in Ind. Sem. Hort. Berol. App. p. 5. 1854. *Arum odoratum* Roxb. Fl. Ind. 3: 499. 1832.

*Herbs.* *Caudex* stout, 0.3-1 m high, 5-10 cm thick. *Leaves* coriaceous, slightly peltate, ovate, cordate, 50-90 × 40-80 cm, bright green; apical lobe acuminate with a stout midrib and 6-10 pairs of lateral nerves; basal lobes shortly connate; petioles stout, up to 1 m (or more?) long. *Peduncles* several 12-25 cm long. *Spathe* tube ovoid, 3-5 cm long; limb coriaceous, cymbiform, cuspi-

date, 10-15 × 4-5 cm, pale green or yellowish. *Spadix* white, fragrant, male and female floriferous zones separated by 2.5-3.5 cm long neuter zone; male zone 3-4 cm long; female zone 2-2.5 cm long; appendage narrowly conoid, sinuous, *ca* 3-4 × 1 cm. *Berries* ovoid, *ca* 1 cm long.

*Fls.*: Dec.; 300-1200 m.

ASSAM: Goalpara, Kamrup, Lakhimpur. MEGHALAYA: K. & J. Hills.

4. **A. fornicata** (Roxb.) Schott in Oesterr. Bot. Wochenbl. 4: 410. 1854. Balakrishnan in Bull. bot. Surv. India 6: 91. 1964. *Arum fornicatum* Roxb. Fl. Ind. 3: 501. 1832.

*Herbs.* *Caudex* erect or inclined, 15-60 cm long, *ca* 4 cm thick. *Leaves* peltate, ovate-lanceolate, sagittate, 20-45 × 10-25 cm; apical lobe acute or obtuse with 5-8 pairs of lateral nerves; basal lobes about half or less as long as the apical, obtuse or subacute, connate for one tenth to half its length; petioles 20-90 cm long, together with the peduncles, green or black-blotched. *Peduncles* 12-20 cm long. *Spathes* 7.5-10 cm long, whitish or yellowish green; tube ovoid, *ca* 2.5 cm long; limb oblong, cuspidate, 2-2.5 cm broad. *Spadix*: male and female floriferous zones separated by about 2 cm long neuter zone; male zone 1.7-2 cm long; female zone *ca* 1 cm long; appendage conoid, 2.5-3 cm long; ovaries ovoid; style short. *Berries* subglobose, 3-4 mm.

5. **A. navicularis** C. Koch et Bouche, Ind. Sem. Hort. Berol. App. p. 2. 1855.

*Herbs.* *Caudex* short. *Leaves* peltate, broadly oblong, sagittate, 20-45 × 12-20 cm, pale green, narrowed opposite the basal lobes; apical lobe cuspidate, with 3-4 pairs of lateral nerves; basal lobes triangular, diverging, about half as long as the apical lobe, connate for about one fourth to half its length; petioles 25-50 cm long. *Peduncles* 15-20 cm long, 1-1.5 cm thick. *Spathe* tube ovoid-globose, 4-5 cm long; limb cymbiform, cuspidate, 7-10 × 4-4.5 cm. *Spadix*:

male and female floriferous zones separated by ca 2 cm long neuter zone; male zone ca 1.5 cm long; female zone 1-2 cm long; appendage conoid, sinuously sulcate, 3-4 cm long; ovaries ovoid; style short; stigma discoid, obscurely lobed. *Berries* obovoid, 5-8 mm long.

MEGHALAYA: K. & J. Hills.

6. **A. fallax** Schott in Bonpland. 7: 28. 1859.

*Herbs.* Leaves peltate, broadly ovate or ovate-orbicular, sagittate, 30-50 × 24-30 cm, lateral nerves 7-9 pairs; basal lobes converging, about one third as long as the apical lobe, connate for one eighth to half its length; petioles 30-60 cm long. *Peduncles* ca 45 cm long. *Spathes* membranaceous, 12-15 cm long, yellow; tube oblong-ellipsoid; limb lanceolate, cuspidate. *Ovaries* narrowed into a rather long style, stigma 3-cleft. *Seeds* globose, ca 6 mm across.

MEGHALAYA: Khasi hills, Hook. f. & Thon (n.v.).

15. **Aglaonema** Schott in Schott & Endl. Melet. Bot. 20. 1832.

**A. hookerianum** Schott in Bonpland. 7: 30. 1859; Nicolson in Smithsonian Contr. Bot. no. 1: 28. 1969. ?*A. clarkei* Hook. f. Fl. Brit. Ind. 6: 529. 1893.

*Monoecious* herbs with the rhizome continued above into an erect, 5-10 cm long and 1-2 cm thick caudex. *Leaves* simple, coriaceous, 1-5, contemporaneous with the flowers, obliquely elliptic-ovate or oblong, 15-30 × 7-12 cm, apex apiculate or caudate-acuminate, base rounded, obtuse or broadly acute; nerves pinnate, ascending, 7-9(-13) on either side of the midrib; petioles 15-30 cm long, sheathed for about half to two-third its length. *Peduncles* 1-4, slender, often curved, 8-17 cm long. *Spathes* elliptic, cuspidate, convolute at the base, 3.5 × 1 cm, dark green, caducous. *Spadix* subsessile, narrowly cylindric, slightly shorter or equaling the spathe, dense-flowered; male and female floriferous zones contiguous; ap-

pendage and perianth absent; male zone 1-3 cm long; stamens 2, subclavate; connective broad; ovaries 1-loculed, ovule solitary, subbasilar; style short, stigma discoid. *Berries* few, 2-2.5 × 0.8 cm, orange-red; seeds exalbuminous.

*Fls.*: Nov.; *frts.*: Nov.-Feb., 200-1100 m.

ASSAM: Lakhimpur, N. Cachar & Mikir Hills. MEGHALAYA: K. & J. Hills. TRIPURA.

16. **Homalomena** Schott in Schott & Endl. Melet. Bot. 20. 1832.

*Monoecious* herbs. *Rhizome* produced above into a caudex; roots stout, villous. *Leaves* several, distichous, usually approximate, long petioled, contemporaneous with the flowers, pinnately-nerved. *Peduncles* usually several. *Spathes* erect, wholly convolute, whether or not contracted above the female zone, persistent round the fruit. *Spadix* shortly stipitate, cylindric, shorter than the spathe; male and female floriferous zones contiguous; appendage and perianth absent; stamens 2-4, in dense groups, connective broad (or narrow); anther locules opening by slits; ovaries usually mixed with some narrowly clavate staminodes, ovoid or globose, completely or incompletely 2-5-loculed; ovules usually many, on parietal placentae, or subbasal, or entirely or partly distributed over the central axis; style short or absent; stigma discoid or lobed. *Berries* few-many-seeded; seeds small, ovoid, albuminous.

1a. Spathes red	...	<i>H. pendula</i> -1
1b. Spathes green or pale yellowish green	...	<i>H. aromatica</i> -2

1. **H. pendula** (Bl.) Bakh. f. in Blumea 12: 67. 1963. *Caladium pendulum* Bl. Cat. 103. 1823. *H. purpurea* (Thunb.) Backer, Bakh. f. & van Steenis in Blumea 6: 359. 1950. *H. rubescens* (Roxb.) Kunth. Enum. Pl. 3: 57. 1841. *Arum purpureum*, Thunb. Fl. Java 20. 1825. *Calla rubescens* Roxb. Fl. Ind. 3: 515. 1832.

*Herbs.* Caudex 8-20 (or more) cm long, 4-5 cm thick. *Leaves* ovate, shortly acumi-

nate, cordate, or sagittately cordate, 15-30 (-63) × 10-22 (-40) cm, usually red-tinged particularly along the margins; basal lobes slightly outwardly directed, rather broadly triangular with rounded tips, half to one-third the length of the apical lobe; petioles 30-45 (-83) cm long, reddish, broadening below into a firm sheath. *Peduncles* 8-15 (-34) cm long, reddish. *Spathes* oblong-lanceolate, convolute, not constricted, shortly acuminate, 7-8 cm long, 1.5-2 cm in dia. *Spadix* with 5-7 mm long stipe; male zone 3.6 × 1-1.5 cm, white; female zone 1.5-2.5 × 1 cm, reddish; stamens 4; ovaries 3-loculed; stigma sessile, discoid.

MEGHALAYA: K. & J. Hills.

2. **H. aromatica** (Roxb.) Schott in Schott & Endl. Melet. Bot. 20. 1832; Nicolson in Taxon 16: 517. 1967. *Calla aromatica* Roxb. Fl. Ind. 3: 513. 1832.

*Herbs*. *Rhizomes* aromatic. *Caudex* 10-30 cm long, 2-4 cm thick. *Leaves* broadly ovate, acuminate, cordate, 15-30 × 10-25 cm; basal lobes usually divaricate, ovate, obtuse, about one-third the length of the apical lobe; petioles 30-60 cm long. *Peduncles* 10-15 cm long, elongating to 30 cm in fruits. *Spathes* oblong, convolute, not constricted, apiculate, 5-7 cm long, 1-1.5 cm across. *Spadix* stipitate, equalling the spathe; male zone 2.5-3.5 cm long; stamens 4; ovaries 3-loculed, stigma sessile, discoid.

*Fls.*: June-Sept., 100-700 m.

Rhizomes used as a condiment, dye and medicine; leaves eaten boiled with pork.

ASSAM: Lakhimpur; Sibsagar.

17. **Scindapsus** Schott in Schott & Endl. Melet. Bot. 21. 1832.

**S. officinalis** (Roxb.) Schott, *l.c.* *Pothos officinalis* Roxb. Fl. Ind. 1: 431. 1832.

Robust, branched, shrubby climbers on trees, 10-20 m high. *Stems* 7-12 mm thick, with adhesive roots on the nodes. *Leaves* several, simple, spiral, thinly coriaceous, broadly elliptic-ovate to nearly orbicular,

sometimes oblique, 10-31 × 6-19 cm, caudate-acuminate, base rounded or slightly cordate; nerves pinnate, ascending; petioles 8-18 cm long, winged. *Peduncles* 5-8 cm long. *Spathes* oblong, not constricted, 10-15 cm long, fully convolute when young, later slightly opening like a slit, with slender, ca 1.5 cm long tip, greenish without, yellowish brown within, ultimately caducous. *Spadix* sessile, subcylindric, about as long as the spathe, enlarging in fruits, greenish yellow, dense-flowered; appendage absent. *Flowers* bisexual; perianth absent; stamens 4, free, filaments flattened; anthers 2-loculed; ovaries with flattened tetragonal tops, 6-8 mm long, 1-loculed; ovule solitary, basal, anatropous; stigma sessile, discoid. *Berries* only few ripening, fleshy, ca 1 cm long; seeds reniform.

