

# The South African Species of *Lagarosiphon*

by

A. A. Obermeyer

An examination of the southern African species of this genus revealed that each had a typical leaf-structure, a useful character since plants are often sterile.

Very little was known of the life-history of this genus until Wager's work appeared in 1928.\* Afterwards Dr. M. Ernst-Schwarzenbach also studied the flower-biology of *L. muscoides*.† Wager observed 2 species common on the Highveld, *L. muscoides* and *L. major*. As the other three South African species appear closely related, it is likely that in general their behaviour will be similar.

Examining dried material, especially of such small dimensions, is not very satisfactory. Living plants must be studied in the manner in which it was done by Wager, to give us a more complete picture of their life-history. As so little was known about these species when Wright made his compilation for the Flora of Tropical Africa, his treatment of them is unsatisfactory. Some are no better than generic descriptions and without having seen the types, it is impossible to recognize the plants concerned.

*Lagarosiphon* Harv. in Hook., Journ. Bot. Lond. 4: 230 (1841). Benth. & Hook. f., Gen. Pl. iii: 450 (1883). Phill., Gen. ed. 2: 58 (1951).

Submerged, dioecious, rooted herbs from a perennial rhizome with long terete leafy stems; branches arising from inside a spathe next to a flower. *Leaves* widely spaced below, dense above, alternate, subopposite or whorled; with 2 minute narrowly ovoid intravaginal squamulae; margin toothed (each tooth unicellular); lamina with variation in cell structure. *Male inflorescence* axillary; spathes 2 united bracts, obovate or ovate to lanceolate, compressed or cup-shaped, dentate; the axis (rudimentary inflorescence) producing numerous pedicellate flowers (up to 50 were counted in *L. major*) consecutively; the buds (in South African species) become detached and rise to the surface before anthesis where they expand; perianth in 2 whorls of 3 segments each (the outer segments slightly narrower), recurving suddenly to form a bell-shaped structure that floats on the water; stamens 3, the filaments when expanded situated parallel to the water-surface with the anthers at right angles to them; each pollen-sac containing 4 tetrads, grains large; staminodes 3, longer than the stamens, papillate and usually coloured above, joined at the top, acting as a sail. *Female inflorescence* axillary; spathes 2, fused, narrowly oblong, ovoid or cylindrical, entire or toothed, containing 1–2–3 flowers (when the capsule develops the inner spathe, which is usually larger, splits centrally along the midrib); perianth-tube exerted laterally near the apex of the spathes, lengthening and giving off gas-bubbles continuously inside the delicate tube to buoy it up so that it will reach the surface (ultimate length of flower depends on the species: in *L. muscoides* up to 25 cm, in *L. major* 15 cm; if it has not reached the surface by then, it will die); limb 6-lobed; staminodes 3, small, filiform; ovary 1-locular with 3 parietal placentas; styles 3, adnate to the perianth-tube, each divided above into 2 long, papillate, often brightly coloured stigmas; ovules 6–30, orthotropous, funicle short or long, straight or bent. *Capsule* ovoid or cylindrical, attenuate at the apex into a beak (the persistent base of the perianth), protruding from torn spathe-valves; becoming mucilaginous and bursting irregularly and so dispersing the seeds:

\* Wager, V. A. in Trans. Roy. Soc. S.A. 16: 191–204 (1928).

† Ernst-Schwarzenbach, M. in Ber. Schweiz. Bot. Ges. 5: 56–58 (1945).

seeds cylindrical, with a short stipe at the base, pointed at the apex, size varying with each species, closely ribbed or honeycombed, buoyant at first, sinking later (viable only after about 6 months in *L. muscoides* and *L. major*, unknown in other species).

About 16 species found in Africa, 2 endemic to Madagascar. *L. major* is reported as an adventive in Europe and New Zealand.

