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Studies in Cyperaceae 8. A revision of *Lipocarpha*, including *Hemicarpha* and *Rikliella*.

Paul Goetghebeur (1) & An Van den Borre (1)

(1) Leerstoel voor Morfologie, Systematiek en Ecologie van de Planten, K. L. Ledeganckstraat 35, 9000 Gent (BELGIUM).

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SUMMARY

A survey is given of the taxonomical history of the three genera *Lipocarpha*, *Hemicarpha*, and *Rikliella*. Due to the common possession of a highly specialized (reduced) type of inflorescence with dense spikes of many one-flowered spikelets, and due to the absence of any other individual synapomorphy, it is decided to merge the three genera. The (lecto)typification of *Lipocarpha*, *Hypolytrum*, *Hypaelyptum*, *Tunga*, *Hemicarpha* and *Rikliella* is commented. The general description and the key to the species is followed by an alphabetical treatment of the 35 species. New species are *L. abietina*, *L. constricta*, *L. thermalis*. New combinations are *L. crassicuspis*, *L. hemisphaerica*, *L. kernii*, *L. rehmannii*, *L. squarrosa*.

1. INTRODUCTION

While studying the genus *Ascolepis* (Goetghebeur 1977 & 1980), the senior author had the opportunity to study some of the related or resembling genera, as *Lipocarpha*, *Hemicarpha*, *Rikliella* and a few others. Due 1) to the presence of a prophyllar scale at the base of each lateral spike in those three genera, and 2) to the presence of several transitional forms between them, they seemed to form a most natural unit, and doubt arose on the validity of treating them as separate genera (Goetghebeur 1980: 304).

Meanwhile, Wilson (1981: 170) had a close look at the only Australian representative of *Rikliella* (*R. australiensis*), and 'a series of specimens with one or two reduced scales has been collected, connecting this [scaleless form] with the typical *Lipocarpha microcephala*, with two hyaline scales enveloping the nut'. Clearly, this meant a breakdown of the sole differential character of the three genera (*Lipocarpha* with two scales, *Hemicarpha* with one, and *Rikliella* without hypogynous scales). Much earlier, also *Hemicarpha schomburgkii* was described as having no hypogynous scales at all; nevertheless Raynal (1973: 154) did not include this species in his *Rikliella* with its scaleless spikelets!

We should consider 1) that *Lipocarpha*, *Hemicarpha* and *Rikliella* are closely related, 2) that the single differential character is not valid any more, and 3) that from all continents prophyll- and glumeless species are known which almost certainly arose independently. Obviously neither *Hemicarpha* nor *Rikliella* are possessing a single synapomorphy, they should be united into a *Lipocarpha* s.l.

2. TAXONOMICAL HISTORY

A. *Lipocarpha*: a problematical start.

Of the species now included in *Lipocarpha* (s.s.) the first were described in, of course, *Scirpus* (see *S. chinensis*, *S. senegalensis*): the two hypogynous scales were, ór overlooked, ór considered homologous to the perianth bristles of the traditional Scirpi, even until recently (Kern 1974: 521).

The second step was made by L.C. Richard (in Persoon 1805: 70) who united several species with two hypogynous scales into a heterogeneous *Hypolytrum* (s.l.). Shortly afterwards Vahl (1805: 283-285) also created a new genus *Hypaelyptum* (s.l.) for a similar mixture, but without any reference to Richard's work. Brown (1810: 219) being well aware of the situation, first tried to separate both groups, by 1) applying *Hypaelyptum* to the species with dorsiventrally placed scales, and 2) excluding those with lateral scales, which 'proprium genus constituunt' namely *Hypolytrum*, as understood nowadays. A few years later, to avoid further confusion, he eventually created a completely new genus *Lipocarpha* for the former group (Brown 1818: 459).

Starting with Richard (l.c.) and until quite recently (Hooper 1973: 866; Kern 1974: 521), the inflorescence of *Lipocarpha* was considered as a head of 1-several scirpoid spikelets, each comprising numerous glumes, and each of these axillating a bisexual floret with a perianth composed of two dorsiventral hypogynous scales. Already Brown (1810: 219) had questioned this idea, and cautiously pointed to the possible derivation from *Kyllinga*. After Rikli (1895) demonstrated the chlorocyperoid anatomy of o.a. *Chlorocyperus* and *Lipocarpha*, this splendid Brownian hypothesis was candidly reworded and convincingly argued by Holm (1899: 171-173): in assuming a reductional process from a many-flowered cyperoid spikelet to a single-flowered *Lipocarpha* spikelet, the adaxial and abaxial hypogynous scales could be seen as the respective prophyll and glume of the reduced spikelet. Consequently, *Lipocarpha* was removed from the *Scirpeae* to the *Cypereae*. This is indeed the view that is now generally accepted among cyperologists (see e.g. Hooper 1986). Koyama (1961: 44-46, 72) went even so far as to include *Lipocarpha* in *Cyperus*, uncritically making a number of superfluous combinations (Koyama 1960: 438).

Recently, a tribe *Lipocarpheae* was created, including *Lipocarpha* s.l. (+ *Hemicarpha*, + *Rikliella*) and *Ascolepis*, *Alinula* (Koyama 1982: 224). First, *Ascolepis* and *Alinula* are much closer to *Cyperus* s.l. (incl. 'Mariscus') than to *Lipocarpha*. If a close relative of Lipocarpha should be indicated, we suggest *Volkiella* (spikes with distichous bracts, axillating a reduced single-flowered spikelet with

a tiny spikelet prophyll and a first glume). Second, in our opinion the rank of tribe is somehow exaggerated for these two genera, which fit well into *Cypereae*. Thirdly, the description includes some obvious errors (for *Ascolepis* and *Alinula*): 'spiculae ... a bractea occultae', 'glumeae [sic] semper hyalinae', 'spicae 1-3', the latter two character states are not true, not even for *Lipocarpha*!

B. *Hemicarpha*: a superfluous creation.

Hemicarpha was described by Nees (1834a: 287) as a monotypic genus, based on *H. isolepis* from India, the supposed 'perianth' with only one scale, adaxial in the 'flower', whence the generic name. The type specimen however proved to be a genuine *Lipocarpha*, with a fruit surrounded by the two hypogynous scales (Haines & Lye 1971: 476-477). Meanwhile a few other species were added to this genus, some of these indeed with a single, adaxial scale (*H. aristulata*, *H. drummondii*, *H. occidentalis*), another with a reduced scale which eventually could be virtually absent (*H. micrantha*), and still another with no scales at all (*H. schomburgkii*).

Consequently, either this genus should be discarded completely and its contents combined under *Lipocarpha*, or a new name and a new type are needed for the remainder of the genus. But

1) one of the remaining species (*H. schomburgkii*) is described with completely reduced hypogynous scales (Friedland 1941: 858-860, fig. 4C), and

2) likewise, of several *Lipocarpha*-species, forms with reduced or even suppressed hypogynous scales are known (Palla 1905: 319; Wilson 1981: 170).

Obviously, this new genus would be very ill defined, therefore we are strongly in favour of an inclusion of *Hemicarpha* in the highly resembling genus *Lipocarpha*. This was already formulated long time ago by Kunth (1837: 268): '*Lipocarphae* proxima, vix distinguenda', and by Schultes (in sched. Schreber 272, M): 'Wahrscheinlich wird aber zu seiner Zeit dieses Genus [*Hemicarpha*] mit *Lipocarpha* vereint werden mussen'.

The formal inclusion was recently published by Tucker (1987: 410-411), who incorrectly ascribed to the senior author the intention of merging *Ascolepis* with *Lipocarpha*. The third genus that was mentioned is of course *Rikliella* (Goetghebeur, pers. comm.).

C. *Rikliella*: an uncertain affiliation.

The first step in recognizing this taxon was made by Raynal (1968: 94), who suggested that *Scirpus squarrosus*, *S. kernii* and *S. rehmannii* could have originated out of *Ascolepis* ór *Lipocarpha*, by the loss of their hypogynous scales. Haines & Lye (1971: 479), strongly influenced by the embryographical studies of Van der Veken (1965), but on the other hand disregarding the anatomical evidence

mentioned by Chermezon (1937: 141), have seriously missed the point by putting the whole of *Isolepis* on top of the cyperoid evolutionary branch. They transferred the three mentioned species, with the not closely related *Scirpus hystrix* Thunberg towards *Isolepis*, a genus with a *Cyperus*-type embryo, but with eucyperoid anatomy, whilst the three were known to show a chlorocyperoid anatomy. This action was of course criticized by Raynal (1973: 152-154), and corrected by creating a new genus *Rikliella*, including those three species. His new genus was supposed to be clearly related to either *Ascolepis* ór *Lipocarpha*, depending on the interpretation of the remaining scale either as the spikelet glume or spikelet bract.

At that moment Raynal (1973: 155) was inclined to accept *Ascolepis* as the closer relative. Later on was argued by Goetghebeur (1980: 303) that a derivation from *Lipocarpha* was much more probable, due to the presence of a spike prophyll in *Rikliella* and *Lipocarpha*, and the absence of this in *Ascolepis*. Furthermore, '*Hemicarpha*' is a clear intermediate between those 'genera'. Finally, the description of *Rikliella australiensis* J. Raynal (Govindarajalu & Raynal 1976: 220) proved the polyphyletic nature of this taxon: *R. rehmannii* and *R. kernii* are close relatives, *R. squarrosa* comes as close to *L. microcephala* as to *R. kernii*, and *R. australiensis* is no more than a prophyll- and glumeless form of *L. microcephala* with no other differences (Wilson 1981: 170): both 'species' (of two 'genera'!) were repeatedly collected in one population (e.g. Wilson 1473a+b, Wilson 3527a+b). This seems quite unacceptable to us, and an inclusion in *Lipocarpha* is hereby proposed.

3. GENERIC SYNONYMY AND TYPIFICATION

A. *Lipocarpha* R.Brown in Tuckey J.K., Narr. Exp. Congo, App.: 459 (1818), nom. cons.

Nees C.G., 1834, Linnaea 9: 287. – Kunth C.S., 1837, Enum. Pl. 2: 266. – Nees C.G., 1842, Fl. Brasil. 2(1): 64. – Steudel E.G., 1855, Syn. Pl. Glum. 2: 129. – Böckeler O., 1871, Linnaea 37: 114. – Bentham G., 1878, Fl. Austr. 7: 336. – Bentham G., 1883, in Bentham & Hooker, Gen. Pl. 3: 1054. – Clarke C.B., 1883, Fl. Brit. Ind. 6: 667. – Ridley H.N., 1884, Trans. Linn. Soc., Bot., 2: 162. – Holm T., 1899, Amer. J. Sci., ser. 4, 7: 171. – Clarke C.B., 1902, Fl. Trop. Afr. 8: 468. – Palla E., 1905, Ber. Deutsch. Bot. Ges. 23: 316. – Clarke C.B., 1908, Kew. Bull., Add. Ser., 8: 116. – Pfeiffer H., 1935, Repert. Spec. Nov. 39: 38. – Chermezon H., 1937, Fl. Madag. 29: 166. – Peter A., 1937, Fl. D.O.Afr.: 382. – Napper D.M., 1965, J. E. Afr. Nat. Hist. Soc. 25: 22. – Hooper S.S., 1972, Fl. W. Trop. Afr., ed. 2, 3: 328. – Kern J.H., 1974, Fl. Males., ser. 1, 7: 519. – Goetghebeur P., 1980, Adansonia, ser. 2, 19: 302. – Wilson K.L., 1981, Telopea 2: 170. – Koyama T., 1982, Acta Phytotax. Geobot. 33: 224. – Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 294.

Type: *L. argentea* (Vahl) R. Brown, nom. illeg.

The name *L. argentea* was based on *Hypaelyptum argenteum* Vahl (1805: 283), where *Scirpus senegalensis* Lamarck is explicitely mentioned as a synonym. This is a clear case where Art. 63 on superfluous names applies.

B. *Hypolytrum* L.C. Richard in Persoon, Syn. Pl. 1: 70 (1805), p.p. non typica.

Accompanying the description by Richard (see Panigrahi 1985: 510-511), three species were created, in this order: 1) *H. latifolium* L.C. Richard, 2) *H. senegalense* L.C. Richard, 3) *H. gracile* L.C. Richard. Clearly this is a mixture of two genera, viz. *Hypolytrum* (1 = *H. nemorum* (Vahl) Sprengel) and *Lipocarpha* (2 = *L. chinensis*, 3 = *L. ?sphacelata*). From Brown (1818: 459) we know that Richard actually had intended this name for what we know now as *Hypolytrum* s.s. Furthermore, the first species – in the non-alphabetical sequence – is a member of *Hypolytrum*. For these two reasons we can readily accept the lectotypification by Koyama (1961: 68), who indeed has selected this very species, *H. latifolium*.

Recently, the same conclusion was reached by Panigrahi (1985: 511), who

was unaware of the previous lectotypification, and selected the same species as lectotype. Again, this proves that the entries in Farr et al. (1979) should not too heavily be relied upon. A second edition could possibly take advantage of consulting the specialists' knowledge.

C. *Hypaelyptum* Vahl, Enum. Pl. 2: 283 (1805), p.p. typica.

Brown R., 1810, Prodr.: 219. – Schumann K., 1895, Engl. Pflanzenw. Ost-Afr. C: 126.

Lectotype: H. *filiforme* Vahl (lectotypification by Panigrahi, 1985: 511).

Exactly as happened with *Hypolytrum*, also this genus was based on a mixture of two groups of species, in the following sequence: 1) *H. pungens* Vahl, 2) *H. argenteum* Vahl, 3) *H. sphacelatum* Vahl, 4) *H. filiforme* Vahl. This would give, in *Hypolytrum* s.s.: 1 (= *H. pulchrum* (Rudge) H. Pfeiffer), and in *Lipocarpha*: 2 (= *L. chinensis*), 3 (= *L. sphacelata*) and 4 (= *L. filiformis*). Brown (1810: 219), in making a clear distinction between *Hypolytrum* and *Hypaelyptum* (resp. as = *Hypolytrum* s.s. and = *Lipocarpha*), was the first to give an implicite lectotypification of both names. One of the three species belonging to *Lipocarpha* should be indicated as lectotype. This was done by Panigrahi (1985: 511) 'to maintain the current uses', which is of course a most valid reason; *Hypaelyptum filiforme* ('*filiformis*') was selected as lectotype. The characters 'col. bivalvis, corolla nulla, setae nullae' are wrongly attributed by Panigrahi to *H. filiforme*; actually these words are excerpted from an addendum 'character naturalis' following some of the genera (e.g. also *Dichromena, Mariscus*, ...), and that is why they are very similar to the wording in the generic description. There is nothing against the choice of *H. filiforme*, which represents a typical species of *Lipocarpha*.

This choice makes strictly obligatory the rejection of the earlier *Hypaelyptum* against the younger, but conserved *Lipocarpha*, confirming the situation on the list of the Nomina generica conservanda, sub no. 452.

D. *Tunga* Roxburgh, Fl. Ind. (ed. Wallich) 1: 187 (1820), p.p. typica.

Roxburgh W., 1832, Fl. Ind. (ed. Carey) 1: 183.

Lectotype: *T. triceps* Roxburgh (hereby proposed).

Also this generic name is concealing a heterogeneous assemblage of *Lipocarpha*: 1) *T. triceps* Roxburgh (= *L. sphacelata*), 2) *T. laevigata* Roxburgh (= *L. sphacelata*), and *Hypolytrum*: 3) *T. diandra* Roxburgh (= *H. nemorum* (Vahl)

Sprengel). Since from the description we cannot distinguish *Lipocarpha* from *Hypolytrum*, we would like to propose the first species – in non-alphabetical sequence ! – as lectotype. As a result, *Tunga* is to be considered a younger taxonomical synonym of *Lipocarpha*.

E. *Hemicarpha* Nees, Linnaea 9: 287 (1834).

Kunth C.S., 1837, Enum. Pl. 2: 268. – Nees C.G., 1842, Fl. Brasil. 2(1): 61. – Coville F.V., 1894, Bull. Torrey Bot. Club 21: 34. – Palla E., 1908, Österr. Bot. Zeitschr. 58: 417. – Friedland S., 1941, Amer. J. Bot. 28: 855. – Svenson H.K., 1957, N. Amer. Fl. 18(9): 508. – Haines R. & Lye K., 1971, Bot. Notiser 124: 477. – Goetghebeur P., 1980, Adansonia, ser. 2, 19: 303. – Koyama T., 1982, Acta Phytotax. Geobot. 33: 224.

Type: *H. isolepis* Nees, nom. illeg.

The genus was formally published late June 1834 (Farr et al. 1979: 797) with the short diagnosis: 'Perianthium proprium univalve, squamae communi oppositum', besides a general description of the tribe ('sectio') *Hypolytreae* and of an unnamed subdivision B. The diagnosis is followed by a nomen nudum '*H. Isolepis* N. ab E. in Wight Prodr. Fl. Penins. Ind. or.' (Nees 1834a: 287).

Now, two cyperological papers (Nees 1834b & c) were published later on, almost simultaneously in Oct. 1834 (Farr et al., l.c. & Stafleu 1967: 501-502). In Nees (1834b: 263) we find a more elaborate description of *Hemicarpha*, followed by the first description of *H. isolepis*. However, in the synonymy the name *Scirpus haemisphericus* [sic] Roth is mentioned, although with a question mark. Article 34.2 is unequivocal in this respect, and therefore Farr et al. (l.c.) were quite right to consider *H. isolepis* as a superfluous name (Art. 63). In the second paper (Nees 1834c: 92) both the discussed genus and species are merely followed by bibliographical references to a.o. Nees (1834b: 263), and Roth's reference still with a question mark.

F. *Rikliella* J. Raynal, Adansonia, ser. 2, 13: 154 (1973).

Govindarajalu E. & Raynal J., 1976, Adansonia, ser. 2, 16: 220. – Goetghebeur P., 1980, Adansonia, ser. 2, 19: 303. – Wilson K.L., 1981, Telopea 2: 170. – Koyama T., 1982, Acta Phytotax. Geobot. 33: 224. – Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 301.

Type: *R. rehmannii* (Ridl.) J. Raynal.

4. GENERAL DESCRIPTION AND NOTES

Annuals, more rarely cespitose or rhizomatous perennials. Culm erect, more or less cylindrical, glabrous and smooth. Leaves basal, with a rather short, closed leaf sheath, no ligule and a linear, flat or rarely more or less inrolled, glabrous and smooth leaf blade. Inflorescence terminal, head-like, with few to many spikes or reduced to a single spike, surrounded by 1-few spike-bearing or empty bracts, the lowermost bract(s) elongate, the uppermost bracts smaller and resembling the spikelet bracts; inflorescence sometimes pseudolateral due to the permanent upright position of the lowermost spike bract. Spike composed of a cylindrical axis with many well developed spikelet bracts in a dense helicoidal arrangement, the lateral spikes with an empty spike prophyll. Each spikelet bract is axillating a highly reduced one-flowered spikelet with two tiny hyaline scales, an empty adaxial prophyll, and a flower-bearing abaxial glume; in some species either the glume or both scales can be partly to completely reduced. The spikelet bracts are more or less obovate to spathulate, with a short to elongate apical part. The single bisexual flower has a 3- or 2-merous ovary with a (very) short to medium-sized style and 3 or 2 stigmatic branches, 3, 2 or 1 stamen at the ribs of the ovary, no perianth. Fruit (broadly) obovate, ellipsoid, to narrowly subcylindrical, often constricted at the base and apically with a small stylebase remnant, rarely beaked (fig. A).

Notes

1. Fruit shape:

The ripe fruits were described according to 1) a frontal view, and 2) an upper view (= cross section through the widest part). In frontal view the fruit is usually oblong to obovate with a slightly or not constricted base and a small style base remnant (*L. chinensis*, fig. 39A). The style base can be nearly absent in species with the style divided to the base (*L. kernii*, fig. 40D). On the other hand some species have a clearly beaked fruit, most pronounced in *L. sphacelata* (fig. 36C), less so in *L. salzmanniana* (fig. 36B), *L. microcephala* (fig. 36D), *L. maculata* (fig. 37A), *L. humboldtiana* (fig. 37D). The base of the fruit can be conspicuously constricted, apparently due to a swelling of the basal cells, markedly so in *L. sphacelata* (fig. 36C), *L. humboldtiana* (fig.37D), *L. maculata* (fig. 37A). The narrowly elliptical (and subcylindrical) fruit of *L. microcephala* (fig. 36D) serves as a fine diagnostic feature for the species, while a very broadly obovate and dorsiventrally flattened fruit is characteristic of *L. prieuriana* (fig. 36E). The small, in lateral view curved fruit of *L. schomburgkii* (fig. 40G) also deserves mentioning. Most fruits are rounded trigonous (when trimerous), or subterete

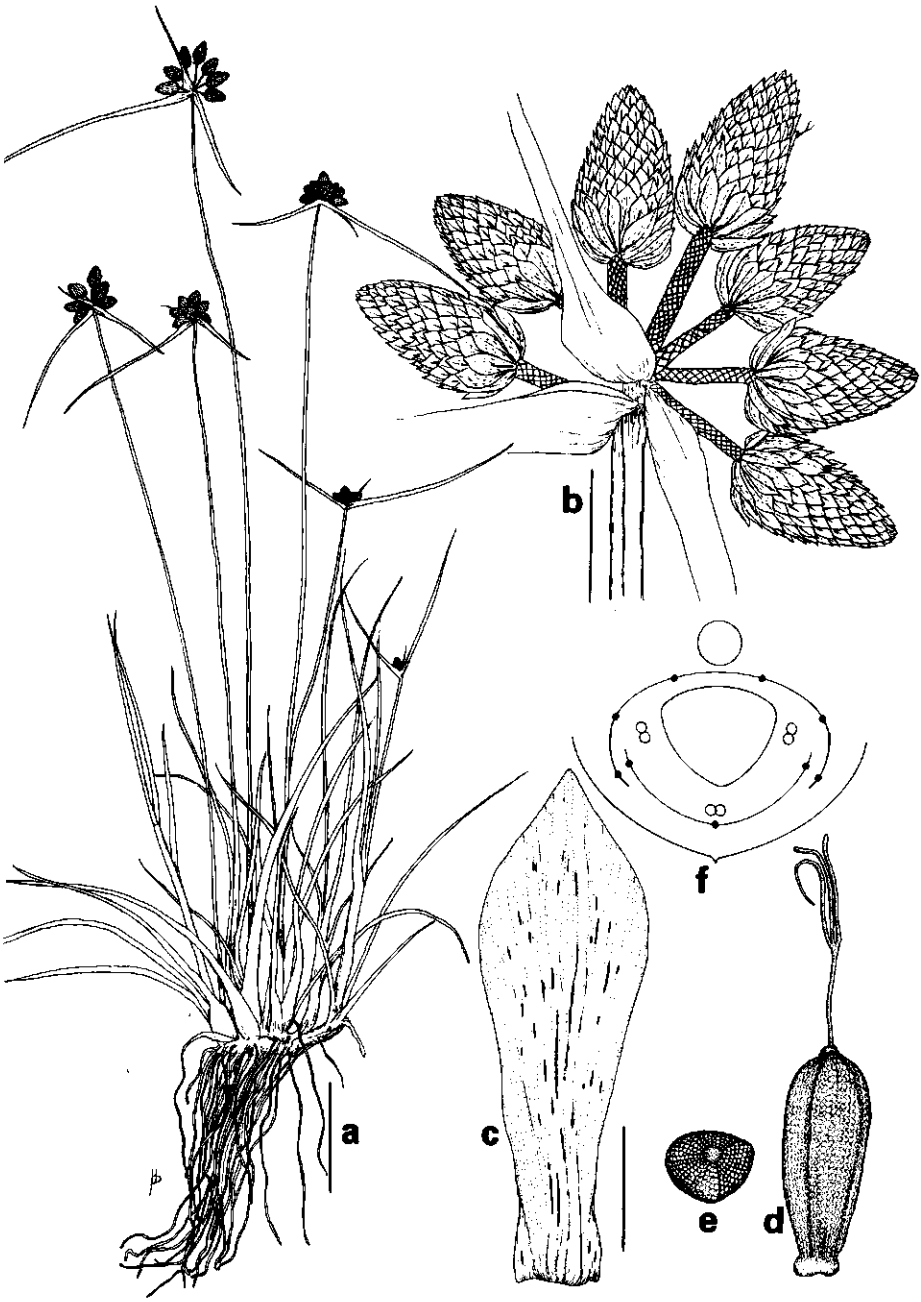

Fig. A. *Lipocarpha chinensis* (Osbeck) Kern (Hess 50-307, GENT). – a) Habit. b) Inflorescence with 7 spikes, spikelets partly shed, exposing the rachis of the spike. c) Bract of spikelet. d) Fruit, abaxial view. e) Fruit, apical view. f) Diagrammatical cross section of the spikelet. Bar: 5 cm (a), 5 mm (b), 0.5 mm (c-e).

(when dimerous) on cross section, although dimerous fruits can be subtrigonous towards the base (*L. micrantha*, *L. kernii*), and trimerous fruits can be much flattened towards the apex (*L. prieuriana*). The flattened fruit of *L. kernii* makes identification quite easy. More or less triquetrous fruits were observed in e.g. *L. squarrosa*, but we do not know if this holds true for freshly collected specimens too.

2. Fruit wall ornamentation:

In an early phase of this study, we had hoped to find new characters for specific delimitation and infrageneric classification, therefore a more close examination of the fruit wall was started. Several preparation methods of the fruits for SEM-studies were tested. Cleaning during 15 hours in water in an ultrason was not sufficient to remove the outer cell walls. Ultrasonic treatment during 30 minutes with acids (sulphuric acid and anhydric acetic acid, 1/9) yielded the best results; small fruits seemed to need a somewhat shorter treatment, they became rather brittle.

Of all species 1-10 fruits were isolated, treated and photographed, 1) complete, 2) a detail of a few cells in surface view, 3) the same in lateral view, 4) if needed or useful, even more details of the silica bodies were taken. The single copy atlas of these pictures is deposited in the library of the Laboratory of Plant Systematics, State University of Gent (GENT), the negatives are in the National Botanical Garden, Meise (BR).

The hexagonal subisodiametrical cells of the fruitwall epidermis have a single large silica body, centrally on the inner tangential wall, sometimes resting on a strange reticulate base (*L. robinsonii*, fig. 39E-F). These bodies are mostly mesa-shaped (*L. humboldtiana*, fig. 37E-F), the mesa often with widened shield (*L. filiformis*, fig. 41B-C, *L. kernii*, fig. 40E-F, *L. squarrosa*, fig. 40B-C), or the shield with a warted margin (*L. chinensis*, fig. 39B-C), or irregularly fringed (*L. albiceps*, fig. 41E-H). Also dome-shaped bodies may occur (*L. schomburgkii*, fig. 40H). They may fill one third to over half of the cell surface, sometimes nearly the complete cell is covered by the widened shield (*L. kernii*, fig. 40E-F). The inner tangential wall is otherwise free from other silica deposits, but in *L. albiceps* strange vermicular outgrowths are frequently present (fig. 41E-H). The radial cell walls are usually straight, but undulating walls were observed in e.g. *L. maculata* (fig. 37B-C). Because of a lack of sufficient data on the intraspecific variability, we have refrained of making extensive descriptions or of proposing a formal typology.

3. Habitat:

Most species of *Lipocarpha* are inhabitants of open, sunny, often weedy types of vegetation on temporarily wet to humid or even peaty soils. The perennial

species tend to grow more often under more or less permanently wet to humid conditions, while the annuals are often observed on seasonally wet sand. The single known gathering of *L. thermalis* was collected on damp sand (of 41.5 °C!) close to a hot water spring. A notable exception on this general rule is the mesophytic *L. comosa*, growing in the rather dry *Brachystegia* woodland.

In the short notes under the species we have refrained of giving altitudinal ranges, because summarizing figures would be simply misleading for species distributed from the tropics well into the subtropical and even warm temperate regions. The altitudinal notation arranged per latitude proved too cumbersome, and furthermore for many species we still do not have a sufficient amount of data.

4. Phytogeography:

The results of our analysis are represented in table 1, which gives an idea of the (sub)continental distribution of all species of *Lipocarpha* s.l. Noteworthy are following observations:

a) Africa has by far the largest number of species and endemics (21-15), compared with America (9-7), Madagascar (4-0), Asia (9-5), and Australia (2-0).
b) The commonest species, by distribution and by collected numbers, is *L. chinensis*, widespread over Africa, Madagascar, S. and E. Asia, even reaching Australia. Its occurrence as a weed in swampy places (a.o. ricefields) is playing a part in this pattern.
c) Another common species is *L. micrantha*, widespread over N., C. and S. America (the only one!). It has even succeeded in bridging the Atlantic Ocean, and is collected scattered along the west coast of Africa, occasionally also more inland. Three of its four close relatives (*L. aristata*, *L. drummondii*, *L. occidentalis*) are restricted to parts of the USA, and the fourth (*L. schomburgkii*) is a rare species known only from a few localities in northern South America.
d) Up to five species are linking Africa to the east (*L. chinensis*, *L. hemisphaerica*, *L. kernii*, *L. nana*, *L. rehmannii*). But there is only one species (*L. micrantha*) in common between Africa and America. The most strange occurrence of *L. mexicana* in Madagascar is a rather disturbing fact, whose interpretation is not fully clear to us. It should be noted however that a more or less similar pattern was found in *Ascolepis brasiliensis* (Kunth) Bentham ex C.B.Clarke (Goetghebeur 1980: 293).

More than a few species have a rather ephemeral appearance, and the large gaps in the records of some of them will probably be filled up when further collections are made by the right person on the right spot at the right time.

Table 1. Continental distribution of *Lipocarpha*.

America		Africa	Madagascar	Asia	Australia
	NCS				
–	–	*abietina*	–	–	–
–	–	*albiceps*	–	–	–
aristulata	N	–	–	–	–
–	–	*atra*	–	–	–
–	–	*barteri*	–	–	–
–	–	*chinensis*	*chinensis*	*chinensis*	*chinensis*
–	–	*comosa*	–	–	–
–	–	*constricta*	–	–	–
–	–	*crassicuspis*	–	–	–
drummondii	N	–	–	–	–
–	–	*echinus*	–	–	–
–	–	*filiformis*	–	–	–
–	–	*hemisphaerica*	–	*hemisphaerica*	–
humboldtiana	CS	–	–	–	–
–	–	*kernii*	–	*kernii*	–
–	–	*leucaspis*	–	–	–
maculata	N	–	–	–	–
mexicana	CS	–	*mexicana*	–	–
micrantha	NCS	*micrantha*	–	–	–
–	–	–	–	*microcephala*	*microcephala*
–	–	*monostachya*	–	–	–
–	–	*nana*	*nana*	–	–
occidentalis	N	–	–	–	–
–	–	*perspicua*	–	–	–
–	–	*prieuriana*	–	–	–
–	–	–	–	*pygmaea*	–
–	–	–	–	*raynaliana*	–
–	–	–	–	*reddyi*	–
–	–	*rehmannii*	*rehmannii*	–	–
–	–	*robinsonii*	–	–	–
salzmanniana	CS	–	–	–	–
schomburgkii	S	–	–	–	–
–	–	–	–	*sphacelata*	–
–	–	–	–	*squarrosa*	–
–	–	*thermalis*	–	–	–

5. Species delimitation:

In the course of this revision we gradually came upon a narrow delimitation of the species. This was due in particular to the study of the two complexes, *L. sphacelata* s.l. and *L. micrantha* s.l. At first we were inclined to recognize indeed these large entities as such, as broadly conceived species. However, after a closer inspection several differential characters appeared and turned out correlated with different geographical distribution. In order to reach a consistent treatment either a small number of 'broad' taxa or a larger number of narrowly

defined taxa was to be presented. As it is, most species in *Lipocarpha* are distinguished from each other by 1 or few characters.