*Fls.*: May-Aug.; 100-300 m.

Stems yield fibres; leaves sometimes eaten cooked; berries medicinal.

ASSAM: Kamrup; N. Cachar & Mikir Hills; Nowgong; Sibsagar. TRIPURA,

18. **Rhaphidophora** Hassk. in Flora 25, 2, Beibl. 11. 1842.

Usually robust, branched, shrubby climbers on trees. *Stems* with adhesive roots on the nodes. *Leaves* distichous, entire or pinnatifid, pinnately-nerved, petioled; pulvinus short or long; petioles grooved along the upper side, shortly sheathing. *Peduncles* axillary, in the upper part of the stem. *Spathes* coriaceous, at first fully convolute, later expanding, not constricted, ovate, acuminate, soon caducous. *Spadix* stout, sessile or subsessile, cylindric, obtuse. *Flowers* numerous, crowded, bisexual or sometimes a few only female; perianth absent; stamens 4, filaments short, flat, anthers dehiscing by slits; ovaries obconic, 1-loculed or incompletely 2-loculed; ovules many, basal or parietal; style short or absent; stigma roundish or elliptic-oblong. *Berries* many-seeded; seeds oblong or reniform, albuminous.

## 1a. Leaves entire.

- 2a. Primary nerves scarcely distinct from the secondary nerves, scarcely raised and inconspicuous along both the surfaces.

3a. Petioles less than half the length of the lamina ... *R. hongkongensis*-1

3b. Petioles more than half the length of the lamina ... *R. calophyllum*-2

- 2b. Primary nerves much stouter than the secondary nerves, raised and prominent along both the surfaces.

4a. Leaves subcoriaceous, brownish yellow on drying ... *R. peepla*-3

4b. Leaves herbaceous, dark greenish brown or greyish brown on drying ... *R. hookeri*-4

## 1b. Leaves pinnatifid.

- 5a. Leaves 30-80 cm long, pale green beneath, pinnately divided almost up to the midrib.

6a. Spathes yellow ... *R. decursiva*-6

6b. Spathes deep purple ... *R. affinis*-7

- 5b. Leaves 13-32 cm long, glaucous beneath, usually much less divided ... *R. glauca*-5

1. ***R. hongkongensis*** Schott in Bonpland. 5: 44. 1857 *et* in Prodr. 378. 1860. *R. peepla* Schott, Prodr. 380. 1860, excl. specimen Silhetense *et* Icon. Hook. f. ined. *R. schottii* Hook. f. Fl. Brit. Ind. 6: 544. 1893, excl. Icon. ined.

*Stems* stout, 1.4-1.8 cm thick, purple except the young branches; internodes 3-6 cm long. *Leaves* subcoriaceous, falcately lanceolate or oblong-lanceolate, 12-22 × 3-6.5 cm, caudate-acuminate, brownish-yellow on drying; nerves erecto-patent; petioles stout, 4-8 cm long, channelled to the middle of the knee. *Peduncles* 2.5-4 cm long, elongating to 10 cm in fruits. *Spathes* ovate, 7-8 cm long, shortly acuminate, yellow along both the surfaces. *Spadix* 5-6 cm long, *ca* 1 cm thick, reddish, elongating to 8 cm in fruits; ovaries *ca* 3 mm across; stigma raised.

*Fls.*: May; at *ca* 200 m.

ASSAM: Goalpara.

2. ***R. calophyllum*** Schott in Bonpland. 5: 45. 1857 *et* in Prodr. 380. 1860; Furtado in Gard. Bull. Straits Settlement. 8: 150. 1934. *R. lancifolia* Schott in Bonpland. 5: 45. 1857. *et* in Prodr. 380. 1860; Hook. f. Fl. Brit. Ind. 6: 545. 1893. *R. peepla* Schott,

Prodr. 380. 1860 quoad Icon. Hook. f. ined.; Hook. f., *l.c.*, excl. Wt. Icon. t. 789 *et* Roxb. Icon. ined.; *non Pothos peepla* Roxb. *R. schottii* Hook. f. Fl. Brit. Ind. 6: 544. 1893 quoad Icon. ined.

*Stems* 6-8 mm thick. *Leaves* herbaceous or subcoriaceous, lanceolate or falcately lanceolate, 15-25 × 4-8.5 cm, with 1-2 cm long acumen, brownish green or brownish yellow on drying; nerves usually all similar, rarely 3-5 primary nerves are more prominent towards the base; petioles 8.5-20 cm long, channelled to the base, *Peduncles* 3-5 cm long, elongating to 10 cm in fruits. *Spathes* ovate, 8-11 × 3.5-6 cm, beaked, orange outside, deep red inside. *Spadix* 5-6 cm long, elongating to 10 cm in fruits; ovaries *ca* 3 mm across, stigma raised.

*Fls.*: Aug.-Nov.; 1200-1500 m.

ARUNACHAL PRADESH: Kameng. MANIPUR. MEGHALAYA: K. & J. Hills.

3. ***R. peepla*** (Roxb.) Schott in Bonpland. 5: 45. 1857 *et* in Prodr. 380. 1860 *p.p.*; Furtado in Gard. Bull. Straits Settlement. 8: 154. 1934. *Pothos peepla* Roxb. Fl. Ind. 1: 454. 1820 *et* 1: 433. 1832. *Scindapsus peepla* Schott in Schott & Endl. Melet. Bot. 21. 1832; Wt. Icon. t. 780. 1845. *R. hookeri* Schott, Prodr. 361. 1860 quoad specimen Silhetense; Hook. f. Fl. Brit. Ind. 6: 546. 1893, *p.p.*

*Stems* *ca* 2 cm thick. *Leaves* oblong, slightly oblique, 10-30 cm long, acuminate; petioles about as long as or sometimes even longer than the lamina, channelled. *Peduncles* 6-11 cm long, with persistent sheaths at the base. *Spathes* ovate-oblong, 8-10 cm long, beaked. *Spadix* as long as the spathe, pale yellow; ovaries wedge-shaped, truncate.

*Fls.*: Aug.

MEGHALAYA: K. & J. Hills.

4. ***R. hookeri*** Schott in Bonpland. 5: 45. 1857 *et* in Prodr. 361. 1860 excl. specimen Silhetense; Hook. f. Fl. Brit. Ind. 6: 546. 1893 *p.p.* (Wallich's no. 4441 is misprinted as 4444).

*Stems* 8-12 mm thick. *Leaves* usually crowded at the tips of the branches, usually oblong, falcate, sometimes lanceolate, cuspidately acuminate, 15.45 × 10-20 cm, cordate or subcordate at the base; petioles 12-23 cm long, usually shorter than, rarely equalling the length of the lamina, shallowly channelled up to the knee. *Peduncles* 1.5-3 cm long, elongating to 15 cm in fruits. *Spathes* ovate-oblong, 5-8.5 × 2-3 cm, beaked, green outside, yellow or orange yellow inside. *Spadix* 4.5-5.5 cm long, yellow, elongating to 15 cm in fruits; ovaries *ca* 3 mm across, stigma subsessile, orbicular, *ca* 3 mm broad. *Seeds* orange-red.

*Fls. & frts.*: Dec.-July; 150-1200 m.

ARUNACHAL PRADESH: Kameng, Tirap. ASSAM: Lakhimpur. MEGHALAYA: Garo Hills. NAGALAND. TRIPURA.

5. ***R. glauca*** (Wall.) Schott in Bonpland. 5: 45. 1857. *Pothos glaucus* Wall. Pl. Asiat. Rar. 2: 45. t. 156. 1831.

*Stems* stout, 12-25 mm thick. *Leaves* subcoriaceous, elliptic-ovate, falcate, 13-32 × 9-20 cm, pinnatisect, glaucous beneath; segments 3-5, unequal, falcately linear-lanceolate, base narrowed, apex caudate-acuminate, primary lateral nerves two-several; petioles slender, 12-25 cm, long, channelled up to the blade. *Peduncles* slender, 8-16 cm long. *Spathes* coriaceous, ovate-oblong or oblong-lanceolate, 10-14 × 3-5 cm, with 1.5-2 cm long beak, creamy yellow along both the surfaces. *Spadix* 6-10 cm long, 1.5-2 cm thick, pale yellow; ovaries 4-6-angled; stigma raised (Figs. 14 & 14a).

*Fls. & frts.*: March-June, 1000-1500 m.

ARUNACHAL PRADESH: Kameng, Siang, Subansiri, Tirap. MEGHALAYA: K. & J. Hills.

var. ***khasiana*** Hook. f. Fl. Brit. Ind. 6: 547. 1893.

*Leaves* 30-50 × 20-45 cm, segments numerous and longer.

MEGHALAYA: K. & J. Hills (n.v.).

6. ***R. decursiva*** (Roxb.) Schott in Bonpland. 5: 45. 1857. *Pothos decursiva* Roxb. Fl. Ind. 1: 456. 1832.

*Stems* stout, *ca* 3 cm thick. *Leaves* coriaceous, oblong, 30-80 cm long; segments 5-15 (or more), unequal, falcately ensiform, 15-30 × 3-9 cm, tips acuminate to sometimes almost truncate; primary lateral nerves 1-3, prominent beneath; petioles stout, about as long as the blade, shallowly channelled. *Peduncles* stout, 8-15 cm long, *ca* 15 mm thick. *Spathes* leathery, cymbiform, 12-18 × 8-10 cm, beaked, yellow along both the surfaces. *Spadix* 10-20 cm long, 2-3 cm thick; ovaries hexagonal; stigma raised on the conical top of the ovary.

*Fls. & frts.*: throughout the year, 100-1000 m.

ARUNACHAL PRADESH: Kameng, Lohit, Siang, Subansiri, Tirap. ASSAM: Kamrup. MEGHALAYA: Garo Hills, K. & J. Hills. TRIPURA.

Very near to *R. eximia* Schott (l.c.) and *R. grandis* Schott (in Oesterr. Bot. Zeit. 394-1858), requiring further study.

7. ***R. affinis*** Schott in Bonpland. 5: 45. 1857.