Leaves thin, transparent, 0.5–2 mm broad, cells usually longer than broad:

Leaves with a hyaline margin consisting of at least 3 layers of cells without chlorophyll 1. *L. muscoides*

Leaves green to the margin, teeth on small excrescences:

Leaves in verticils of 6–8; central band usually narrow and the cells not much different from rest of lamina..... 2. *L. verticillifolius*

Leaves alternate or sometimes in verticils of 2–5; central band usually wide, at least near the base, with the cells much larger and with transverse septa..... 3. *L. crispus*

Leaves more solid, opaque, 2–3 mm broad, cells small, somewhat papillose-rhomboid:

Teeth of leaves minute, blunt, ascending..... 4. *L. major*

Teeth of leaves on triangular excrescences, sharp, patent..... 5. *L. ilicifolius*

1. *L. muscoides* Harv. in Hook. Journ. Bot. Lond. 4: 230, t. 22 (1841). Wright in F.T.A. 7: 3 (1897); F.C. 5, 3: 1 (1912). Marloth, Flora of S.A. 4: 15, fig. 6 t. 2 (1915). Wager in Trans. Roy. Soc. S.A. 16: 191 (1928). Ernst-Schwarzenbach in Ber. Schweiz. Bot. Ges. 55: 56 (1945). Syntypes: Cape, Albany, *Zeyher* ♂, ♀ (TCD); without locality, *Drege* ♀ (TCD).

*Hydrilla dregeana*, Presl, Bot. Bemerk. 112 (1844). Type: Cape, Port Elizabeth district, swamp near the mouth of the Swartkops River, *Drege* 2276c. *H. muscoides* Planch. in Ann. Sci. Nat. Sér. 3, Bot. 11: 79 (1849). *Haloragea* Drege, Zwei Pfl. Doc. 130 (1843). *Fluvialea* Drege, l.c. 136, 140.

*Stems* 0.5–2 mm in diam., usually weak. *Leaves* alternate, somewhat laxly spaced on the stems, spreading, soft, thin, transparent, light green, linear, average size 10 by 1.5 mm, apex acute, margin with 3 rows of hyaline cells, teeth many, acicular, pointing upwards, leaf-tip with 2 slightly larger teeth, cells of lamina elongate-oblong, with 2–3 rows of cells on each side of midrib which are slightly lighter in colour, outer row with thickened cell walls. *Male inflorescence*: spathe-valves flat, obovate, about 4 by 2 mm with about 23 teeth on each side; with up to 40 flower-buds inside, flowers white to pink. *Female inflorescence*: spathe-valves, ovoid, about 4.5 by 1.5 mm, with about 25 long, acute teeth on each side; perianth white, maximum length up to 25 cm; ovary flask-shaped, stigmas purple, ovules about 12, funicles straight or bent in narrow ovaries. *Capsule* narrow-ovoid to tubular, about 5–10 mm long; about 9 seeds in each capsule, breaking away from the placenta and pushed upwards one behind the other, about 2–2.5 mm long, surface honeycombed.

Widespread in the summer rainfall areas of southern Africa, from Uitenhage in the eastern Cape to Natal, Orange Free State, northern Cape, South West Africa, Bechuanaland, Transvaal, Southern Rhodesia, extending to tropical east Africa.

CAPE.—Port Elizabeth, Gamtoos River, *Schlechter* 6059. Albany: Collingham near Grahamstown, *Dickens*. Hay: Papkuil sloot, *Wilman* 1247. Barkly West: in vlei at Holpan, *Acocks* 2308.

ORANGE FREE STATE.—Kroonstad: near convent, *Pont* 602. Fauresmith: near Luckhoff, farm Klein Gryskop, 445, *Smith* 499.

BASUTOLAND.—Banen, boggy water of stream to Pela Tseon River, *Jacot-Guillarmod* 2066. Leribe: Makokoane, *Dieterlen* 1031.

NATAL.—Bergville: Rustenberg Road from Bergville, *Edwards* 2409.