Not the process of taxonomic delimitation but rather the – arbitrary – assignment of a hierarchical rank to these recognized entities is problematical. We have decided in favour of the recognition as species of all groups of specimens that could be distinguished by 1 or (preferably) more macromorphological characters, and as such had a geographical distribution pattern different from that of a resembling group of specimens.

6. Infrageneric classification:

The intricate phylogenetic relationships between many of the species are still unclear to us, because we dispose of a restricted set of characters with limited variability. Only few species are more or less outstanding and rather easy identified.

Of a few species the affinities are more obvious; following are a few examples:

L. robinsonii, outstanding by its rhizome and single involucral bract, but closely related to *L. chinensis*, indicated a.o. by their deciduous involucral bracts.

L. comosa, outstanding by its extremely elongate spikelet bracts, the presence of a well developed rhizome, and its atypical ecological preferences, but doubtless closely related to *L. albiceps*, with the similar colour in the spikelet bract base and the confluent spikes.

L. raynaliana and *L. sphacelata* are close relatives, given the common possession of a clear beak and basal constriction of the fruit, the former species probably a specialized local offshoot of the parental and more common *L. sphacelata*.

L. crassicuspis and *L. prieuriana* are easy recognized by their broadly obovate, dorsiventrally flattened fruit, the former probably a recent, local offspring from the more common parent.

L. micrantha, *L. aristulata*, *L. drummondii*, *L. schomburgkii* and *L. occidentalis* are forming a homogeneous group of essentially New World annuals with reduced glumes. Only the first has crossed the Atlantic, and could well be the oldest taxon from this particular group, given the variability presented over its whole wide range. The other species are much less variable and have a more restricted area.

L. squarrosa, *L. rehmannii* and *L. kernii* also form a group of more or less closely related species, with reduced glumes and spikelet prophylls, but with an Afro-Asian distribution.

7. Citation of specimens:

Apart from the type material, only a limited number of selected specimens are cited here. A complete list of studied exsiccata (3000+) is now made ready for publication and will appear very soon as a special issue of Cyperaceae Newsletter. Requests for copies should be sent to the senior author. Type specimens were seen, unless explicitely stated otherwise.

5. KEY TO THE SPECIES OF *LIPOCARPHA* S.L.

Lipocarpha is a very homogeneous, very natural group (Raynal 1967: 84), species identification is rarely evident, more frequently quite difficult, a thorough examination and careful measuring of the spikelet bract and fruit are often necessary.

Glossary:

Glume: the abaxial, mostly hyaline scale, appressed against the fruit and overlapped by the spikelet prophyll, sometimes completely reduced.

Involucral bracts: 1-few scales, axillating a lateral spike or empty, and larger than the inflorescence; some lateral spikes may be axillated by small bracts, scarcely different from a spikelet bract, and these are not included here.

Spike: the ovoidal to subcylindrical macromorphologically discernable inflorescence unit.

Spikelet: one of the many subunits of a spike, each of them axillated by a spikelet bract.

Spikelet bract: one of the many herbaceous, non-hyaline larger scales on the spike axis, each axillating a lateral spikelet.

Spikelet bract, apical part: the upper part, from the largest width to the top.

Spikelet bract, body: the lower part, from the largest width to the base.

Spikelet prophyll: the adaxial, mostly hyaline scale, appressed against the fruit and overlapping the glume, sometimes completely reduced.

1a. Rhizomatous perennial with a terminal, stellate, subspherical head 12-20 mm diam.; spikelet bract 5-9.5 mm long, white apical part 3-5 × longer than the violet body (C. & E. Africa) . . . . . 7. **L. comosa**
b. Inflorescence head different; spikelet bract shorter than 3 mm 2
2a. Lower involucral bract always strictly erect; annuals 3
b. Lower involucral bract (obliquely) patent to reflexed, rarely erect in a few (young) inflorescences; annuals or perennials 14

3a. Spikelet bract with short apical part, less than 1/5 of the basal part; spikelet prophyll and glume always present; inflorescence of 1 spike 4
b. Spikelet bract with longer apical part, at least 1/5 of the basal part; spikelet prophyll and glume present or absent; inflorescence of 1 or more spikes. . . 5
4a. Spikelet bract 0.4-0.7 mm wide; stamen single; stigmata 2 (Africa, Asia) . . . . . 13. **L. hemisphaerica**
b. Spikelet bract 0.9-1 mm wide; stamens 3; stigmata 3 (SE. Zaire) . . . . . 35. **L. thermalis**
5a. Spike always single; spikelet prophyll and glume present 6
b. Spikes 1-3; spikelet glume absent, prophyll present or absent 8
6a. Spike erect; second involucral bract present, often as long as spike (Angola) . . . . . 24. **L. perspicua**
b. Spike horizontal-pseudolateral; no second involucral bract present, or very short 7
7a. Top of spikelet bract smooth and rounded; stigmata 2 (C. & E. Africa) . . . . . 21. **L. monostachya**
b. Top of spikelet bract with a few spinules; stigmata 3 (Africa, Madagascar) . . . . . 22. **L. nana**
8a. Fruit rounded triquetrous on cross section; stigmata 3, short; spikelet bract mostly longer than 1 mm (Asia) . . . . . 34. **L. squarrosa**
b. Fruit subterete on cross section; stigmata 2; spikelet bract mostly shorter than 1 mm 9
9a. Spikelet prophyll absent 10
b. Spikelet prophyll present, sometimes small 11
10a. Fruit thick, straight, 0.4-0.65 × 0.2-0.3 mm; spikelet bract 0.5-1(-1.1) × 0.3-0.4 mm, shortly acuminate; spikelet prophyll shorter than fruit, often deeply bifid, rarely completely reduced (N. & S. America, Africa) . . . . . 19. **L. micrantha**
b. Fruit more slender, laterally curved, 0.4-0.45 × 0.15 mm; spikelet bract 0.5-0.8 × 0.15-0.2 mm, long tapering; spikelet prophyll absent (S. America) . . . . . 32. **L. schomburgkii**
11a. Spikelet prophyll underdeveloped, shorter than fruit (N. & S. America, Africa) . . . . . 19. **L. micrantha**
b. Spikelet prophyll well developed, as long as to longer than fruit 12
12a. Spikelet bract with apical part much longer than basal part; spikes conspicuously squarrose (N. America) . . . . . 23. **L. occidentalis**
b. Spikelet bract with apical part as long as or shorter than basal part . . 13
13a. Spikelet bract with apical part as long as basal part; spikelet prophyll mostly hyaline and nerveless (N. America) . . . . . 3. **L. aristulata**
b. Spikelet bract with apical part shorter than basal part; spikelet prophyll mostly red brown at tip and with a few basal nerves (N. America) . . . . . 10. **L. drummondii**
14a. Fruit narrowly elliptical to narrowly obovate, stigmas 2; apical part of spikelet bract (nearly) as long as body (Asia, Australia) . . . . . 20. **L. microcephala**

b. Fruit broader, mostly obovate; if narrow, then stigmas 3 15
15a. Apical part of spikelet bract ≥ 1/2 of bract 16
b. Apical part of spikelet bract < 1/2 of bract 18
16a. Spikelet prophyll and glume present; stigmas 3 (Africa, Madagascar) . . . . . 22. **L. nana**
b. Spikelet prophyll and glume absent 17
17a. Fruit conspicuously dorsiventrally flattened, stigmas 2 (Africa, India) . . . . . 15. **L. kernii**
b. Fruit (rounded) trigonous on cross section, stigmas 3 (Africa, Madagascar) . . . . . 29. **L. rehmannii**
18a. Stigmas 2, fruit dorsiventrally flattened; annuals 19
b. Stigmas 3, fruit (rounded) trigonous to subterete on cross section . . . 20
19a. Spikes (1-)3-5; spikelet bract 1.2-1.5 × 0.75-1.2 mm, apical part 0.1-0.25(0.4) mm long (Africa) . . . . . 25. **L. prieuriana**
b. Spikes 1-2(-3); spikelet bract 1.8-2.2 × 1-1.3 mm, apical part 0.6-0.8 mm long (Senegal) . . . . . 9. **L. crassicuspis**
20a. Perennial,with at least a few thick roots 21
b. Annual, with filiform roots 28
21a. Spikes confluent to a pale, rarely purplish head; spikelet bract 1.8-3.9 × 0.5-1.1 mm, apical part 0.6-1.4 mm long (Africa) . . . . . 2. **L. albiceps**
b. Spikes clearly individualized, pale or dark; if pale then apical part of spikelet bract < 1/3 of bract 22
22a. Spikes whitish to pale red brown; apical part of spikelet bract < 1/3 of bract 23
b. Spikes dark; apical part of spikelet bract > 1/3 of bract 25
23a. Plant conspicuously rhizomatous with isolated stems; leaf blade inrolled to subterete, rather pungent; inflorescence with one single involucral bract (Angola, Zambia) . . . . . 30. **L. robinsonii**
b. Plant not or only slightly rhizomatous, stems tufted; leaf blade not or slightly inrolled, soft; involucral bracts 2 or more 24
24a. Spikelet bract 1.5-2.35 × 0.45-0.75(-1) mm, not shouldered, white to creamy with red stripes; stamens 1(-2) (Africa, Madagascar, Asia, Australia) . . . . . 6. **L. chinensis**
b. Spikelet bract 1.8-2.8 × 0.9-1.2(-1.5) mm, conspicuously shouldered, body often pale reddish brown (C. & S. America) . 14. **L. humboldtiana**
25a. Apical part of spikelet bract short, c. 1/6 of bract; wings black; fruit conspicuously constricted at the base (E. Africa) . . . . . 8. **L. constricta**
b. Apical part of spikelet bract longer, ≥ 1/3 of bract 26
26a. Spikes squarrose, top of spikelet bracts recurved; spikelet bract 1.8-2.5 mm long, mostly with many small spinules on the top (W. Africa) . . . . . 5. **L. barteri**
b. Spikes not or only slightly squarrose, top of spikelet bracts not or only slightly recurved; spikelet bract ≤ 2 mm long, top with few or without spinules 27

27a. Spikelet bract 1.3-1.6 mm wide, conspicuously and broadly shouldered, apical part abruptly narrowed (Africa) . . . . . 1. **L. abietina**
b. Spikelet bract ≤ 1 mm wide, not or only slightly shouldered, apical part gradually narrowed (C., E. & S. Africa) . . . . . 4. **L. atra**
28a. Fruit with a conspicuous beak (style base) of 0.2-0.3 mm, and constricted at the base 29
b. Fruit without beak, remnant of style base < 0.1 mm long, at the base constricted or not 30
29a. Fruit 1-1.25 × 0.4-0.45 mm, obovate; spikelet bract 1.3-1.7 mm long; spikelet prophyll and glume 1.1-1.4 mm long (India, Sri Lanka, Burma) . . . . . 33. **L. sphacelata**
b. Fruit 1.3-1.6 × 0.3-0.4 mm, oblong; spikelet bract 2-2.5 mm long; spikelet prophyll and glume 1.8-2.1 mm long (S. India) . . . . . 27. **L. raynaliana**
30a. Spikelet prophyll and glume dark, or hyaline with many and conspicuous red stripes 31H
b. Spikelet prophyll and glume hyaline 32
31a. Spikelet prophyll and glume dark; inflorescence extremely dark (Zambia) . . . . . 11. **L. echinus**
b. Spikelet prophyll and glume hyaline, but with many red stripes; inflorescence pale (Burma, Thailand, Kampuchea) . . . . . 26. **L. pygmaea**
32a. Apical part of spikelet bract rather abruptly narrowed into a long attenuate acumen 33
b. Apical part of spikelet bract gradually narrowed into a short aqa triangular acumen 34
33a. Spikelet bract discolored, wings deep wine-red to dark brown, midnerve and top (yellowish) white; fruit 0.95-1.05 mm long (Africa) . . . . . 16. **L. leucaspis**
b. Spikelet bract rather concolorous, either hyaline with red stripes, or pale reddish brown; fruit 0.65-0.75 mm long (S. India) . . . . . 28. **L. reddyi**
34a. Spikelet prophyll as long as or slightly longer than the fruit; fruit not or only slightly constricted at the base 35
b. Spikelet prophyll much longer than fruit; fruit conspicuously constricted at the base 36
35a. Apical part of spikelet bract triangular, rarely slightly narrowed; spikes (1)2-4(5), ovoidal, 2-8 mm long (C. & S. America, Madagascar) . . . . . 18. **L. mexicana**
b. Apical part of spikelet bract conspicuously narrowed; spikes (2)3-7(12), cylindrical, 3-10(12) mm long (W. & C. Africa) . . . . . 12. **L. filiformis**
36a. Spikelet bract 0.35-0.5 mm wide, apical part (0.4)0.5-0.75 mm long, triangular-attenuate; fruit 0.7-1 mm long (USA) . . . . . 17. **L. maculata**
b. Spikelet bract 0.5-0.7 mm wide, apical part 0.1-0.4 mm long, broadly triangular; fruit 1.4-1.7 mm long (C. & S. America) . . . 31. **L. salzmanniana**

6. SYSTEMATICAL TREATMENT

1. **Lipocarpha abietina** Goetghebeur, sp. nov. – Fig. 1, 42B.

Type: Michel 2487, Burundi, 1952 (holotype BR, isotype K, MO, NY).

Lipocarpha triceps (Roxburgh) Nees var. *latinux* Kükenthal, Repert. Spec. Nov., Beih. 40, Anhang: 123 (1936).
Type: Peter 37325, Tanzania, 1926 (holotype B).

Lipocarpha atra auct., non Ridley: Clarke C.B., 1902, F.T.A. 8: 472, p.p. – Hooper S.S., 1972, F.W.T.A., ed. 2, 3: 328. – Hall J.B., 1973, Bot. J. Linn. Soc. 66: 345.

Proxime *L. atrae* Ridley, ab ea recedit praecipue spiculae bractea 1.3-1.6 mm lata, conspicue humerata atque apice abrupte acuminato.

Tufted perennial; roots up to 1 mm diam.; stem 45-80 cm × 1.25-1.5 mm; leaves up to 45 cm × 1 mm, often inrolled. Inflorescence terminal, with 4-7 spikes, 2.5-10 × 2.0-4.5 mm, ovoidal to conical; involucral bracts 1-2, the largest up to 4.5 cm long. Spikelet bract 1.5-2.1 × 1.3-1.6 mm, broadly obtrullate, conspicuously shouldered, apical part 0.6-0.7 mm long, acuminate, red brown, rarely dark brown, with pale top. Spikelet prophyll and glume 1.25-1.5 mm long. Stamens 2, anthers 0.7-0.75 mm long. Style 0.1-0.3 mm long, with 3 branches. Fruit 0.9-1.1 × 0.3-0.5 mm, frontally obovate, rounded trigonous on cross section.

Distribution:
-Africa: soudano-zambesian, from Senegal to Chad, and from Burundi and Tanzania to Botswana.

Selected specimens:

SENEGAL: Badi, Berhaut 3066 (P).
IVORY COAST: 20 S of Bavé, J. Bokdam 2877 (BR, K, MO, WAG).
MALI: 4 km E of Lobougoula, Lac Ngoroma, J. Raynal 21050 (P).
BURKINA FASO: Lac de Tengréla, Aké Assi 10751 (K).
CENTRAL AFRICAN REPUBLIC: 10 km N of Moroubas, C. Tisserant 1188 (BM, P).
CHAD: Bam, Audru 1423 (P).
CAMEROUN: 22 km NE of Bafia, Taoutia, J. & A. Raynal 10643 (P).
ZAIRE: Kapanga, Overlaet 391 (BR).
BURUNDI: Mosso, Inyakivumu, M. Reekmans 9749 (BR, BRVU, GENT, LG).
TANZANIA: Ujiji, Mchaji to Bugaga, A. Peter 37325 (B).
ANGOLA: Benguela, Membassaca, H. Faulkner 16B (LISC).
BOTSWANA: Okavango Swamps, Gobega lagoon, H. Biegel & G.E. Gibbs Russell 3891 (K, LISC, MO, SRGH).

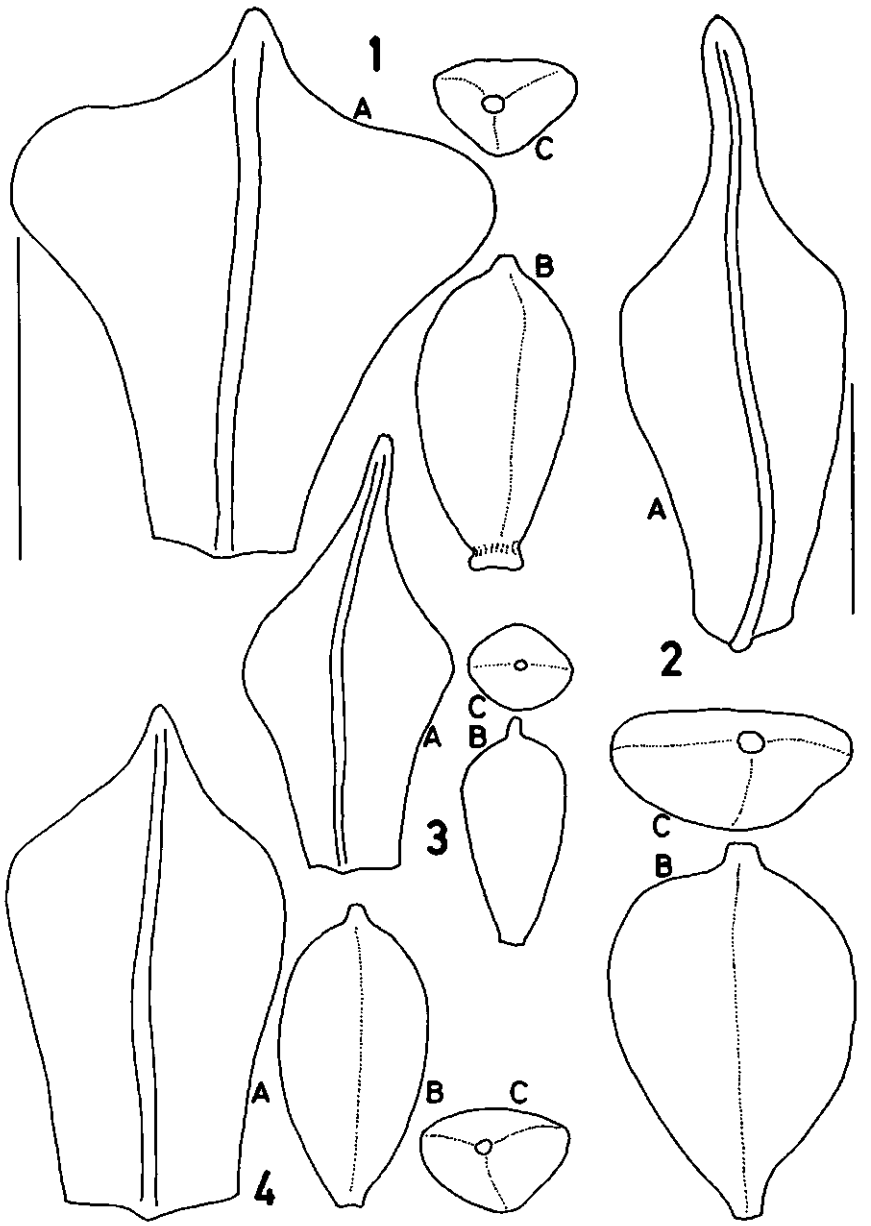

Fig. 1. *Lipocarpha abietina* Goetghebeur (Michel 2487, BR holotype). – Fig. 2. *L. albiceps* Ridley (Schmitz 7031, GENT). – Fig. 3. *L. aristulata* (Coville) Tucker (Suksdorf 2524, G). – Fig. 4. *L. atra* Ridley (Grandvaux Barbosa & Moreno 12474, COI).
A: spikelet bract; B: fruit, frontal view; C: fruit, top view. Bars: 1mm (2A + small bar).

Notes:

1. Two specimens, collected in the Central African Republic, Le Testu 2881 (BM, BR, P) and Tisserant 1188 (BM, P), are bearing a handwritten label by Chermezon: '*Lipocarpha prieuriana* Steud. var. *acuta* H.Cherm.'. As far as we are aware, this name has not been published.

2. Only one mixed collection (*L. abietina* + *L. atra*) is known to us, Faulkner 16 (LISC) (fig.42):
* 16A = *L. atra*, 2 complete plants and a few isolated inflorescences,
* 16B = *L. abietina*, 5 isolated inflorescences.
Both species are clearly and at a glance distinguished by their inflorescence: *L. abietina* with thick broad spikes composed of closely packed broadly shouldered spikelet bracts, resembling an *Abies*-cone (whence the specific epithet), versus the more slender, conical spikes with narrower spikelet bracts with slightly recurved apical parts of *L. atra*.

3. The scar left by the deciduous spikelet bract on the spike axis has the form of a conspicuously winged V, whilst in *L. atra* this V has only very small wings.

2. **Lipocarpha albiceps** Ridley, Trans. Linn. Soc., ser. 2, 2: 163 (1884). – Fig. 2, 38, 41D-H.

Rendle A.B., 1899, Cat. Afr. Pl. Welw. 2: 129. – Clarke C.B., 1902, F.T.A. 8: 471. – Brain C.K., 1934, Proc. Rhod. Sci. Ass. 33: 60. – Peter A., 1937, Fl. D.O.Afr.: 383. – Koyama T., 1960, Bot. Mag. Tokyo 73: 438. – Napper D., 1965, J. E. Afr. Hist. Soc. 25: 22. – Hooper S.S., 1972, F.W.T.A., ed.2, 3: 328. – Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 295, fig. 612.

Syntypes: Welwitsch 6785, Angola, Praesidium, 1855 (BM); 6786, Angola, Sansamande, 1857 (BM); 6786 [sic], Angola, Catete, 1857 (BM, COI).

Lipocarpha purpureolutea Ridley, Trans. Linn. Soc., Bot., 2: 163 (1884).
Rendle A.B., 1899, Cat. Afr. Pl. Welw. 2: 129. – Clarke C.B., 1902, F.T.A. 8: 471. – Kükenthal G., 1934, Bot. Notiser 1934: 79. – de Meneses A., 1956, Garcia de Orta 4: 258.
Type: Welwitsch 6784, Angola, Humpata, 1860 (BM).

Hypaelyptum albiceps (Ridley) K. Schumann, in Engler, Pflanzenw. Ost-Afr. C: 127 (1895).
Type: cf. *Lipocarpha albiceps*.

Cyperus echinolepis Koyama, Bot. Mag. Tokyo 73: 438 (1960), non *Cyperus albiceps* Ridley (1884).

Type: cf. *Lipocarpha albiceps* Ridley.

Shortly rhizomatous or tufted perennial; rhizome up to 3 mm diam., covered by red brown cataphylls; stem 10-60 cm × 1-2(3) mm; leaves up to 20 cm × 1.5 mm, ± inrolled. Inflorescence terminal, with 1-6 confluent spikes, terminal spike 3-10(15) × 3-7 mm, lateral spikes 2-6 × 1.5-4 mm, ovoidal to conical; involucral bracts (1)2-3(4), the largest up to 9(13) cm long. Spikelet bract 1.8-3.9 × 0.5-1.1 mm, obtrullate, apical part 0.6-1.4 mm long, apiculate, body and top creamy, or body (partly) purplish. Spikelet prophyll and glume 1.35-2.2 mm long. Stamens (2)3, anthers 0.9-1.4 mm long. Style 0.5-1.4 mm long, with 3 branches. Fruit 0.8-1.2 × 0.3-0.75 mm, in frontal view obovate with small style base remnant, rounded trigonous on cross section.

Distribution:
-Africa: soudano-zambesian, from Senegal to Chad, and from Uganda to Zimbabwe.

Selected specimens:

SENEGAL: Niokolo-Koba, J.G. Adam 14260 (P).
GHANA: Tumu Rest House, Morton GC 7528 (K, NY).
IVORY COAST: Parc National Bouna, Teheni, W. de Wilde c.s. 707 (BR, K, WAG, Z); Gawi, C. Geerling & J. Bokdam 67 (BR, MO, P, WAG).
MALI: Klela, R. Demange 2860 (BR, P).
BURKINA FASO: Sindou, C. Geerling & J. Bokdam 1101 (BR, C, MO, WAG).
NIGERIA: 15 km N of Bussa, Shagunu, C.D.K. Cook 416 (K, Z).
CHAD: Koulfé, A. Chevalier 8987 (B, BR, G, GENT, K, L, P, Z).
CAMEROUN: Garoua, Ledermann 4846 (B).
ZAIRE: Shaba, Kipopo, A. Schmitz 7031 (BR, GENT, P).
BURUNDI: Rumonge, J. Lewalle 5603 (BR, GENT, WAG).
UGANDA: Torozo, R.W. Haines 4166 (K, P).
KENYA: Kitale to Endebese, km 8, D.M. Napper 2139 (K).
TANZANIA: Lupa Forest Reserve, 150 km N of Mbeya, S.B. Boaler 769 (K).
ANGOLA: Huila, Cuanhama, H. Hess 52-146 (GENT, ZT).
ZAMBIA: Kalenda Plain, N of Matonchi Farm, E. Milne-Redhead 3552 (BM, BR, K, S); Mwinilunga district, E.A. Robinson 5988 (K, M, NY, SRGH); Lusaka district, Chatwenga Headwaters, E.A. Robinson 6180 (K, M, NY, SRGH).
MALAWI: Mzimba district, 10 km NW of Mzuzu, J. Pawek 10888 (K, MO, SRGH, WAG); Nyika Plateau, Lake Kaulime, E.A. Robinson 4482 (BRVU, K, M, P, SRGH).
ZIMBABWE: Inyanga district, Nyamaropa, H.M. Biegel 1747 (K, MO, SRGH).

Notes:

1. The notable differences in colour between typical *L. albiceps* (creamy) and *L. purpureolutea* (purplish-violet) are not matched by any other morphological feature. The dark specimens are centered in Angola and S.Zaire, but many transitional forms are blurring the picture ...

2. Ridley (1884: 163) described *L. albiceps* as with 1 stamen and 3 style branches and *L. purpureolutea* with 3 stamens and 2 style branches. An inspection of his type sheets revealed (2)3 stamens and 3 style branches for both plants !

3. **Lipocarpha aristulata** (Coville) G. Tucker, J. Arnold Arbor. 68(4): 410 (1987). – Fig. 3.

Type: cf. *Hemicarpha micrantha* (Vahl) Pax var. *aristulata* Coville

Hemicarpha micrantha (Vahl) Pax var. *aristulata* Coville, Bull. Torrey Bot. Club 21: 36 (1894).
Friedland S., 1941, Amer. J. Bot. 28: 860. – Jepson W.L., 1970, Man. Fl. Pl. California: 157.
Type: G.C. Neally s.n., USA, Texas, 1888 (holotype US).

Hemicarpha aristulata (Coville) B.B. Smyth, Trans. Kansas Acad. Sci. 16: 163 (1899).
Type: cf. *Hemicarpha micrantha* (Vahl) Pax var. *aristulata* Coville.

Hemicarpha intermedia Piper, in Piper & Beattie, Fl. Palouse Reg.: 36 (1901).
Type: Coll.?, USA, Washington State (n.v.).

Hemicarpha aristulata (Coville) A. Nelson, Bull. Torrey Bot. Club 29: 400 (1902), comb. superfl.
Type: cf. *Hemicarpha micrantha* (Vahl) Pax var. *aristulata* Coville.

Tufted annual; roots thin; stem 2-15 cm × 0.3-0.5 mm; leaves up to 6 cm × 0.5 mm. Inflorescence pseudolateral, with 1-2 spikes, 1-5 × 1-2.5 mm, ovoidal to spherical; involucral bracts 1-2, the largest up to 3.5 cm, erect. Spikelet bract 0.9-1.6 × 0.35-0.6 mm, obtrullate to rhombical, apical part 0.45-1 mm long, long acuminate, recurved, minutely scaberulous at the top, pale to red brown, with greenish midnerve. Spikelet prophyll 0.55-0.8 mm long, nerveless (rarely with a few reddish nerves); spikelet glume absent. Stamen 1, anthers 0.2-0.25 mm long. Style 0.25 mm or shorter, with 2 branches. Fruit 0.5-0.75 × 0.25-0.35 mm, frontally obovate with small style base remnant, rounded on cross section.

Distribution:
-America: western USA, from Washington-Oregon-California E to Illinois-Missouri-Texas.

Selected specimens:

USA: Washington, Bingen, Klickitat County, W.N. Suksdorf 2524 (BRI, G, L, MO, US); California, Tehama County, L.F. Ward 129 (US); Colorado, Denver, M.E. Jones 602 (BR, G, LG, MO, P);

Nebraska, S of Grand Island, along US 34, R. Kral 28900 (C, MO); Kansas, Woodson County, 1 km W of Yates Center, E.W. Lathrop 1380 (US); Oklahoma, Nichita National Forest, C.T. Eskew 1302 (US); Texas, Comanche Springs, Lindheimer 1245 (BM, BR, C, G, K, LE, M, MO, P, UPS); Missouri, Stone County, Galena, E.J. Palmer 26140 (G, K, MO, Z).

Notes:

1. On a printed label, accompanying the collection M.E.Jones 602 (BR, G, LG, MO, P), following name is mentioned: '*Hemicarpha subsquarrosa*, Nees, var. *squarrosa*, Eng. NEW.'. Publication place and date are unknown to us; the plants on this sheet represent *L. aristulata*.

2. Spikelet prophylls with a few red nerves are rarely found, as e.g. in Lindheimer 1245 (BM, BR, C, G, K, LE, M, MO, P, UPS), and in Palmer 26140 (G, K, MO, Z).

4. **Lipocarpha atra** Ridley, Trans. Linn. Soc., ser. 2, 2: 162 (1884). – Fig. 4, 42A.

Rendle A.B., 1899, Cat. Afr. Pl. Welw. 2: 129. – Clarke C.B., 1902, F.T.A. 8: 472, p.p. – Brain C.K., 1934, Proc. Rhod. Sci. Ass. 33: 60.

Syntypes: Welwitsch 6961, Angola, Huilla, 1869 (BM); s.n., Angola, Lake Ivantala, 1860 (BM).

Lipocarpha atra Ridley var. *atra*.
Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 297, fig. 615-616.
Type: cf. *Lipocarpha atra* Ridley.