Robust climbers, 7-10 m high. *Leaves* coriaceous, oblong, 30-60 cm long, broadly cordate; segments several, falcately ensiform, acuminate, narrowed at the base, uncostate with slender lateral nerves. *Peduncles* *ca* 12 cm long. *Spathes* leathery, cymbiform, cuspidate, 12-15 cm long, 8-10 cm broad, deep purple on both the surfaces. *Spadix* subequalling the spathe; stigma raised on the conical top of the ovary.

At about 800 m.

MEGHALAYA: K. & J. Hills.

19. ***Lasia*** Lour. Fl. Cochinchin. 81. 1790.

L. ***spinosa*** (L.) Thw. Enum. Pl. Zeyl. 336. 1864. *Dracontium spinosum* L. Sp. Pl. 967. 1753. *Lasia heterophylla* Schott in Schott & Endl. Melet. Bot. 21. 1832.

Perennial stout herbs with up to 1.5 m



long rhizome continued above into a prostrate or ascending stem. *Stems* up to 0.5 m long, 2-6 cm thick, clothed with up to 1 cm long broad-based spines, inside white turning brown on exposure. *Leaves* coriaceous, very variable, 10-70 × 7-80 cm, young entire, hastate or sagittate, older variously pedately lobed, frequently broader than long, cordate, lobes acuminate; nerves yellowish, raised and prickly beneath; petioles 40-250 cm long, 1-3 cm thick, spiny with a well developed pulvinus. *Peduncles* solitary, axillary, 30-120 cm long, spiny. *Spathes* fleshy, tube ovoid, 6-10 cm long, greenish, limb linear-lanceolate, twisted, 10-30 cm long, 2-3.5 cm long. *Spadix* sessile, cylindric, 2.6 × 0.8-1 cm, elongating to 10-12 cm in fruits, reddish, dense-flowered; appendage absent. *Flowers* bisexual; perianth segments 4-6, obovate with incurved tips, 1.5-3 mm long; stamens 4-6, filaments short, flat, anthers ca 0.5 mm long, dehiscing by longitudinal slits; ovaries ovoid, 1.5-2.5 mm long, 1-loculed, ovule solitary, hanging from the apex, style stout, 0.5-1 mm long, stigma depressed globose, ca 1 mm broad. *Berries* obovoid, hexagonal, top muricate; seeds compressed, exalbuminous.

*Fls.*: Jan.-April; *frts.*: Sept.-Nov., usually in marshy places near ditches, ponds and rivers, 100-1500 m.

Rhizome, young shoots and leaves eaten cooked.

ARUNACHAL PRADESH: Kameng. ASSAM: Kamrup; Lakhimpur; Sibsagar. MEGHALAYA: Garo Hills; K. & J. Hills.

20. *Pothos* L. Sp. Pl. 968. 1753 *et* Gen. Pl. ed. 5. no. 918. 1754.

Shrubby climbers on trees or creeping over rocks. *Stems* with adhesive roots on the nodes. *Leaves* distichous, simple, pinnately-nerved; petioles winged on both the lateral sides, sheathing at the base. *Peduncles* axillary, several along the stem, each enclosed within several sheaths (*cataphylls*). *Spathes* coriaceous, small, cymbiform, at

first convolute, then expanding, ultimately reflexed, persistent. *Spadix* stipitate, ellipsoid, obovoid or subglobose. *Flowers* many, crowded, bisexual; tepals 6, with incurved tips; stamens 6, filaments flattened, anthers dehiscing by longitudinal slits; ovaries 3-loculed, ovule solitary in each locule, sub-basal; stigma sessile, hemispherical. *Berries* 1-3-seeded; seeds exalbuminous.

- |  |     |                         |
|--|-----|-------------------------|
| 1a. Leaves 1.5-10 cm long. Spathes 3-4 mm broad; spadices 4-5 mm long    | ... | <i>P. scandens</i> -1   |
| 1b. Leaves 1.8-18 cm long. Spathes 10-16 mm broad; spadices 5-10 mm long | ... | <i>P. cathcartii</i> -2 |

1. *P. scandens* L. Sp. Pl. 968. 1753.

*Stems* climbing to 6-13 m, ca 2 cm thick; internodes 1-2.5 cm long. *Leaves* coriaceous, elliptic, oblong or ovate, 1.5-10 × 0.5-2.8 cm, usually acute, sometimes apiculate or acuminate, in general about as long as or longer than the petiole but in a few leaves the lamina may be poorly developed or even absent; petiole wings oblanceolate, 0.5-10 cm long, 0.3-2 cm broad nearly obtuse or apex auricled. *Peduncles* sheathed, 0.5-1 cm long, sheaths imbricate, ovate, 3-5 mm long, acute. *Spathes* cymbiform, 4-6 × 3-4 mm, cuspidate, green. *Spadix* ellipsoid, obovoid or subglobose, 4-5 mm long, yellow, on about equally long deflexed stipe. *Berries* oblong, 12-16 mm long, scarlet, only few ripening. (Figs. 13).

*Fls. & frts.*: Feb.-Sept., 100-800 m.

ARUNACHAL PRADESH: Tirap. ASSAM: Darrang, Kamrup, Lakhimpur, N. Cachar and Mikir Hills, Nowgong, Sibsagar. MEGHALAYA: K. & J. Hills. MIZORAM. TRIPURA.

Engler (in *Pflanzenrch. heft* 21: 26-27. 1905) distinguished several taxa allied to the above on comparative shapes and sizes of lamina and petiole which appear variable and need further study.

2. *P. cathcartii* Schott, Aroid. 1: 22. t. 44. 45. 1853.

Shrubby climbers; internodes of the stem

2-3.5 cm long. *Leaves* coriaceous, oblong, ovate-oblong or sometimes lanceolate, 1.8-18×0.6-5.5 cm, usually with a distinct, 1-3 cm long acumen, sometimes acute, generally 2-3-times longer than the petiole; petiole wings oblanceolate, 0.5-10×0.3-2.5 cm, with usually auricled apex. *Peduncles* sheathed, stout, 0.8-1.5 cm long; sheaths imbricate, coriaceous, ovate, 1-1.5 cm long, acute. *Spathes* broadly ovate, 1-1.6(-2.5) cm broad, cuspidate. *Spadix* ellipsoid or obovoid, sometimes subglobose, 5-10 mm long on 1-1.5 cm long, usually erect or suberect stipe. *Berries* oblong, ca 15 mm long, scarlet, only a few ripening.

*Fls.*: Nov.-June; *frts.*: March-Sept., 100-900 m.

Roots recorded to be used as a substitute for canes.

ARUNACHAL PRADESH: Kameng, Lohit, Subansiri, Tirap. ASSAM: Darrang, Lakhimpur, Sibsagar. MEGHALAYA: Garo Hills, K. & J. Hills. TRIPURA.

It may only be a large form of *P. scandens* L. and needs further study.

21. **Acorus** L. Sp. Pl. 324. 1753 et Gen. Pl. ed. 5. no. 392. 1754.

*Perennial*, marshy herbs. *Rhizomes* creeping, branched, aromatic. *Leaves* distichous, equitant, ensiform. *Peduncles* green, trigonous. *Spathes* almost foliaceous, somewhat trigonous, slightly dilated near the spadix. *Spadix* sessile, cylindric, dense-flowered. *Flowers* greenish, bisexual; tepals 6, biseriate, broadly obovate-suborbicular, concave, tips incurved; stamens 6, filaments flattened, about as long as the tepals, anthers reniform, dehiscing by longitudinal slits; ovaries obconic-oblong, 2-3-loculed; ovules two or more in each locule, hanging from the hairy apex; stigma sessile. *Berries* few-seeded; seeds oblong, albuminous.

- |   |                        |
|---|------------------------|
| 1a. Leaves with a prominent midrib. Flowering spadices 7-9 mm thick ... | <i>A. calamus</i> -1   |
| 1b. Leaves without any midrib. Flowering spadices 3-4 mm thick ...      | <i>A. gramineus</i> -2 |

1. **A. calamus** L. Sp. Pl. 324. 1753.

*Rhizomes* 1-2(-3) cm thick, somewhat compressed, very aromatic. *Leaves* 60-80×0.8-1.2 cm (or even larger, up to 200×3 cm). *Peduncles* 25-35 cm long, ca 5(-9) mm thick. *Spathes* (15-)40-60(-90) cm long. *Spadix* 4-5(-10) cm long, 0.7-0.9(-1.8) cm thick. *Tepals* broadly obovate, 1.5(-2.5) mm long.

*Fls.*: May, 500-700 m.

Highly variable, several varieties described on the basis of sizes of leaves, spathes and spadices need further proof of distinctiveness.

Rhizomes known to be medicinally used, as also to protect clothes from insects.

MANIPUR. MEGHALAYA: K. & J. Hills.

2. **A. gramineus** Soland. in Ait. Hort. Kew. 1: 474. 1789.

*Rhizomes* 5-7 mm thick, aromatic. *Leaves* (15-)30-50(-90)×(0.2)0.4-0.7(-1) cm. *Peduncles* 10-20 cm long, 2-4 mm thick. *Spathes* 8-30×0.2-0.4 cm. *Spadix* 4-6(-10) cm long, 3-4 mm thick. *Tepals* obovate, ca 12 mm long. *Berries* ca 2 mm long, 2-3-seeded, greenish brown.

*Fls.*: Jan.; *frts.*: June; at about 650 m.

Rhizomes locally known to be a cure for malarial fever and spleen disorders.

MEGHALAYA: K. & J. Hills.

#### DOUBTFUL SPECIES

Our study of this family from the Herbarium and the Experimental garden has convinced that there is an imperative need for observation of these plants, in life, in their natural habitat throughout their growth-phase, as also subsequently in the experimental garden, thoroughly. We have been unable to decide on the identity of several, due to inaccessibility, incomplete or mixed-up material, and the inadequacy of the original description. We have listed below such names to facilitate further work.

*Alocasia acuminata* Schott, in Bonplandia 7: 28. 1859 Mizo Hills.

*Alocasia cucullata* (Lour.) Schott, in *Oesterr. Bot. Wochenbl.* 410. 1854.

*Arum cucullatum* Lour. *Fl. Cochinch.* 656. 1793; Khasia Hills.

*Alocasia fallax* Schott, in *Bonplandia* 7: 28. 1859; Khasia Hills.