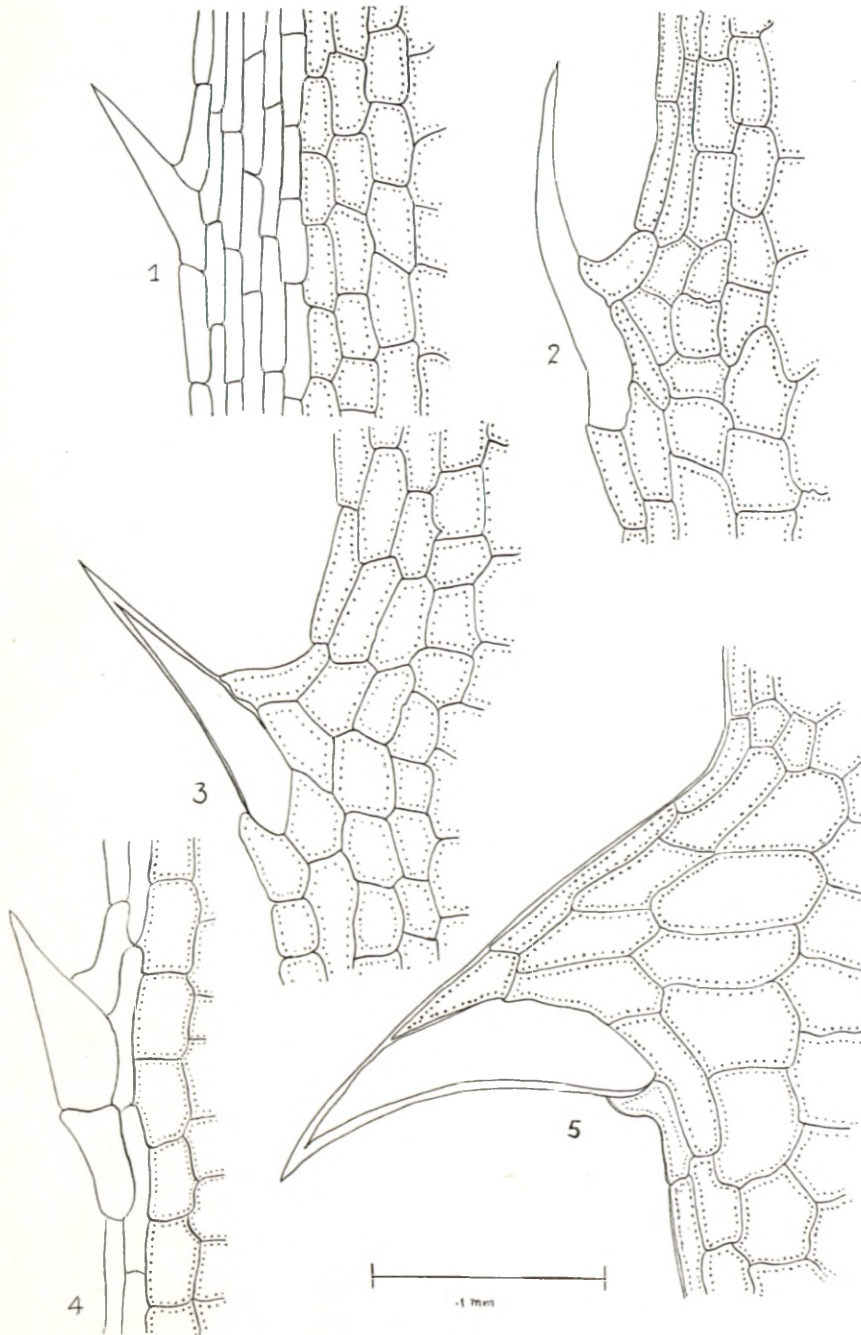


FIG. 1.—Leaf margins of *Lagarosiphon* species showing spines and location of chloroplasts (dotted lines). 1. *L. muscoides* Harv. (Burr Davy, PRE 12792) Transvaal, Christiana. 2. *L. verticillifolius* Oberm. (Sim 436) Moçambique, Lourenço Marques. 3. *L. crispus* Rendle (Erens 351) Bechuana-land, Tsotsoroga Pan about 150 m. North of Maun. 4. *L. major* (Ridley) Moss ex Wager (Cooper 17) Cape, Victoria East, Umdizine River. 5. *L. ilicifolius* Oberm. (Galpin 7027) Southern Rhodesia, Zambesi River above Victoria Falls.

