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NOTES ON THE GENUS *LINDSAEA* DRYAND. EX SMITH— A CLARIFICATION AND THREE NEW RECORDS

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ABSTRACT

Lindsaea bouillodii is a confused taxon as regards to its identity, nomenclature and distribution as given by various workers in the past. The report of its occurrence in Madras Presidency by Beddome (1865, 1883) has been substantiated by its recent collection from Tamil Nadu. It is attempted to clarify the matter by providing key to the taxa confused with it, detailed description and illustrations. Three new recrods of species i.e. *L. glandulifera* v.A.v.R. and *L. malayensis* Holtt. for India and *L. chienii* Ching for Burma are reported. Detailed descriptions and illustrations are provided to facilitate identification.

INTRODUCTION

Lindsaea bouillodii Christ has been subject to confusion by various workers in the past, as regards to its identity, nomenclature and distribution. *L. bouillodii* of Christ (1909) has been confused with *L. tenera* of Dryand. (1797) Fig. 2, *L. tenera* of Beddome (1865) Fig. 3, *L. orbiculata* var. *tenera* of Beddome (1883), *L. commixta* of Tagawa (1937) Figs. 4-5, and *L. orbiculata* var. *commixta* of Kramer (1972). Beddome (1865, Pl. 24) reported the occurrence of *L. tenera* Dryand. from the Travancore hills as a rare fern ; later he renamed it *L. orbiculata* var. *tenera* Bedd. (1883, p. 75), from Madras Presidency. Holttum (1954) made a new combination as *Schizoloma tenerum* (Dryand.) Holtt. and cited *L. orbiculata* var. *tenera* of Bedd. (1883) as synonymous and reported its occurrence in Malaya, Malaysia, Sri Lanka and South India. Kramer (1971) cites *Schizoloma tenerum sensu* Holtt. (1954), Fig. 6, as synonymous to *L. bouillodii* of Christ (1909), again in (1972) he cites *L. tenera sensu* Beddome (1865, Pl. 24), non Dryand. (1797) as synonymous to *L. orbiculata* var. *commixta* of (Tagawa) Kramer. The critical studies of protologues of *L. tenera* Dryand. (1797), *L. bouillodii* Christ (1909) and *L. commixta* Tagawa (1937) along with the herbarium specimens housed in CAL reveal that *L. tenera sensu* Beddome (1865), *L. orbiculata* var. *tenera sensu* Beddome (1883) and *Schizoloma tenerum sensu* Holttum (1954) is *L. bouillodii* Christ. Kramer (1971) rightly cites *Schizoloma tenerum sensu* Holttum (1954) as synonymous to *L. bouillodii* Christ but in 1972 his citation of *L. tenera sensu* Beddome (1865) as synonymous to *L. orbiculata* var. *commixta* (Tagawa) Kramer is not correct. *L. tenera* Dryand., *L. bouillodii* Christ and *L. commixta* Tagawa, although confused in the past, are three different species. A key to the three confused taxa, supported by illustrations of characters of diagnostic importance, are given to facilitate easy identification.

Detailed description and illustrations are provided for *L. bouillodii* Christ, since Kramer (1971, 1972) did not report its occurrence in India and Sri Lanka. Beddome's collections are not present in any

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Indian Herbaria; their presence in the herbaria of Kew or BM have not been reported, either. The only recent collection of *Henry* 16301 from Tennevelly in 1963 substantiates Beddome's observation of its rare occurrence in South India. Its occurrence in Sri Lanka is also confirmed.

KEY TO THE SPECIES

1. Pinnules rounded-rhombic, sori interrupted in incised pinnules, continuous in apical segments; indusium entire *L. tenera*
1. Pinnules suborbicular, flabellate to parallelogram-shaped; sori entire or interrupted; indusium subentire to denticulate:
2. Pinnules suborbicular; sori continuous, rarely interrupted; indusium denticulate .. *L. commixta*
2. Pinnules parallelogram-shaped to subflabellate; sori always interrupted; indusium erose, rarely subentire .. *L. bouillodii*