*Arisaema amurense* Maxim. *Prim. Fl. Amer.* 264. 1859; Panigrahi and Naik in *Bull. bot. Surv. India* 8(1): 90. 1966; K. & J. Hills, Dempep forests.

*Arisaema kunstleri* Hook. f. *Fl. Brit. Ind.* 6: 497. 1893; K. & J. Hills, Naya Bunglow.

*Arisaema jaquemontii* Blume, in *Rumphia* 1: 95. 1835.

*Thomsonia hookeri* (Schott) Engl. in *DC. Mon. Phan.* 2: 307. 1870. *Allophyton hookeri* Schott, *Gen. Ar.* t. 24. 1858; *Prodr.* 122. 1860.

Anything like this has not been seen during our frequent fieldwork at Cherrapunji. Dr. Bogner from Munich kindly sent Schott's illustration of this in his *Genera Aroidearum*, 1858, and noted that it appears to be mixed up material, the incomplete inflorescence, and the leaf-segment, of different species. We agree with him.

**Lemnaceae** S. F. Gray, *Nat. Arr. Brit. Pl.* 2: 729. 1821, 'Lemnadeae'.

*Perennial*, monoecious, minute aquatic herbs, floating on, or slightly below the water surface, usually forming large colonies, consisting of a highly reduced plant body (frond), lacking distinct stems and leaves, chiefly propagating by budding or hibernating bulbils, rarely by seeds. *Roots* simple, solitary or several, or absent. *Flowers* minute, borne in marginal pouches or on pouches on the upper surface of the frond; perianth absent; male flowers 1-2, each consisting of a solitary stamen, filament thickened, slender or absent, anther 1-2-loculed; female flower consisting of a solitary carpel, ovary 1-loculed; ovules 1-7, basal; style short; stigma campanulate.

*Fruit* a 1-7-seeded utricle; seeds albuminous or not.

- |   |     |                     |
|---|-----|---------------------|
| 1a. Root solitary to each frond. Fronds obscurely 1-3-nerved      | ... | <i>Lemna</i> -1     |
| 1b. Roots several to each frond. Fronds conspicuously 5-18-nerved | ... | <i>Spirodela</i> -2 |

1. **Lemna** L. *Sp. Pl.* 970. 1753 *et Gen. Pl.* ed. 5. no. 923. 1754.

*Root* solitary. *Fronds* solitary or in groups of 2-5, obscurely 1-3-nerved. *Reproductive pouches* 2, marginal, unequal, at the basal region of each frond; flowers, when produced, always appearing in the smaller pouch, the vegetative buds in both. *Inflorescence* of one female and two male flowers, surrounded by a membranaceous spathe; anthers transversely dehiscing; ovule solitary, campylotropous. *Utricles* ovoid, smooth.

- |   |     |                           |
|---|-----|---------------------------|
| 1a. Fronds entire, branches obovoid, soon detached                | ... | <i>L. paucicostata</i> -1 |
| 1b. Fronds serrate at the tips, branches hastate, long persistent | ... | <i>L. trisulca</i> -2     |

1. **L. paucicostata** Hegelm. *ex Engelm.* in *Gray, Man. Bot.* ed. 5. 681. 1867.

*Root* arising towards one end, cap acute. *Fronds* rather thin, obovate-oblong, somewhat oblique at the base, 2.6 × 1.5-2 mm, nearly flat along both the surfaces, obscurely 3-nerved; daughter fronds budding from near the point of root insertion.

In ponds; 100-650 m.

ASSAM: Lakhimpur. MEGHALAYA: K. & J. Hills. TRIPURA.

2. **L. trisulca** L. *Sp. Pl.* 970. 1753.

*Root* cap acute. *Fronds* translucent, lanceolate or oblanceolate, 8-18 mm long, flat, ultimately developing a slender, very tapering base, young hastate, arising at right angles from one or both sides of the parent frond and remaining connected with it for a long time in a cross-like fashion.

MANIPUR.

2. **Spirodela** Schleiden in *Linnaea* 13: 391. 1839.

**S. polyrhiza** (L.) Schleiden, *l.c.* 392. *Lemna polyrhiza* L. *Sp. Pl.* 970. 1753.

*Roots* with vascular tissue and with 6 or more rootlets. *Fron*ds solitary or in groups of 2-5, thick, orbicular or orbicular-obovate, 6-8 mm long, flat and dark green above, convex and usually purplish beneath; nerves 7-15. *Reproductive pouches* 2, at the basal margins, the flowers produced in the larger, usually left side pouch, the smaller pouch 'producing vegetative buds. *Spathes* membranaceous, 2-lipped; stamens 2; ovules 1-2. *Utricles* winged.

ASSAM.

**Triuridaceae** Gardner in Trans. Linn. Soc. London 19: 160. 1843 ('*Triuraceae*').

*Annual*, monoecious or dioecious, saprophytic herbs. *Stems* filiform. *Leaves* reduced to a few scales. *Flowers* small, unisexual, actinomorphic, bracteate. *Male flowers*: perianth 3-8-lobed, lobes equal or unequal, ultimately reflexed; stamens 2, 3, 4 or 6 at the base of the perianth lobes or immersed in the swollen torus; filaments short or absent, connective sometimes produced above into a subulate appendage; rudimentary ovary present or absent. *Female flowers*: perianth as in the male flowers; carpels several, free, 1-celled, ovule solitary, basal; style terminal or ventral; staminodes present or absent. *Fruits* globose, of numerous 1-seeded carpels; fruiting carpels obovoid, opening by a longitudinal slit.

**Scaphila** Blume Bijdr. 514. 1825.

Characters of the family.

**S. khasiana** Hook. f. in B. & H. Gen. Pl. 3: 1003. 1883 *et* in Hook. f. Fl. Brit. Ind. 6: 559. 1893.

*Annual*, dioecious, red-purple herbs, 7-15 cm high. *Stems* simple or branched, filiform and flexuous in the male plants, stouter in the female plants. *Male flowers* ca 2.5 mm in dia. with minute bracts, perianth papillose, lobes 4-5, ovate, acuminate; anthers large, sessile, globose, 4-lobed, white. *Female flowers* ca 5 mm across, bracts subulate, ca 3 mm long; perianth as in the

male; carpels many, reniformly obovoid, papillose; style ventral, filiform, much longer than the ovary. *Seeds* yellow-brown, reticulate.

MEGHALAYA: Khasi hills, 1300 m, Hook. f. & Thom. (n. v.).

**Alismataceae** Vent. Tabl. Regne Veg. 2: 157. 1799 ('*Alismoideae*').

*Annual or perennial*, aquatic or marshland herbs, sometimes laticiferous. *Leaves* petioled, basal, erect or floating, curvi-nerved, with numerous transverse nervules connecting the principal nerves; petioles long, sheathing at the base, sheaths open. *Inflorescence* a panicle or a raceme of whorled flowers. *Flowers* pedicelled, actinomorphic bisexual or polygamous, hypogynous, bracteate; sepals 3, imbricate, persistent; petals 3, imbricate, caducous; stamens 3-many, anthers 2-celled, basi-fixed or versatile; carpels 2-many, free, with a solitary basal ovule, style terminal or ventral, persistent. *Seeds* oblong or curved, exalbuminous, testa membranaceous.

1a. Leaves cuneate or truncate at the base.

2a. Leaves linear-lanceolate or narrowly ovate-lanceolate. Carpels in a single whorl. Achenes membranaceous, compressed ...

*Alisma*-1

2b. Leaves suborbicular. Carpels spirally crowded. Achenes hard, swollen ...

*Caldesia*-2

1b. Leaves deeply cordate, sagittate or hastate at the base.

3a. Inflorescence a much-branched panicle. Carpels 3-7 on a minute receptacle. Achenes hard, swollen ...

*Caldesia*-2

3b. Inflorescence a raceme, or sometimes bearing one or two branches at the lower nodes. Carpels numerous on a large, oblong or subglobose receptacle. Achenes membranaceous, compressed ...

*Sagittaria*-3

1. **Alisma** L. Sp. Pl. 342. 1753 *et* Gen. Pl. ed. 5. no. 418. 1754.

**A. plantago** L. Sp. Pl. 342. 1753.

*Rhizome* fleshy, swollen. *Leaves* erect or suberect, linear-lanceolate or narrowly

ovate-lanceolate, sometimes linear, 5-20 cm long, 5-7-nerved; petioles 7-25 cm long. *Panicles*, including the peduncle, 2.5-13 cm long; peduncles swollen and fleshy below. *Flowers* whorled, 2-6 together, bisexual; pedicels 8-22 mm long; sepals navicular, 2-2.5 mm long, spreading in fruits; petals membranaceous, oblong, cuneate, 3-3.5 mm long, white or pink with yellow claws; stamens 6, filaments filiform, 1-1.5 mm long; anthers linear-oblong, *ca* 0.5 mm long; carpels 20-30, inserted in a single whorl on *ca* 2 mm broad receptacle, style ventral. *Achenes* membranaceous, compressed, linear-oblong, *ca* 1 mm long; seeds curved, brown. (Fig. 17).

*Fls. & frts.*: May-Sept. In drains and streams, 1200-1600 m.

ARUNACHAL PRADESH: Subansiri. MANIPUR. NAGALAND.

2. ***Caldesia*** Parl. Fl. Ital. 3: 598. 1858.

*Perennial*, aquatic or marsh-land herbs. *Leaves* long petioled, floating, or emersed in dry seasons, ovate to suborbicular; petioles somewhat septate. *Panicles* 1-3, large, pyramidal, their branches and flowers in whorls of threes, each subtended by oblong-lanceolate bracts. *Flowers* long-pedicelled, bisexual; sepals elliptic-oblong, greenish, ultimately spreading or reflexed; petals elliptic, white; stamens 6-11, filaments filiform, anthers versatile; carpels 2-many, spirally crowded on a minute receptacle, style ventral. *Achenes* swollen, very hard due to endocarp being sclerenchymatic; exocarp spongy or membranaceous; seeds elliptic-oblong.

1a. Leaf-base deeply cordate ...

1b. Leaf-base truncate ...

*C. oligococca*-1

*C. grandis*-2

1. ***C. oligococca*** (F. v. Muell.) Buchen. in Bot. Jahrb. 2: 479. 1882. *Alisma oligococcum* F. v. Muell. Fragm. 1: 23. 1858.