TRANSVAAL.—Christiana: *Burt Davy* 12792. Potchefstroom: Witpoort, *Louw* 1708. Benoni: *Moss* 11175. Pretoria: Kaallaagte 5 miles E. of Hammanskraal, *Mauve & Schlieben* 9599. Belfast: pan 5 miles W. of Belfast, *Obermeyer* in TRV 36067. Kruger National Park: Bobubu, *van der Schijff* 5671. Pietersburg: Blauwberg, Nacarene, *Strey & Schlieben* 8579. Soutpansberg: Duwenhage's Pan, *Schweickerdt & Verdoorn* 627.

SOUTH WEST AFRICA.—Gibeon: Haribes, *Volk* 12405. Rehoboth: Bullspoort, *Strey* 2118; *Rodin* 2940. Okahandja: *Bradfield* 390. Grootfontein: Kumkaus, *Kinges* 2836; Grosshuis, in vleiwater, *Schoenfelder* S648 ♀; *Dinter* 7384 ♀.

BECHUANALAND.—Northern part, Mumpswe Pan, 25 miles N.N.W. of mouth of Nata River, *Drummond & Seagrief* 5165; 5166.

SOUTHERN RHODESIA.—Salisbury, 6 Mile Spruit, *Wild* 3799; 3800; 3803 (SRGH); Avondale, *Eyles* 5841 (SRGH). Wankie Game Reserve, 8 miles from Ngomo, *Weir* 9 (SRGH).

TANGANYIKA.—Mbulu: Mbulumbula, *Greenway* 6799 (SRGH).

The following specimens cannot be named satisfactorily:—

CAPE.—Komga: near Komga, *Flanagan* 1335.

NATAL.—Dundee: Tim Worthington Dam, *Hammer*. Estcourt: Tabamhlope Research Station, Little Bushmans River, *West* 900. Newcastle: west of Laingsnek—Quaggasnek Road, *Edwards* 2369.

TRANSVAAL.—Standerton: Farm Beginsel, *Burt Davy* 2287. Potchefstroom: Frederikstad, Mooi River, *Louw* 1709.

In appearance these plants resemble an overgrown *L. muscoides* plant. Wager noted that he found this large form usually together with *L. muscoides* in Natal. There is only one fertile collection (*Flanagan* 1335). As *L. muscoides* and *L. major* are both recorded from these regions, it was thought that they could be hybrids but Ernst-Schwarzenbach, who crossed these two taxa, found them to be incompatible [Oesterr. Bot. Zeitschr. 100: 420 (1953)].

## 2. *L. verticillifolius* Oberm., sp. nov.

Planta tenuis. *Caulis* ca 0.5–1 mm diam. *Folia* 5–7 verticillata, verticillis ad apicem congestis; lamina pellucida patens linearis, margine chlorophyllacea dentibus multis brevibus acicularibus e exrescentibus triangularibus ortis, cellulis centralibus amplioribus parte media anguste formantis. *Spatharum valvae*, ♂, lanceolatae paucidentatae apice acutae, ♀, ad basin ovoidea ad apicem tubulosae tantum pauci-dentatae; ovarium 9–12 ovulis funiculo recto brevi. *Capsula* ovoidea attenuata. *Semina* 1.5 mm longa.

Type: Natal, Hlabisa, Hluhluwe Game Reserve, *Ward* 2551 ♀ (PRE, holotype).