SYSTEMATIC ACCOUNT

Lindsaea bouillodii Christ, Not. Syst. 1: 59. 1909. Kramer, Fl. Mal. ser. II, Pterid. 1(3): 204, t. 21. 1971; Gard. Bull. Singapore 26(1): 28, 1972. *L. tenera* auct. non Dryand. (1797), Bedd. Ferns. South. India, 7, t. 24, 1865. *L. orbiculata* var. *tenera sensu* Bedd., Handb. Ferns. Brit. India 75. 1883. *Schizoloma tenerum sensu* Holtt. Rev. Fl. Mal. 2: 348, f. 201, 1954 (non Dryand., 1797). *L. cambodgensis sensu* Kramer, Blumea 15: 563, 1968 (non Christ). *L. orbiculata* (Lam.) Mett. ex Kuhn var. *odontosorioides* Copel., Philip. J. Sci. 6: 138. 1911. *L. orbiculata* (Lam.) Mett. ex Kuhn var. *sumatrana* Rosenstock in Fedde Rep. 13: 214. 1914.

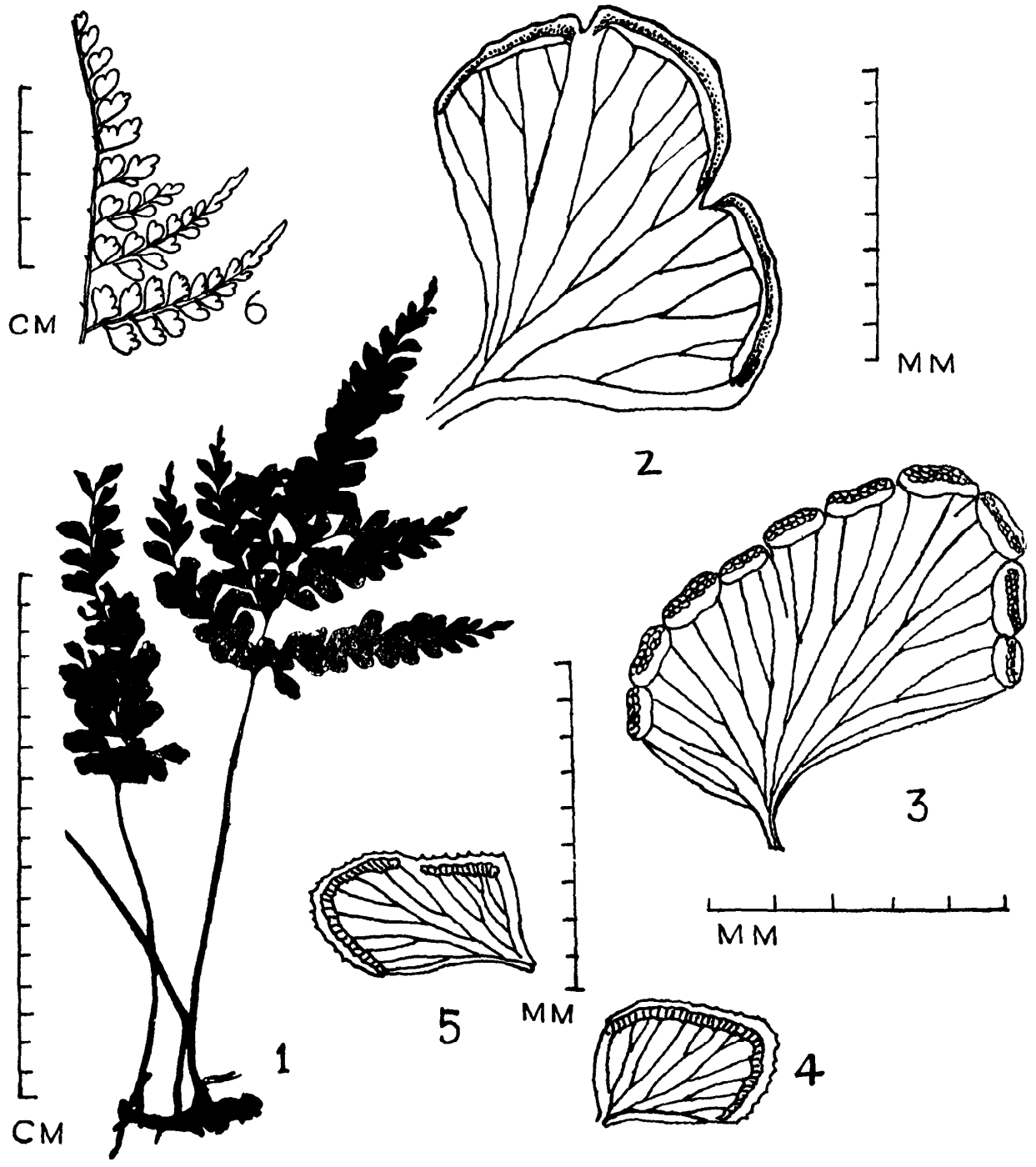
Rhizome short, creeping; scales brown, narrowly triangular, 2-3 mm long, 5-seriate at the base and lang-uniseriate at apex; stipes atropurpureous to black, 10-20 cm long, quadrangular at base, terete and broadly sulcate above; Lamina deltoid to triangular, 10-20 × 12-20 cm, bipinnate to tripinnate at base; primary pinnae 3-8 to a side, distant, spreading to ascending, narrowly oblong, 7-10 × 2-2.5 cm, narrowing gradually towards the apex; the upper pinnae gradually reduced; secondary rachises pale, shallowly sulcate; pinnules herbaceous, dark green when dry, spreading to slightly ascending, the lower ones petiolulate, the upper ones subsessile, dimidiate, parallelogram shaped to subflabellate, lower edge straight, truncate, larger ones 10-12 × 5 mm, upper margins incised, the incisions reaching beyond the receptacle, 0.5-1.5 mm deep, with cuneate lobes. Fertile pinnules usually slightly erose and sterile pinnules with toothed edge; veins visible on the lower surface. Sori interrupted, convex, 2-4-nerval; indusium grey to brownish, firm, erose, rarely subentire, reaching up to the margin, not reflexed at maturity. Spores pale-brown, trilete, 20-25 μ m, smooth (Fig. 1).