Shortly rhizomatous or tufted perennial; rhizome short, rarely elongate, roots thick, up to 1 mm diam.; stem 20-65 cm × 1-1.5 mm; leaves up to 20 cm × 1.5 mm, often inrolled. Inflorescence terminal, with (3)4-10 spikes, 3-13 × 2-4 mm, ovoidal to conical; involucral bracts 1-2, the largest up to 4.5 cm long. Spikelet bract 1.2-1.75 × 0.65-1.0 mm, obovate to obtrullate, apical part 0.5-0.7 mm long, acuminate, smooth to slightly scaberulous at the top, dark red brown, top often pale. Spikelet prophyll and glume 1-1.2 mm long. Stamens 1-2, anthers 0.25-0.35 mm long. Style 0.05 mm long or shorter, with 3 branches. Fruit 0.7-1 × 0.2-0.45 mm, in front view obovate with small style base remnant, rounded trigonous on cross section.

Distribution:
-Africa: southern soudano-zambesian, from Zaire and Tanzania to Zimbabwe.

Selected specimens:

ZAIRE: Kapanga, Overlaet 182 (BR).

TANZANIA: Selous Game Reserve, Msolwa Camp, K. Vollesen MRC 4454 (C, K, WAG).
ANGOLA: Cachingues to Silva Porto, Grandvaux Barbosa & F. Moreno 12474 (COI, LISC).
ZAMBIA: Mwinilunga d., bank of Luao river, E. Milne-Redhead 3841 (BM, BR, K, L, MO, NY, P); Lusaka district, Munali School, E.A. Robinson 1463 (BR, K, NY, SRGH).
ZIMBABWE: Matobos, farm Besna Kobila , O.B. Miller 4335 (K, NY, SRGH).
MOZAMBIQUE: Ribau, A. Tinoco 33 (LISC).

5. **Lipocarpha barteri** C.B. Clarke, F.T.A. 8: 472 (1902). – Fig. 5.

Type: Barter 1585, Nigeria, 1857-1859 (holotype K, isotype LE, P, S).

Lipocarpha barteri C.B. Clarke, in Durand & Schinz, Consp. Fl. Afr. 5: 650 (1894), nom. nud.
Type: cf. *L. barteri* C.B.Clarke.

Kyllinga baoulensis A. Chevalier, Expl. Bot. Afr. Occ. Fr. 1: 698 (1920), nom. nud.
Type: Chevalier 22340, Ivory Coast, 1909 (holotype P).

Cyperus neobarteri Koyama, Bot. Mag. Tokyo 73: 438 (1960), non *Cyperus barteri* Böckeler (1867).
Type: cf. *Lipocarpha barteri* C.B. Clarke.

Lipocarpha atra Ridley var. *barteri* (C.B. Clarke) J. Raynal, Adansonia, ser. 2, 7: 85 (1967).
Hooper S.S., 1972, F.W.T.A., ed.2, 3: 328. – Haines R. & Lye K., 1983, Sedg. & Rush. E. Afr.: 298.
Type: cf. *Lipocarpha barteri* C.B. Clarke.

Tufted perennial; roots up to 1 mm diam.; stem 20-75 cm × 1-1.5 mm; leaves up to 30 cm × 2 mm, often inrolled. Inflorescence terminal, with 3-6 spikes, 4-10 × 3-5 mm, ovoidal to conical; involucral bracts 1-2, the largest up to 5 cm long. Spikelet bract 1.8-2.5 × 0.7-0.9 mm, obtrullate, apical part 0.6-0.9 mm long, acuminate, recurved, minutely scaberulous at the top, pale to dark brown with a greenish midnerve. Spikelet prophyll and glume 1.3-1.7 mm long. Stamens 2, anthers 0.65 mm long. Style 0.1 mm long or shorter, with 3 branches. Fruit 1.0-1.25 × 0.35-0.45 mm, frontally obovate with small style base remnant, (rounded) trigonous on cross section.

Distribution:
-Africa: western soudano-zambesian, from the Ivory Coast to Cameroon.

Selected specimens:

IVORY COAST: 1 km W of Bouna, C. Geerling & J. Bokdam 2592 (BR, MO, WAG).

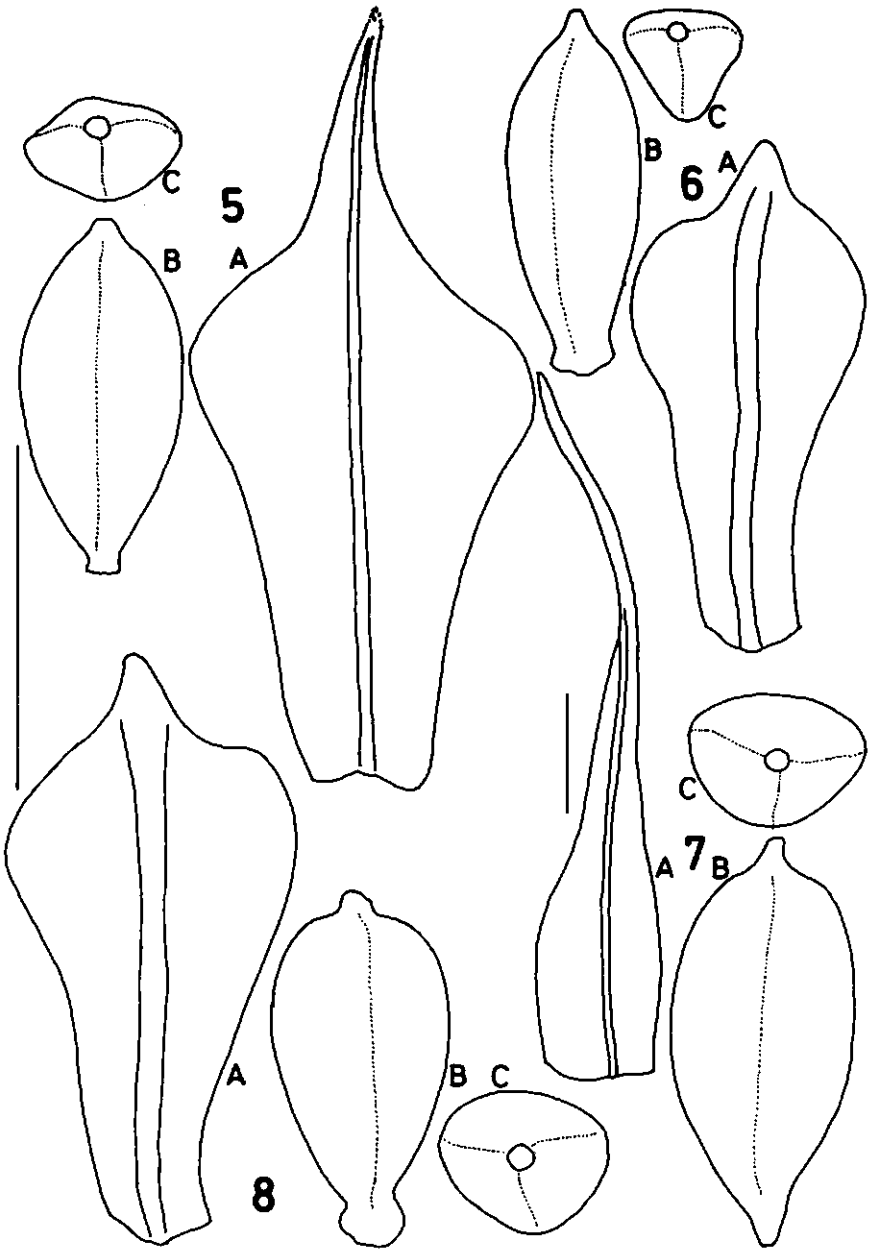

Fig. 5. *Lipocarpha barteri* C.B. Clarke (Lorougnon 3089, BR). – Fig. 6. *L. chinensis* (Osbeck) Kern (Vanden Berghen 3692, GENT). – Fig. 7. *L. comosa* J. Raynal (Symoens 3161, GENT). – Fig. 8. *L. constricta* Goetghebeur (Reekmans 8801, BR holotype).
A: spikelet bract; B: fruit, frontal view; C: fruit, top view. Bars: 1mm (7A + small bar).

GHANA: Afrem Plains, Tiasi, Hall CC 163 (K, L).
TOGO: Tchoré Lama Hara, P.G. Mahoux 2052 (P).
NIGERIA: Lokoja, 15 km E of Okori road, R.W. Haines 21 (K, L).

6. **Lipocarpha chinensis** (Osbeck) Kern, Blumea, Suppl. 4: 167 (1958). – Fig. A, 6, 39A-D.

Kern J.H., 1961, Reinwardtia 6: 32. – Napper D.M., 1965, J. E. Afr. Nat. Hist. Soc. 25: 22, fig. 51. – Haines R. & Lye K., 1971, Bot. Notiser 124: 473, fig. 1. – Hooper S.S., 1972, F.W.T.A., ed. 2, 3: 328. – Kern J.H., 1974, Fl. Males., ser. 1, 7: 521, fig. 33. – Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 296, fig. 613.

Type: cf. *Scirpus chinensis* Osbeck.

Scirpus chinensis Osbeck, Dagb. Ostind. Resa: 220 (1757).
Type: Osbeck s.n., China, s.d. (holotype S).

Scirpus senegalensis Lamarck, Tabl. Encycl. Méth., Bot., 1: 140 (1791).
Type: Roussillon s.n., Senegal, 1789 (holotype P-LA n.v., isotype G, P).

Hypolytrum senegalense (Lamarck) L. C. Richard, in Persoon, Syn. 1: 70 (1805), non Clarke (1902).
Type: cf. *Scirpus senegalensis* Lamarck.

Hypaelyptum argenteum Vahl, Enum. 2: 283 (1805), nom. superfl. pro *Scirpus senegalensis* Lamarck.
Steudel E.G., 1821, Nomencl. Bot., ed. 1, 1: 419.
Syntypes: König s.n., India, s.d. (C); Dupuis s.n., Senegal, s.d. (C, G).

Hypolytrum argenteum (Vahl) Kunth in H.B.K., Nov. Gen. Spec. Pl. 2: 218 (1816), quoad comb.
Type: cf. *Hypaelyptum argenteum* Vahl.

Lipocarpha argentea (Vahl) R. Brown, in Tuckey J.H., Narr. Exp. Congo, App.: 477 (1818), nom. superfl.
Nees C.G., 1834, Linnaea 9: 287. – Kunth C.S., 1837, Enum. Pl. 2: 266, excl. pl. austroamer. – Steudel E.G., 1855, Syn. Pl. Glum. 2: 129. – Böckeler O., 1871, Linnaea 37: 114, excl. specim. austroamer. – Bentham G., 1878, Fl. Austr. 7: 336. – Böckeler O., 1879, Flora 62: 567. – Ridley H.N., 1884, Trans. Linn. Soc., ser.2, 2: 163. – Clarke C.B., 1893, Fl. Brit. India 6: 667. – Holm T., 1899, Amer. J. Sci., ser. 4, 7: 173. – Rendle A.B., 1899, Cat. Afr. Pl. Welw. 2: 129. – Clarke C.B., 1902, F.T.A. 8: 469. – Schönland S., 1922, Bot. Surv. S. Afr. Mem. 3: 53, pl. 56. – Brain C.K., 1934, Proc. Rhod. Sci. Ass. 33: 60. – Chermezon H., 1937, Fl. Madagascar 29: 166. – Peter A., 1937, Fl. D.O.Afr.: 383.
Type: cf. *Hypaelyptum argenteum* Vahl.

Tunga laevigata Roxburgh, Fl. Ind. 1: 188 (1820).
Type: Roxburgh s.n., India, s.d. (holotype K? n.v.).

Hypolytrum laevigatum (Roxburgh) Sprengel, Syst. Veg., ed. 16: 233 (1825).
Type: cf. *Tunga laevigata* Roxburgh.

Lipocarpha laevigata (Roxburgh) Nees, Linnaea 9: 287 (1834).
Steudel E.G., 1855, Syn. Pl. Glum. 2: 129.
Type: cf. *Tunga laevigata* Roxburgh.

Schoenus laevigatus Roxburgh ex Nees, in Wight, Contrib. Bot. India: 92 (1834), nom. nud. in syn.
Type: not indicated.

Hypaelyptum albidum Willd. ex Kunth, Enum. 2: 266 (1837), nom. nud. in syn.
Type: Willdenow 1446, from ?, s.d. (holotype B-W n.v.).

Kyllingia albescens Steudel, Syn. Pl. Glum. 2: 68 (1854).
Type: Cuming 1418, Philippines, ante 1841 (holotype P, isotype G, K, L, LE, MO, UPS).

Hypaelyptum senegalense (Lamarck) K. Schumann, in Engler, Pflanzenw. Ost-Afr. C: 127 (1895).
Type: cf. *Scirpus senegalensis* Lamarck.

Lipocarpha senegalensis (Lamarck) Th. & H. Durand, Syll. Fl. Congol.: 619 (1909).
Ohwi J., 1944, Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, 18: 166. – Nelmes E. & Baldwin J., 1952, Amer. J. Bot. 39: 375. – Andrews F.W., 1956, Fl. Pl. Sudan 3: 363. – de Meneses A., 1956, Garcia de Orta 4: 258.
Type: cf. *Scirpus senegalensis* Lamarck.

Lipocarpha debilis Ridley, Trans. Linn. Soc., Bot., 9: 243 (1916).
Type: Kloss s.n., New Guinea, ante 1913 (holotype BM).

Lipocarpha senegalensis (Lamarck) Dandy, J. Bot. 70: 331-332 (1932), comb. superfl.
Blake S.T., 1947, J. Arnold Arb. 28: 229.
Type: cf. *Scirpus senegalensis* Lamarck.

Cyperus lipocarpha Koyama, Bot. Mag. Tokyo 73: 438 (1960), non *Cyperus sinensis* Debeaux (1877).
Type: cf. *Scirpus chinensis* Osbeck.

Cyperus submaculatus Koyama, Bot. Mag. Tokyo 73: 438 (1960), non *Cyperus argenteus* Ridley (1884).

Type: cf. *Hypaelyptum argenteum* Vahl.

Lipocarpha chinensis (Osbeck) Tang & Wang, Fl. Reipubl. Popul. Sin. 11: 194 (1961), comb. superfl.

Type: cf. *Scirpus chinensis* Osbeck.

Lipocarpha triceps auct., non (Roxburgh) Nees: Camus E.G., 1912, Fl. Gén. Indochine 7: 144.

Tufted perennial; stem 15-80 cm × 0.5-2 mm; leaves up to 40 cm × 4 mm, ± flat. Inflorescence terminal, with (1)2-10 subequal spikes, 3-13 × 1.5-5 mm, ovoidal to conical; involucral bracts 2-3(5), the largest up to 13 cm long. Spikelet bract 1.5-2.35 × 0.45-0.75(1) mm, obtrullate, apical part 0.3-0.75 mm long, white to pale yellowish brown, often with red dots and a green midnerve. Spikelet prophyll and glume 1.25-2 mm long, often with reddish stripes. Stamens 1(2), anthers 0.8-1 mm long. Style 0.2-0.8 mm long, with 3 branches. Fruit 0.8-1.15 × 0.25-0.4 mm, in frontal view oblong to narrowly obovate with a small style base remnant, (rounded) trigonous on cross section.

Distribution:
widespread in the Palaeotropis, and reaching into more temperate regions (South Africa, Japan).

Selected specimens:

SENEGAL: Badi, Berhaut 817 (BR, P, Z).
GUINÉ BISSAU: Antula, Espírito Santo 1607 (LISC, WAG).
GUINÉE: Fouta Djalon, Daralabe, I. Langdale-Brown 2572 (BR, G, K).
SIERRA LEONE: 3 km W of Waterloo, F.A. Melville & T. Hooker 293 (K, MO, P).
LIBERIA: Kolahun district, Kailahun, J.T. Baldwin 10127 (K, MO, NY, US).
IVORY COAST: Forêt du Téké, A.J.M. Leeuwenberg 1857 (BR, K, L, WAG).
CENTRAL AFRICAN REPUBLIC: Ndellé, A. Chevalier 6969 (BR, G, P).
MALI: SW of Kita, Koumakizé, G. Roberty 10294 (G, Z).
BURKINA FASO: 10 km E of Bobodiolassou, C. Geerling & J. Bokdam 1338 (BR, MO, WAG).
CAMEROUN: 8 km W of Yaoundé, N'Kolbisson, W. de Wilde c.s. 1415 (BR, K, MO, P, WAG); 20 km SE of Douala, A.J.M. Leeuwenberg 6469 (BR, K, MO, P, WAG).
SUDAN: Bahr El Ghazal, N.D. Simpson 7411 (G, K).
ETHIOPIA: Kaffa, 10 km W of Jimma, W. de Wilde c.s. 6890 (BR, MO, P, WAG); Kaffa, Kochi, 5 km E of Jimma, I. Friis c.s. 4 (BR, C, K, WAG).
GABON: marais du Haut Ntem, G. Le Testu 9223 (B, P).
CONGO: Sangha, B. Descoings 9327 (P, WAG).
ZAIRE: Kasai, Bakwanga, L. Liben 2714 (BR, G, NY, P, WAG) & 3628 (BR, K, WAG, Z); Shaba, near Kipopo, A. Schmitz 7057 (BR, P, SRGH, WAG).
RWANDA: Parc National Akagera, Kalenga, P. Van der Veken 9079 (BR, GENT, LG).
BURUNDI: near Kigwena, Lake Tanganyika, J. Lambinon 75-123 (BR, GENT, LG, M, MO, WAG); Ruyigi, Kihofi, M. Reekmans 3697 (BR, LG, MO, SRGH, WAG).
UGANDA: Masaka district, Lake Kayanja, K. A. Lye 2666 (K, UPS, WAG).

KENYA: Mt. Kenya, near Nithi river, R.E. Fries & T.C.E. Fries 1950 (K, S, UPS).
TANZANIA: Ufiomi, Bonga to Berén, A. Peter 44180 (MO, SRGH, WAG).
ANGOLA: Silva Porto to Nova Sintra, P. Bamps c.s. 4146 (BR, GENT, LISC, WAG).
ZAMBIA: E of Lake Mweru, Y. Chongo 18 (BR, K, SRGH, WAG).
MALAWI: Mzuzu, Marymount dambo, J. Pawek 7208 (K, MO, SRGH, WAG).
ZIMBABWE: Chipinga Experimental Farm, N.C. Chase 7616 (K, SRGH).
MOZAMBIQUE: Bandula, N.C. Chase 4544 (K, LISC, MO, SRGH, UPS).
BOTSWANA: Santantadibe river, P.A. Smith 2183 (K, SRGH).
SOUTH AFRICA: Transvaal, Lothiel, E. Werdermann & H.D. Oberdieck 2223 (BR, K, US, WAG).

MAURITIUS: Grand Bassin crater lake, D. Lorence M59 (C, M, MO, WAG).
MADAGASCAR: Norontsanga, J.M. Hildebrandt 3022 (G, K, L, LE, M, P).

CHINA: Kwantung, Na Leung, W.T. Tsang 26606 (C, K, P).
HONG KONG: Saiwan, Y.W. Taam 2260 (G, LG, NY).
JAPAN: Okinawa, NW of Ishikawa, T. Koyama 7345 (NY).
INDIA: East Bengal, Griffith 6297 (C, G, K, L, LE, M, NY, P, S).
NEPAL: Sundarijal, Dobremez CYP 002 (G, NY); Almora, Kumaon, R. Strachey & J.E. Winterbottom 1247 (BR, LE, P).
SRI LANKA: Sabaragamuwa, Ratnapura district, 17 km E of Deniyaya, G. Davidse 7874 (BRI, L, MO, NY); Badulla district, 5 km W of Koslanda, T. Koyama c.s. 14034 (C, K, NY).
THAILAND: Doi Sutep, C.C. Hosseus 481 (C, G, L, M, P); Chayaphum district, Tunkamang, C.F. van Beusekom c.s. 4240 (C, MO, L, P).
VIETNAM: Annam, Mt. Bani, J. & M.S. Clemens 3813 (G, NY, P, U).
PHILIPPINES: Luzon, Baguio, A.D.E. Elmer 6484 (G, NY, P, US); Luzon, Benguet, E.D. Merrill BS 570 (G, M, U, Z).
SUMATRA: Tapianoeli, Rahmat si Boeea 10342 (G, L, NY, S).
BORNEO: Mt. Kinabalu, Tenompak, J. & M.S. Clemens 28074 (G, L, M, NY).
SULAWESI: Lombasang, Bünnemeijer 11050 (L, U).
NEW GUINEA: Kubor Range, Agie, W. Vink 16449 (C, L, P).

AUSTRALIA: Queensland, Glasshouse Mts., C.E. Hubbard 3351 (BR, BRI, K, L, P).

Notes:

1. The stem base may be elongated under certain ecological conditions, and comes to resemble an oblique, even branched rhizome. This phenomenon was observed in a.o. Baldwin 5989 (K), Drummond & Hemsley 4666 (P), and Jaeger 1034 (P).

2. The involucral bracts are sometimes deciduous, the smaller one(s) are shed first, the largest (= lowermost) one last of all, conspicuously so on several inflorescences of Kornas Pl. Afr. 2796 (GENT).

3. Koyama (1978: 294) erroneously mentioned a 2-branched style.

7. **Lipocarpha comosa** J. Raynal, Bull. Mus. Nat. Hist. Nat., 2e sér., 41: 974, fig. 1 (1969). – Fig. 7.

Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 295, fig. 611.

Type: E.A. Robinson 6380, Zambia, 1965 (holotype P, isotype K, NY).

Rhizomatous perennial; rhizome slender, 1-3 mm diam., covered by small red brown cataphylls; stem 15-55 cm × 1-1.5 mm; leaves up to 20 cm × 1.5 mm, inrolled to subterete. Inflorescence terminal, capitate, with several confluent spikes, 15-20 mm diam.; involucral bracts 2-3, the largest 4-8 cm long. Spikelet bract 5-12 × 0.4-1 mm, body obovate, yellowish to violet, apical part 4-10 mm long, long acuminate, creamy. Spikelet prophyll and glume 1.0-1.7 mm long. Stamens 3, anthers 1 mm long. Style 0.2 mm long, with 3 branches. Fruit 1-1.2 × 0.5-0.6 mm, in frontal view obovate with small style base remnant, (slightly rounded) trigonous on cross section.
Distribution:
-Africa: Zaire, Tanzania, Malawi, Zambia.

Selected specimens:

ZAIRE: Shaba, Kasumbalesa, J.J. Symoens 3161 (BRVU, GENT).
TANZANIA: Chunya Escarpment, H.M. Richards 7946 (K, SRGH).
ZAMBIA: 20 km SE of Tunduma, E.A. Robinson 2977 (K, NY, PRE); Bwana Mkubwa, T. Kassner 2273A (BM, BR, K, P, Z); Mkushi district, Fiwila, E.A. Robinson 2626 (K, NY, P, SRGH).
MALAWI: Chongoni Forest, P.G. Adlard 402 (K, SRGH).

8. **Lipocarpha constricta** Goetghebeur, sp. nov. – Fig. 8.

Type: M. Reekmans 8801, Burundi, 1980 (holotype BR, isotype BRVU, GENT, LG, WAG).

Proxime *L. atrae* Ridley, ab ea recedit praecipue spiculae bractea apice (0.1) 0.3-0.5 mm longo, late triangulari, tenui, haud spinuloso, bractea lateribus semper aterrimis atque fructu basi conspicue constricto.

Rhizomatous or loosely tufted perennial, tufts with extravaginal shoots, rhizome when present slender and elongate; roots thick, up to 1 mm diam.; stem 10-60 cm × 0.75-1 mm; leaves up to 12 cm × 1.5 mm, often inrolled. Inflorescence terminal, with (2)3-4(5) spikes; terminal spike 3-8 × 2-5 mm, lateral spikes 3-7 × 1-4 mm, ovoidal; involucral bracts 2, the largest up to 8 cm long. Spikelet bract 1.6-2.1 × 0.7-1 mm, obtrullate, apical part (0.1)0.3-0.5 mm long, rounded to subacute, yellowish brown to dark red brown. Spikelet prophyll and glume 1.5-1.9 mm long, tip often protruding in the lower spikelets. Stamens 1-2, anthers 0.75-0.9 mm long. Style 0.5-0.8 mm long, with 3 branches. Fruit 1-1.2 × 0.45-0.55 mm, in front view obovate with a conspicuous basal constriction, rounded trigonous on cross section.

Distribution:
-Africa: Burundi, Ethiopia.

Studied specimens:

ETHIOPIA: Ordobba, Mooney 7213 (K) & 8392 (K).
BURUNDI: Nyakararo, J. Lewalle 2667 (BR) & 5152 (BR, GENT); Nyamiyaga, L. Niyongéré 105 (BR); Kisozi, M. Reekmans 8801 (holotype BR, isotypes BRVU, GENT, K, LG, WAG).

9. **Lipocarpha crassicuspis** (J. Raynal) Goetghebeur, stat. nov. – Fig. 9.

Basionym: *L. prieuriana* Steudel var. *crassicuspis* J. Raynal, Adansonia, ser. 2, 7: 86, fig. 2 (1967).

Raynal J. & A., 1967, Adansonia, ser. 2, 7: 320. – Hooper S.S., 1972, F.W.T.A., ed. 2, 3: 328.

Type: J. & A. Raynal 6711, Senegal, 1960 (holotype P).

Tufted annual; roots thin; stem 5-15 cm × 0.4-0.5 mm; leaves up to 8 cm × 2 mm. Inflorescence terminal, with 1-2(3) spikes, 3-8 × 2.5-4 mm, ovoidal; involucral bracts 1-2, the largest up to 3 cm long, often suberect. Spikelet bract 1.8-2.2 × 1-1.3 mm, obovate to obtrullate, apical part 0.7-1.1 mm long, conspicuously thickened, smooth, rounded, yellowish brown with red spots. Spikelet prophyll and glume 1.3-1.5 mm long. Stamen 1, anthers 0.3-0.5 mm long. Style 0.2 mm long or shorter, with 2 branches. Fruit 1-1.3 × 0.5-0.75 mm, frontally obovate with small style base remnant, flattened trigonous on cross section.

Distribution:
-Africa: Senegal.

Studied specimens:

SENEGAL: Kaolack, J.G. Adam 8241 (K, P); Fatick-Foundiougne, km 5, J. & A. Raynal 6711 (P).

10. **Lipocarpha drummondii** (Nees) G. Tucker, J. Arnold Arbor. 68(4): 410 (1987). – Fig. 10.

Type: cf. *Hemicarpha drummondii* Nees.

Hemicarpha drummondii Nees, in Martius, Fl. Brasil. 2(1): 62, in obs. (1842).
Steudel E.G., 1855, Syn. Pl. Glum. 2: 130. – Svenson H.K., 1957, N. Amer. Fl. 18(9): 508.
Type: Drummond s.n., USA, Missouri, 1832 (holotype K).

Hemicarpha micrantha (Vahl) Pax var. *drummondii* (Nees) Friedland, Amer. J. Bot. 28: 860 (1941).

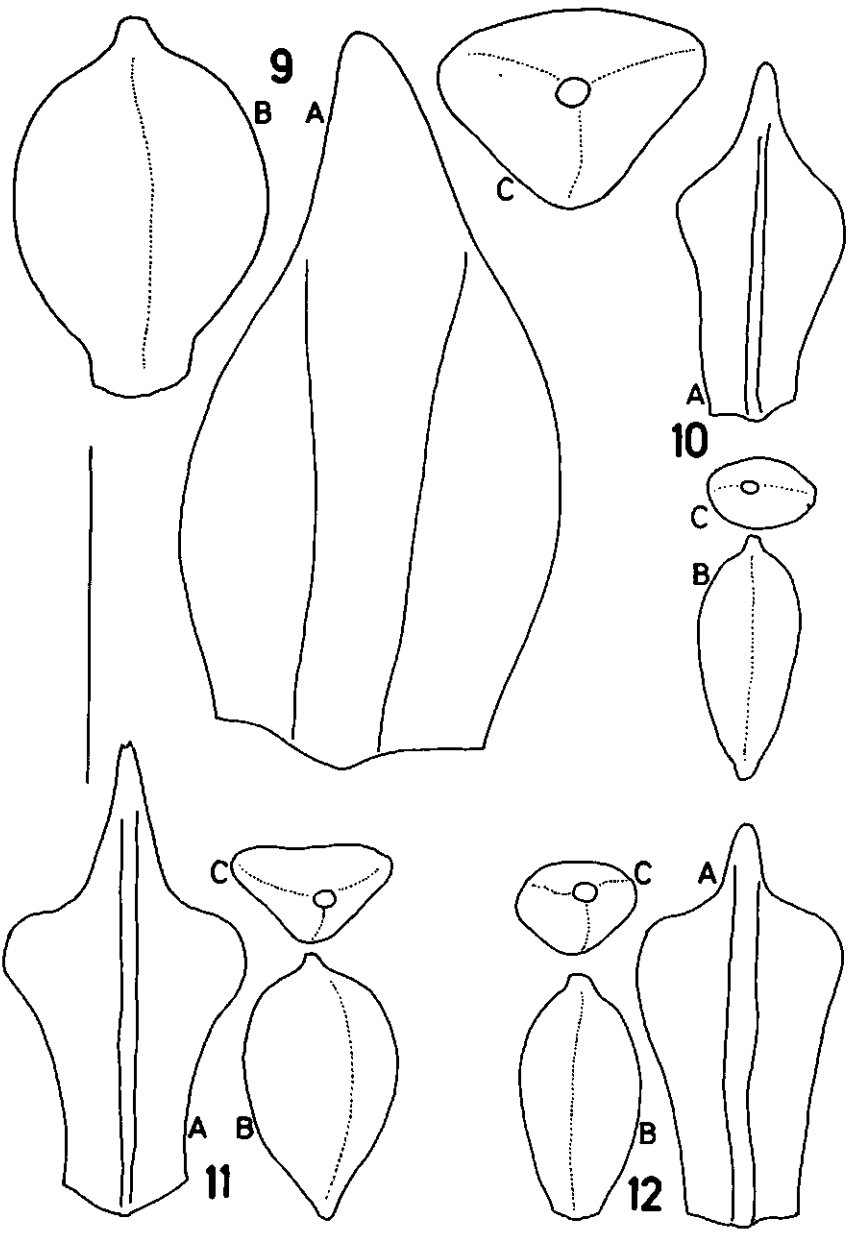

Fig. 9. *Lipocarpha crassicuspis* (J. Raynal) Goetghebeur (J.&A. Raynal 6711, P holotype). – Fig. 10. *L. drummondii* (Nees) Tucker (Umbach in Kneucker Cyp. Exsicc. 244, GENT). – Fig. 11. *L. echinus* J. Raynal (Robinson 1550, NY holotype). – Fig. 12. *L. filiformis* (Vahl) Kunth (Luja 225, GENT).
A: spikelet bract; B: fruit, frontal view; C: fruit, top view. Bar: 1mm.

Shreve F. & Wiggins I.L., 1964, Veget. Fl. Sonoran Desert 1: 303. – Correll D.S. & Johnston M.C., 1970, Man. Vasc. Pl. Texas: 284. – Scoggan H.J., 1978, Fl. Canad. 2: 442.

Type: cf. *Hemicarpha drummondii* Nees.

Scirpus micranthus Vahl var. *drummondii* (Nees) Mohlenbrock, Amer. Midl. Natur. 70(1): 22 (1963).

Type: cf. *Hemicarpha drummondii* Nees.