Stems 0.5–1 mm in diam., fairly firm, densely leafy. *Leaves* in verticils of 7 (sometimes 5) occasionally sub-whorled, closely spaced on the stems (internodes up to 2 cm below, 4–2 mm above), spreading, soft, thin, transparent, linear, average size 10 by 0.5 mm, but occasionally up to 20 mm; margin chlorophyllous, teeth many, short, acicular, pointing out- and upwards, emerging from a triangular excrescence; leaf-tip 1–2-toothed similar to the marginal teeth, with a few rows of cells beside the midrib that are slightly larger, lacunar, the outer row with thickened walls. *Male inflorescence* with the spathe-valves lanceolate, convex, about 2.5 by 1 mm, pointed at the apex, with a few small marginal teeth. *Female inflorescence* with the spathe-valves ovoid below, tubular above, apex bifid, occasionally with a few marginal teeth; perianth white; stigma-branches long, with large papillae; ovary with 9–12 ovules,

funicle straight, shorter than ovule. *Capsule* ovoid 5 by 2 mm, elongated at the apex; seeds 1.5 mm long, narrowly grooved and with some protrusions (glandular?).

Recorded from Southern Rhodesia, eastern Transvaal, Zululand and Mozambique.

SOUTHERN RHODESIA.—Nuanetsi, 30 miles S. of Chipinda Pools, *Phipps* 2909; Malangwe River, S.W. of Mateka Hills, *Drummond* 5627; 5628.

MOZAMBIQUE.—Lourenço Marques, *Sim* 436, *Rogers* 21378. Rikatla, *Junod* in TRV 25432.

TRANSVAAL.—Pilgrim's Rest: Kruger National Park, 19½ miles N.E. of Skukuza, *Codd* 6069; Letaba: K.N.P., Shangoni, Mathlambanthlova Pan, *van der Schijff* 2857.

NATAL.—Hlabisa: Hluhluwe Game Reserve, *Ward* 2518; 2549 ♂; 2551 ♀ (PRE, holotype). Ubombo: Mkuzi Game Reserve, *Tinley* 443.

Easily distinguished by the many-leaved whorls.

3. *L. crispus* Rendle in J. Linn. Soc. Bot. 30: 381, pl. 31, fig. 8-17 (1895); F.T.A. 7: 4 (1897). Type: Tanganyika, between Uyui and coast, *Taylor* (BM, holo.).

*L. tsotsorogensis* Brem. & Oberm. in Ann. Tvl. Mus. 16: 401 (1935). Type: Bechuanaland, Tsotsoroga Pan, *van Son* TRV 28853 (PRE, holo.).

Stems filiform, 1-2 mm in diam. *Leaves* alternate, sub-opposite to verticillate above, usually densely spaced on the stems, spreading, soft, thin, transparent, linear, average size 14 by 0.5 mm, marginal cells chlorophyllous, the many, sharp curved teeth pointing upwards, situated on small, triangular excrescences; leaf-tips bi-dentate; central area narrow to very broad, consisting of larger lacunar cells without or with very little chlorophyll, usually with transverse septa, midrib distinct. *Male inflorescence*: spathe-valves cup-shaped, obovoid, about 2 mm long, acute at first becoming broad and gaping during anthesis, with about 8 teeth on each side. *Female inflorescence*: spathes forming a narrow ovoid tube 2.5 mm long, entire or with a few small teeth, apex entire at first, becoming bilobed; perianth white, limb about 2 mm in diam.; ovary with 24-30 ovules, funicles about as long as the ovules; stigmas with short papillae. *Capsule* ovoid, acuminate, about 3 mm long, many-seeded; seeds 1 mm long, turbinate, with raised ridges which have transverse septa (in the dried state).

Recorded from East Africa, Southern Rhodesia, Bechuanaland, South West Africa, eastern and northern Transvaal.

KENYA.—Northern Province, Sololo, *Gillett* 13683.

TANGANYIKA.—Kivingo, *Greenway* 1979.