*Leaves* ovate, 8-12 × 5-8 cm, pellucid dotted, obtuse, nerves 11-13, nervules 2-3 mm apart, perpendicular to the principal nerves;

petioles 40-60 cm long. *Panicles* 25-40 cm long; peduncles as long as the petioles; lowest bract 6-8 cm long; pedicels 1-1.5 cm long. *Sepals* *ca* 2 × 1 mm; petals *ca* 3 × 0.8 mm; stamens 6; filaments *ca* 1.5 mm long, anthers 0.5-1 mm long; carpels 3-7, style ventral, *ca* 1 mm long. *Achenes* somewhat reniform, 2-3 mm long, spinulose-warty; seeds *ca* 1.5 mm long, red-brown.

*Fls. & frts.*: October.

MEGHALAYA: K. & J. Hills.

2. ***C. grandis*** Samuelsson in Svensk Bot. Tidskr. 24: 116. 1930. *Alisma reniforme* Hook. f. Fl. Brit. Ind. 6: 560. 1893 *p.p.*; non D. Don, 1825.

*Leaves* suborbicular, slightly broader than long, 8-13 × 9-15 cm, apiculate, nerves 13-17, nervules 0.5-0.7 mm apart, obliquely ascending; petioles 35-60 cm long. *Panicles* 20-45 cm long (sometimes also producing turions); peduncles 50-70 cm long; bracts lanceolate, lowest *ca* 2 cm long; pedicels 2-3 cm long. *Sepals* 3-5 × 1.5-2.5 mm; petals 4-5 × 2 mm; stamens 9-11 (sometimes 6?), filaments *ca* 2 mm long, anthers *ca* 1.2 mm long; carpels 6-20, style subterminal, 2-2.5 mm long. *Achenes* elliptic, 3-4 mm long; seeds *ca* 2 mm long, yellowish-brown. (Figs. 18, 18a).

*Fls. & frts.*: August-October.

MEGHALAYA: K. & J. Hills.

3. ***Sagittaria*** L. Sp. Pl. 993. 1753 *et* Gen. Pl. ed. 5. no. 946. 1754.

*Leaves* submersed, sagittate or cordate; petioles septate with air-channels, ribbed, sheaths broadly scarious-margined. *Inflorescence* a raceme or a few-branched panicle. *Flowers* long pedicelled, upper male, lower female or bisexual, mostly 3-together; sepals reflexed in male flowers, appressed, patent or reflexed in female flowers; petals delicate; stamens 6-many, filaments filiform or dilated at the base, anthers oblong; carpels numerous, spirally



Figs. 17-20a. 17. *Alisma plantago* L. 18. *Caldesia grandis* Samuel. 18a. Part of panicle. 19. *Sagittaria guayanensis* H.B.K. ssp. *lappula* (D. Don) Bogin 20. & 20a. *S. sagittifolia* L. ssp. *leucopetala* (Miq.) Hartog.

crowded on a large, oblong or subglobose receptacle, style terminal. *Achenes* membranaceous, laterally compressed, beaked; seeds horse-shoe-shaped.

- 1a. Leaves hastate or sagittate with linear-lanceolate lobes ... *S. sagittifolia* ssp. *leucopetala*-1  
 1b. Leaves ovate-cordate ... *S. guayanensis* ssp. *lappula*-2

1. ***S. sagittifolia*** L. ssp. ***leucopetala*** (Miq.) Hartog in Fl. Males. ser. 1. 5: 332. 1957. *S. sagittifolia* L. var. *leucopetala* Miq. Ill. Fl. Arch. Ind. 2: 49. 1870. *S. sagittata* Thunb. Fl. Jap. 242. 1784.

*Stolons* long, ending in tubers. *Leaves* hastate or sagittate; terminal lobe  $3.5-17 \times 1-1.5$  cm, acute or obtuse, 5-9-nerved; basal lobes  $4.5-22 \times 0.2-2$  cm, finely acuminate, 4-5-nerved; petioles trigonous, 20-90 cm long. *Racemes* sometimes bearing 1-2 branches from the lower nodes, including the peduncle, 25-100 cm long; bracts elliptic, lowest 5-15 mm long. *Flowers* of the upper whorls male, of the lower whorls female; sepals oblong,  $3-6 \times 2.5-4$  mm; petals broadly obovate, 12-15 mm long, white; stamens many, filaments *ca* 1.5 mm long, anthers *ca* 1.5 mm long; carpels, including the style, 1-1.5 mm long, style straight or curved. *Achenes* obliquely obovate with entire or subcrenate wings,  $3.5 \times 1.5-3$  mm; seeds 1.5 mm long, pale brown. (Figs. 20 & 20a).

*Fls. & frts.*: throughout the year. In ponds and streams, 300-1600 m.

ARUNACHAL PRADESH: Kameng, Subansiri. ASSAM: Darrang, Nowgong, Sibsagar. MANIPUR. MEGHALAYA: K. & J. Hills.

2. ***S. guayanensis*** H.B.K. ssp. ***lappula*** (D. Don) Bogin in Mem. N. Y. Bot. Gard. 9: 192. 1955. *S. lappula* D. Don, Prodr. Fl. Nep. 22. 1825.

*Annuals*. *Leaves* ovate, deeply cordate,  $2.5-10 \times 2-8$  cm, apex broadly rounded or obtuse, basal lobes about as long as the terminal, ovate, obtuse or acute; petioles 7-45 cm long, together with the peduncles and pedicels frequently hairy. *Racemes* including

the peduncle 6-40 cm long; peduncles 1-7, flaccid; bracts elliptic, lowest 1-2 cm long. *Flowers* of the upper whorls male, of the lower whorls bisexual; sepals broadly ovate,  $8-11 \times 7-10$  mm, green; petals obovate-suborbicular, 12-18 mm long, white (sometimes with a purple spot above the yellowish base), erose; stamens 8-12 in bisexual flowers, 6-10 in male flowers, filaments 2-3 mm long, anthers *ca* 1.5 mm long. *Achenes* elliptic, beaked, 3-4 mm long, broadly winged, wings toothed; beak scarious-margined; seeds *ca* 1.5 mm long, brown. (Fig. 19).

*Fls. & frts.*: June-Oct. In ponds and streams, 150-800 m.

ARUNACHAL PRADESH: Kameng, Lohit. ASSAM: Cachar, Darrang, Kamrup, Lakhimpur: North Cachar and Mikir Hills. TRIPURA.

**Butomaceae** L. C. Rich. in Mem. Mus. Hist. Nat. Paris 1: 366. 1815 ('*Butomeae*').

*Perennial*, rhizomatous, aquatic or marsh-land herbs, usually lactiferous. *Leaves* basal; petioles sheathing at the base. *Flowers* usually umbellate, sometimes solitary, bisexual, actinomorphic; bracts 2-3; bracteoles several; sepals 3, imbricate, persistent; petals 3, imbricate, fugacious, rarely absent; stamens 6-9, or numerous, filaments free, flattened, anthers 2-celled, basifixed, dehiscing by slits; carpels superior, few to several, free or cohering only at the base, 1-celled, ovules numerous, scattered on the reticulately branched parietal placenta. *Fruiting carpels* finally dehiscing along the ventral suture; seeds numerous, exalbuminous; embryo straight or horse-shoe-shaped.

**Tenagocharis** Hochst. in Flora 24: 369. 1841 (June). *Butomopsis* Kunth, Enum. Pl. 3: 164. 1841 (July).

Characters of the family.

**T. latifolia** (D. Don) Buchen. in Abh. Naturw. Ver. Bremen 2: 1. 1868. *Butomus latifolius* D. Don, Prodr. Fl. Nep. 22. 1825. *Butomus lanceolatus* Roxb. Fl. Ind. 2: 315. 1832. *Butomopsis latifolia*

Kunth, Enum. pl. 3: 165. 1841. *Butomopsis lanceolata* Kunth, l.c.

*Perennial*, marsh-land herbs. *Rootstocks* short; roots stout. *Leaves* erect, oblanceolate, cuspidate, 4-15 × 1.7-6.2 cm, 3-7-nerved;

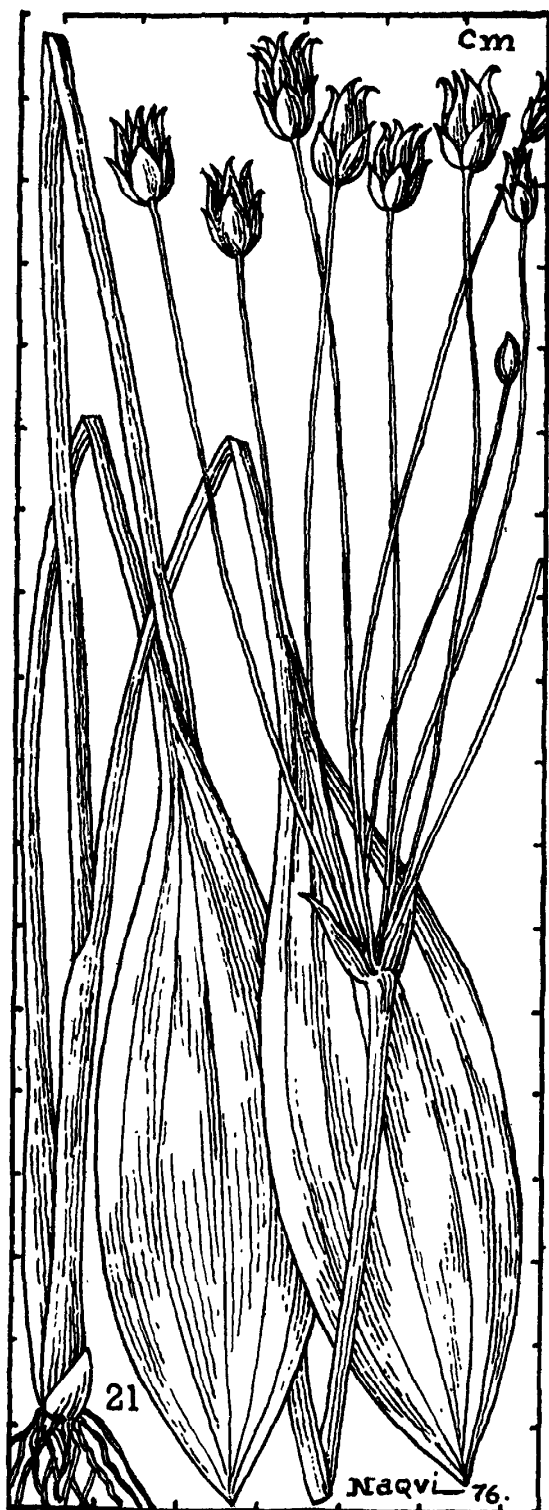


Fig. 21. *Tenagocharis latifolia* (D. Don) Buchen.

petioles 6-20(25) cm long. *Peduncles* 25-50 cm long, usually bearing a single terminal whorl of 3-30 flowers but sometimes the rachis elongating to bear a second whorl of flowers; pedicels unequal, 5-14 cm long; bracts lanceolate, acute, 1-1.5 cm long; bracteoles smaller. *Sepals* elliptic-obovate, obtuse or emarginate, 4.9 × 3.4-5 mm; petals exceeding the sepals, white, soon disintegrating into a mucilaginous mass; stamens 6-12, filaments 2-3 mm long, anthers 1.5 mm long, sagittate; carpels 5-7, cohering at the base, stigma sessile, yellow. *Fruiting carpels* elliptic, shortly beaked, 9-12 mm long; seeds elliptic-oblong, compressed, smooth or slightly warty, shining brown. (Fig. 21).