Tufted annual; roots thin; stem 2-12 cm × 0.2-0.5 mm; leaves up to 3 cm × 0.5 mm. Inflorescence pseudolateral, with 1-2(3) spikes, 1-6 × 1-2 mm, ovoidal to spherical; involucral bracts 1-2, the largest up to 2 cm long, erect. Spikelet bract (0.9)1-1.3 × 0.35-0.6 mm, obtrullate, apical part 0.15-0.6 mm long, long acuminate, smooth to minutely scaberulous at the top, pale to red brown with a greenish midnerve. Spikelet prophyll 0.55-0.75 mm long, 3-5 nerved, nerves mostly red to red brown; spikelet glume absent. Stamen 1, anthers 0.2-0.25 mm long. Style 0.2 mm or shorter, with 2 branches. Fruit 0.5-0.75 × 0.2-0.35 mm, frontally obovate with small style base remnant, rounded on cross section.

Distribution:
-America: USA, scattered in the central and southern states.

Selected specimens:

USA: Arizona, Camp Lowell, J.T. Rothrock 715 (US); Kansas, Pottawatomie County, G.L. Clothier 1062 (MO, P); Oklahoma, Sapulpa, B.F. Bush 1429 (BM, K); Texas, Dallas, J. Reverchon 3607 (G, MO, Z); Texas, Hempstead, E. Hall 694 (BM, G, K, M, MO); Missouri, Eagle Rock, B.F. Bush 3150 (MO); Arkansas, Argenta, F.V. Coville 90 (US); Wisconsin, Juneau County, Lyndon Station, T.G. Hartley 7836 (US); Indiana, Dune Park, L.M. Umbach in Kneucker, Cyp. Exsicc. 244 (B, BM, BRI, C, G, GENT, K, L, LG, M, MO, P, Z).

11. **Lipocarpha echinus** J. Raynal, Adansonia, ser. 2, 13: 159, pl. 6, 1-7 (1973). – Fig. 11.

Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 299.

Type: E.A.Robinson 1550, Zambia, 1956 (holotype NY, isotype K).

Tufted annual; roots thin; stem 5-20 cm × 0.4-0.6 mm; leaves up to 7 cm × 0.5 mm, inrolled. Inflorescence terminal, with 3-5 spikes, 3-7 × 2-3 mm, ovoidal to conical; involucral bracts 1-3, the largest up to 5 cm long. Spikelet bract 1.3-1.7 mm × 0.8 mm, obovate, apical part 0.25-0.45 mm long, long acuminate, scabrid at the top, dark violet with pale to greenish midnerve. Spikelet prophyll and glume 0.7-0.8 mm long, dark violet. Stamens 3, anthers not seen.

Style 0.1 mm or shorter, with 3 branches. Fruit 0.75-0.8 × 0.5-0.6 mm, frontally obovate with small style base remnant, subtriquetrous on cross section.

Distribution:
-Africa: Zambia, known only from the type collection.

Studied specimens:

ZAMBIA: Shiwa Ngandu, E.A. Robinson 1550 (K, NY).

Notes:

1. Raynal (1973: 161) observed a minor deviating feature, i.c. 'un niveau inconstant de l'abscission de la diaspore, ... la préfeuille demeure fréquemment attachée à l'axe de l'épi'. In our opinion, this is not really an abnormal character state, in fact we have observed this more or less regularly in several species, as *L. filiformis* (De Smet 77-42A, GENT), *L. nana*, *L. prieuriana* (Vanden Berghen 3104, BR), *L. aristulata* (Weber 11145, C), *L. drummondii*, *L. micrantha*, ... More exceptional and of great diagnostic value seems to us the conspicuous dark colour of this prophyll!

12. **Lipocarpha filiformis** (Vahl) Kunth, Enum. Pl. 2: 267 (1837). – Fig. 12, 41A-C.

Steudel E.G., 1855, Syn. Pl. Glum. 2: 130. – Böckeler O., 1871, Linnaea 37: 117-118. – Clarke C.B., 1902, F.T.A. 8: 470.

Type: cf. *Hypaelyptum filiforme* Vahl.

Hypaelyptum filiforme Vahl, Enum. 2: 284 (1805).
Steudel E.G., 1821, Nomencl. Bot., ed. 1,1: 419.
Type: Thonning s.n., 'Guinea', s.d. (holotype C n.v., isotype LE).

Lipocarpha sphacelata (Vahl) Kunth var. *barteri* C.B. Clarke, in Durand & Schinz, Consp. Fl. Afr. 5: 651 (1894), nom. nud.
Type: Barter 344, Nigeria, s.d. (holotype K).

Lipocarpha sphacelata auct., non (Vahl) Kunth: Ridley H.N., 1884, Trans. Linn. Soc., ser. 2, 2: 162 – Rendle A.B., 1899, Cat. Afr. Pl. Welw. 2(1): 129 – Raynal J., 1967, Adansonia, ser. 2, 7: 85 – Hooper S., 1972, F.W.T.A., ed. 2, 3: 328 – Hall J.B., 1973, Bot. J. Linn. Soc. 66: 345 – Vanden Berghen C., 1982, Mat. Fl. Sénégal 1: 32 – Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 298.

Tufted annual; roots thin; stem 5-50 cm × 0.5-1 mm; leaves up to 15 cm

× 3 mm. Inflorescence terminal, with (2)3-7(12) spikes, 3-10(12) × 1.5-3 mm, cylindrical-ovoidal to conical; involucral bracts 2(3), the largest up to 8 cm long. Spikelet bract 1.1-1.5 × 0.4-0.6 mm, obovate to obtrullate, apical part 0.2-0.4 mm long, shortly acuminate, smooth to minutely scaberulous at the top, (pale) red brown with pale midnerve. Spikelet prophyll and glume 0.8-1(1.3) mm long. Stamen 1, anthers 0.25-0.35 mm long. Style 0.1-0.25 mm long, with 3 branches. Fruit 0.6-0.8(1) × 0.25-0.4 mm, frontally obovate to subelliptical with small style base remnant, (rounded) trigonous on cross section, slightly constricted at the base.

Distribution:
-Africa: mainly western soudano-zambesian, from Senegal to Chad, and along the west coast to Angola.

Selected specimens:

SENEGAL: Casamance, Heudelot 561 (G, P).
GUINÉ BISSAU: Gabú, Piche, Espírito Santo 3462 (LISC).
GUINÉE: Nzerekore, J.G. Adam 6294 (P).
SIERRA LEONE: Freetown, M.J. Harvey 75 (BRVU, K).
LIBERIA: Robertsfield, J.G. Adam 29497 (MO).
IVORY COAST: 7 km NE of Bouaké, W. de Wilde c.s. 69 (BR, K, P, WAG, Z); Ouangofetini, C. Geerling & J. Bokdam 975 (BR, K, MO, WAG).
MALI: Bamako, J.F. Rogeon 3 (B, P).
BURKINA FASO: Comoê falls, J.G. Adam 15261 (P).
GHANA: Tumu Dam, J.K. Morton 8856 (K, SRGH).
TOGO: near Zolo-Kpuita, J.K. Morton GC 9359 (K, NY).
NIGERIA: Zaria, J.L. Blum 2458 (K, NY); Lagos, I. Dawodu in MacGregor 24 (BM, K, P, Z).
CAMEROUN: 20 km SE of Douala, A.J.M. Leeuwenberg 6484 (BR, K, LISC, MO, P, WAG).
GABON: Libreville, Thollon 171 (BR, MO, P).
ZAIRE: Kwango, Guillaume falls, H. Callens 3426 (BR, GENT, K, ZT); Luala, territoire Luozi, Devred 1074 (BR, MO, NY, P).
ANGOLA: Lombe, Welwitsch 6776 (BM).

Notes:

1. This is the *L. sphacelata* auct. Afr., which differs strikingly from the strictly Asian species by the absence of the fruit beak; typical specimens are remarkable for their numerous, slender cylindrical spikes.
If a broad species concept is preferred, a merger with the American *L. maculata*, *L. mexicana*, and *L. salzmanniana* could be thought of. The Asian *L. sphacelata* is not to be included in such broadly conceived species.

2. Abnormally large specimens have been collected sporadically: Adam 6294 (P), Hagerup 667 (C), Heudelot 561 (G, P).

13. **Lipocarpha hemisphaerica** (Roth) Goetghebeur, comb. nov. – Fig. 13.

Basionym: *Scirpus hemisphaericus* Roth, Nov. Pl.: 29 (1821).

Type: Heyne s.n., India, s.d. (B n.v.).

Isolepis minima Schrader, Gött. Gel. Anz. 3: 2068 (1821).
Type: Hesse s.n., South Africa, s.d. (n.v.).

Isolepis hemisphaerica (Roth) A. Dietrich, Spec. Pl. 2: 109 (1832).
Type: cf. *Scirpus hemisphaericus* Roth.

Hemicarpha isolepis Nees, Linnaea 9: 287 (1834), nom. nud.
Type: non indicatus.

Hemicarpha isolepis Nees, Edinb. N. Phil. J. 17: 263 (1834).
Kunth C.S., 1837, Enum. Pl. 2: 268 – Steudel E.G., 1855, Syn. Pl. Glum. 2: 130. – Ridley H.N., 1884, Trans. Linn. Soc., Bot., 2: 161. – Coville F.V., 1894, Bull. Torrey Bot. Club 21: 34. – Kern J.H., 1961, Reinwardtia 6: 32. – Raymond M., 1966, Dansk Bot. Arkiv 23: 319. – Raynal J. & A., 1967, Adansonia, ser. 2, 7: 319.
Type: C. Wight s.n. (1856?), India, s.d. (holotype ?, isotype C, G, K, LE, NY).

Scirpus setaceus L. var. *monandra* Willdenow ex Kunth, Enum. Pl. 2: 268 (1837), nom. nud. in syn.
Type: Willdenow 1198a, from ?, s.d. (B-W n.v.).

Hemicarpha schraderi Kunth, Enum. Pl. 2: 268-269 (1837), nom. superfl.
Richard A., 1850, Tent. Fl. Abyss. 2: 507. – Steudel E.G., 1855, Syn. Pl. Glum. 2: 130.
Type: Coll.?, 'Cap. b. spei', s.d. (n.v.).

Hemicarpha schraderiana Nees, in Martius, Fl. Brasil. 2(1): 62, in obs. (1842).
Type: Coll.?, 'in promontoris bonae spei', s.d. (n.v.) (= praec.?)

Isolepis bellula Steudel, Syn. Pl. Glum. 2: 318 (1855).
Type: Griffith s.n., India, s.d. (holotype P, isotype G, NY).

Hemicarpha senegalensis Steudel, Syn. Pl. Glum. 2: 130 (1855).
Type: Leprieur 39, Senegal, 1827 (holotype P, isotype NY, P).

Scirpus isolepis (Nees) Böckeler, Linnaea 36: 498 (1870).
Clarke C.B., 1893, Fl. Brit. India 6: 663. – Rendle A.B., 1899, Cat. Afr. Pl. Welw. 2: 128. – Clarke C.B., 1902, F.T.A. 8: 459. – Schönland S., 1922, Bot.

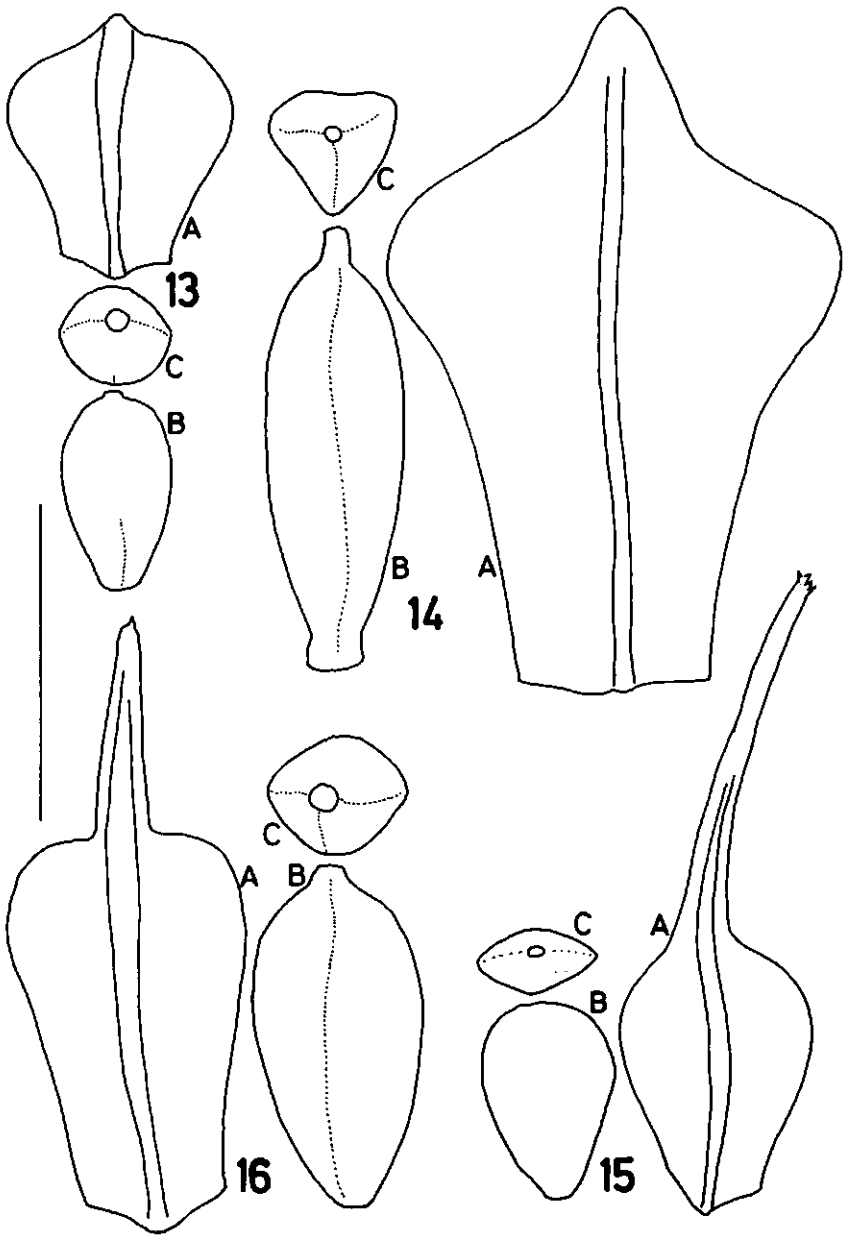

Fig. 13. *Lipocarpha hemisphaerica* (Roth) Goetghebeur (Vanden Berghen 3105, GENT). – Fig. 14. *L. humboldtiana* Nees (Klug 3353, G). – Fig. 15. *L. kernii* (Raymond) Goetghebeur (Schweinfurth 2003, G). – Fig. 16. *L. leucaspis* J. Raynal (Mullenders 668, BR).
A: spikelet bract; B: fruit, frontal view; C: fruit, top view. Bar: 1mm.

Survey S. Afr. Mem. 3: 40. – Peter A., 1937, Fl. D.O.Afr.: 393. – Napper D.M., 1965, J. E. Afr. Nat. Hist. Soc. 25: 14. – Hooper S.S., 1972, F.W.T.A., ed. 2, 3: 310.

Type: cf. *Hemicarpha isolepis* Nees.

Lipocarpha rautanenii Böckeler, in Schinz, Verh. Bot. Ver. Brandenburg 31: 179-180 (1890).

Type: Rautanen 2, Namibia, 1898 (holotype Z).

Lipocarpha micrantha Peter, Abh. Ges. Wiss. Göttingen, n.F., 13 (2): 114 (1928), nom. nud.

Syntypes: Peter 34934f & 35570, Tanzania, 1926 (B).

Lipocarpha monocephala Turrill, Kew Bull. 1913: 307 (1913).

Brain C.K., 1934, Proc. Rhod. Sci. Ass. 33: 58.

Type: F.A. Rogers 6024, Zimbabwe, 1907 (holotype K).

Lipocarpha isolepis (Nees) R. Haines, Bot. Notiser 124: 476, fig. 3 (1971).

Goetghebeur P., 1980, Adansonia, ser. 2, 19: 303. – Vanden Berghen C., 1982, Mat. Fl. Sénégal 1: 32. – Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 300, fig. 622.

Type: cf. *Hemicarpha isolepis* Nees.

Tufted annual; roots thin; stem 2-15(25) cm × 0.25-0.5 mm; leaves up to 6 cm × 0.6 mm. Inflorescence pseudolateral, with 1 spike, 1-7(10) × 1-3 mm, spherical, ovoidal to conical; involucral bract 1, up to 10(16) cm long, erect. Spikelet bract 0.5-0.95 × 0.4-0.7 mm, broadly obovate, apical part 0.2-0.5 mm long, shortly acuminate to obtuse, smooth at the top, brown to red brown, often with pale to greenish midnerve. Spikelet prophyll and glume 0.5-0.7 mm long. Stamen 1, anthers 0.25 mm long. Style 0.1 mm or shorter, with 2 branches. Fruit 0.5-0.75 × 0.25-0.3 mm, frontally obovate with small style base remnant, rounded to elliptical on cross section.

Distribution:
-Africa: common in the soudano-zambesian region , from Senegal to Ethiopia, S to Namibia.
-Asia: rare in India and Thailand.

Selected specimens:

SENEGAL: Basse Casamance, Diembéreng, C. Vanden Berghen 3105 (BR, GENT, K).
GHANA: near Yapei bridge, Hall & Enti GC 35730 (K).
NIGERIA: Kabba Province, near Agbaja, Hall 829 (K).
CENTRAL AFRICAN REPUBLIC: Bozoum, Tisserant 3142 (BM, P).
ETHIOPIA: Gallabat, near Matamma, G. Schweinfurth 2044 (BM, G, K, LE, P).
CAMEROUN: 5 km NE of N'Digou, W. de Wilde c.s. 4734 (BR, P, WAG).

ZAIRE: Shaba, 6 km W of Kabiashia, F. Malaisse 4023 (BR, BRVU).
UGANDA: Kaburoron, R.W. Haines 4218 (K).
KENYA: Kitale, A. Bogdan 5182 (K).
TANZANIA: Ufipa District, Richards 19108 (K).
ANGOLA: Pungo Andongo, Sansamanda, F. Welwitsch 6814 (BM, COI).
ZAMBIA: E of Lusaka, E.A. Robinson 2869 (K, M, NY, SRGH).
MALAWI: 15 km E of Chitipa at Kaseye Mission, J. Pawek 11080 (BR, K, MO, SRGH, WAG).
ZIMBABWE: Harare S, Old Charter Road, H. Wild 3790 (K, LISC, NY, S, SRGH); Victoria Falls, C.K. Brain 8728 (BR, K, LISC, MO, S, SRGH).
NAMIBIA: Grootfontein District, farm Sus, H.G. Schweickerdt 2138 (K, M).
BOTSWANA: Makgadikgadi Depression, P.A. Smith 2376 (K, SRGH).

INDIA: Mysore, Hassan district, near Dandiganahalli, S.S. Hooper & K.N. Gandhi HFP 2407 (K, MO).
THAILAND: Chan Tuk, Korat, Kerr 8064 (K).

Notes:

1. The type specimen of *Scirpus hemisphaericus*, found by Roth intermingled with a Heyne collection of '*Scirpus arcticus*', is not present (any more) in Berlin (H. Scholz, in litt.) and is most probably lost. The description by Roth (1821: 29) however is very clear, and points unequivocally to our species. Already Nees (1834b: 263) relegated this – priorable ! – name to the synonymy of his *Hemicarpha isolepis*, be it with a question mark. Beetle (1949: 469) refers this name to the synonymy of *L. sphacelata*, a species with several spikes in a terminal inflorescence.

2. There is somewhat doubt on the exact date of publication of *Isolepis minima* Schrader, but even if this epitheton would be priorable over *hemisphaerica*, it cannot be used because of the validly published name *L. minima* Chermezon.

3. *Hemicarpha schraderi* Kunth is a superfluous name, since *Isolepis minima* Schrader is explicitely mentioned as a synonym.

4. Contrary to the description sub *Scirpus isolepis* in Hooper (1972: 310) this species has an inflorescence invariably composed of one single spike.

14. **Lipocarpha humboldtiana** Nees, Linnaea 9: 287 (1834). – Fig. 14, 37D-F.

Pfeiffer H., 1935, Repert. Spec. Nov. 39: 42. – Schnee L., 1945, Cat. Fl. Venez. 1: 121.

Type: von Humbold & Bonpland s.n., Venezuela, Guayana, s.d. (holotype P).

Lipocarpha sellowiana Kunth, Enum. Pl. 2: 267 (1837).
Nees C.G., 1842, Fl. Brasil. 2(1): 64-65. – Steudel E.G., 1855, Syn. Pl. Glum. 2: 129. – Böckeler O., 1871, Linnaea 37: 115. – Palla E., 1905, Ber. Deutsche

Bot. Gesellsch. 23: 318-319, 323, fig. 7. – Pfeiffer H., 1933, Repert. Sp. Nov. 33: 205. – Pfeiffer H., 1935, Repert. Sp. Nov. 39: 43. – Schnee L., 1945, Cat. Fl. Venez. 1: 121. – Barros M., 1960, Sellowia 12: 316, fig. 68. – Goetghebeur P., 1980, Adansonia, ser. 2,19: 304.

Type: Sellow s.n., Brazil, s.d. (holotype B n.v., isotype G, K, LE, P).

Lipocarpha glomerata Nees, in Martius, Fl. Brasil. 2(1): 64 (1842).

Steudel E.G., 1855, Syn. Pl. Glum. 2: 129.

Syntypes: Martius 119, Brazil, Minas Geraes, s.d. (M); Martius 123, Brazil, Bahia, s.d. (B, M); Pohl s.n., Brazil, Minas Geraes, s.d. (BR, M).

Hypolytrum glomeratum Schrader ex Nees, in Martius, Fl. Brasil. 2(1): 64 (1842), nom. nud. in syn.

Type: non indicatus.

Ascolepis venezuelensis Schnee, Bol. Soc. Venez. Cienc. Nat. 9: 5-6, ill. (1943).

Schnee L., 1945, Catal. Fl. Venez. 1: 121.

Type: Killip 37666, Venezuela, d.d.? (holotype VEN n.v.).

Cyperus sellowianus (Kunth) Koyama, Bot. Mag. Tokyo 73: 438 (1960).

Type: cf. *Lipocarpha sellowiana* Kunth.

Hypolytrum argenteum auct., non (Vahl) Kunth: Kunth C.S., 1816, in H.B.K., Nov. Gen. Spec. Pl. 2: 218, quoad specim.

Lipocarpha argentea auct., non (Vahl) R. Brown: Böckeler O., 1871, Linnaea 37: 115, quoad pl. Amer.

Tufted perennial with up to 1 mm thick roots; stem 30-95 cm × 0.75-3.5 mm; leaves up to 40 cm × 1.5 mm, ± inrolled. Inflorescence terminal, with (2)3-8(10) spikes, terminal spike 5-16 × 2-5.5 mm, lateral spikes 4-11 × 2-5 mm, ovoidal; involucral bracts 2-3, the largest up to 8(16) cm long. Spikelet bract 1.8-2.8 × 0.9-1.2(1.5) mm, obovate to obtrullate, apical part 0.4-0.8 mm long, apiculate, body cream to dark brown, top cream to pale brown. Spikelet prophyll and glume 1-2 mm long. Stamens 2-3, anthers 0.65-1.35 mm long. Style 0.2-0.9 mm long, with 3 branches. Fruit 0.9-1.4 × 0.25-0.5 mm, in frontal view obovate with a small style base remnant, somewhat constricted at the base, (rounded) trigonous on cross section.

Distribution:
-America: C. and (sub)tropical S. America, from Honduras to N. Argentina.

Selected specimens:

HONDURAS: El Achote, hills above plain of Siguatepeque, T.G. Yuncker c.s. 6350 (G, K, MO, U).

PANAMA: Chiriqui Prov., 2 km W of El Hato del Volcán, Dos Lagunas, S. Mori & A. Bolten 7387 (K, MO, UB).
VENEZUELA: Edo. Guárico, P.N. Aguaro-Guariquito, Do Infante, F. Delascio c.s. 11086 (BM, MO); Edo. Bolivar, SE base of Auyan-Tepui, Uruyen, G. Davidse & O. Huber 22548 (MO).
GUYANA: Takutu, C. Appun 1530 (K).
SURINAM: Zuid river, near Kayser-airstrip, J.P. Schulz 10392 (U).
COLOMBIA: Caripe, Moritz 760 (BM, C, G, LE).
BRAZIL: Mato Grosso, Rio Vacaria, Rio Brilhante, G. Hatschbach 25164 (C, K, MO, US, Z); Rio Grande do Sul, Porto Alegre, Taquarí, O. Camargo 61955 (B, WAG); Paraná, Capão Grande, P. Dusén 7725 (BM, K); São Paulo, Fazenda Campininha, G. & L.T. Eiten 1965A (G).
PERU: Chachapoyas Prov., E of Chachapoyas, J.J. Wurdack 740 (G, MO, P, U); Dep. San Martín, Zepelacio near Moyobamba, C. Klug 3353 (G, K, MO).
BOLIVIA: Sara, Playitar, Buena Vista, J. Steinbach 6863 (BM, K).
PARAGUAY: San Pedro, Primavera, A.L. Woolston 1183 (C, K, U); Misiones, Santiago, La Soledad, T.M. Pedersen 7695 (C, K, L, P, US).
ARGENTINA: Entre Rios, Colón, T.M. Pedersen 9006 (C); Corrientes, Empedrado, La Yela, T.M. Pedersen 12029 (C, K, L, MO, WAG).
URUGUAY: Dep. Tacuarembo, Paso Mariano, Rosengurtt B 4795 (BM, U).

Notes:

1. The name *L. humboldtiana* was published for a taxon previously known under a misapplied name, *Hypolytrum argenteum* auct., non (Vahl) Kunth. A clear reference to the latter name is provided, and that name was published with an extensive description plus a few cited specimens. According to Art. 33.3, Note 1, *L. humboldtiana* is to be considered validly published.

2. In Kunth (1837: 267) sub *L. sellowiana* is given 'Montevideo' as type locality. The printed labels on Sellow's sheets however invariably show 'Brasilia'.

3. This species is not rarely confounded with *Ascolepis brasiliensis* (Kunth) C.B.Clarke, with similar ecological preferences (mixed collections e.g.: Glaziou s.n., K, and Hassler 8452, K). The latter is easily distinguished by its uniformly thin roots, and by the small spikelet bract and large spikelet glume.

15. **Lipocarpha kernii** (Raymond) Goetghebeur, comb. nov. – Fig. 15, 40D-F.

Basionym: *Scirpus kernii* Raymond, Natur. Canad. 86: 230 (1959).

Raynal, J., 1968, Adansonia, ser. 2,8: 95, fig. 1,1-5. – Hooper S.S., 1972, F.W.T.A., ed. 2, 3: 310.

Type: Berhaut 4692, Senegal, 1954 (holotype MT n.v., isotype P).

Isolepis kernii (Raymond) Lye, Bot. Notiser 124: 479 (1971).
Type: cf. *Scirpus kernii* Raymond.

Rikliella kernii (Raymond) J. Raynal, Adansonia, ser. 2,13: 155 (1973).
Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 301, fig. 624.
Type: cf. *Scirpus kernii* Raymond.

Scirpus squarrosus auct., non Linnaeus: Böckeler O., 1870, Linnaea 36: 735, pro specim. Schweinfurth. – Böckeler O., 1879, Flora 62: 563. – Clarke C.B., 1902, F.T.A. 8: 458-459, pro specim. Schweinfurth 2572 & 3003. – Andrews F.W., 1956, Fl. Pl. Sudan 3: 366. – Cufodontis G., 1970, Enum. Pl. Aethiop.: 1473.

Tufted annual; roots thin; stem 2-40 cm × 0.5-1.5 mm; leaves up to 16 cm × 2 mm. Inflorescence terminal, with (1)2-8 spikes, 2-8 × 1.5-5 mm, ovoidal; involucral bracts 2-5, the largest up to 15 cm long. Spikelet bract 1.45-2.6 × 0.4-0.55 mm, elliptical to obovate, apical part 0.7-1.5 mm long, (very) long acuminate, scaberulous at the top, body yellowish green to pale brown with red dots, top yellow. Spikelet prophyll and glume absent. Stamen 1, anthers 0.2-0.25 mm long. Style 0.1 mm or shorter, with 2 branches. Fruit 0.45-0.65 × 0.3-0.4 mm, frontally obovate with very small style base remnant, dorsiventrally flattened and elliptical to narrowly rhombic on cross section.

Distribution:
-Africa: common in the soudano-zambesian region, from Senegal to Ethiopia, S to Zimbabwe.
-Asia: rather rare in India.

Selected specimens:

SENEGAL: Kaolak, Berhaut 2622 (BR, GENT, K, Z).
GHANA: edge of Lake Volta, 10 km NW of Makongo, near Salaga, J.B. Hall GC 39571 (MO, NY, P).
NIGER: E of Niamey, Dallol Boboye, G. Cremers 952 (BR, P).
NIGERIA: Kainji, F.N. Hepper 3870 (K, P).
CAMEROUN: 3 km S of Garoua, W. de Wilde c.s. 4794 (WAG).
CENTRAL AFRICAN REPUBLIC: N of Bozoum, Tisserant 3173 (BM, K, L, P).
ETHIOPIA: Gallabat, near Matamma, G. Schweinfurth 2003 (G, K, L, P).
SUDAN: Seriba Ghattas, Djur, Schweinfurth 2572 (BRI, K, P, S, Z).
TANZANIA: Ifakara airstrip, K. Vollesen MRC 3634 (C, K, WAG); Mahenge-Kilwa, near Rutiji, H.J. Schlieben 2391 (BM, BR, G, Z).
ZAMBIA: Lake Tanganyika, Niamkolo, M. Richards 12768 (K).
MALAWI: Kota-Kota, Verboom 110S (K).
ZIMBABWE: Matusodonha N.P., Tashinga Camp, F. Mushori 97 (SRGH).

INDIA: Mysore, Hassan d., near Dandiganahalli, S.S. Hooper & K.N. Gandhi HFP 2402 (K, MO, P).

Notes:

1. Hall 832 (K) is a remarkable specimen, several plants have their spike rachis

crest-like disformed. This phenomenon is probably best considered as a kind of fasciation.

16. **Lipocarpha leucaspis** J. Raynal, Bull. Mus. Nat. Hist. Nat., 2e sér., 41(4): 978, fig. 2 (1969). – Fig. 16.

Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 299, fig. 620.

Type: Michel 3338, Burundi, 1952 (holotype BR, isotype WAG).

Lipocarpha barteri auct., non C.B.Clarke: Peter A., 1937, Fl. D.O.Afr.: 384.

Loosely tufted annual; roots thin; stem 5-40 cm × 0.5-1 mm; leaves up to 10 cm × 1.5 mm. Inflorescence terminal, with (1)2-3(4) spikes, 2-7 × 2-5 mm, ovoidal; involucral bracts 1-2, the largest up to 4.5 cm long. Spikelet bract 1.6-2.1 × 0.7-0.8 mm, obovate to obtrullate, apical part (0.6)0.7-0.8(0.9) mm long, 1/2 – 1/3 of the body, acuminate, scabrid at the top, body brownish to dark red, midnerve and apical part whitish. Spikelet prophyll and glume 1-1.3 mm long. Stamens 1-2, anthers 0.4-0.75 mm long. Style 0.1-0.3 mm long, with 3 branches. Fruit 0.95-1.05 × 0.3-0.45 mm, frontally (narrowly) obovate with small style base remnant, (rounded) trigonous on cross section.