SOUTHERN RHODESIA.—Urungwe, Zambesi Valley, Menswa Pan, *Wild* 4069; 17 miles E.S.E. of Chirundu Bridge, *Drummond* 5404 (SRGH). Lower Sabie, *Wild* 2318 (SRGH). Subungwe, Marawa road, *Davies* D1968 (SRGH).

TRANSVAAL.—Soutpansberg: Limpopo River, farm Weipe, in pan, *Codd & de Winter* 348; *Verdoorn* 2273. Pilgrim's Rest: Leeupan near Tshokwane, *van der Schijff* 2766; 4198.

BECHUANALAND.—Tsotsoroga Pan about 150 miles N. of Maun, *Erens* 351.

SOUTH WEST AFRICA.—Caprivi Strip: Kabuta Village in Chobe River, *Munro*. Okavango: Niangana, Okavango River, *Dinter* 7246. Grootfontein: West of Andara, *Merxmüller* 2096.

Characteristic of *L. crispus* Rendle are its small flowers (limb 1.5-2 mm in diam.), small, broadly ovoid capsules about 2.5 mm long and many seeds which are 1 mm long

(ovary with 24–30 ovules). In the South African specimens the leaves show the characteristic lacunar broad central band with transverse septa at least in lower half. However, some specimens from tropical Africa have the leaves longer (2 cm instead of 1) and the band indistinct. Whether they belong to another species could not be decided here.

In *van der Schijff* 4198, three setaceous appendages were noticed at the base of the ovary similar to those seen in *Schoenfelder* 5648 (*L. muscoides* Harv.) from South West Africa. They may be the rudiments of aborted flowers. Rendle noted that he found no intrafoliar stipules. They were present in some specimens, but others appeared to be without them; they may be early deciduous; such delicate organs easily disintegrate during pressing and drying.

Sometimes the plants are much branched, foliose, with the leaves rather long (2 cm). This could be its habit when, through external circumstances, natural sexual reproduction is hampered. The species is apparently related to *L. tenuis* Rendle.