*Fls. & frts.*: March-Dec., at about 600 m.

MEGHALAYA: K. & J. Hills.

**Aponogetonaceae** J. G. Agardh, Theor. Syst. Pl. Fam. Phan. 44. 1858 (*Aponogetaceae*).

*Perennial*, aquatic herbs. *Rootstocks* tuberous, rhizomatous or stoloniferous. *Leaves* rather membranaceous, in a radical cluster, floating, usually petioled, oblong-elliptic to linear, principal nerves 3-7, connected by numerous oblique nervules; petioles sheathing at the base. *Peduncles* long, emersed; spikes simple or 2-forked (rarely more-forked), subtended by a caducous spathe; bracts absent. *Flowers* minute, bisexual; tepals 1-3, thin, equal or unequal, usually persistent, or absent; stamens 6 (or more), biseriate, free, persistent; filaments unequal, filiform or subulate, anthers 2-celled, basifixed; carpels superior, 3-6, 1-celled, ovules 2 or more, basal, style short, stigma discoid or decurrent. *Fruits* of 3 or more coriaceous follicles; seeds exalbuminous.

**Aponogeton** L. f. Suppl. 32. 1781, *nom. cons.*

Characters of the family.

**A. natans** (L.) Engl. et Krause in Engl. Pflanzenrch. heft 24: 22. 1906. *Saururus natans* L. Mant. 2: 227. 1767. *A. monostachyon* L. f. Suppl. 214. 1781.



*Rootstocks* ca  $2.5 \times 1$  cm, stoloniferous. *Leaves* mostly floating, oblong or sometimes linear-oblong,  $8-20 \times 2.5-5$  cm, apex acute or obtuse, base cuneate, rounded or shallowly cordate; nerves 3-5; petioles long, subtriangular. *Spike* solitary, 2.5-15 cm long, ca 5 mm in dia. *Flowers* white, pink or pale blue; tepals 2, obovate-suborbicular, ca 2 mm long; stamens equalling to or exceeding the tepals, filaments subulate, anthers blue-purple. *Follicles* 3, subglobose; seeds 1-8, oblong, 6-8-ribbed.

*Fls. & frts.*: March-Aug. In drains, 150-500 m.

ASSAM: North Cachar & Mikir Hills; Sibsagar.

**Potamogetonaceae** Dumort. Anal. Fam. 59, 61. 1829 ('Potamogetoneae').

*Perennial*, aquatic herbs. *Stems* simple or branched, usually rooting at the lower nodes. *Leaves* alternate or opposite, sheathing at the base; ligules (stipules) free, or adnate to the petiole or the blade. *Spikes* axillary, peduncled, emerged or submersed; peduncles enclosed within a sheath at the base. *Flowers* small, bisexual, ebracteate; tepals 4, free, navicular, shortly clawed, greenish, valvate; stamens 4; anthers sessile, inserted on the claws of the tepals, 2-celled; carpels 4; ovary 1-celled, 1-ovuled, stigma subsessile. *Fruit* of 4 somewhat compressed drupelets; seeds subreniform, exalbuminous.

**Potamogeton** L. Sp. Pl. 126. 1753 et Gen. Pl. ed. 5. no. 160. 1754.

Characters of the family.

- 1a. Leaves all or at least the upper ones elliptic or oblong-lanceolate, distinctly petioled.
- 2a. Leaves lower filiform, sessile, upper elliptic or oblong-lanceolate. Spikes 0.5-1.5 mm long ... *P. octandrus*-3
- 2b. Leaves all oblong or oblong-lanceolate. Spikes 2-4 cm long.
- 3a. Leaves coriaceous. Peduncles 2.5-15 cm long ... *P. nodosus*-1
- 3b. Leaves membranaceous. Peduncles 1-2 cm long ... *P. oblongus*-2

- 1b. Leaves all linear-oblong or filiform, sessile.
- 4a. Leaves linear-oblong, 3-6 mm broad, serrate ... *P. crispus*-4
- 4b. Leaves filiform, entire ... *P. pectinatus*-5

1. **P. nodosus** Poir. in Lam. Encycl. Meth. Bot. Suppl. 4: 535. 1816. *P. indicus* Roxb. Fl. Ind. 1: 452. 1832; *non* Roth ex Roem. et Schult., 1818.

*Stems* rather stout, terete, branched. *Leaves* all or only the upper floating; floating leaves coriaceous, with 3-10 cm long petioles, lanceolate or elliptic-oblong,  $7.5-11 \times 2.5-6$  cm, cuneate, rounded or subcordate at the base, many-nerved; submersed leaves linear-lanceolate, usually more elongate (up to 20 cm long), narrower and soon decaying leaving remnants of the petioles; ligules free, up to 3.5 cm long. *Peduncles* 2.5-15 cm long; spikes 2.5-3.5 cm long, dense-flowered. *Tepals* suborbicular, ca 0.3 mm long. *Drupelets* ca 3 mm long, oblique, shortly beaked.

*Fls. & frts.*: Throughout the year, 600-1700 m.

ARUNACHAL PRADESH: Subansiri. MANIPUR.

2. **P. oblongus** Viv. Fl. Ital. 2. t. 13. 1808.

*Stems* simple or branched at the top; 20-60 cm long. *Leaves* membranaceous, petioled, floating and submersed; floating leaves oblong,  $3.9 \times 1.3-3.5$  cm, 11-20-nerved, brownish, on 12-15 cm long petioles, base rounded, obtuse or acute, apex acute or obtuse; submersed leaves oblong or lanceolate, subrugose, smaller; ligules rather broad, 1-4 cm long. *Peduncles* 1-2 cm long; spikes 2-4 cm long. *Drupelets* smooth or obscurely dorsally keeled, ca 3 mm long.

MEGHALAYA: Khasi hills, Hook. f. & Thoms. (n. v.).

3. **P. octandrus** Poir. in Lamk. Encycl. Bot. Suppl. 4: 534. 1816. *P. javanicus* Hassk. in Act. Soc. Sci. Ind. Neerl. 1. 8: 26. 1856.

*Stems* very slender, up to 1 m long, usually much-branched. *Leaves* submersed



Figs. 22: & 23: 22. *Potamogeton octandrus* Poir.  
23. *P. crispus* L.

leaves narrower, linear to filiform; ligules free, 1-3.5 cm long, caducous. *Peduncles* 1-3.5 cm long; spikes 5-15 mm long, interrupted. *Flowers* 4-12; tepals ovate orbicular, ca 1 mm long. *Drupelets* ovoid-semilunar, 2-4 mm long, tubercled, with hooked beak. (Fig. 22).

*Fls. & frts.*: May-November. In streams; 800-2000 m.

ARUNACHAL PRADESH: Subansiri. MEGHALAYA: K. & J. Hills.

4. *P. crispus* L. Sp. Pl. 126. 1753.

*Stems* slender, compressed, usually dichotomously branched. *Leaves* all submersed, distichous, semi-amplexicaul, linear-oblong, 2.5-6.5(-9) × 0.3-0.6(-1.5) cm, 3-5-nerved, tips rounded, margins crisped and serrulate; ligules up to 1 cm long, caducous. *Peduncles* long or short, tapering upwards; spikes 5-8 mm long. *Flowers* 6-8; tepals broadly obovate, ca 1.5 mm long. *Drupelets* obliquely ovoid, 2-3 mm long, with half to almost equally long straight beak. (Fig. 23).

*Fls. & frts.*: Jan.-March. In pond, streams and rivers, 200-800 m.

ASSAM: Darrang, Lakhimpur, North Cachar and Mikir Hills. MANIPUR.

5. *P. pectinatus* L. Sp. Pl. 127. 1753.

*Stems* filiform, copiously distichously branched. *Leaves* all submersed, filiform, entire, 3-16 cm long, up to 0.2 mm broad, acute, 1-3-nerved, margins slightly thickened and inrolled; ligules adnate to the leaf-sheaths with free tips. *Peduncles* filiform; spikes interrupted, 0.5-3.3 cm long. *Flowers* few; tepals suborbicular, minute. *Drupelets* turgid, obliquely obovoid, shortly beaked.

*Fls. & frts.*: Feb. In rivers, at about 120 m.

ASSAM: Lakhimpur.

**Eriocaulaceae** Desv. in Ann. Sci. Nat. 13: 47. 1828 ('*Eriocauloneae*').

*Annual* or *perennial*, monoecious, usually marsh-land but sometimes aquatic or dry-

and floating; upper leaves elliptic or oblong-lanceolate, 1-4 × 0.2-1 cm, acute or subobtuse at both the ends, 5-7(-10)-nerved; petioles usually shorter than the lamina; lower

land herbs. *Stems* usually very short or absent but sometimes long, slender. *Leaves* sessile, setaceous, linear or narrowly linear-lanceolate, usually clustered or rosulate. *Inflorescence* a peduncled involucrate capitulum; peduncles 1-several, arising from the obliquely splitting tubular sheaths, ribbed, usually twisted to the right; involucre bracts several. *Flowers* small, in the axils of obovate-oblong bracts, crowded, sessile or subsessile, unisexual, male and female flowers mixed together or the males in the middle and the females around it. *Male flowers*: sepals 2-3, greyish-black, free, or connate into an adaxially splitting spatha-

ceous calyx; petals 3, connate into a clavate corolla tube (stipe); stamens 4 or 6, filaments slender, anthers 2-celled, dorsifixed. *Female flowers*: sepals 2-3, greyish-black, usually free, rarely absent; petals 1-3, usually borne on a short stipe, or absent; ovary superior, 3(-2)-celled; ovule solitary, pendulous; style 3(-2)-branched. *Capsules* membranaceous; seeds elliptic-oblong or ovoid, usually scabrid or papillose, endosperm copious.