Distribution:
-Africa: scattered in Nigeria, Zaire, Burundi, and Tanzania.

Studied specimens:

NIGERIA: Panshanu Pass, D.W. Lawlor & J.B. Hall 238 (K).
ZAIRE: Shaba, Plateau des Kibara, near Lusinga, Lisowski, Malaisse & Symoens 4651 (BR) & 5013 (BR); Kumanua, F. Malaisse 8502 (BR, GENT); Upper-Lomami, Sakadi, W. Mullenders 668 (BR).
BURUNDI: Kininya, Michel 3175 (BR, K, MO, NY) & 3338 (holotype BR, isotype WAG).
TANZANIA: 85 km from Mpanda, S.S.Hooper & C.C. Townsend 1971B (K); Ujiji, Kigoma, A. Peter 37009 (B); Kapapa, M. Richards 25930 (C, K, MO, WAG).

Notes:

1. This species is sometimes difficult to distinguish from well developed specimens of *L. nana* (e.g. Lye 6499, K, Overlaet 94, BR & 152, BR, Vanderyst 23405, BR). In the latter species the apical part of the spikelet bract is longer than the body, and the mucro is often more recurved, the fruit is under 0.8 mm long. In the present species, the shoulders of the spikelet bract are more pronounced, with a creamy coloured centre.

2. One mixed collection from Tanzania, Hooper & Townsend 1971 (K), is interesting in this regard: a small plant with small spikes is *L. nana*, a much larger

plant with conspicuously larger spikes is *L. leucaspis*. We suspect that this phenomenon may be explained by a different ploidy level of both closely related taxa.

3. The species is known from Nigeria by a single collection, Lawlor & Hall 238 (K). This disjunct area is rather difficult to explain, but would fit into the hypothesis of a polyploid origin of *L. leucaspis* out of a *L. nana*-stock.

17. **Lipocarpha maculata** (A. Michaux) Torrey, Ann. Lyc. New York 3: 288 (1836). – Fig. 17, 37A-C.

Steudel E.G., 1855, Syn. Pl. Glum. 2: 130. – Böckeler O., 1871, Linnaea 37: 117. – Holm T., 1899, Amer. J. Sci., ser. 4,7: 172, fig. 1-3, 5-9. – Standley P.C., 1931, Publ. Field Mus. Nat. Hist., Bot. Ser., 8: 271. – Pfeiffer H., 1933, Repert. Spec. Nov. 33: 205.

Type: cf. *Kyllingia maculata* A. Michaux.

? *Scirpus cephalotes* Walter, Fl. Carol.: 71 (1788), nom. illeg., non L. (1762).
Type: Walter, USA, Carolina (BM ?), (n.v.).

Kyllingia maculata A. Michaux, Fl. Bor.-Amer. 1: 29 (1803).
Type: Coll.?, USA, 'Carolina', s.d. (holotype P).

Mariscus maculatus (A. Michaux) Roemer & Schultes, Syst. Veg. 2: 243 (1817).
Type: cf. *Kyllingia maculata* A. Michaux.

Lipocarpha maculata (A.Michaux) Kunth, Enum. Pl. 2: 267 (1837), comb. superfl.
Type: cf. *Kyllingia maculata* A. Michaux.

Cyperus neotropicalis Alain, Bull. Torrey Bot. Club 92: 291 (1965), non *Cyperus maculatus* Böckeler (1864).
Type: cf. *Kyllingia maculata* A. Michaux.

Tufted annual; roots thin; stem 5-30 cm × 0.5-1.5 mm; leaves up to 11 cm × 2 mm. Inflorescence terminal, with (1)2-5 spikes, 2.5-10(12) × 2-4.5 mm, ovoidal; involucral bracts 2-3, the largest up to 12 cm long. Spikelet bract 1.5-2 × 0.35-5 mm, obtrullate, apical part (0.4)0.5-0.75 mm long, acuminate, smooth at the top, yellowish brown to (pale) red brown and midnerve green. Spikelet prophyll and glume 1.1-1.55 mm long. Stamen 1, anthers 0.5 mm long. Style 0.1-0.3 mm long, branches 3. Fruit 0.75-1.0 × 0.25-0.3 mm, frontally obovate to subelliptical, (rounded) trigonous on cross section, constricted at the base.

Distribution:
-America: eastern USA, from Washington D.C. to Florida.

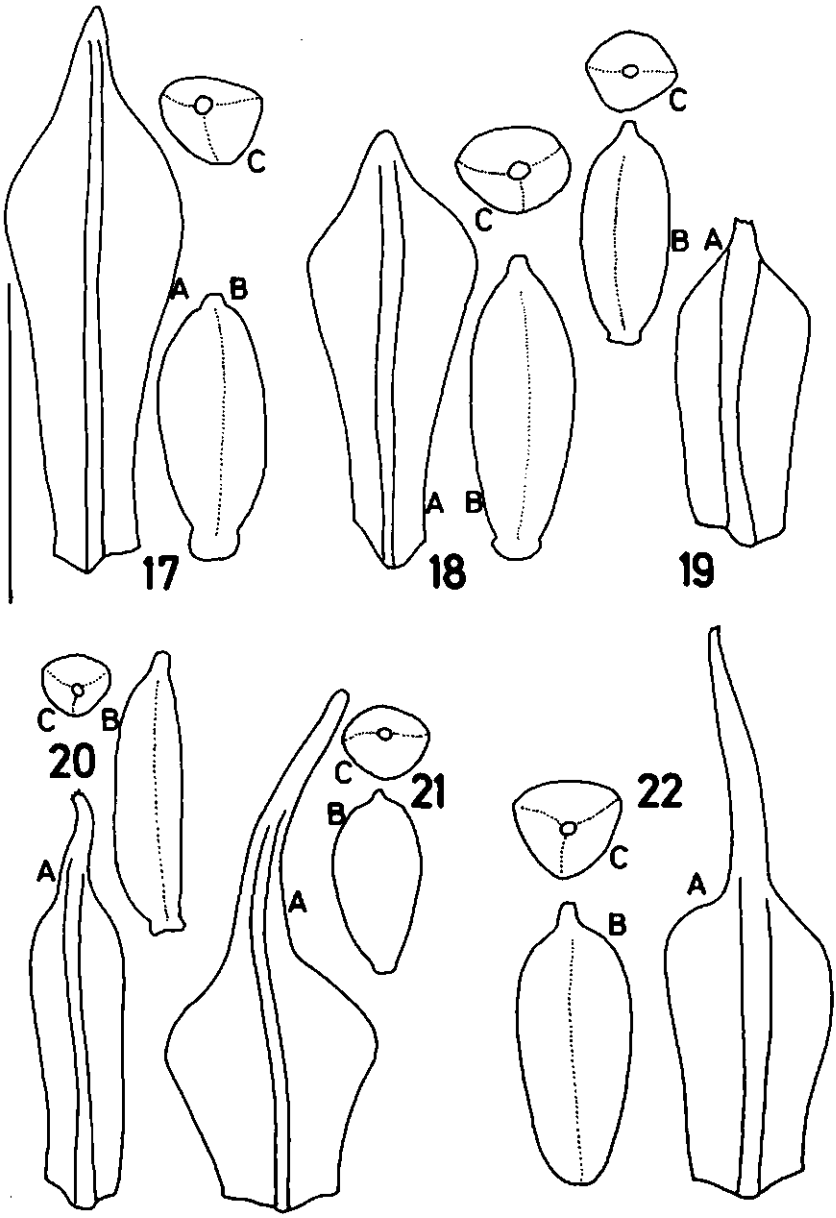

Fig. 17. *Lipocarpha maculata* (A. Michaux) Torrey (Bradley & Sears 3605, S). – Fig. 18. *L. mexicana* Liebmann (Liebmann 786, C holotype). – Fig. 19. *L. micrantha* (Vahl) Tucker (Bartlett in Pl. Exsicc. Grayanae 146, Z). – Fig. 20. *L. microcephala* (R. Brown) Kunth (Merrill BS 547, GENT). – Fig. 21. *L. monostachya* Gross & Mattfeld (Robinson 453O, M). – Fig. 22. *L. nana* (A. Richard) Chermezon (Ujor FHI 30229, MO).
A: spikelet bract; B: fruit, frontal view; C: fruit, top view. Bar: 1mm.

Selected specimens:

USA: Alabama, 3 km S of Union Springs, R. Kral 33139 (MO); Virginia, Warwick Swamp, NW of Waverly, M.L. Fernald & B. Long 6057 (MO); Virginia, Isle of Wight, S of Zuni, M.L. Fernald c.s. 6541 (BM, K, US); North Carolina, 7 km NW of Williamston, Conoho Creek, A.E. Radford & J.R. Bozeman 45283 (BR, C, K, U); South Carolina, 13 km N of Hardeeville, near Okeetee Fire Tower, S.W. Leonard & A.E. Radford 2758 (B); Georgia, w.p.l., Beyrich 18 (BM, L, LE, MO); Florida, Lake County, near Eustis, G.V. Nash 1162 (G, K, LE, MO, US); Florida, Wakulla County, along US 98, 1 km W of X FA 369, N.C. Henderson 64-510 (BR, G); Florida, near Jacksonville, A.H. Curtiss 5285 (G, K, LE, MO, P, Z).

Notes:

1. The name *Scirpus cephalotes* Walter is indicated by both Index Kewensis and Beetle (1949: 461) as a synonym of '*L. humboldtiana*'. The North American plant often identified as such is really *L. maculata*. However we have not seen the original material nor the description in Walter.

18. **Lipocarpha mexicana** Liebmann, Kgl. Danske Vidensk. Selsk. Skr., 5.R., 2: 235 (1850). – Fig. 18.

Steudel E.G., 1855, Syn. Pl. Glum. 2: 130.

Type: Liebmann 786, Mexico, 1841 (holotype C, isotype G, K, L, LE, P, S, UPS).

Tufted annual; roots thin; stem 5-30 cm × 0.5-1 mm; leaves up to 10 cm × 1 mm. Inflorescence terminal, with (1)2-4(5) spikes, 2-8 × 2-3.5 mm, ovoidal to fusiform; involucral bracts 2(3), the largest up to 6 cm long. Spikelet bract 1.1-1.5(1.6) × 0.4-0.6 mm, obovate to obtrullate, apical part 0.2-0.4 mm long, triangular to shortly acuminate, smooth at the top, yellowish brown to reddish tinged, with pale or greenish midnerve. Spikelet prophyll and glume 1-1.3(1.4) mm long. Stamen 1, anthers 0.25-0.35 mm long. Style 0.15 mm long or shorter, with 3 branches. Fruit 0.8-1(1.1)$_{ab}$ × 0.25-0.4 mm, frontally (narrowly) obovate to elliptical with small style base remnant, (rounded) trigonous on cross section, slightly constricted at the base.

Distribution:
-America: from Mexico S to Peru and Brazil.
-Madagascar.

Selected specimens:

MEXICO: Orizaba, E. Bourgeau 2732 (G, K, LE, P) & F. Müller 1969 (BR, K, LE, P); Oaxaca, H. Galeotti 5742 (BR, G, LE, P).
GUATEMALA: Chojoja near Mazatenanga, G. Bernouilli 436 (BR, G, K).

EL SALVADOR: San Salvador, S. Calderón 1147 (US).
HONDURAS: Depto. El Paraiso, Rio Yeguare, A. Molina R. 3373 (BM, US).
NICARAGUA: Dep. Zelaya, Puerto Isabel, F.C. Seymour 2974 (BM).
PANAMA: Chagras, A. Fendler 344 (MO).
COLOMBIA: Llanos Orientales, Puerto López, SE of Cabuyaro, R. Jaramillo Mejia c.s. 1250 (US).
VENEZUELA: Edo. Carabobo, near San Diego, La Cumaca, A.H.G. Alston 5912 (BM, GENT, P, U).
BOLIVIA: Santa Cruz, F. Brooke 25 (K).
BRAZIL: São Paulo, Fazenda Campininha, G. & L.T. Eiten 1942 (BRI, G, US); Goias, Chapado dos Veadeiros, 10 km S of Cavalcante, H.S. Irwin c.s. 24268 (UPS); Mato Grosso, Varza Grande, T.M. Pedersen 12180 (C, L).

MADAGASCAR: near Arivonimamo, P.K.22, Bosser 7286 (P) & 12981 (P); near Zazafitsy, Bosser 14116 (P); Ambalarao-Ihosy, P.K.573, Bosser 17373 (P); Tsaramandroso, J. & M. Peltier 5202 (P); Tananarive, Prudhomme 113 (P).

Notes:

1. To my great discomfort, all Madagascar collections of '*L. sphacelata*' turned out to be quite similar to *L. mexicana*. They do not have the numerous, slender cylindrical spikes of *L. filiformis*, on the contrary their inflorescence with 2-4 fusiform spikes and the broader apical part of the spikelet bract are really typical of the American taxon. This situation is reminiscent of what we have observed in *Ascolepis brasiliensis* (Kunth) C.B.Clarke (Goetghebeur 1980: 293).

19. **Lipocarpha micrantha** (Vahl) G. Tucker, J. Arnold Arbor. 68(4): 410 (1987). – Fig. 19.

Type: cf. *Scirpus micranthus*.

Scirpus micranthus Vahl, Enum. Pl. 2: 254 (1805).
Böckeler O., 1870, Linnaea 36: 499. – Rendle A.B., 1899, Cat. Afr. Pl. Welw. 2: 128. – Clarke C.B., 1902, F.T.A. 8: 459. – Pfeiffer H., 1933, Repert. Spec. Nov. 33: 204. – Uittien H., 1934, Fl. Surinam. 1: 126. – Mohlenbrock R.H., 1963, Amer. Midl. Natur. 70(1): 21. – Hooper S.S., 1972, F.W.T.A., ed.2, 3: 310.
Type: L.C. Richard s.n., Fr. Guyana, s.d. (holotype P).

Scirpus minimus Pursh, Fl. Amer. Sept. 1: 55 (1814), non Vahl (1805).
Type: Coll.?, USA, Virginia to Carolina, s.d. (holotype? n.v.).

Isolepis micrantha (Vahl) Roemer & Schultes, Syst. Veg. 2: 110 (1817).
Kunth C.S., 1837, Enum. Pl. 2: 203.
Type: cf. *Scirpus micranthus* Vahl.

Isolepis humboldtii Roemer & Schultes, Syst. Veg. 2: 112 (1817).
Type: von Humboldt s.n., Venezuela, s.d. (holotype P).

Scirpus subsquarrosus Muhlenberg, Descr. Gram.: 39 (1817).
Syntypes: coll.?, USA, 'Pennsylvania, Susquehanna River, etiam in Georgia', s.d. (PH n.v.).

Isolepis subsquarrosa (Muhlenberg) Schrader, in Schultes J.A., Mant. 2: 64 (1824).
Nees C.G., 1834, Linnaea 9: 291.
Type: cf. *Scirpus subsquarrosus* Muhlenberg.

Isolepis subsquarrosa (Muhlenberg) Schrader var. *minor* Schrader, in Schultes J.A., Mant. 2: 64 (1824).
Type: 'Princ. Ser. Max. Neowid.', Brazil, s.d. (holotype GOET n.v.).

Scirpus humboldtii (Roemer & Schultes) A.Dietrich, Sp. Pl. 2: 112 (1832).
Type: cf. *Isolepis humboldtii* Roemer & Schultes.

Scirpus sesquipollicaris Willdenow ex Kunth, Enum. Pl. 2: 203 (1837), nom. nud. in syn.
Type: Willdenow 1200, from ?, s.d. (holotype B-W n.v.).

Hemicarpha subsquarrosa (Muhlenberg) Nees, in Martius, Fl. Brasil. 2(1): 61 (1842).
Steudel E.G., 1855, Syn. Pl. Glum. 2: 130. – Ridley H.N., 1884, Trans. Linn. Soc., ser.2, 2: 162.
Type: cf. *Scirpus subsquarrosus* Muhlenberg.

Hypolytrum capillare Schrader ex Nees, in Martius, Fl. Brasil. 2(1): 61 (1842), nom. nud. in syn.
Type: not indicated.

Hemicarpha subsquarrosa (Muhlenberg) Nees var. *minor* (Schrader) Nees, in Martius, Fl. Brasil. 2(1): 61 (1842).
Type: cf. *Isolepis subsquarrosa* (Muhlenberg) Schrader var. *minor* Schrader.

Isolepis caespitula Liebmann, Kgl. Danske Vidensk. Selsk. Skr., 5.R., 2: 237 (1850).
Syntypes: Liebmann 808, Mexico, 1842 (C) & Liebmann s.n., Mexico, 1842 (C, G, K, L, P, S, UPS).

Scirpus micranthus Vahl var. *humboldtii* (Roemer & Schultes) Böckeler, Linnaea 36: 500 (1870), quoad comb.
Type: cf. *Isolepis humboldtii* Roemer & Schultes.

Hemicarpha micrantha (Vahl) Pax, in Engler & Prantl, Natürl. Pflanzenfam. 2(2): 105 (1-1888).

Standley P.C., 1931, Publ. Field Mus. Nat. Hist., Bot. Ser., 8: 271. – Schnee L., 1943, Bol. Soc. Venez. Cienc. Nat. 57: 3. Schnee L., 1945, Cat. Fl. Venez. 1: 121. – Svenson H.K., 1957, N. Amer. Fl. 18(9): 508. – Raynal J. & A., 1967, Adansonia, ser. 2,7: 320. – Jepson W.L., 1970, Man. Fl. Pl. California: 157.

Type: cf. *Scirpus micranthus* Vahl.

Hemicarpha micrantha (Vahl) Britton, Bull. Torrey Bot. Club 15: 104 (4-1888), comb. superfl.

Coville F.V., 1894, Bull. Torrey Bot. Club 21: 34. – Palla E., 1908, Österr. Bot. Zeitschr. 58: 417. – Friedland S., 1941, Amer. J. Bot. 28: 860, fig. 5-7. – Svenson H.K., 1948, Bull. Torrey Bot. Club 75: 92. – Podlech D., 1967, Prodr. Fl. S.W.A. 165: 27. – Goetghebeur P., 1980, Adansonia, ser. 2,19: 303.

Type: cf. *Scirpus micranthus* Vahl.

Hemicarpha caespitula (Liebmann) Palla, Österr. Bot. Zeitschr. 58: 417, 420 (1908).

Type: cf. *Isolepis caespitula* Liebmann.

Hemicarpha micrantha (Vahl) Pax var. *micrantha*.

Shreve F. & Wiggins I.L., 1964, Veget. Fl. Sonoran Desert 1: 302. – Correll D.S. & Johnston M.C., 1970, Man. Vasc. Pl. Texas: 284. – Scoggan H.J., 1978, Fl. Canada 2: 442.

Type: cf. *Scirpus micranthus* Vahl.

Hemicarpha micrantha (Vahl) Pax var. *minor* (Schrader) Friedland, Amer. J. Bot. 28: 860 (1941).

Type: cf. *Isolepis subsquarrosa* (Muhlenberg) Schrader var. *minor* Schrader.

Isolepis squarrosa auct., non (L.) Kunth: Kunth C., 1837, Enum. Pl. 2: 203 – Böckeler O., 1870, Linnaea 36: 500.

Tufted annual; roots thin; stem 2-20 cm × 0.3-0.5 mm; leaves up to 10 cm × 0.5 mm. Inflorescence pseudolateral, with 1-2(3) spikes, 1-5 × 1-2 mm, ovoidal to spherical; involucral bracts 1-2(3), the largest up to 3-5 cm long, erect. Spikelet bract 0.5-1.0(1.1) × 0.3-0.4 mm, obovate to obtrullate, apical part 0.1-0.25 mm long, acuminate, scaberulous at the top, yellowish to red brown, with greenish midnerve. Spikelet prophyll reduced, often deeply bifid, or virtually absent; spikelet glume absent. Stamen 1, anthers c. 0.15 mm long. Style c. 0.1 mm or shorter, with 2 branches. Fruit 0.4-0.65 × 0.2-0.3 mm, frontally obovate to subelliptical with small style base remnant, rounded on cross section.

Distribution:
-America: common from S.Canada to Peru, Paraguay, and Uruguay.
-Africa: rather rare in Senegal, Angola, Namibia, and Zimbabwe.

Selected specimens:

CANADA: Québec, Missisquoi Bay, Frère Louis-Alphonse s.n. (12.9.1957) (US).
USA: Washington, Falcon Valley, W.N. Suksdorf 811 (G); California, Butte County, S of Paradise, L. Ahart 4430 (MO); Arizona, near Tucson, Sabino Canyon, F.W. Gould & H.S. Haskell 3311 (MO); Nebraska, Antelope County, S of Neligh, S.P. Churchill 2413 (MO); Texas, Gonzales County, J.F. Normand 9167 (MO); Minnesota, Houston County, Mississippi river, Navigation Pool 8, S.R. Ziegler & M.F. Leykom 2347 (MO); Iowa, Johnson County, Swan Lake, R.F. Thorne 13705 (US); Missouri, Courtney, B.F. Bush 9231 (G, K, MO); Wisconsin, Crawford County, N.C. Fassett 4332 (MO); Illinois, Spring Bay, V.H. Chase 10098 (BM, U); Indiana, Millers, J.M. Greenman 2253 (BM, MO); Alabama, Marengo County, Beckley's Landing, R.M. Harper 123 (MO); Massachusetts, Winchester, H.H. Bartlett in Pl. Exsicc. Grayanae 146 (B, BM, BR, C, G, K, L, LE, M, MO, P, Z); New Jersey, Morris County, Pequannock Township, R.T. Clausen 4118 (MO); Virginia, Southampton County, Courtland, M.L. Fernald & B. Long 6540 (K); South Carolina, Williamsburg County, Kingstree, S.W. Leonard & A.E. Radford 2175 (BM, BR, C, P, S, U); Florida, near Jacksonville, A.H. Curtiss 5240 (K, MO, Z); Florida, Hillsborough County, W of Tampa, O. Lakela 25497 (BM, C, L).
MEXICO: San Luis Potosi, J.G. Schaffner 199 (C, G, M, P).
GUATEMALA: Sololá, Atitlan, J.D. Smith 6399 (B, G, K, M, MO, US) & Santa Rosa, J.D. Smith 3545 (G, K, M, P, US).
BELIZE: Boomtown, H. O'Neill 8883 (BRI, K, LE, US).
EL SALVADOR: Sonsonate, Chalchuapa, O. Rohweder ES 159 (MO).
HONDURAS: Gracias a Dios, Puerto Lempira, G.R. Proctor 38918 (BM).
COSTA RICA: Talamanca, H. Pittier & T. Durand 8607 (B, BR, G, L, M, P).
PANAMA: Canal Zone, S of Madden Dam, J.P. Folsom 3710 (MO).
CLIPPERTON ISLAND: Clipperton Rock, M.H. Sachet 310 (K, L, NY, P).
CUBA: East, C. Wright 714 (G).
JAMAICA: Lazaretto, C.D. Adams 10008 (BM, M, MO).
BONAIRE: I. Boldingh 7139 (C, K, L, P).
ARUBA: Playa, Frater M. Arnoldo 171 (U).
MARTINIQUE: Camp-Bulala, Duss 460a (C).
GUADELOUPE: Camp-Jacob, Duss 4155 (US).
TRINIDAD: Piasco, Arouca, W.E. Broadway 2123 (BR, G, MO, US).
COLOMBIA: Santa Marta, H.H. Smith 242 (BR, G, K, L, LE, MO, P, U).
VENEZUELA: Isla Margarita, O.O. Miller & J.O. Johnston 196 (K, MO, P).
GUYANA: Corentyne river, Berbice, G.S. Jenman 71 (K, P).
SURINAM: Saramacca river, near Kwatta hede, B. Maguire 23951 (K, MO, U).
GUYANE: Cayenne, Sagot 1359 (K, P).
ECUADOR: Guayas, Salinas, E. Asplund 5627 (BR, G, K, P, UPS).
BRAZIL: Amazonas, near Serra do Mel, Rio Branco, Suruma, E. Ule 8082 (G, K, L); near San Gabriel do Cachoeiras on the Rio Negro, R. Spruce 2065 (C, K, LE, P); Piaui, w.p.l., Gardner 2377 (G, K, P, US); Porto Real, Burchell 8469 (K, L, P).
BOLIVIA: Santa Cruz, F. Brooke 31B (K).
PERU: Libertad river, Barclay 1128 (BM).
PARAGUAY: San Bernardino, Rojas in C. Osten 7412 (B).
URUGUAY: Cerro Largo, Palleros, W.G. Herter Pl. Urug. 1770 (G, MO, U, Z).

SENEGAL: Hann, Adam 12408 (P); Mbao, Berhaut 1186 (BR, P); Kayar, J. & A. Raynal 6432 (P).
ANGOLA: Huila, Ruacana, A.W. Exell & F.A. Mendonça 2751 (COI); Moçamedes, Vila Arriaga, Lungo, J.B. Teixeira 1078 (COI, K, LISC, P); Conceição, Welwitsch 6981 (BM).
ZIMBABWE: Binga district, Sengwa, P. Jarman BM 22 (SRGH); Urungwe, Zambesi Valley, Menswa Pan, H. Wild 4022 (K, MO, SRGH).
NAMIBIA: Tsumale-Bobos, Dinter 7555 (BM, K, M, Z); Grootfontein, farm Sus, along Omuramba, Schweickerdt 2145 (M, S); Omaruru, farm Kawab, Schweickerdt 2258 (K, M, S).

Notes:

1. As could be expected, some minor differences are noted between the American and the African populations respective:

-spikelet bract	(0.9)1 mm or longer	0.5-0.8(0.9) mm long
-fruit	0.5 mm or longer	0.5 mm or shorter
-fruitwall cones	20-25 rows	10-15 rows
-colour of ripe fruit	black	dark brown

These provisional observations should be checked on more abundant African material, preferably with ample field studies.

20. **Lipocarpha microcephala** (R. Brown) Kunth, Enum. Pl. 2: 268 (1837). – Fig. 20, 36D.

Kunth C.S., 1837, Enum. Pl. 2: 268. – Steudel E.G., 1855, Syn. Pl. Glum. 2: 130. – Böckeler O., 1871, Linnaea 37: 118. – Bentham G., 1878, Fl. Austr. 7: 337. – Clarke C.B., 1893, Fl. Brit. India 6: 668. – Holm T., 1899, Amer. J. Sci., ser. 4,7: 173. – Domin K., 1915, Bibl. Bot. 85: 468. – Kern J.H., 1961, Reinwardtia 6: 32. – Ohwi J., 1965, Fl. Japan: 200. – Raymond M., 1966, Dansk Bot. Arkiv 23: 319. – Kern J.H., 1974, Fl. Males., ser. 1,7: 522. – Wilson K.L., 1981, Telopea 2: 170. – Koyama T., 1982, Acta Phytotax. Geobot. 33: fig. 1.

Type: cf. *Hypaelyptum microcephalum* R. Brown.

Hypaelyptum microcephalum R. Brown, Prodr.: 220 (1810).
Steudel E.G., 1821, Nomencl. Bot., ed. 1,1: 419.
Type: R. Brown 5986, Australia, 1803 (holotype BM).

Kyllingia squarrosa Steudel, Syn. Pl. Glum. 2: 68-69 (1854).
Type: Labillardière s.n., Moluccas, s.d. (holotype P, isotype BM, G).

Ascolepis kyllingioides Steudel, in Zollinger, Syst. Verz. 1: 63 (1854), nom. nud.
Type: non indicatus.

Ascolepis kyllingioides Steudel, Syn. Pl. Glum. 2: 105 (1855).
Type: Zollinger 3287, 'Java' (vere: Sulawesi), 1847 (holotype P, isotype BM, BR, G, L).

Scirpus leptocarpus F. von Mueller, Trans. Phil. Soc. Vict. 1: 109 (1855).

Syntypes: F. von Mueller s.n., Australia, King river, s.d. (n.v.), Murray river, s.d. (n.v.) & Ovens river, 1853 (G, K).

Lipocarpha zollingeriana Böckeler, Flora 42: 100-101 (1859), nom. superfl.
Type: cf. *Ascolepis kyllingioides* Steudel.

Scirpus dietrichiae Böckeler, Flora 58: 109 (1875).
Type: A. Dietrich s.n., Australia, Queensland, s.d. (holotype B n.v., isotype B, BM, L, MO, WAG, Z).

Scirpus squarrosus Linnaeus var. *dietrichiae* (Böckeler) Bentham, Fl. Austr. 7: 329 (1878).
Type: cf. *Scirpus dietrichiae* Böckeler.

Cyperus zollingerianus (Böckeler) Koyama, Bot. Mag. Tokyo 73: 438 (1960).
Koyama T., 1964, Micronesica 1: 101.
Type: cf. *Lipocarpha zollingeriana* Böckeler.

Isolepis squarrosa Miquel ex Koyama, Bot. Mag. Tokyo 73: 438 (1960).
err. pro '*Kyllingia squarrosa* Steudel'.

Rikliella australiensis J. Raynal, Adansonia, ser. 2,16: 220, fig. 1-1 (1976).
Type: H.S. Mc Kee 9504, Australia, 1962 (holotype P, isotype K).

Scirpus squarrosus auct., non Linnaeus: Schumann K. & Lauterbach H., 1900, Fl. Schutzgeb.: 195. – Valckenier Suringar J., 1912, Nova Guinea 8: 705.

Tufted annual; roots thin; stem 3-35 cm × 0.5-0.75 mm; leaves up to 10 cm × 1.5 mm. Inflorescence terminal, with (1)2-4(5) spikes, 2-8 × 1.5-4 mm, ovoidal; involucral bracts 2-3, the largest up to 13 cm long. Spikelet bract 0.95-1.7(1.85) × 0.2-0.35 mm, obtrullate, apical part 0.5-0.8 mm long, acuminate, recurved, scaberulous at the top, yellowish to brown, midnerve green. Spikelet prophyll and glume 0.6-1.15 mm long, sometimes reduced or even absent. Stamens 1-2, anthers 0.25 mm long. Style 0.1-0.2 mm or shorter, with 2 branches. Fruit 0.7-1.05 × 0.15-0.2 mm, in frontal view (very) narrowly elliptical to narrowly obovate with small style base remnant, rounded to elliptical on cross section.

Distribution:
-Asia: China, Korea, Japan, Thailand, Burma, Java, Philippines, New Guinea.
-Australia.

Selected specimens:

CHINA: Hainan, H.Y. Liang 66387 (NY).

HONG KONG: Wilford 267 (K).
KOREA: Ouen-San, U. Faurie 952 (BM, G, P); Quelpaert, Honguo, E. Taquet 2135 (C, G, K).
JAPAN: Nagasaki, R. Oldham 914 (BR, C, G, K, L, M, NY, P).
THAILAND: Aran Pratet, A.F.G. Kerr 195601 (BM).
VIETNAM: Tonkin, Bon 1910 (P).
TAIWAN: Taitoo, Matsumura 146 (TI).
PHILIPPINES: Luzon, Manila, Merrill BS 547 (G, GENT, M, U, Z).
SINGAPORE: H.N. Ridley 1722 (BM).
JAVA: J.H. Coert 1108 (L).
MOLUCCAS: Ambon, C.B. Robinson BS 1890 (BM, L).
SULAWESI: S.H. Koorders 16665 (L, P).
NEW GUINEA: Papua, Keneyia, R. Schlechter 18452 (BR, L, P); Fly River Expedition, Daru Island, L.J. Brass 6246 (BM, BRI, U).
BOUGAINVILLE: Barilo village, L. Craven & R. Schodde 408 (K, L).