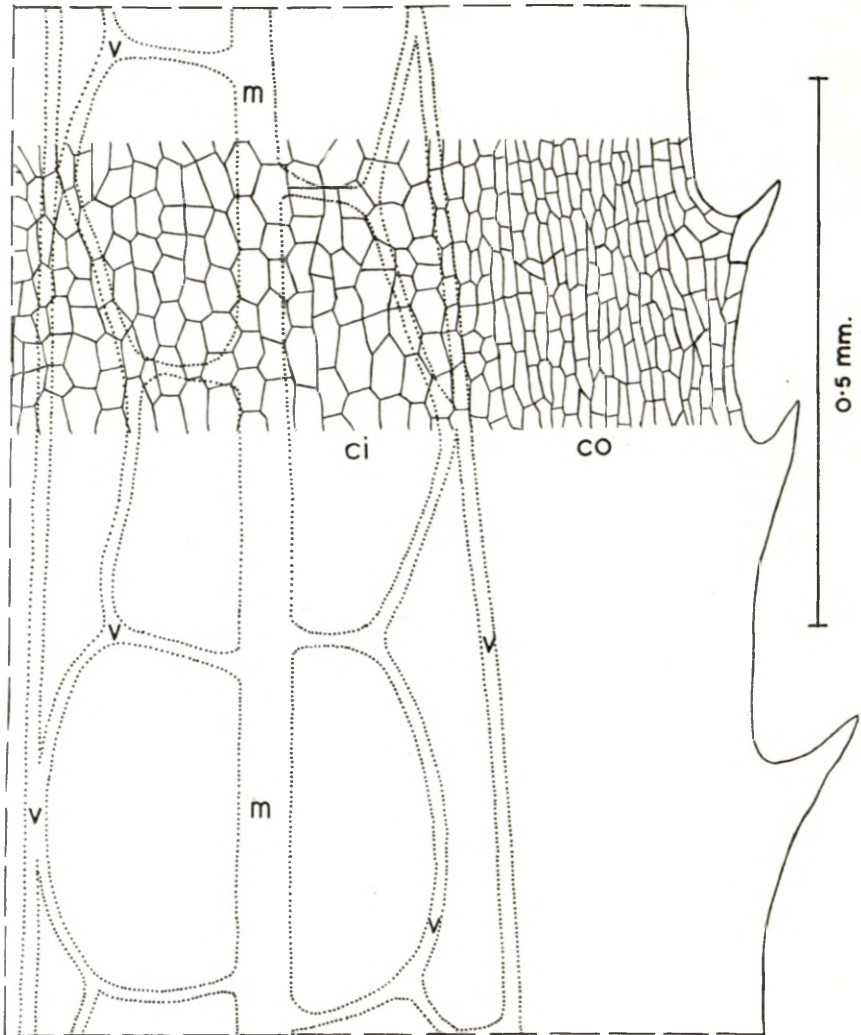


FIG. 2.—*Lagarosiphon crispus* Rendle. Part of leaf seen from above showing midrib (m) and network of veinlets (v); ci, large central cells; co smaller outer cells (Erens 351).

4. *L. major* (Ridley) Moss apud Wager in Trans. Roy. Soc. S.A. 16: 193 (1928). Mason in New Zeal. Journ. Sci. 30: 384 (1960). Wild in Kirkia 2: 39, t. 13, d (1961). *L. muscoides* Harv. var. *major* Ridley in J. Linn. Soc. Bot. 22: 233 (1886).<sup>\*</sup> Syntypes: Cape, Victoria East, Umdizine River, Cooper 17 (K, PRE); Transvaal, Bronkhorst-spruit, Rehmann 6559 (K); Bethal, Trigardtsfontein, Rehmann 6678 (K). *Elodea crispa* hort. non *Lagarosiphon crispus* Rendle.

Stems about 3 mm in diam., usually firm. *Leaves* alternate, laxly spaced below, dense above forming obtuse, broad apices, spreading-recurved, soft, usually fairly firm, opaque, linear, average size 16 by 2 mm (occasionally up to 3 cm); apex obtuse to acute to acuminate, margin with the outermost row of cells hyaline, producing minute, blunt, closely-spaced teeth; leaf-tips with teeth similar to marginal; midrib sunk above, prominent below; lamina with small papillose, rhomboid cells when viewed from above, those of the midrib slightly longer and larger. *Male inflorescence*: spathe-valves oblong-lanceolate, 5 by 3 mm, with about 8-9 teeth on each side, bearing about 50 flowers consecutively, perianth pinkish. *Female inflorescence*: spathe-valves ovoid, up to 5.5 by 2.5 mm, with about 12 teeth on one side and about 6 on the other; perianth pink, maximum length 15 cm; ovary flask-shaped, stigmas red, ovules about 12. *Capsule* ovoid, about 5 mm long; seeds about 2 mm long.

Widespread in southern Africa from the eastern Cape, Orange Free State, Transvaal to Southern Rhodesia. Recorded as an adventive from Europe and New Zealand.

CAPE.—King William's Town: near King William's Town, Sim 1561.

NATAL.—Newcastle: W. of Laingsnek-Quaggasnek Rd., Edwards 2369.

ORANGE FREE STATE.—Boshoff: Smitskraal, Burt Davy in PRE 10731.

TRANSVAAL.—Piet Retief: Kleber ♂. Standerton: Schlechter 3464. Belfast: Wager NH 49186 ♀; Franks in PRE 9770. Pretoria: Rietvei Dam, Repton 2001. Germiston: Birchleigh, Wager NH 49187 ♂, ♀. Potchefstroom: Frederikstad, Louw 1709.

SOUTHERN RHODESIA.—Umtali, Tsungwesi River, Wild 4649. Salisbury, Hunyani Poort Dam, Wild 4146. Matobo: Matopos Dam, Ratray ♀ in SRGH 82664.