**Eriocaulon** L. Sp. Pl. 87. 1753 et Gen. Pl. ed. 5. no. 95. 1754.  
Characters of the family.

- |   |     |                                |
|---|-----|--------------------------------|
| 1a. Aquatic submersed herbs, with distinct, up to 40 cm long, slender stems. Leaves scattered below, crowded above                        | ... | <i>E. setaceum</i> -1          |
| 1b. Marsh-land, dry-land, or aquatic submersed or emerged herbs, stemless or with short indistinct stems. Leaves all rosulate or crowded. |     |                                |
| 2a. Anthers white or yellow.  |     |                                |
| 3a. Female petals 3, spatulate, with a black apical gland. Anthers yellow   | ... | <i>E. miserum</i> -3           |
| 3b. Female petals absent, or 1-2 poorly developed filiform processes, eglandular. Anthers white   | ... | <i>E. cinereum</i> -6          |
| 2b. Anthers black.  |     |                                |
| 4a. Involucral bracts about twice as long as the floral heads   | ... | <i>E. xeranthemum</i> -15      |
| 4b. Involucral bracts shorter than to as long as the floral heads.  |     |                                |
| 5a. One of the male petals much longer than the other two and conspicuously projecting out of the floral bract                            | ... | <i>E. cristatum</i> -2         |
| 5b. Male petals subequal, shorter than to as long as the floral bract.  |     |                                |
| 6a. Receptacles villous, floral bracts puberulus  | ... | <i>E. hamiltonianum</i> -9     |
| 6b. Receptacles either glabrous with glabrous or papillose hairy floral bracts, or villous with papillose hairy floral bracts.            |     |                                |
| 7a. Female sepals connate   | ... | <i>E. alpestre</i> -7          |
| 7b. Female sepals free.   |     |                                |
| 8a. Receptacles glabrous.   |     |                                |
| 9a. Stems profusely branched  | ... | <i>E. barbicaprae</i> -11      |
| 9b. Stems unbranched.   |     |                                |
| 10a. Leaves setaceous, ca 0.5 mm broad  | ... | <i>E. gregatum</i> -12         |
| 10b. Leaves linear-lanceolate, more than 2 mm broad.  |     |                                |
| 11a. Floral bracts bearded at the tips with greyish-white hairs. Female sepals 3  | ... | <i>E. nepalense</i> -10        |
| 11b. Floral bracts glabrous or puberulus. Female sepals 2, rarely 3   | ... | <i>E. truncatum</i> -8         |
| 8b. Receptacles villous.  |     |                                |
| 12a. Male sepals 2, free  | ... | <i>E. achiion</i> -14          |
| 12b. Male sepals 3, free or connate.  |     |                                |
| 13a. Female petals with a black apical gland.   |     |                                |
| 14a. Floral bracts acute or apiculate   | ... | <i>E. brownianum</i> -4        |
| 14b. Floral bracts caudate-acuminate  | ... | <i>E. robustobrownianum</i> -5 |
| 13b. Female petals eglandular   | ... | <i>E. luzulaefolium</i> -13    |

i. **E. setaceum** L. Sp. Pl. 129. 1753; non Hook. f. Fl. Brit. Ind. 6: 572. 1893. *E. capillus-naiadis* Hook. f. l.c.

*Submersed* herbs. *Stems* slender, unbranched, up to 40 cm (or more) long, sus-

pending in water. *Leaves* scattered below, crowded above, filiform, 1.5-7 cm long, 1-nerved. *Peduncles* several, aggregated towards apex, slender, unequal, 1-3.5 cm long, 6-ribbed. *Heads* conical, 3-4 mm broad;

receptacles conical, villous; outer involucre bracts orbicular, inner broadly obovate, rigid, greenish-yellow; floral bracts obovate, apiculate, villous with white papillose hairs. *Male flowers*: sepals 3, free or shortly connate, hairy; petals 3, connate below, lobes equal, short, hairy, glandular; stamens 6, anthers black. *Female flowers*: sepals 3, free, hairy; petals 3, free, narrowly oblanceolate, hairy, glandular.

*Fls. & frts.*: October. In ponds, at about 1300 m.

MEGHALAYA: K. & J. Hills.

2. ***E. cristatum*** Mart. in Wall. Pl. Asiat. Rar. 3: 28. 1832.

*Stems* short or up to 2 cm long. *Leaves* setaceous, often curved,  $5-18 \times 0.1-0.2$  cm, several-nerved. *Peduncle* solitary or sometimes two, 15-40 cm long, 5-7-ribbed; sheaths 4-6 cm long. *Heads* globose, 5-7 mm in dia.; receptacles flat or concave, glabrous or rarely sparsely hairy; involucre bracts obovate-oblong, ca 2 mm long, blackish upwards; floral bracts rounded or subtruncate at the apex, apiculate, hairy. *Male flowers*: sepals 3, spatulate, hairy; petals 3, two small, the third 2-3-times larger, obovate and conspicuously projecting out of the floral bracts, all with a large black gland and densely ciliate; anthers black. *Female flowers*: sepals 3, rarely 2, spatulate, hairy; petals 3, spatulate, one slightly larger than the other two, all glandular and densely ciliate. (Figs. 27 & 27a).

*Fls. & frts.*: June-Oct. In wastelands, mostly near drains; 800-1900 m.

MEGHALAYA: K. & J. Hills.

3. ***E. miserum*** Koern. in Linnaea 27: 607. 1856.

Densely tufted herbs. *Stems* underground, up to 4 cm long, 2-4 mm thick, usually villous at the base. *Leaves* erect or curved, filiform from a broad base, 3-10 cm long, 3-7-nerved. *Peduncles* 10-28 cm long, 5-7-ribbed; sheaths 2-5 cm long with mem-

branaceous tips. *Heads* subglobose, 2-6 mm broad; receptacles globose when few-flowered, columnar when many-flowered, glabrous; involucre bracts obovate-oblong, ca 2 mm long, black-tinged; floral bracts obovate, often apiculate, shortly hairy becoming glabrous with age. *Male flowers*: sepals 3, free or connate, lanceolate, hairy; petals subequal or one slightly larger, glandular, hairy; anthers yellow. *Female flowers*: sepals 3, broadly oblong, hairy; petals 3, spatulate, one often larger, all glandular, villous or sometimes sparsely hairy at the tip. *Seeds* oblong yellowish. (Figs. 26 & 26a).

*Fls. & frts.*: March-Nov. In wastelands; 600-1900 m.

ASSAM: Goalpara. MEGHALAYA: K. & J. Hills.

*E. mitophyllum* Hook. f. (in Fl. Brit. Ind. 6: 575. 1893) is probably synonymous with the above; requires further study.

4. ***E. brownianum*** Mart. in Wall. Pl. Asiat. Rar. 3: 25. 1832.

*Stemless* herbs. *Leaves* suberect, linear, acuminate,  $10-50(-80) \times 0.2-1(-2)$  cm, several-nerved, usually copiously hairy on both the surfaces, sometimes glabrous. *Peduncles* 1-6, hairy or glabrous, 20-100 cm long, 5-7-ribbed; sheaths 10-25 cm long. *Heads* depressed globose, 8-13 mm broad; receptacles flat or convex, villous; involucre bracts obovate-oblong, obtuse or apiculate, glabrous or hairy; floral bracts obovate, apiculate, hairy. *Male flowers*: sepals 3, free or connate, oblong, hairy; petals 3, subequal, hairy, glandular; anthers black. *Female flowers*: sepals 2-3, oblanceolate, scabrid; petals linear-oblanceolate, long-hairy, glandular; ovary subsessile. *Seeds* ovoid, dark brown.

*Fls. & frts.*: May-Dec. In marsh-lands, 500-2000 m.

ARUNACHAL PRADESH: Subansiri. ASSAM: Kamrup. MANIPUR. MEGHALAYA: K. & J. Hills.

5. **E. robustobrownianum** Ruhl in Engl. Pflanzenrch. heft 13: 77. 1903; Das & Mukerjee in Bull. Bot. Soc. Beng. 23: 185. 1969.

*Leaves* linear-lanceolate, about half as long as the peduncles, up to  $50 \times 2.5$  cm, glabrous. *Peduncles* several, up to 80 cm long, 6-9-ribbed, glabrous or sparsely hairy; sheaths lax, very obliquely mouthed, acuminate. *Heads* globose, 1-2 cm broad, appearing echinate due to the very prominent floral bracts; receptacles columnar, pilose; involucre bracts black or brownish at the base; floral bracts obovate, cuneate, apex caudate-acuminate, greyish-green clothed with white papillose hairs. *Male flowers*: sepals 3, connate, hairy; petals subequal, white hairy, glandular; anthers black. *Female flowers*: sepals 3, free, oblanceolate-oblong, hairy; petals 3, oblanceolate, hairy, glandular or eglandular. *Seeds* subglobose, red-brown, ribbed.

MEGHALAYA: K. & J. Hills, Cherrapunji, S. Paul, s.n. (n.v.).

6. **E. cinereum** R. Br. Prodr. 254. 1810. *E. sieboldianum* Sieb. et Zucc. ex Steud. Syn. Pl. Cyp. 2: 272. 1855.

*Stemless* herbs. *Leaves* narrowly linear,  $2.5 \times 0.1-0.15$  cm, obtuse, few-nerved. *Peduncles* several, 5-15 cm long, 5-ribbed; sheaths shorter than to equalling the leaves. *Heads* subglobose, 2.5-3.5 mm broad; receptacles subglobose-conical, glabrous or sparsely hairy; involucre bracts oblong-lanceolate, obtuse or acuminate, glabrous, pale; floral bracts oblong-lanceolate, long acuminate, glabrous, purplish-black with pale margins and tips. *Male flowers*: sepals 3, all connate or sometimes one free; petals minute; anthers white. *Female flowers*: sepals absent, or 2-3, linear-lanceolate; petals absent, or 1-2, subulate; ovary long stipitate, stipe swollen in the middle. *Seeds* red-brown.