AUSTRALIA: N.T., Port Bradshaw, R.L. Specht 740 (AD, BRI, K, L, US); Queensland, Archer river, L.J. Brass 19732 (BRI, G, K, L); W.A., Coongan river, N.T. Burbidge 689 (BRI); S.A., Murray river, Hj. Eichler 13753 (AD); New South Wales, Richmond, C.T. Musson NSW 24086 (K, L, MO); Victoria, Winton Swamp, H.I. Aston WS 122 (AD).

Notes:

1. The occurrence of mixed collections (plants with and without spikelet prophyll and glume) has led Wilson (1981: 170) to the inclusion of *Rikliella australiensis* into the synonymy of this species. Worth mentioning are following gatherings: A.S.George 10711 (K) with plants with poorly developed spikelet prophylls, and both plants mixed in one population in Blake 13274 (K), Wilson 1473 (BRI, K, P), 3527 (BRI), and 5509 (K).

2. This species is a rather variable one, as to the colour of the spikelet bract (pale yellowish green to dark red brown), the top of the spikelet bract (smooth to conspicuously spinulose), the development of the spikelet prophyll and glume (well developed to completely reduced). Although an Australian concentration of aberrant forms is obvious, no clear geographically disjunct morphological entities could be distinguished.

3. The number of style branches was observed by us as invariably 2. In Ohwi's (1965: 200) description are mentioned 3 style branches.

4. Here can be added as a synonym '*Isolepis squarrosa* Miq., 1865', taken from Koyama (1960: 438). Most probably this is an erroneous citation for *Kyllingia squarrosa* Steudel, a name that was mentioned in Miquel (1856: 294).

21. **Lipocarpha monostachya** Gross & Mattfeld, Notizbl. Bot. Gart. Berlin 14: 189 (1938). – Fig. 21.

Napper D.M., 1965, J. E. Afr. Nat. Hist. Soc. 25: 23. – Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 300, fig. 621.

Type: H.J. Schlieben 6399, Tanzania, 1935 (holotype B n.v., isotype BM, BR, G, GENT, M, P, Z).

Tufted annual; roots thin; stem 3-18 cm × 0.2-0.3 mm; leaves up to 3.5 cm × 0.5 mm. Inflorescence pseudolateral, with 1 spike, 1.5-5.5 × 1-3 mm, ovoidal to conical; involucral bract 1, up to 1.5 cm long, erect. Spikelet bract 1-1.6 × 0.4-0.6 mm, obovate, apical part 0.5-1.1 mm long, acuminate, ± recurved, smooth at the top, yellowish to reddish brown, with mostly greenish midnerve. Spikelet prophyll and glume 0.3-0.5 mm long. Stamen 1, anthers c. 0.15 mm long. Style 0.1 mm long or shorter, with 2 branches. Fruit 0.35-0.65 × 0.2-0.25 mm, frontally obovate with very small style base remnant, rounded on cross section.

Distribution:
-Africa: scattered in Zaire, Tanzania, Malawi, Zimbabwe.

Studied specimens:

ZAIRE: plaine de la Ruzizi, Luvingu, R. Germain 6267 (BM, BR).
TANZANIA: 40 km S of Itigi Station, P.J. Greenway & R.M. Polhill 11672 (BRVU, K, LISC); Songea district, Milne-Redhead & Taylor 9798A (K); Uyansi, Tschaya, A. Peter 34123c (B) , 34242b (B), 34335 (B) & 45804b (B); Ngulu, E of Goweko, A. Peter 34898b (B); Ngulu, W of Goweko, A. Peter 34934e (B); Ngulu, E of Goweko, A. Peter 45915b (B); Mbeya district, R. Polhill & S. Paulo 2006 (K); 150 km SW of Lindi, near Massassi, H.J. Schlieben 6399 (isotype BM, BR, G, GENT, M, P, Z); Shinyanga district, E. Stefanescu 437 (K).
MALAWI: 10 km S of Kasungu, J. Pawek 14342B (K); 5 km SE of Fort Hill, E.A. Robinson 4530 (M, MO, NY, SRGH).
ZIMBABWE: Harare, C.K. Brain 3632 (COI, MO) & 3713 (SRGH).

Notes:

1. Specimens of this species are often identified as *L. nana*, which is undeniably a resembling species. The present species however is easily recognized by the smooth tip of the spikelet bract, and the 2-branched style. Furthermore, its inflorescence is 'uniformly monocapitate over a wide range of habitat' (note on Robinson 4530, M), what is only very rarely the case in *L. nana*.

22. **Lipocarpha nana** (A. Richard) Chermezon, Bull. Soc. Bot. France 71: 142 (1924). – Fig. 22.

Cufodontis G., 1970, Enum. Pl. Aethiop.: 1415. – Hooper S.S., 1972, F.W.T.A., ed.2, 3: 328.

Type: cf. *Fuirena nana* A. Richard.

Fuirena nana A. Richard, Tent. Fl. Abyss. 2: 497 (1850).

Type: Quartin-Dillon & Petit s.n., Ethiopia, s.d. (holotype P).

Lipocarpha pulcherrima Ridley, Trans. Linn. Soc., Bot., 2: 162 (1884).
Rendle A.B., 1899, Cat. Afr. Pl. Welw. 2: 129. – Clarke C.B., 1902, F.T.A. 8: 473. – Brain C.K., 1934, Proc. Rhod. Sci. Ass. 33: 60. – Chermezon H., 1937, Fl. Madagascar 29: 167. – Peter A., 1937, Fl. D.O.Afr.: 383. – de Meneses A., 1956, Garcia de Orta 4: 258. – Napper D.M., 1965, J. E. Afr. Nat. Hist. Soc. 25: 23. – Cufodontis G., 1970, Enum. Pl. Aethiop.: 1415.
Syntypes: Welwitsch 6774, Angola, Catete, 1856 (BM, COI); 6774 [sic], Angola, Quilange, 1857 (BM); 6775, Angola, Huilla, 1860 (BM); 6785, Angola, Catete, 1857 (BM).

Lipocarpha atropurpurea Böckeler, Cyp. Nov. 1: 21 (1888).
Type: J. Buchanan 69, Malawi, ante 1885 (holotype B n.v., isotype K, LE, NY, P).

Lipocarpha tenera Böckeler, Cyp. Nov. 1: 21 (1888).
Type: Buchanan 63, Malawi, s.d. (holotype B n.v.).

Hypaelyptum pulcherrimum (Ridley) K. Schumann, in Engler, Pflanzenw. Ost-Afr. C: 127 (1895).
Type: cf. *Lipocarpha pulcherrima* Ridley.

Lipocarpha minima Chermezon, Bull. Soc. Bot. France 68: 425 (1922).
Chermezon H., 1937, Fl. Madagascar 29: 168.
Type: H. Perrier de la Bâthie 2680, Madagascar, 1913 (holotype P, isotype P).

Cyperus persquarrosus Koyama, Bot. Mag. Tokyo 73: 438 (1960), non *Cyperus pulcherrimus* Willdenow ex Kunth (1837).
Type: cf. *Lipocarpha pulcherrima* Ridley.

Cyperus unistamen Koyama, Bot. Mag. Tokyo 73: 438 (1960), non *Cyperus minimus* Linnaeus (1753).
Type: cf. *Lipocarpha minima* Chermezon.

Lipocarpha nana (A. Richard) J. Raynal, Adansonia, ser. 2,7: 84 (1967), comb. superfl.
Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 299, fig. 618-619.
Type: cf. *Fuirena nana* A. Richard.

Lipocarpha pulcherrima Ridley f. *luxurians* Merxmüller, Mitt. Bot. Staatssamml. München 1(5): 164 (1952).
Type: H.G.Schweickerdt 2319, Mozambique, 1952 (holotype M).

Tufted annual; roots thin; stem 3-40 cm × 0.3-0.75 mm; leaves up to 7 cm × 1.2 mm. Inflorescence terminal, (very rarely pseudolateral), with 1-9 spikes, 2-8 × 1.5-4 mm, ovoidal to conical; involucral bracts (1)2(3), the largest up to 4 cm long. Spikelet bract 0.90-1.65(2.2) × 0.25-0.8 mm, obtrullate, apical part 0.45-0.8(1.3) mm long, (very) long acuminate, recurved, scabrid at the top, body red brown to black, with a pale midnerve and yellowish to greenish apical part. Spikelet prophyll and glume 0.3-0.8 mm long. Stamens 1-2, anthers 0.35 mm long. Style 0.15 mm or shorter, with 3 branches. Fruit 0.55-0.8 × 0.2-0.4 mm, frontally obovate with short style base remnant, rounded trigonous on cross section.

Distribution:
-Africa: soudano-zambesian, from Guinée to Ethiopia, S to South Africa.
-Madagascar.

Selected specimens:

NIGERIA: Bauchi Plateau, Lely P 471 (K).
CAMEROUN: N'Ganha Mts. near N'Digou, W. de Wilde 4498 (WAG).
SUDAN: Imatong Mts., Gilo-Mt. Konoro, I. Friis & K. Vollesen 416 (BR, C).
ETHIOPIA: Wollega region, Ghimbi-Asosa, km 23, M.G. Gilbert & M. Thulin 771 (C, P, UPS).
ZAIRE: Shaba, 20 km from Minga, L. Poelman 18 (BR, BRVU, K).
BURUNDI: Mosso, Kininya, Michel 3174 (BR, K, MO, P); Bururi, Mahwa, M. Reekmans 6113 (BR, GENT, LG, MO).
UGANDA: Namanyonyi, R.A. Dümmer 2561 (BM, K, P); Bulumazi, R.A. Dümmer 4116 (BM, K, Z); Buloga district, 1.5 km N of Bunyindi, G. Wood 199 (BR, GENT, K).
KENYA: Nairobi, Beentje 1704 (WAG); Kiambu district, Thika town, Lye 6341 (K, P, UPS).
TANZANIA: Useguha, Hale-Mnyussi, A. Peter 24282a (B, K, MO, P, S, SRGH, WAG); Lupembe, Upper-Ruhudje river, H.J. Schlieben 393 (BM, BR, G, K, M, P, S, Z); Kyimbila, A. Stolz 1172 (BM, C, G, K, L, P, S, U, UPS, Z).
ANGOLA: Huila, Humpata, A.W. Exell & F.A. Mendonça 2597 (BM, COI).
ZAMBIA: Chilongowelo, Plain of Death, H.M. Richards 8124 (BR, K, SRGH); Kawambwa, E.A. Robinson 2340 (K, M, NY, SRGH); Barotseland, Mongu, E.A. Robinson 6870 (K, NY, P).
MALAWI: Shiri Highlands, J. Buchanan 69 (K, LE, NY, P); Nkhata Bay district, 56 km SW of Mzuzu, J. Pawek 10934 (BR, K, MO, SRGH, WAG).
ZIMBABWE: Matobo district, Besna Kobila Farm, O.B. Miller 2753A (K, LISC, SRGH); Inyanga district, 8 km N of Inyanga village, J.E. Rushworth 900 (K, L, P, SRGH, WAG).
MOZAMBIQUE: Dororo near Bandula, Fisher & Schweickerdt 249 (BM, M).
SOUTH AFRICA: Transvaal, 1 km from Lake Chrissie on road to Ermelo, T.H. Arnold 279 (K, MO).

MADAGASCAR: Imeriah, H. Perrier de la Bâthie 7430 (B,P).

Notes:

1. For a discussion of the differences with the closely related *L. leucaspis*, see under that name.

23. **Lipocarpha occidentalis** (A. Gray) G. Tucker, J. Arnold Arbor. 68(4): 410 (1987). – Fig. 23.

Type: cf. *Hemicarpha occidentalis* A.Gray.

Hemicarpha occidentalis A. Gray, Proc. Amer. Acad. Arts & Sci. 7: 391 (1868).
Coville F.V., 1894, Bull. Torrey Bot. Club 21: 36. – Friedland S., 1941, Amer. J. Bot. 28: 858. – Svenson H.K., 1957, N. Amer. Fl. 18: 509. – Jepson W.L., 1970, Man. Fl. Pl. California: 157.
Type: H.N. Bolander 6223, USA, California, 1866 (holotype GH n.v., isotype BM, G, K, LE, MO).

Scirpus occidentalis (A. Gray) C.B. Clarke, Kew Bull. Add. Ser. 8: 30 (1908).
Type: cf. *Hemicarpha occidentalis* A.Gray.

Tufted annual; roots thin; stem 0.5-5 cm × 0.3 mm; leaves up to 2 cm × 1 mm. Inflorescence pseudolateral, with 1-2 spikes, 2-3 × 1.5-3 mm, ovoidal to spherical; involucral bracts 2-3, the largest up to 2 cm, erect. Spikelet bract 1.8-2.8 × 0.25-0.35 mm, narrowly obovate, apical part 0.6-1.3 mm long, long acuminate, recurved, scaberulous at the top, greenish yellow with red dots. Spikelet prophyll 0.6-0.75 mm, 5-nerved; spikelet glume absent. Stamen 1, anthers c. 0.2 mm long. Style 0.1 mm or shorter, with 2 branches. Fruit 0.55-0.8 × 0.3-0.35 mm, frontally obovate with small style base remnant, rounded on cross section.

Distribution:
-America: western USA, Washington and California.

Studied specimens:

USA: Washington, Falcon Valley, W.N. Suksdorf s.n. (8.9.1881) (BM, MO) & s.n. (11.9.1884) (BR, LE, P); California, Yosemite Valley, H.N. Bolander 6223 (BM, G, K, LE, MO) & s.n. (1867) (G); California, Yosemite National Park, 2 km W of Wawona Tunnel, W.J. Dress 3922 (G); California, Yosemite National Park, Miguel Meadow, H.L. Mason 11904 (BM, K, S, US) & base of El Capitan Meadow, H.L. Mason 11945 (BM, BR, C, G, K, LE, MO, S).

24. **Lipocarpha perspicua** S. Hooper, Kew Bull. 41(2): 424-427, fig. 1 (1986). – Fig. 24.

Type: E. Milne-Redhead 4039, Angola, 1938 (holotype K).

Tufted annual; roots thin; stem 5-15 cm × 0.3-0.4 mm; leaves up to 10 cm × 0.5 mm. Inflorescence terminal to slightly pseudolateral, with 1 spike, 4-6 × 3-4 mm, ovoidal to ellipsoid; involucral bracts 1-2, the largest up to 5 cm long, (sub)erect. Spikelet bract 2.6-3.2 × 1-1.2 mm, spathulate, apical part

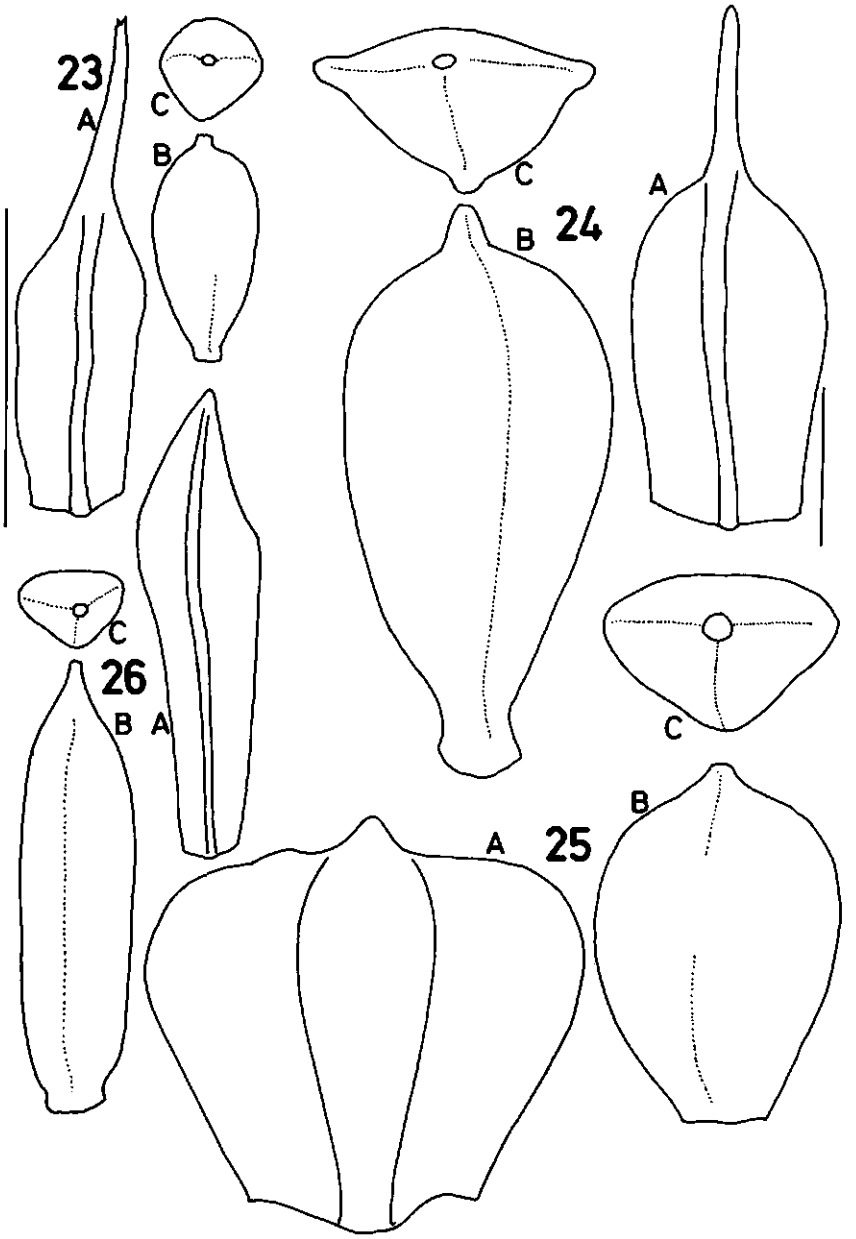

Fig. 23. *Lipocarpha occidentalis* (A. Gray) Tucker (Mason 11904, S). – Fig. 24. *L. perspicua* S. Hooper (Milne-Redhead 4039, K holotype). – Fig. 25. *L. prieuriana* Steudel (Vanden Berghen 3109, GENT). – Fig. 26. *L. pygmaea* Kern (Wallace 9211, C).
A: spikelet bract; B: fruit, frontal view; C: fruit, top view. Bars: 1mm (24A + small bar).

0.8-1.6 mm long, rather abruptly narrowing into a long, thin acute acumen, smooth at the tip, wings dark red brown, midnerve and acumen pale. Spikelet prophyll and glume 2.5 mm long. Stamens 3, anthers c. 1.5 mm long. Style c. 1 mm long, with 3 branches. Fruit 1.4-1.6 × 0.9-1.0 mm, frontally obovate with a very small style base remnant, compressed and rounded triquetrous on cross section.

Distribution:
-Africa: Angola, known only from the type collection.

Studied specimens:

ANGOLA: Moxico district, few km W of Kaperu, E. Milne-Redhead 4039 (K).

Notes:

1. This truly remarkable species is known from one single gathering. Additional collections would be highly valuable in order to assess the species' variability, especially concerning the number of spikes and the position of the large involucral bract.

2. The dimensions given in the description and those in the accompanying illustration (Hooper 1986: 426, fig. 1) do not match each other.

25. **Lipocarpha prieuriana** Steudel, Syn. Pl. Glum. 2: 130 (1855). – Fig. 25, 36E.

Böckeler O., 1871, Linnaea 37: 118. – Clarke C.B., 1902, F.T.A. 8: 471. – Cufodontis G., 1970, Enum. Pl. Aethiop.: 1415. – Hooper S.S., 1972, F.W.T.A., ed.2, 3: 328. – Vanden Berghen C., 1982, Mat. Fl. Sénégal 1: 32. – Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 298.

Type: Leprieur s.n., Senegal, s.d. (holotype P, isotype G, L).

Lipocarpha schweinfurthiana Böckeler, Flora 62: 567 (1879).
Type: Schweinfurth 197, ser. 3, Sudan, 1869 (holotype B n.v., isotype K).

Cyperus prieurianus (Steudel) Koyama, Bot. Mag. Tokyo 73: 438 (1960).
Type: cf. *Lipocarpha prieuriana* Steudel.

Tufted annual; roots thin; stem 5-50 cm × 0.5-1 mm; leaves up to 25 cm × 2 mm. Inflorescence terminal, with (1)3-5 spikes, 3-10 × 2-4 mm, ovoidal; involucral bracts 2, the largest up to 20 cm long. Spikelet bract 1.2-1.5 × 0.75-1.2 mm, broadly obovate, apical part 0.1-0.25(0.4) mm long, rather short, rounded, smooth at the top, ± cucullate, pale brown to red brown with green midnerve.

Spikelet prophyll and glume 1-1.2 mm, red brown spotted. Stamen 1, anthers 0.3-0.4 mm long. Style 0.1-0.15 mm long, with 2 branches. Fruit 1-1.1 × 0.65-0.7 mm, in frontal view broadly obovate with small style base remnant, flattened trigonous on cross section.

Distribution:
-Africa: soudano-zambesian, from Senegal to Ethiopia, S to Zimbabwe.

Selected specimens:

SENEGAL: Saint Louis, Berhaut 813 (BR, GENT, K, P, Z).
MALI: Sotuba, 8 km E of Bamako, J. Raynal 5010 (P, SRGH).
GHANA: near Burufo, Lawra, C.D. Adams 4388 (K, NY).
NIGER: Tapoa village, M. Mazurski 465 (MO).
NIGERIA: Kainji, Hepper 3874 (K, WAG).
CHAD: Hirim, G. Fotius 1886 (G, P).
CAMEROUN: 5 km S of Garoua, W. de Wilde c.s. 4817 (WAG).
CENTRAL AFRICAN REPUBLIC: NE of Bozoum, Tisserant 3386 (BM, P).
SUDAN: 4 km E of Bor, H.J. Raad 57 (WAG); Seriba Ghattas, Djur, Schweinfurth 197-ser.III (K).
TANZANIA: 6.5 km from Urambo, Hooper & Townsend 2023 (K).
ZAMBIA: Kabulamwanda, 110 km N of Choma, E.A. Robinson 1286 (K, NY, SRGH); Namwala district, 150 km NNW of Choma, town on Kafue river, E.A. Robinson 2081 (K, NY, SRGH); Central Prov., 62 km W of Lusaka, on Mumbwa road, E.A. Robinson 6457 (K, M, NY).
MALAWI: Kota-Kota, W.V. Verboom 1015 (K).
ZIMBABWE: Wankie district, Wankie N.P., Tshabema Pan, J.E. Rushworth 2564 (SRGH).

Note:

1. Raynal (1973: 161) incorrectly described this species with 3 stamens.

26. **Lipocarpha pygmaea** Kern, Blumea 10: 638, fig. 2 (1960). – Fig. 26, 36A.

Kern J.H., 1962, Reinwardtia 6: 153. – Raymond M., 1966, Dansk Bot. Arkiv 23: 319.

Type: C. van Steenis 19587, Cambodja, 1957 (holotype L, isotype K).

Tufted annual; roots thin; stem 3-30 cm × 0.5-1 mm; leaves up to 9 cm × 2 mm. Inflorescence terminal, with (1)3-4 spikes, 4-7 × 2.5-5 mm, ovoidal; involucral bracts 2-3, the largest up to 5 cm long. Spikelet bract 1.3-2 × 0.4-1 mm, obtrullate, apical part 0.4-0.45 mm long, acute, subcucullate, red brown spotted. Spikelet prophyll and glume 1.3-1.75 mm long, often red brown spotted. Stamens 1(2), anthers 0.3-0.5 mm long. Style 0.1-0.35 mm long, with 3 branches. Fruit 1.2-1.5 × 0.25-0.4 mm, narrowly elliptical to narrowly obovate with small style base remnant, trigonous on cross section.

Distribution:
-Asia: rare in Thailand, Burma, Cambodja.

Studied specimens:

BURMA: Ramree Island, Kyaukpyu, Wallace 9211 (BM, C, K, L) & s.n. (9.1945) (BM).
THAILAND: Doi Sutep, A.F.G. Kerr 2749 (BM, K).
KAMPUCHEA: Siem Reap, C.G.G.J. van Steenis 19587 (K, L).
INDIA ?: Wallich s.n. (1849) (K).

Notes:

1. The specific epitheton points to the small size of the type specimens, but these are abnormal, dwarfed plants. Much more typical are the reddish striped spikelet bract, prophyll and glume.

27. **Lipocarpha raynaliana** Govindarajalu, Adansonia, ser. 2, 20(4): 369, pl. 1 (1981), '*raynaleana*'. – Fig. 27.

Type: Govindarajalu 14948, India, d.d.? (holotype PCM n.v., isotype BLAT, BSI, CAL, DD, MH, PCM n.v.).

Tufted annual; roots rather thin; stem 5-30 cm × 0.5-0.9 mm; leaves up to 15 cm × 2 mm. Inflorescence terminal, with (1)2-3 spikes, 4-7 × 3-5 mm, ovoidal; involucral bracts 2, the largest up to 10 cm, spreading to reflexed. Spikelet bract 2-2.5 × 0.6-0.9 mm, spathulate, apical part 0.6-0.9 mm long, triangular, (sub)acute, smooth at the top, subhyaline but conspicuously red brown striped, sometimes with 2 lateral red brown patches. Spikelet prophyll and glume 1.8-2.1 mm long. Stamens 2, anthers c. 0.4 mm long. Style c. 0.4 mm long, with 3 branches. Fruit 1.3-1.6 × 0.3-0.4 mm, frontally oblong with a c. 0.2 mm long, slender beak, subtriquetrous on cross section, constricted at the base.

Distribution:
-Asia: S.India.

Studied specimens:

INDIA: Kerala, Poringalkuthu, Govindarajalu 5985 (L) & 5988 (L); id., Sholayar, Govindarajalu 6070 (L).

Notes:

1. The dimensions given in the species' description and those in the accompanying illustration (Govindarajalu 1981: 369, pl. 1) do not match each other. Therefore I have asked for a loan of the holotype, an isotype or a paratype. Three

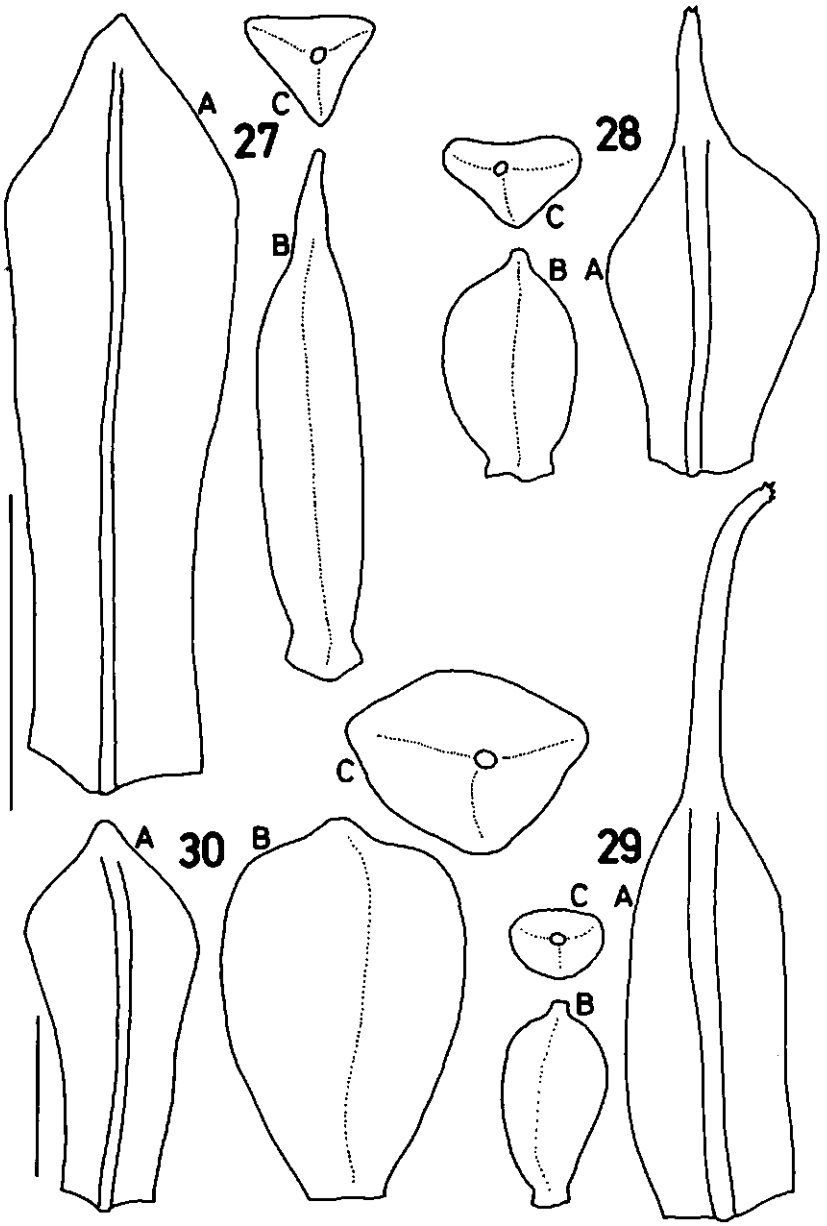

Fig. 27. *Lipocarpha raynaliana* Govindarajalu (Govindarajalu 5988, L). – Fig. 28. *L. reddyi* S. Hooper (Reddy & Rajagopal 219, K). – Fig. 29. *L. rehmannii* (Ridley) Goetghebeur (Dinter 7560, K). – Fig. 30. *L. robinsonii* J. Raynal (Robinson 5053, M).
A: spikelet bract; B: fruit, frontal view; C: fruit, top view. Bars: 1mm (30A + small bar).

demands were in vain. However I was a bit lucky in finding in the Leyden herbarium (L) three sheets (Govindarajalu 5985, 5988 & 6070), obviously related to but differing from *L. sphacelata*, thus in all probability representing this interesting species. For a definitive conclusion I am awaiting an inspection of some type material.

28. **Lipocarpha reddyi** S. Hooper, Kew Bull. 41(2): 427, fig. 2 (1986). – Fig. 28.

Type: P.S. Reddy 1232, India, s.d. (holotype K).

Tufted annual; roots thin; stem 5-15 cm × 0.4-0.6 mm; leaves up to 4 cm × 1 mm. Inflorescence terminal, with (1)2-3 spikes, 3-6 × 2-3 mm, ovoidal to cylindrical; involucral bracts 2, the largest up to 3 cm, patent to reflexed. Spikelet bract 1.5-1.8 × 0.6-0.7 mm, spathulate, apical part 0.6-0.75 mm long, rather abruptly narrowed into a thin acumen, smooth to minutely scaberulous at the top, top of wings pale to dark red brown, often with red stripes, midnerve and acumen more pale, rarely as dark. Spikelet prophyll and glume 0.75-0.85 mm long. Stamens 1(2), anthers c. 0.5 mm long. Style very short, with 3 short branches. Fruit 0.7-0.8 × 0.3 mm, frontally obovate with a very small style base remnant, subtriquetrous on cross section.