Usually sterile. Often an obnoxious water pest, choking pans in the Republic and Southern Rhodesia.

#### 5. *L. ilicifolius* Oberm., sp. nov.

Planta robusta. *Caulis* ca 3 mm diam. albidus. *Folia* alterna interdum subopposita laminae opaca reflexa lanceolata 8 × 2.5 mm margine dentibus patentibus Ilici simili basi triangulari. Cellulae quadrangulae sparse papillosae. *Spatharum valvae* anguste ovatae dentatae; ovarium ovoideum attenuatum 9-ovulatis. *Capsula* ovoidea. *Semen* 2 mm longum.

Type: Bechuanaland, Bridge at Toteng on the N.E. tip of Lake Ngami, Story 4727 (PRE, holotype).

Stems about 3 mm in diam. (thinner in fertile plants), usually firm, whitish. *Leaves* alternate, occasionally subopposite, regularly spaced below with the internodes about 3-6 mm long, densely leafy above forming broad obtuse apices to the shoots, reflexed or recurved, fairly firm, opaque, lanceolate, average size 8 by 2.5 mm (smaller in fertile plants) apex acute, margin with the outer row of cells hyaline, with the patent strong teeth situated on broad triangular excrescences, closely spaced, leaf-tip with 2 teeth similar to marginal ones; all cells of the lamina small, similar, squared and somewhat papillose viewed from above, midrib faint depressed, prominent-below, purplish in dried specimens, its cells somewhat longer and narrower. *Male inflorescence* unknown. *Female inflorescence*: spathe-valves narrow-ovate, 4 mm long, toothed or

\* F. C. 5, 3: 1 (1912).

entire, acute, pale wine red; perianth pale lilac (*Story*); ovary ovoid, attenuate, ovules about 9, funicle erect, short. *Capsule* ovoid, tapered towards the apex, 5–7 mm long; seeds 2 mm.

Recorded from Northern South West Africa (Okavango River), northern Bechuanaland (Lake Ngami), Southern and Northern Rhodesia (Zambesi River).

SOUTH WEST AFRICA.—Okavango Native Territory, lagoon in Okavango River at Kapako Camp, 4 miles W. of Mupini Mission, *de Winter & Marais* 4516; Runtu, bog and riverbed of Okavango River, *Merxmüller* 1890; Niangana, Okavango River, *Dinter* 7202a.

BECHUANALAND.—Bridge at Toteng on the N.E. tip of Lake Ngami, *Story* 4727 (PRE, holo.); *McConnell* in SRGH 68901; Maun, Thamalakane River, *McConnell* in SRGH 68903.

SOUTHERN RHODESIA.—Zambesi River just above Victoria Falls, *Galpin* 7027; *Wilde* in TRV 9066; *Young* 1592; *Sim* 19176; *Wild* 3111 (SRGH).

NORTHERN RHODESIA.—Livingstone, Zambesi River, *Greenway* 6252. Mangu, Luanginga River, about 4 miles N.W. of Sandaula Pontoon, *Drummond & Cookson* 6586.

Usually sterile in which case it is much coarser than the female plants collected at lake Ngami.

NOTE.—The tropical African types of *L. schweinfurthii* Casp., *L. steudneri* Casp., *L. cordofanus* Casp. and *L. fischeri* Gürke were not found at Berlin: probably destroyed in 1943.

#### ACKNOWLEDGMENTS

For loan of material I sincerely thank the Keepers of the Southern Rhodesian Herbarium, Salisbury, the Bolus Herbarium, Cape Town, the Natal Herbarium, Durban and that of the Eastern Province at the Albany Museum. From Dr. M. Ernst-Schwarzenbach we gratefully received reprints of her work on this genus. Last but not least my sincere thanks to Mr. J. E. Dandy, Keeper of Botany, British Museum (Natural History) for his helpful comments.