*Fls. & frts.*: Sept.-Oct. In marshy places, 200-1000 m.

ARUNACHAL PRADESH: Lohit. ASSAM: Goalpara. MEGHALAYA: K. & J. Hills.

7. **E. alpestre** Hook. f. & Thoms. ex Koern. in Miq. Ann. Mus. Lugd. Batav. 3: 163. 1867.

*Stems* short or absent. *Leaves* usually spreading, linear-lanceolate, acute or obtuse,  $4.15 \times 0.2-0.6$  cm, few-several-nerved. *Peduncles* many, 5-20 cm long. *Heads* obconic to globose on maturity, 4-6 mm broad, 10-15-flowered; receptacles subglobose, glabrous; involucre bracts obovate-oblong, 2-3 mm long, obtuse or acute, pale; floral bracts obovate, apiculate, glabrous. *Male flowers*: sepals 3, connate; petals small, pubescent, glandular; anthers black. *Female flowers*: sepals 3, connate; petals 3, coriaceous, spatulate, long clawed, tip hook-like with a terminal gland, hirsute. *Seeds* brown. (Figs. 24 & 24a).

*Fls. & frts.*: Sept.

MEGHALAYA: K. & J. Hills.

8. **E. truncatum** Buch.-Ham. ex Mart. in Wall. Pl. Asiat. Rar. 3: 29. 1832.

*Stemless* herbs. *Leaves* linear-lanceolate,  $2.7 \times 0.2-0.3$  cm, obtuse, few-several-nerved. *Peduncles* several, 5-10(-20) cm long, 5-ribbed; sheaths 3-6 cm long with membranaceous tips. *Heads* conical, 3-4 mm broad; receptacles conical, glabrous; involucre bracts obovate, shorter than the or equalling the head, scarious; floral bracts obovate, apiculate, glabrous. *Male flowers*: sepals 2, free or connate, spatulate, toothed upwards, glabrous; petals minute, glabrous, with a terminal gland; anthers black. *Female flowers*: sepals 2(-3), oblanceolate, toothed upwards, glabrous; petals 3, linear or narrowly oblanceolate, glabrous, with a terminal gland. *Seeds* ellipsoid, brown.

*Fls. & frts.*: March-Dec. Along streams, in shallow water; 100-400 m.

ASSAM: Lakhimpur. TRIPURA.

9. **E. hamiltonianum** Mart. in Wall. Pl. Asiat. Rar. 3: 29. 1832. *E. oryzetorum* Hook. f. Fl. Brit. Ind. 6: 579. 1893 p.p.



Figs. 24-28a. : 24. *Eriocaulon alpestre* Hook. f. & Thom. ex Koern. 24a. Male & female flowers. 25. *E. xeranthemum* Mart. 25a. Male & female flowers. 26. *E. miserum* Koern. 26a. Male & female flowers. 27. *E. cristatum* Mart. 27a. Male & female flowers. 28. *E. nepalense* Presc. ex Bong. 28a. Male & female flowers.

*Stemless* herbs. *Leaves* suberect, linear-lanceolate,  $4.8 \times 0.15-0.25$  cm, obtuse, several-nerved. *Peduncles* several, slender, 10-25 cm long, several-ribbed; sheaths 3.5 cm long. *Heads* conical, ca 3 mm broad; receptacles villous; involucre bracts obovate, obtuse, scarious, glabrous; floral bracts cuneate-obovate, acutish, puberulus, yellowish. *Male flowers*: sepals 2, almost free, narrowly oblong, acute, white; corolla tube not lobed; anthers black. *Female flowers*: sepals 2, free, narrowly oblong, white; petals 3, narrowly oblanceolate, white.

ASSAM: without precise locality.

10. ***E. nepalense*** Presc. ex Bong. in Act. Petrop. Sc. Math. ser. 6. 1: 610. 1831.

*Stems* short or absent. *Leaves* linear-lanceolate,  $2.7 \times 0.2-0.7$  cm, acute or obtuse, several-nerved. *Peduncles* several, 6-20 cm long, 5-6-ribbed; sheaths 2.5-6 cm long with membranaceous tips. *Heads* subglobose, 2.5-5 mm broad; receptacles convex or columnar, glabrous; involucre bracts obovate, 1-2 mm long, apex rounded or truncate, often apiculate, ultimately recurved; floral bracts obovate, apiculate, hairy. *Male flowers*: sepals 3, free or sometimes connate, spatulate, shortly hairy at the tips; petals 3, glabrescent-shortly hairy; anthers black. *Female flowers*: sepals 3, oblanceolate, apex rounded or acute, hairy; petals 3, linear or narrowly oblanceolate, hairy, eglandular or with a small to fairly large gland, rarely the gland shortly stipitate. *Seeds* ellipsoid, brownish. (Figs. 28 & 28a).

*Fls. & frts.*: Sept.-Dec. In wet places, 900-1300 m.

ARUNACHAL PRADESH: Subansiri. MEGHALAYA: K. & J. Hills. NAGALAND.

Ruhland (in Engl. Pflanzenrch. 13: 88. 1903) reported that the petals of female flowers are eglandular while Fyson (in J. Indian bot. Soc. 2: 198. 1923) stated that these are glandular. We have found it to be a variable character. In addition, in some of the Subansiri plants, sometimes the glands

are sessile and sometimes distinctly stipitate, even in the same head. Such stipitate glands do not appear to have been reported so far in any of the *Eriocaulon* spp.

11. ***E. barbacaprae*** Fyson in J. Indian bot. Soc. 2: 197. 1923.

*Submersed* herbs. *Stems* shortly elongate, branched. *Leaves* linear with a broad base, 5-8 cm long, acute, black when dry. *Peduncles* several, 10-12 cm long. *Heads* globose, ca 6 mm broad; receptacles elongated, glabrous, floral bracts obovate-cuneate, hairy. *Male flowers*: sepals connate, spatheaceous, black, hairy at the tips; petals 3, subequal, glandular, hairy at the tips; anthers black. *Female flowers*: sepals 2, navicular, hairy at the tips; petals oblanceolate, glandular, hairy at the tips.

MEGHALAYA: K. & J. Hills, Shillong.

12. ***E. gregatum*** Koern. in Linnaea 27: 606. 1856.

*Submersed* herbs. *Stems* somewhat elongated, more or less underground, up to 6.5 cm long, ca 3 mm thick. *Leaves* setaceous, 2-3.5 cm long, obtuse. *Peduncles* solitary or few together, flexuous, obscurely 4-ribbed, up to 10 cm long though frequently much shorter; sheaths equalling to or exceeding the leaves. *Heads* conical, ca 3 mm broad; receptacles glabrous; involucre bracts obovate, obtuse, glabrous, blackish; floral bracts cuneate-obovate, hairy at the tips, blackish. *Male flowers*: sepals 3, oblong, obtuse, puberulous; petals 3, ciliate, glandular; anthers black. *Female flowers*: sepals 3, oblong, obtuse, puberulous; petals 3, free, spongy, spatulate, hairy upwards, glandular.

*Fls. & frts.*: Sept.-Oct.; 1300-1650 m.

MEGHALAYA: K. & J. Hills.

13. ***E. luzulaefolium*** Mart. in Wall. Pl. Asiat. Rar. 3: 28. 1832.

*Stemless* herbs. *Leaves* spreading, linear-lanceolate,  $2.6(-10) \times 0.2-0.4$  cm, acute, several-nerved. *Peduncles* many, 10-25(-40) cm long, 5-7-ribbed; sheaths subequalling the leaves,

tips scarious. *Heads* obconic-globose, 3-6 mm broad; receptacles subglobose, villous; involucre bracts obovate, glabrous, stramineous; floral bracts obovate-cuneate, apiculate, black with white hairs at the back. *Male flowers*: sepals 3, spatulate, black, hairy; petals 3, minute, eglandular; anthers black. *Female flowers*: sepals 3, narrowly oblanceolate, glabrous or hairy, blackish; petals 3, equal, narrowly oblanceolate, eglandular, tips hairy. *Seeds* ellipsoid, brown, with ca 8 longitudinal hairy ribs.

*Fls. & frts.*: Sept.-Oct.; at about 1300 m.

MEGHALAYA: Garo Hills, K. & J. Hills.

14. **E. achiton** Koern. in *Linnaea* 27: 630. 1856.

*Stemless* herbs. *Leaves* linear-lanceolate, spreading,  $2.4 \times 0.07-0.1$  cm, acute, 3-5-nerved. *Peduncles* few to several, 4-9 cm long, 4-ribbed; sheaths 2-3 cm long, tips finely acuminate, green. *Heads* obconic-subglobose, 2-3 mm broad; receptacles subglobose, villous; involucre bracts oblong, ca 2 mm long, obtuse, pale, glabrous; floral bracts obovate, apiculate, hairy. *Male flowers*: sepals 2, narrowly linear-oblanceolate, glabrous; petals minute or obsolete; anthers black.

*Female flowers*: sepals 2, oblanceolate, hairy; petals absent (sometimes 2 or 3, narrowly oblanceolate, hairy, glandular). *Seeds* ellipsoid, red-brown.

*Fls. & frts.*: Sept.-Oct., at about 1300 m.

MEGHALAYA: K. & J. Hills.

15. **E. xeranthemum** Mart. in Wall. Pl. Asiat. Rar. 3: 29. 1832.

*Stemless* herbs. *Leaves* spreading, linear-lanceolate,  $0.8-4 \times 0.1-0.3$  cm, several-nerved. *Peduncles* usually 2-3, sometimes 1-5, equaling to almost twice as long as the leaves, 5-ribbed; sheaths 2-3 cm long with scarious tips. *Heads* including the involucre, 4-6 mm broad; receptacles globose, glabrous; involucre bracts stellately spreading, lanceolate, acuminate, yellowish, shining; floral bracts obovate, apex truncate, hairy. *Male flowers*: sepals 3, free or partially connate, obovate, apex subtruncate, hairy; petals minute; anthers black. *Female flowers*: sepals 3, equal or unequal, or 2, free, oblanceolate, apex rounded, glabrous; petals 3, oblanceolate, ciliate, glandular. *Seeds* linear-ellipsoid, pale yellow. (Figs. 25 & 25a).

*Fls. & frts.*: July-Aug.

MEGHALAYA: K. & J. Hills.