Distribution:
-Asia: S.India.

Studied specimens:

INDIA: Madras, Ganjam district, Chatiapur, J.S. Gamble 21559B (K); Andhra Pradesh, Nalgonda district, Anaram, P.S. Reddy 1232 (holotype K) & Hanamkonda area, Warangal, P.S. Reddy & T. Rajagopal 219 (K).

Notes:

1. Apart from the type specimen I have seen two more collections of this rare species: Reddy & Rajagopal 219 (K), and Gamble 21559B (K, 1 plant on this sheet, mixed with the common *L. sphacelata*).

29. **Lipocarpha rehmannii** (Ridley) Goetghebeur, comb. nov. – Fig. 29, 36F.

Basionym: *Scirpus rehmannii* Ridley, Trans. Linn. Soc., ser. 2, 2: 159 (1884).

Raynal J., 1968, Adansonia, ser. 2, 8: 97, t. 1, fig. 6-8.

Syntypes: Rehmann 7305 & 7315, South Africa, Natal, 1875-1880 (K, Z); Welwitsch 6771, Angola, Lopollo, 1860 (BM).

Isolepis rehmannii (Ridley) Lye, Bot. Notiser 124: 479 (1971).
Type: cf. *Scirpus rehmannii* Ridley.

Rikliella rehmannii (Ridley) J. Raynal, Adansonia, ser. 2, 13: 155 (1973).
Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 301, fig. 623.
Type: cf. *Scirpus rehmannii* Ridley.

Scirpus hystricoides Nordenstam, Dinteria 11: 55 (1974).
Type: B. Nordenstam 2836, Namibia, 1963 (holotype S).

Scirpus hystrix auct., non Thunberg: Rendle A.B., 1899, Cat. Afr. Pl. Welw.2: 127. – Clarke C.B., 1902, F.T.A. 8: 459. – Kükenthal G., 1921, in R.E. Fries, Wiss. Ergebn. Schwed. Rhod. – Kongo – Exped. 1, Ergänz.:8. – Schönland S., 1922, Bot. Survey S. Afr. Mem. 3: 40 p.p., pl. 40. – Chermezon H., 1923, Bull. Soc. Linn. Norm., sér. 7, 6: 77. – Brain C.K., 1934, Proc. Rhod. Sci. Ass. 33: 82. – Chermezon H., 1936, Arch. Bot. Caen 7, Mém. 2: 2. – Chermezon H., 1937, Fl. Madagascar 29: 141. – de Meneses A., 1956, Garcia de Orta 4: 254. – Podlech D., 1967, Prodr. Fl. Südwestafr. 165: 49.

Scirpus squarrosus auct., non Linnaeus: Clarke C.B., 1902, F.T.A. 8: 458-459, pro specim. Whyte.

Tufted annual; roots thin; stem 2-25 cm × 0.5-1.5 mm; leaves up to 7 cm × 1.5 mm. Inflorescence terminal, with 3-12 spikes, 3-10 × 3-5 mm, more or less confluent; involucral bracts (3)4-9, the largest up to 12 cm long. Spikelet bract 1.2-3.15(3.45) × 0.2-1 mm, elliptical, ovate or obovate, apical part 0.6-1.9(2.2) mm long, (very) long acuminate, recurved, scaberulous at the top, body red brown, top yellow. Spikelet prophyll and glume absent. Stamen 1, anthers 0.25-0.35 mm long. Style 0.1-0.15 mm long, with 3 branches. Fruit 0.5-0.6 × 0.2-0.4 mm, frontally obovate with small style base remnant, rounded trigonous on cross section.

Distribution:
-Africa: E. and S. soudano-zambesian, from Kenya to South Africa.
-Madagascar.

Selected specimens:

ZAIRE: Shaba, Lubumbashi, Somona 72 (BR, BRVU, GENT).
KENYA: Kiambu, Thika, Lye 6339 (K, P, WAG) & 6360 (C, K, P).
TANZANIA: Songea district, Milne-Redhead & Taylor 9371 (K).
ANGOLA: Huila, Matas da Vindama, J.B. Borges 117 (K, LISC).
ZAMBIA: 20 km N of Choma, Pengelly's Dam, E.A. Robinson 465 (K, NY); Siamambo, E.A. Robinson 2813 (K, NY, P); Broken Hill, A. Rogers 8103 (K, P, SRGH).
MALAWI: Fort Hill, A. Whyte s. n. (s.d.) (K).
ZIMBABWE: Harare, C.K. Brain 8936 (K, MO, SRGH); Wankie, Matettsi, P. Gonde 211 (K, MO, SRGH).

MOZAMBIQUE: Bandula, N.C. Chase 4549 (BR, BRLU, K, MO, SRGH).
NAMIBIA: Tsumeb, Dinter 7560 (BM, BR, G, GENT, K, P, Z).
BOTSWANA: Gaborone, Aedume Park,O.J. Hansen 3377 (C, K, SRGH).
SOUTH AFRICA: Transvaal, near Moletse, Schlechter 4677 (BR, GENT, K) & Lydenburg, F. Wilms 1594 (K, L, P, U, Z).
LESOTHO: w.p.l., A. Dieterlen 835 (P).

MADAGASCAR: Antsirabé, H. Perrier de la Bâthie 13060 (BR, K, P).

30. **Lipocarpha robinsonii** J. Raynal, Adansonia, ser. 2,7: 81-82, pl. 1 (1967). – Fig. 30, 39E-F.

Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.: 296, fig. 614.

Type: E.A. Robinson 6739, Zambia, 1965 (holotype P, isotype M, NY).

Rhizomatous perennial, stems isolated on a long-creeping, reddish, somewhat fleshy rhizome, covered by distant cataphylls of c. 3 cm long; stems 50-90 cm × 1.5-3 mm; leaves up to 50 cm × 3 mm, rather thick and pungent. Inflorescence terminal, with 3-9 subequal spikes, 3-7 × 2-4 mm, ovoidal; involucral bract 1, 1-10 cm long. Spikelet bract 2.2-3 × 0.5-1 mm, obtrullate, apical part c. 0.3 mm long, white to pale yellowish. Spikelet prophyll and glume 2.5-3 mm long. Stamens 3, anthers 0.75-1.25 mm long. Style 0.75-1.8 mm long, with 3 branches. Fruit 1-1.1 × 0.7 mm, in frontal view obovate with a small style base remnant, flattened trigonous on cross section.

Distribution:
-Africa: Angola, Zambia.

Studied specimens:

ANGOLA: Lusano Falls area, E. Milne-Redhead 4114 (WAG).
ZAMBIA: Bangwelu Swamps, Matongo and Kaleya Islands, N.H. Chabwela 137 (SRGH); Kasama, Mungwi, E.A. Robinson 5053 (M, NY); Barotseland, 40 km NE of Mongu, E.A. Robinson 6739 (M, NY, P); Shiwa Ngandu, J.J. Symoens 10848 (BR, BRVU); Kafue, Mutenda Swamp, D.E.F. Vesey-FitzGerald 3814 (NY).

31. **Lipocarpha salzmanniana** Steudel, Syn. Pl. Glum. 2: 129 (1855). – Fig. 31, 36B.

Type: Salzmann 603, Brazil, Bahia, 1830 (holotype P, isotype G, K, LE, MO, US).

Scirpus pycnostachyus Salzmann ex Steudel, Syn .Pl. Glum. 2: 129 (1855), nom. nud. in syn.
Type: cf. *Lipocarpha salzmanniana* Steudel.

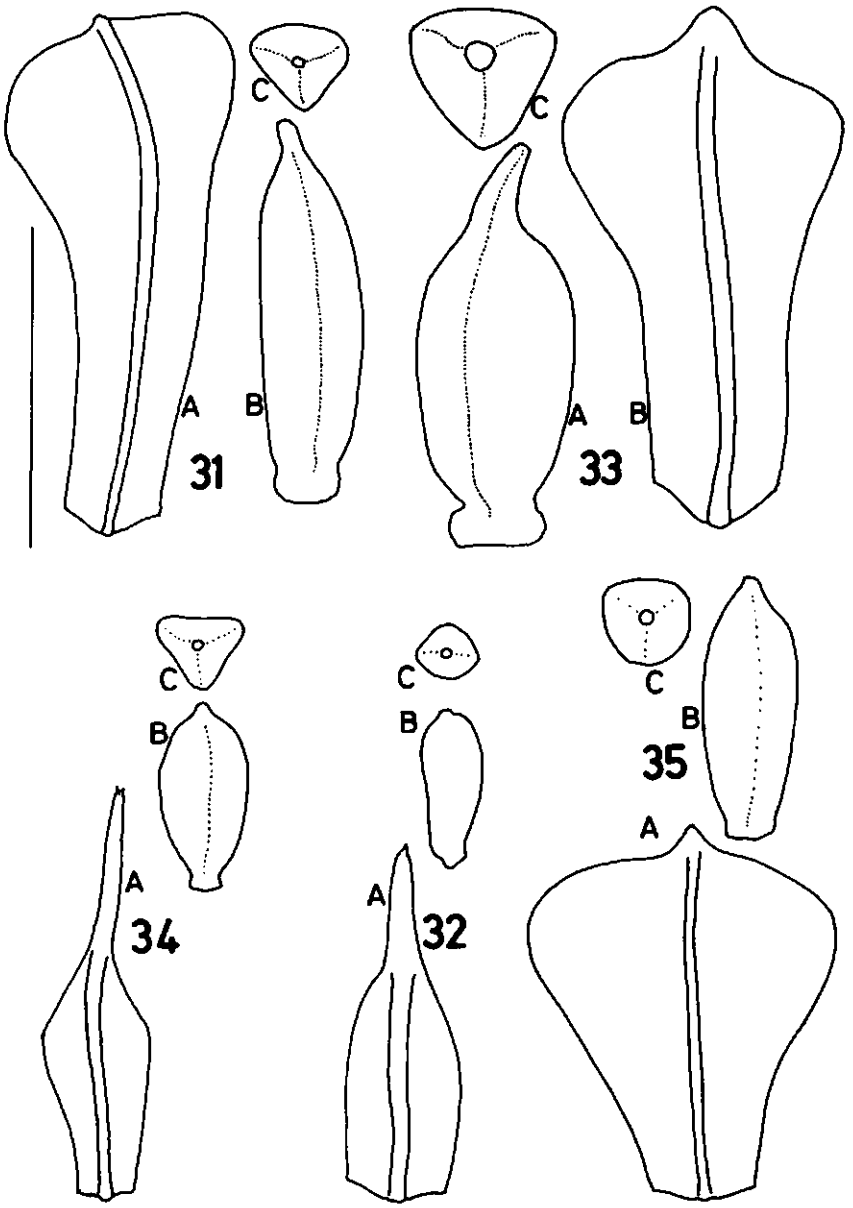

Fig. 31. *Lipocarpha salzmanniana* Steudel (O'Neill 8887, C). – Fig. 32. *L. schomburgkii* (Friedland) Tucker (Schomburgk 657, G isotype). – Fig. 33. *L. sphacelata* (Vahl) Kunth (Koyama 14052, C). – Fig. 34. *L. squarrosa* (L.) Goetghebeur (Thwaites 854, G). – Fig. 35. *L. thermalis* J. Raynal ex Goetghebeur (de Witte 5199, BR holotype).
A: spikelet bract; B: fruit, frontal view; C: fruit, top view. Bar: 1mm.

Lipocarpha cochleata Grisebach, Cat. Pl. Cub.: 241 (1866).
Type: C. Wright 3386, Cuba, 1860-1864 (holotype ?, isotype BM, G, K, LE, MO, P).

Tufted annual; roots thin; stem 3-30 cm × 0.5-1 mm; leaves up to 12 cm × 1.5 mm. Inflorescence terminal, with (1)2-3(5) spikes, 2.5-8 × 2-5 mm, obovoidal; involucral bracts 2(3), the largest up to 11 cm long. Spikelet bract 1.5-2 × 0.5-0.7 mm, obtrullate, apical part 0.1-0.4 mm long, (very) shortly acuminate, smooth at the top, yellowish brown to red brown, with pale to greenish midnerve. Spikelet prophyll and glume 1.4-1.75(1.9) mm long. Stamen 1, anthers 0.3-0.35 mm long. Style 0.2-0.3 mm long, with 3 branches. Fruit 1.0-1.3 × 0.25-0.4 mm, frontally oblong to oblanceolate, rounded trigonous on cross section, constricted at the base.

Distribution:
-America: from Mexico to Brazil.

Selected specimens:

MEXICO: Veracruz, 20 km W of Alvarado, R. Kral 25469 (MO).
HONDURAS: Colon, Capuchin site, J. Saunders 957 (BM, MO).
BELIZE: Boomtown, H. O'Neill 8887 (BM, BRI, C, K, LE).
NICARAGUA: Greytown, R. Tate 41 (K).
COSTA RICA: Guanacaste, La Cruz, D.N. Hepper 136 (BM).
PANAMA: Chagras, A. Fendler 346 (BM, K).
CUBA: Pinar del Rio, Laguna Santa Maria, E.L. Ekman 17272 (BM, G, UPS).
COLOMBIA: La Jagua, Magdalena Valley, C. Allen 529 (MO); El Valle, Buenaventura, E.P. Killip 5317 (K, US).
VENEZUELA: Tachira, Cerro La Espuma, J.A. Steyermark & R. Liesner 119246 (MO).
BRAZIL: w.p.l., Blanchet 2952 (BM, G); Piaui Prov., Gardner 2378 (K); Goias, Cerro de Morcêgo, 40 km NE of Formosa, H.S. Irwin c.s. 15164 (UB); Pernambuco, Tapera, D.B. Pickel 2448 (P, US).

32. **Lipocarpha schomburgkii** (Friedland) G. Tucker, J. Arnold Arbor. 68(4): 410 (1987). – Fig. 32, 40G-H.

Type: cf. *Hemicarpha schomburgkii* Friedland.

Hemicarpha schomburgkii Friedland, Amer. J. Bot. 28: 858-859, fig. 4 a-c (1941).
Type: Schomburgk 657, Guyana, ante 1839 (holotype NY n.v., isotype G, L, P).

Hemicarpha subsquarrosa auct., non (Muhlenberg) Nees: Nees C., 1842, in Martius, Fl. Brasil. 2(1): 61, quoad specim. Schomburgk 657.

Scirpus micranthus Vahl var. *humboldtii* auct., non (Roem. et Schult.) Böckeler: Böckeler O., 1870, Linnaea 36: 500, quoad specim. Schomburgk 657.

Tufted annual; roots thin; stem 2-6 cm × 0.35 mm; leaves up to 4 cm × 0,5 mm. Inflorescence pseudolateral, with 1-3 spikes, 1-5.5 × 1-3 mm, ovoidal to conical; involucral bracts 1-2, the largest up to 1.7 cm long, erect. Spikelet bract 0.5-0.8 × 0.15-0.2 mm, obtrullate, apical part 0.2-0.3 mm, acuminate, often with 1 spinule on the top, pale brown. Spikelet prophyll and glume absent. Stamen 1, anthers 0.2 mm long. Style 0.1 mm or shorter, with 2 branches. Fruit 0.4-0.45 × 0.15 mm, in frontal view narrowly obovate with small style base remnant, rounded on cross section, conspicuously curved in lateral view.

Distribution:
-America: Venezuela, Guyana.

Studied specimens:

VENEZUELA: Amazonas, San Juan-Morrocoy, Manapiare river, G. Agostini 1516 (MO, U, US); Apure, 3 km S of Pesquero, G . Davidse & A.C. González 12249A (MO), 9 km WNW of Paso de Cinaruco, G; Davidse & A.C. González 12449 (MO) & 27 km WSW of Paso de Cinaruco, G. Davidse & A.C. González 12564 (MO) & 12576 (MO).
GUYANA: w.p.l., Schomburgk 657 (isotype G, L, P).

33. **Lipocarpha sphacelata** (Vahl) Kunth, Enum. Pl. 2: 267 (1837). – Fig. 33, 36C.

Steudel E.G., 1855, Syn. Pl. Glum. 2: 130. – Böckeler O., 1871, Linnaea 37: 116. – Ridley H.N., 1884, Trans. Linn. Soc., ser. 2, 2: 162. – Clarke C.B., 1893, Fl. Brit. Ind. 6: 667. – Holm T., 1899, Amer. J. Sci., ser. 4,7: 173. – Rendle A.B., 1899, Cat. Afr. Pl. Welw. 2(1): 129. – Kern J.H., 1961, Reinwardtia 6: 32. – Raymond M., 1966, Dansk Bot. Arkiv 23: 318. – Raynal J., 1967, Adansonia, ser.2, 7: 85. – Hooper S., 1972, F.W.T.A., ed.2, 3: 328. – Hall J.B., 1973, Bot. J. Linn. Soc. 66: 345. – Govindarajalu E., 1981, Adansonia, ser.2, 20: 374. – Koyama T., 1982, Acta Phytotax. Geobot. 33: fig. 3. – Vanden Berghen C., 1982, Mat. Fl. Senegal 1: 32. – Haines R. & Lye K., 1983, Sedg. Rush. E. Afr.:298.

Type: cf. *Hypaelyptum sphacelatum* Vahl.

Hypaelyptum sphacelatum Vahl, Enum. 2: 283-284 (1805).
Steudel E.G., 1821, Nom. Bot., ed. 1,1: 419.
Syntypes: König s.n., India, 1774 (BM, C); Rottler s.n., India, 1798 (C, LE, M).

Tunga triceps Roxburgh, Fl. Ind. 1: 187 (1820).
Type: Roxburgh s.n., India, s.d. (holotype K? n.v., isotype BM, G, L, LE, P).

Hypoelytrum sphacelatum (Vahl) K.B. Presl, Reliq. Haenk. 1: 184 (1828).
Type: *Hypaelyptum sphacelatum* Vahl.

Hypolytrum ceylanicum Heyne ex Nees, Linnaea 9: 288 (1834), nom. nud.
Type: non indicatus.

Lipocarpha triceps (Roxburgh) Nees, Linnaea 9: 287 (1834).
Clarke C.B., 1902, F.T.A. 8: 470. – Peter A., 1928, Abh. Gesell. Wiss. Göttingen 13: 114. – Pfeiffer H., 1933, Repert. Spec. Nov. 33: 205. – Kükenthal G., 1934, Bot. Notiser 1934: 78. – Peter A., 1937, F.D.O.Afr.: 383. – Nelmes E. & Baldwin J., 1952, Amer. J. Bot. 39: 375. – de Meneses A., 1956, Garcia de Orta 4: 563. – Cufodontis G., 1970, Enum. Pl. Aethiop.: 1415.
Type: cf. *Tunga triceps* Roxburgh.

Cyperus ceylanicus Koyama, Bot. Mag. Tokyo 73: 438 (1960), non *Cyperus sphacelatus* Rottbøll (1773).
Type: cf. *Hypaelyptum sphacelatum* Vahl.

Tufted annual; roots thin; stem 5-40 cm × 0.75-1 mm; leaves up to 25 cm × 2 mm. Inflorescence terminal, with (1)2-3(4) spikes, 2-7(15) × 1.5-4 mm, ovoidal to conical; involucral bracts 2-3, the largest up to 15 cm long. Spikelet bract 1.3-1.7 × 0.6-0.85 mm, obovate to obtrullate, apical part 0.2-0.4 mm long, shortly acuminate, top smooth, body yellowish to pale brownish, top red brown. Spikelet prophyll and glume 1.1-1.4 mm long. Stamens 1-2, anthers 0.2-0.3 mm long. Style 0.1-0.25 mm long, with 3 branches. Fruit 1-1.25 × 0.4-0.45 mm, frontally obovate to subelliptical, trigonous on cross section, conspicuously beaked at the top and constricted at the base.

Distribution:
-Asia: India, Sri Lanka, Burma.

Selected specimens:

INDIA: Rugonathpur, C.B. Clarke 34451A (G,K); Madras, Irumbuliyur, near Perungalathur, E. Govindarajalu 5362 (L); Mysore, 3 km before Hassan from Dudda, S.S. Hooper & K.N. Gandhi HFP 2384 (K, MO, US); Orissa, Sambalpur, Raupara, H.F. Mooney 3636 (K, L, NY).
SRI LANKA: Inginiagala N.P., T. Koyama c.s. 13998 (C, K, NY); Doombera, Thwaites 3756 (BM, BR, G, K, LE, P).
BURMA: Meiktila, U Thein Lwin 405 (K, L).
THAILAND: Bua Yai, Korat, Put 4294 (BM, K, L).

Notes:

1. A priorable epitheton might be available from:

Hypolytrum gracile L.C.Richard, in Persoon, Syn. Pl. 1: 70 (1805).
Hypaelyptum gracile (L.C.Richard) Steudel, Nomencl. Bot., ed.1, 1: 419 (1821).
Lipocarpha gracilis (L.C.Richard) Nees, Linnaea 9: 287 (1834).
Lipocarpha sphacelata (Vahl) Kunth var. *gracilis* (L.C.Richard) Böckeler, Linnaea 37: 116-117 (1871).

In Richard (o.c.) type specimens are usually indicated by a reference to their country of origin, e.g. with *Hypolytrum latifolium* 'Hab. in India'. The Paris herbarium now contains a sheet labelled 'Herbarium Richard / *Hypoelytrum gracile* / *Scirpus monander* Willd.', followed by an extensive description. Data on collector, locality or date are completely absent. That could be the reason why Richard did not refer to any specimen at all under the discussed name. Moreover, this has led to much speculation on the origin of the plant. Most if not all authors first suggested and later on accepted a (South) American origin, equalling this plant with any of the American vicarious species of *L. sphacelata* (*L. maculata*, *L. mexicana*, *L. salzmanniana*) or even with the more distantly related *L. humboldtiana* (Kunth 1837: 268, Nees 1842: 64, Steudel 1855: 130, Böckeler 1880: 364, Pfeiffer 1933: 205 & 1935: 43, Eiten 1963: 222, de Castro Oliveira 1980: 364).

The single plant on the mentioned sheet however clearly (fruit conspicuously beaked !) represents *L. sphacelata*, a strictly Asian species. If this sheet really is the specimen Richard had at hand, then the well known and widely used name for the common, weedy species *L. sphacelata*, would have to be replaced by a name (*L. gracilis*) persistently used for taxa not including its type. Because of the uncertainty – the absence of any reference made by Richard to this sheet – and for reasons of clarity and stability, we prefer to continue using the epitheton '*sphacelata*', and to consider *Hypolytrum gracile* a confused name. The rejection of this name and the combinations based on it will be proposed.

Here we would like to make a renewed plea for the stability of names. A growing minority of taxonomists is well aware of the long term devastating effect of the pettyfogging approach towards nomenclature. In order to gain credit from the users and fund-releasing agencies, some fundamental alterations of and far-reaching restrictions to the Code will be necessary. Most important seem to be 1) the creation of approved lists for existing names, and 2) the formal examination and validation by an experts' team of proposed novelties (taxa, names, combinations) prior to their addition to the lists of approved names.

2. Raynal (1973: 161) mentions 3 stamens for this species, but he could have had the African *L. filiformis* before him. Both species however have only 1(2) stamens.

34. **Lipocarpha squarrosa** (Linnaeus) Goetghebeur, comb. nov. – Fig. 34, 40A-C.

Basionym: *Scirpus squarrosus* Linnaeus, Mant. Pl. 2: 181 (1771).

Vahl M., 1805, Enum. Pl. 2: 259-260. – Böckeler O., 1870, Linnaea 36: 735, quoad specim. asiat. – Clarke C.B., 1893, Fl. Brit. Ind. 6: 663. – Kern J.H., 1956, Reinwardtia 4: 93. – Raymond M., 1959, Natur. Canad. 86: 228. – Kern J.H., 1961, Reinwardtia 6: 34. – Kern J.H., 1962, Reinwardtia 6: 146. – Raymond M., 1966, Dansk Bot. Arkiv 23: 321. – Raynal J., 1968, Adansonia, ser. 2,8: 95, t. 1, fig. 9-12. – Kern J.H., 1974, Fl. Males., ser. 1, 7: 516.

Type: König s.n., India, s.d. (holotype LINN n.v., isotype BR, C, S).

Isolepis squarrosa (Linnaeus) Kunth, Nov. Gen. Sp. Pl. 1: 202 (1815), quoad comb.
Kunth C.S., 1837, Enum. Pl. 2: 202.
Type: cf. *Scirpus squarrosus* Linnaeus.

Ascolepis tenuior Steudel, Syn. Pl. Glum. 2: 105 (1855).
Type: Griffith s.n., India, s.d. (holotype P n.v., isotype G, NY).

Rikliella squarrosa (Linnaeus) J. Raynal, Adansonia, ser. 2,13: 154 (1973).
Type: cf. *Scirpus squarrosus* Linnaeus.

Lipocarpha microcephala auct., non (Vahl) Kunth: Hance H., 1866, Ann. Sci. Nat., sér. 5, 5: 249 – Long R.W.& Lakela O., 1971, Fl. Trop. Florida: 223-224.

Scirpus chinensis auct., non Osbeck: Raymond M., 1957, Natur. Canad. 84:123.

Tufted annual; roots thin; stem 2-20 cm × 0.3-0.5 mm; leaves up to 4 cm × 0.5 mm. Inflorescence pseudolateral, with 1-3 spikes, 2-10 × 1.5-4 mm, ovoidal; involucral bracts (1)2-3(5), the largest up to 4 cm, erect. Spikelet bract 1-1.5 × 0.2-0.4 mm, obtrullate, apical part 0.5-0.8 mm long, long acuminate, recurved, scaberulous at the top, body pale to red brown, top yellowish. Spikelet prophyll and glume absent. Stamens 1-2, anthers 0.15-0.2 mm long. Style 0.1 mm or shorter, with 3 branches. Fruit 0.4-0.55 × 0.2-0.3 mm, frontally obovate with small style base remnant, subtriquetrous on cross section.

Distribution:
-Asia: from India to China and Vietnam.
-America: 2 adventicious collections in the USA, S.Florida.

Selected specimens:

CHINA: Kwangtung, near Canton, Huan-pu, H.F. Hance 10152 (K, P, S).
INDIA: Punjab, Karnal, J.R. Drummond 24977 (K); Dehra Dun, Gamble 20197 (K); Bengal, near Calcutta, J.W. Helfer 144 (BR, C, G, L, NY, P).
SRI LANKA: Wilpattu N.P., F.R. Fosberg c.s. 50711 (NY) & T. Koyama 13373 (K, NY); w.p.l., Thwaites 854 (G, K, P).
BURMA: Mergui, Dunaon, A. Meebold 14709 (B); Ramree Island, Kyaukpyu, E.G. Wallace 9233 (K, L).
THAILAND: Doi Sutep, Kerr 2244 (K) & T. Samarensen c.s. 5900 (C); Kanburi, T. Smitinand 3861 (L)
KAMPUCHEA: near border with Thailand, P. Couderc s.n. (1883-1885) (K).
VIETNAM: Saigon, F. Evrard 130 (P); Annam, Torong, O. Kuntze 3594 (NY).
MALAYSIA: Malaya, Johore, J. Sinclair 9369 (K, L); Penang, J. Sinclair SF 39292 (K, L, P).
SINGAPORE: J.W. Purseglove 4047 (K, L).

USA: Florida, W. Sanibel, W.C. Brumbach 7337 (US); near Immokalee, specimen not cited (fide Long R.W. & Lakela O., Fl. Trop. Florida: 223-224 (1971) sub *L. microcephala*).

Notes:

1. This species bears a widely misapplied name. In e.g. Clarke (1902: 458-459) are united under this name specimens belonging to 4 (four !) different species: *Ascolepis dipsacoides* Schumacher (Barter 761 p.p.), *A. pusilla* Ridley (Barter 761 p.p.), *Lipocarpha kernii* (Schweinfurth 2572 & 3003), and *L. rehmannii* (Whyte s.n.). Confusion started early and lasted until quite recently, when Raynal (1968: 86-91) brought the needed clarification.

2. The erect larger involucral bract is a reliable diagnostic feature for distinguishing this species at a glance from the resembling *L. kernii*. On one sheet (Gamble 20342, K) however, a few plants have their involucral bracts reflexed. It has not escaped our attention that in these few plants other irregularities exist in the floral structures, e.g. the branching of the spikes' rachis!

3. Extremely small individuals (e.g. Helfer 144, BR, and Saldanha 13530B, K) may come to resemble *L. micrantha* and its New World relatives. The trimerous ovary is here the reliable distinguishing character.

4. We have not seen the material on which the citation as *L. microcephala* in Long & Lakela (1971: 223) was based. Nevertheless from their description ('ascending bract 12-20 mm long', 'mature nutlet ... 0.3 mm long ... three-angled, obovate') it is apparent that not *L. microcephala* but rather *L. squarrosa* is involved.

35. **Lipocarpha thermalis** J. Raynal ex Goetghebeur, sp. nov. – Fig. 35.

Type: G.D. de Witte 5199, Zaire, P.N. Upemba, sources chaudes de Kiabukwa, près de Bukena, sur terrain sablonneux, près de la source, 11-1-1949 (holotype BR).

Primo adspectu *L. hemisphaericae* maxime simile, sed spiculae bractea maiore (1.0-1.1 × 0.9-1.0 mm), spiculae prophyllo glumaque longioribus (0.9-1.0 mm), atque staminibus 3 et stigmatibus 3 differt.

Tufted annual; roots thin; stem 8-15 cm × 0.3-0.5 mm; leaves up to 5 cm × 0.5 mm. Inflorescence pseudolateral, with 1 spike, 1-4 × 1-2 mm, ovoidal to spherical; involucral bract 1, up to 2 cm long, erect. Spikelet bract 1-1.1 × 0.9-1 mm, broadly obovate, conspicuously shouldered, apical part c. 0.3 mm long, shortly acuminate, top smooth, pale brown with yellowish top. Spikelet prophyll and glume 0.9-1 mm long. Stamens 3, anthers 0.8 mm long. Style 0.1 mm or shorter, with 3 branches. Fruit 0.7 × 0.25 mm, frontally obovate to subelliptical with small style base remnant, rounded trigonous on cross section.

Distribution:
-Africa: S.Zaire, known only from the type collection.

Studied specimens:

ZAIRE: Parc National Upemba, near Bukena, hot springs of Kiabukwa, G.F. de Witte 5199 (BR).

Note.

1. The type sheet bears a label with the manuscript name *L. thermalis* written by the deplored Jean Raynal.

7. NOMINA EXCLUDENDA

Hemicarpha axillaris Britton ex Th.Durand & B.D.Jackson, Index Kewensis, Suppl. 1: 201 (1906), nom. nud., err. pro **Rhynchospora axillaris** (Lamarck) Britton.

Hemicarpha nuda Böckeler, Flora 41: 604-605 (1858).
Type: 'E Nova Hollandia ?' (holotype B n.v.).
According to Böckeler (1858: 605) a similar plant (same collection ?) was identified by Sprengel as *Scirpus tener*. Blake (1939: 114-115) brought this name in the synonymy of *Eleocharis acuta* R.Brown. However, Böckeler's description is probably partly erroneous and his notes confused, only an inspection of his type will elucidate this problem.

Hypaelyptum pungens Vahl, Enum. Pl. 2: 283 (1805).
Type: L.C.Richard s.n., 'America meridionalis', s.d. (holotype C ? n.v.).
= **Hypolytrum pulchrum** (Rudge) H.Pfeiffer

Lipocarpha foliosa Miquel, Fl. Ned. Ind. 3: 332 (1856).
Type: Junghuhn s.n., Sumatra, s.d. (holotype L n.v.).
= **Remirea maritima** Aublet.

Lipocarpha multibracteata C.B.Clarke, in Thiselton-Dyer, Fl. Trop. Afr. 8: 472 (1902).
Type: Welwitsch 6773, Angola, 1860 (holotype BM).
= **Ascolepis pusilla** Ridley.

Lipocarpha paradoxa Chermezon, Bull. Soc. Bot. France 68: 425 (1922).
Type: H.Perrier de la Bâthie 2423b, Madagascar, c. 1913 (holotype P n.v.).
= **Alinula paradoxa** (Chermezon) Goetghebeur & Vorster.

Lipocarpha tenera auct., non Böckeler: Camus E.G., 1884, in H.Lecomte, Fl. Gén. Indochine 7: 143.
= **Ascolepis pusilla** Ridley.

Tunga diandra Roxburgh, Fl. Ind. 1: 188 (1820).
Type: Roxburgh s.n., 'Amboyna', s.d. (holotype ? n.v.).
= **Hypolytrum nemorum** (Vahl) Sprengel.

8. ALPHABETICAL LIST OF ACCEPTED NAMES AND SYNONYMS IN *LIPOCARPHA*.

Accepted names are printed in bold face. The numbers are referring to the text number of the species, 'excl.' refers to the annotated list of excluded names.

Ascolepis
kyllingioides 20; *tenuior* 34; *venezuelensis* 14.

Cyperus
ceylanicus 33; *echinolepis* 2; *lipocarpha* 6; *neobarteri* 5; *neotropicalis* 17; *persquarrosus* 22; *prieurianus* 25; *sellowianus* 14; *submaculatus* 6; *unistamen* 22; *zollingerianus* 20.

Fuirena
nana 22.

Hemicarpha
aristulata 3; *axillaris* excl.; *caespitula* 19; *drummondii* 10; *intermedia* 3; *isolepis* 13; *micrantha* 19; *micrantha* var. *aristulata* 3; *micrantha* var. *drummondii* 10; *micrantha* var. *minor* 19; *nuda* excl.; *occidentalis* 23; *schomburgkii* 32; *schraderi* 13; *schraderiana* 13; *senegalensis* 13; *subsquarrosa* 19; *subsquarrosa* var. *minor* 19.

Hypaelyptum
albiceps 2; *albidum* 6; *argenteum* 6; *filiforme* 12; *gracile* 33, note; *microcephalum* 20; *pulcherrimum* 22; *pungens* excl.; *senegalense* 6; *sphacelatum* 33.

Hypoelytrum
sphacelatum 33.

Hypolytrum
argenteum 6; *argenteum* auct. 14; *capillare* 19; *ceylanicum* 33; *glomeratum* 14; *gracile* 33, note; *laevigatum* 6; *senegalense* 6.

Isolepis
bellula 13; *caespitula* 19; *hemisphaerica* 13; *humboldtii* 19; *kernii* 15; *micrantha* 19; *minima* 13, note; *rehmannii* 29; *squarrosa* 34; *squarrosa* auct. 19 & 20, note; *subsquarrosa* 19; *subsquarrosa* var. *minor* 19.

Kyllinga
baoulensis 5.

Kyllingia
albescens 6; *maculata* 17; *squarrosa* 20.

Lipocarpha
abietina 1; **albiceps** 2; *argentea* 6; *argentea* auct. 14; **aristulata** 3; **atra** 4; *atra* auct. 1; *atra* var. *barteri* 5; *atropurpurea* 22; **barteri** 5; *barteri* auct. 16; **chinensis** 6; *cochleata* 31; **comosa** 7; **constricta** 8; **crassicuspis** 9; *debilis* 6; **drummondii** 10; **echinus** 11; **filiformis** 12; *foliosa* excl.; *glomerata* 14; *gracilis* 33, note; **hemisphaerica** 13; **humboldtiana** 14; *isolepis* 13; **kernii** 15; *laevigata* 6; **leucaspis** 16; **maculata** 17; **mexicana** 18; **micrantha** 19; *micrantha* 13; **microcephala** 20; *microcephala* auct. 34; *minima* 22; *monocephala* 13; **monostachya** 21; *multibracteata* excl.; **nana** 22; **occidentalis** 23; *paradoxa* excl.; **perspicua** 24; **prieuriana** 25; *prieuriana* var. *acuta* 1, note; *prieuriana* var. *crassicuspis* 9; *pulcherrima* 22; *pulcherrima* f. *luxurians* 22; *purpureolutea* 2; **pygmaea** 26; *rautanenii* 13; **raynaliana** 27; **reddyi** 28; **rehmannii** 29; **robinsonii** 30; **salzmanniana** 31; **schomburgkii** 32; *schweinfurthiana* 25; *sellowiana* 14; *senegalensis* 6; **sphacelata** 33; *sphacelata* auct. 12; *sphacelata* var. *barteri* 12; *sphacelata* var. *gracilis* 33, note; **squarrosa** 34; *tenera* 22; *tenera* auct. excl.; **thermalis** 35; *triceps* 33; *triceps* auct. 6; *triceps* var. *latinux* 1; *zollingeriana* 20.

Mariscus
maculatus 17.

Rikliella
australiensis 20; *kernii* 15; *rehmannii* 29; *squarrosa* 34.

Schoenus
laevigatus 6.

Scirpus
chinensis 6; *chinensis* auct. 34; *dietrichiae* 20; *hemisphaericus* 13; *humboldtii* 19; *hystricoides* 29; *hystrix* auct. 29; *isolepis* 13; *kernii* 15; *leptocarpus* 20; *micranthus* 19; *micranthus* var. *drummondii* 10; *micranthus* var. *humboldtii* 19; *micranthus* var. *humboldtii* auct. 32; *minimus* 19; *occidentalis* 23; *pycnostachyus* 31; *rehmannii* 29; *senegalensis* 6; *sesquipollicaris* 19; *setaceus* var. *monandra* 13; *squarrosus* 34; *squarrosus* auct. 15, 20 & 29; *squarrosus* var. *dietrichiae* 20; *subsquarrosus* 19.

Tunga
diandra excl.; *laevigata* 6; *triceps* 33.

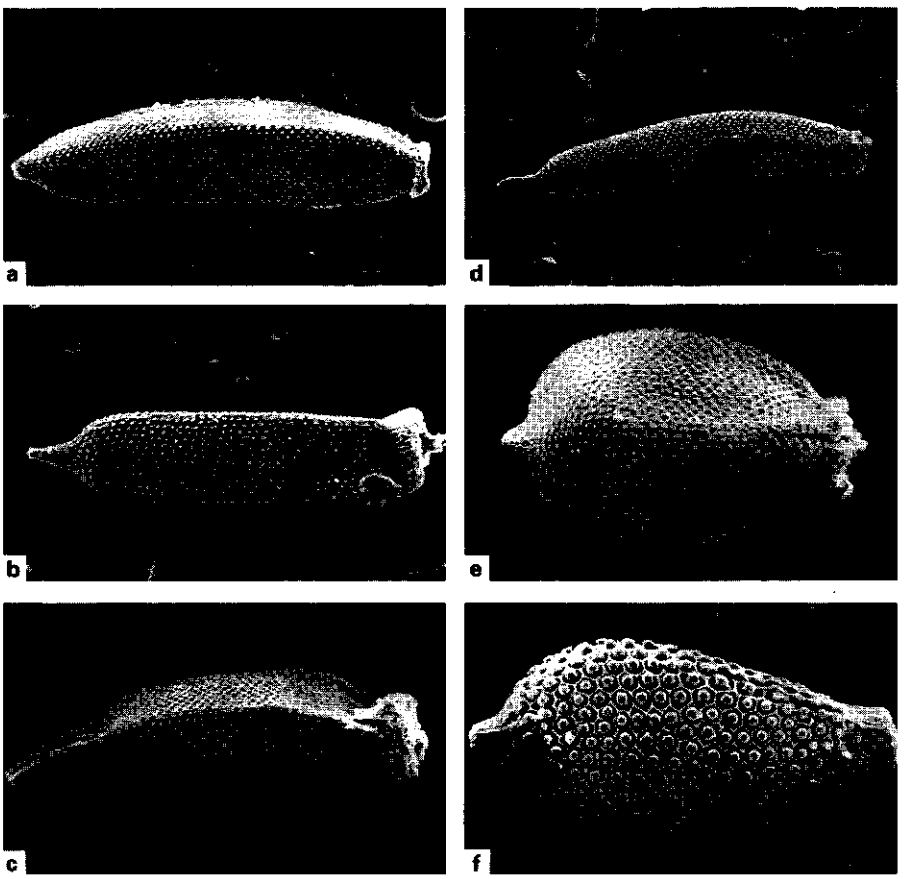

Fig. 36A. *L. pygmaea* Kern, fruit (Wallace 9211, C). – B. *L. salzmanniana* Steudel, fruit (Salzmann 603, G isotype). – C. *L. sphacelata* (Vahl) Kunth, fruit (Koyama 14052, C). – D. *L. microcephala* (R. Brown) Kunth, fruit (Brass 19732, G). – *L. prieuriana* Steudel, fruit (Leprieur 8, G). – F. *L. rehmannii* (Ridley) Goetghebeur, fruit (Dinter 7560, G). Bar: 0.1 mm.

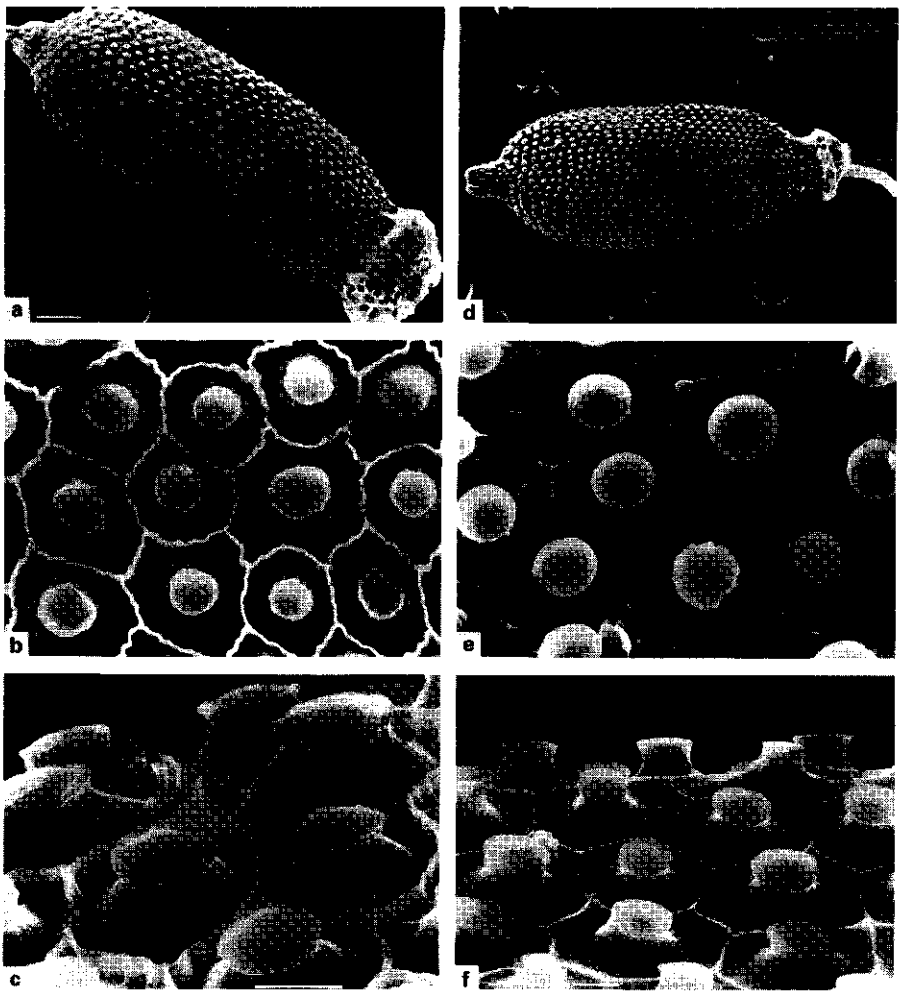

Fig. 37A. *L. maculata* (A. Michaux) Torrey, fruit. – B. id., silica bodies, top view. – C. id., side view. (A-C: Bradley 3605, S) – D. *L. humboldtiana* Nees, fruit. – E. id., silica bodies, top view. – F. id., side view. (D-F: Pedersen 9006, G). Bar: 0.1 mm (A,D), 0.01 mm (B,C,E,F).

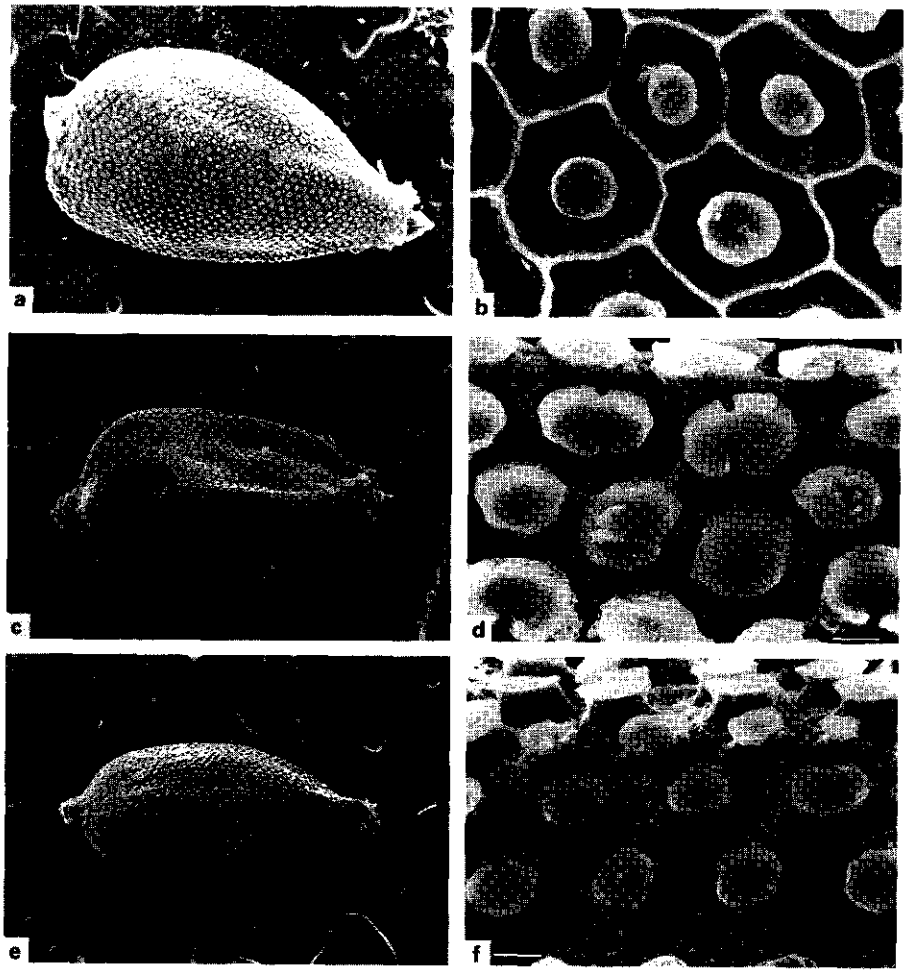

Fig. 38. *Lipocarpha albiceps* Ridley. – A,C,E. fruit. – B. silica bodies, top view. – D,F. id., side view. (A-B: Robinson 4482, M; C-D: Lisowski 11383, BR; E-F: Welwitsch 6786, COI). Bar: 0.1 mm (A,C,E), 0.01 mm (B,D,F).

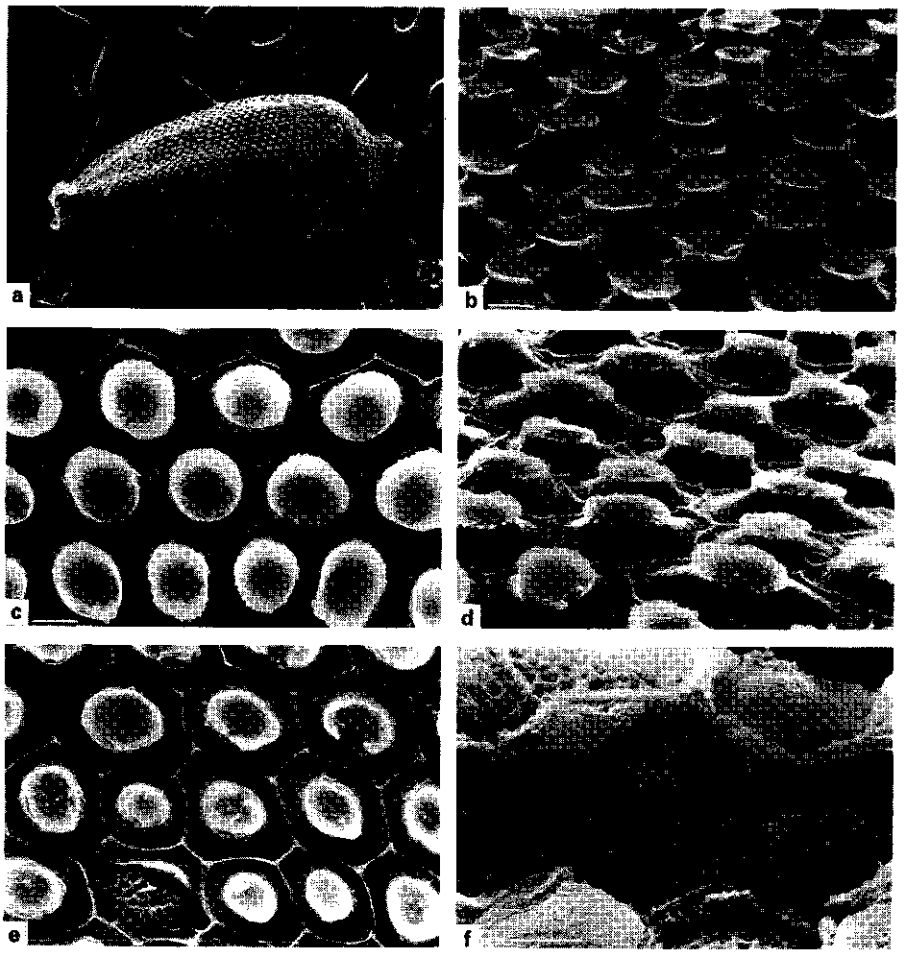

Fig. 39A. *Lipocarpha chinensis* (Osbeck) Kern, fruit. – B,D. id., silica bodies, side view. – C. id., top view. (A-B: Løfgren & Edwall 2005, C; C-D: Strackey & Winterbottom 1247, BR). – E. *L. robinsonii* J. Raynal, silica bodies, side view. – F. id., base of removed silica body. (E-F: Robinson 5053, M). Bar: 0.1 mm (A), 0.01 mm (B-F).

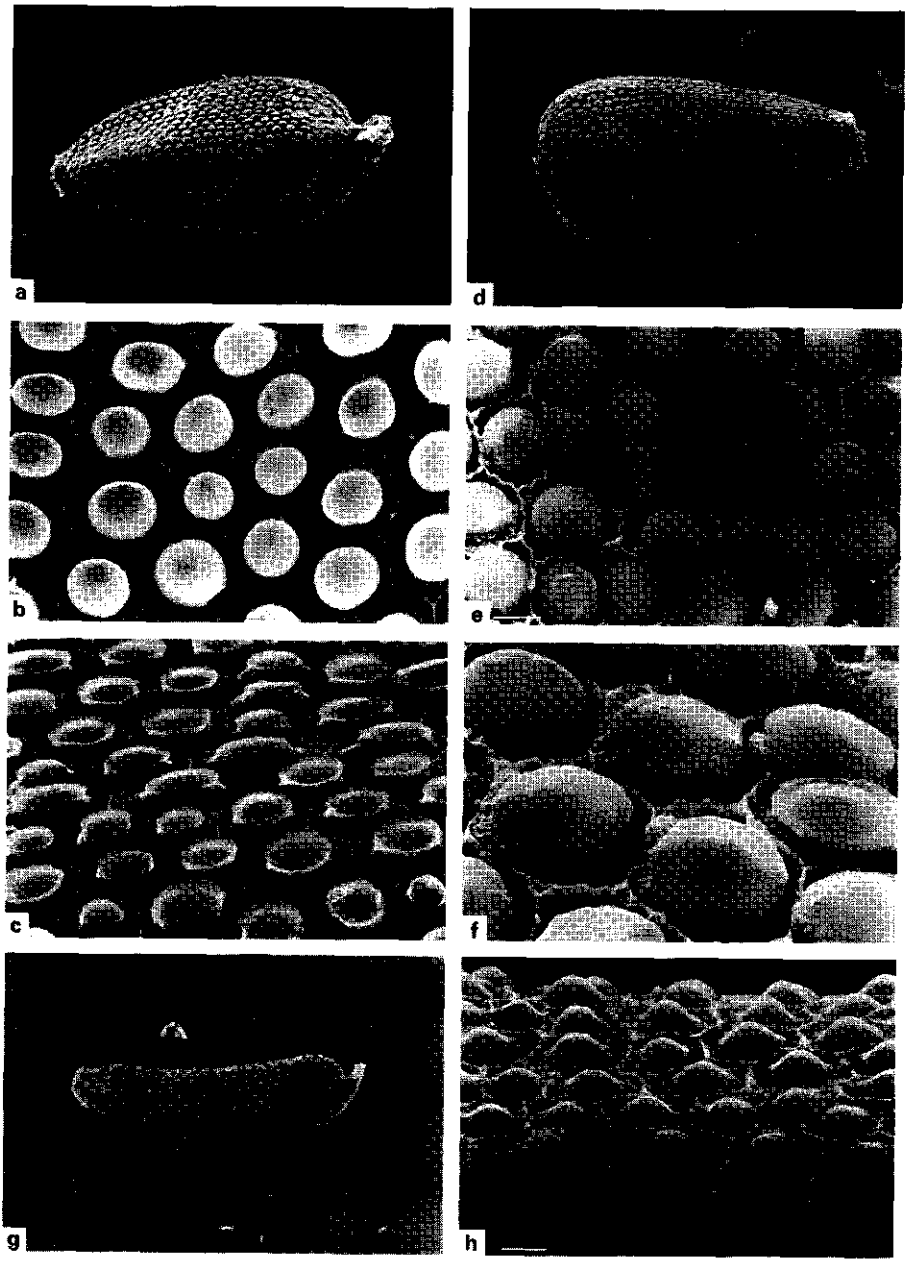

Fig. 40A. *Lipocarpha squarrosa* (L.) Goetghebeur, fruit. – B. id., silica bodies, top view. – C. id., side view. (A-C: Thwaites 854, G). – D. *L. kernii* (Raymond) Goetghebeur, fruit. – E. id., silica bodies, top view. – F. id., side view. (D-F: Cremers 952, BR). – G. *L. schomburgkii* (Friedland) Tucker, fruit. – H. id., silica bodies, side view. (G-H: Schomburgk 657, G isotype). Bar: 0.1 mm (A,D,G), 0.01 mm (B,C,E,F,H).

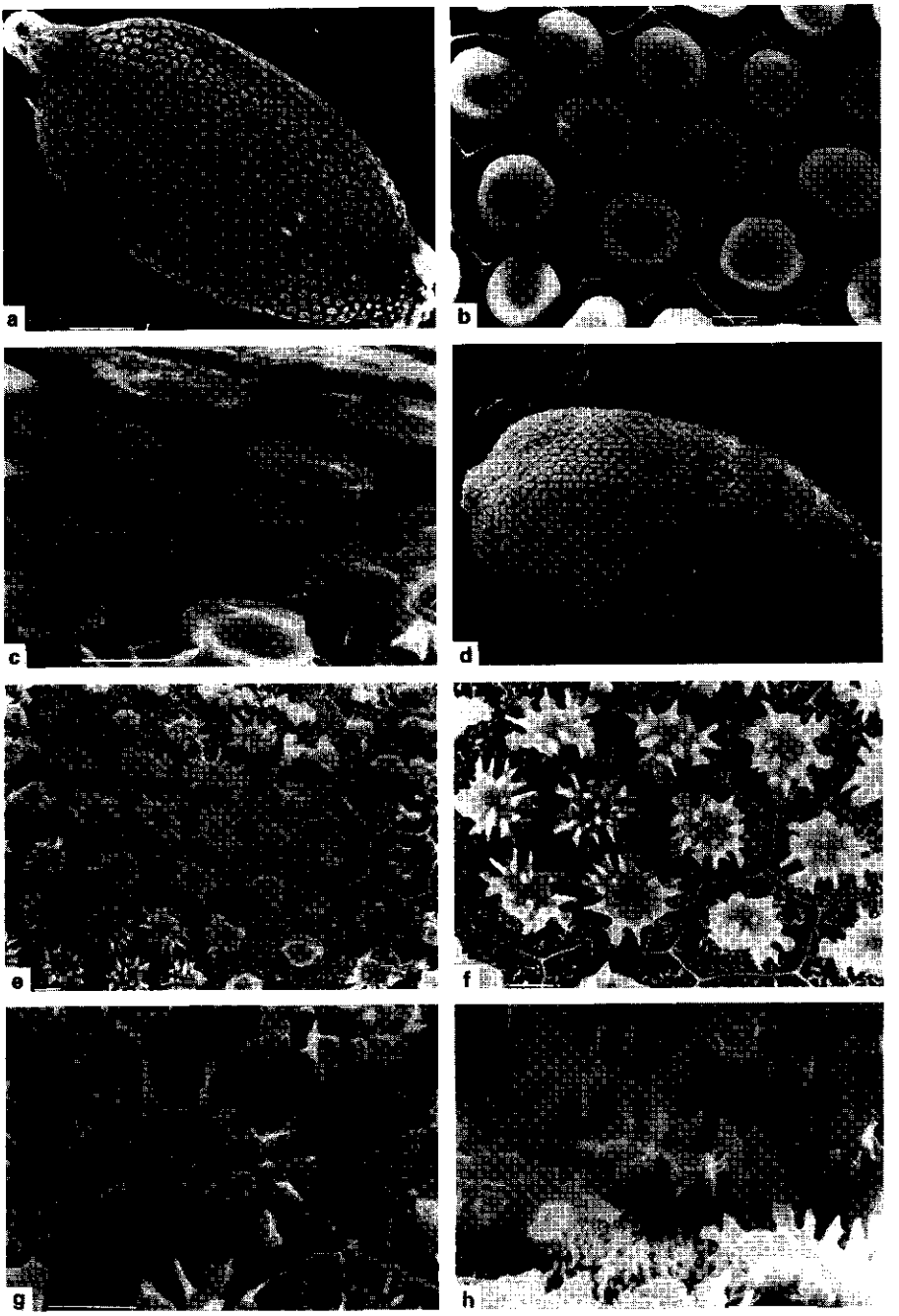

Fig. 41A. *Lipocarpha filiformis* (Vahl) Kunth, fruit. – B. id., silica bodies, top view. – C. id., side view. (A-C: Luja 225, BR). – D. *L. albiceps* Ridley, fruit. – E. id., silica bodies, side view. – F. id., top view. – G. id., silica body, top view. – H. id., side view. (D-H: Lye 5698, UPS). Bar: 0.1 mm (A,D), 0.01 mm (B,C,E-H).

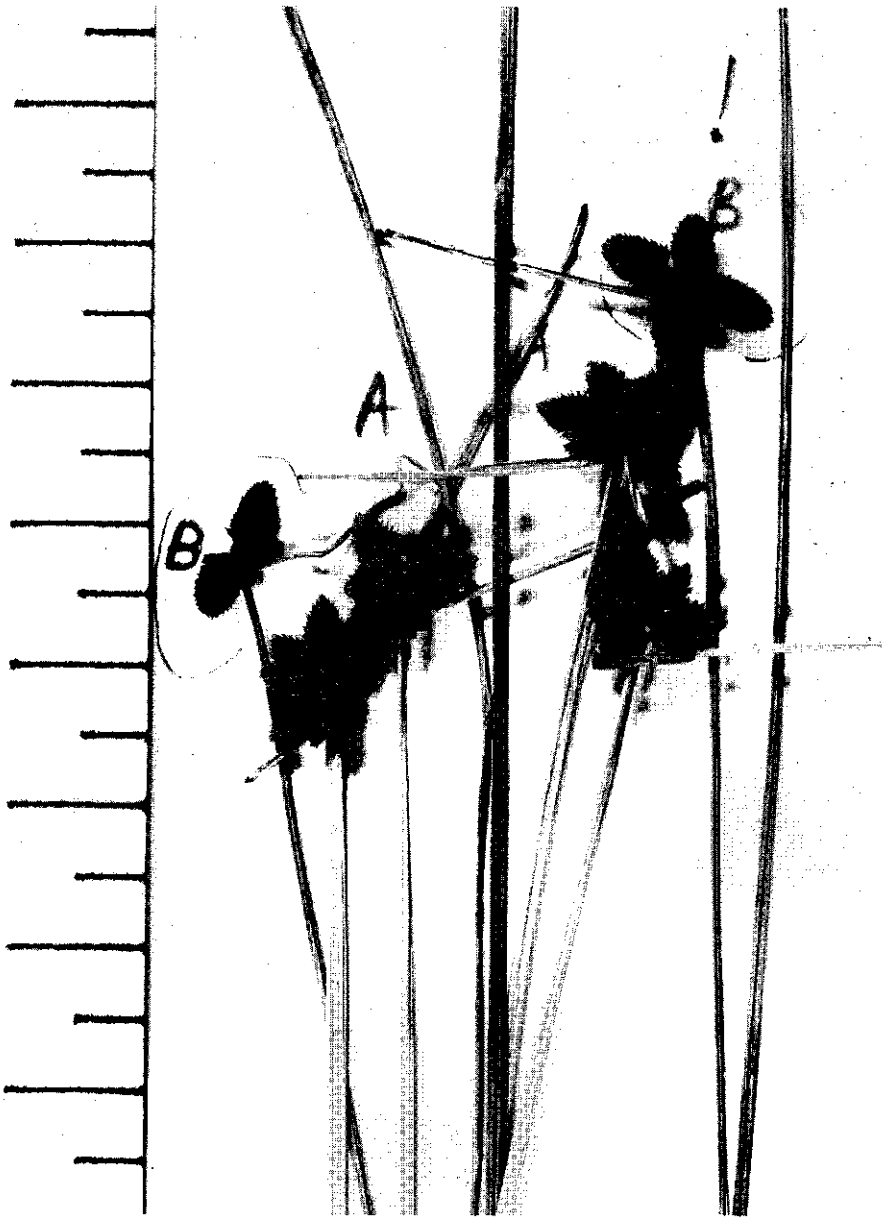

Fig. 42. *Lipocarpha atra* Ridley (A) and *L. abietina* Goetghebeur (B), detail of mixed sheet (Faulkner 16, LISC). Scale in 1/2 cms.

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