Specimens examined: TAMIL NADU: Tennevelly—way to Agastyamalai, 1200 m, 26.5.1963; *Henry* 16301 (MH). SRI LANKA: *Brekett* 58 (CAL, DD); *Thwaites* 1381, Accession nos. 5420, 5422 (CAL); *Thwaites* 3311, specimens numbered III & IV (CAL). MALAY PENINSULA: Kedah Peak, 4000 ft. *Robinson & Kloss* 6020 (CAL); Perak; Gumong Batu Pateh, 6700 ft. *Wray Jr.* 374 (CAL); *King's collector* 18039 (CAL); Pahang: Gunong Tahan, 3306 ft, 2.6.1905; *Wray Jr.* & *Robinson* 5372 (CAL); Morris ex. Herb. *Hooker s. l. s. n.*, Accession no. 5417 (CAL); Larut, 5000 ft. May, 1884, *s. l.* 133 (CAL), 1600-2000 ft., July 1881, *Kunstler* 1989 (CAL). MALESIAN ISLANDS—Java: Pisu, 3000 ft. Nov. 1879, *Forbes* 213 (CAL).

Michrofiche examined: (Obtained from Royal Botanic Gardens, Kew).

Wallich sheet no. 2195 is without any specimen.

Kramer (1972) cites *Thwaites* 1381, 3311 under *L. orbiculata* var. *commixta* (Tagawa) Kramer; however, critical examination of the duplicate numbers present in CAL reveals that *Thwaites* 3311 represents mixture of two species i.e. plants numbered I & II represent *L. orbiculata* var. *commixta* and



Figs. 1-6. 1. *Lindsaea bouillodii* Christ, Habit, Tamil Nadu, Henry 16301 (MH). 2. *L. tenera* Dryand. (1797), a fertile pinnule, after Ghosh & Dixit, 1978. 3. *L. tenera sensu* Bedd. 1865, a fertile pinnule, after Beddome, 1865. 4-5. *L. connivta* Tagawa, two fertile pinnules, after Tagawa, 1937. 6. *Schizoloma tenerum* (Dryand.) Holtt., upper part of frond, after Holttum, 1954.

plants numbered III & IV and 1381 represent *L. boúillodii* Christ. In this light rechecking of *Thwaites* numbers housed in different herbaria of the world is required for establishing correct identity.

Distribution: India (Tamil Nadu), Sri Lanka, Thailand and Tonkin to Malesia, Malay Peninsula, Malesian Islands, Indo-China.

Three new records of species *viz. Lind-*

saea glandulifera v. A. v. R., *L. malayensis* Holtt. and *L. chienii* Ching are described in detail with illustrations to facilitate easy identification.

Lindsaea glandulifera v. A. v. R., Bull. Jard. Bot. Btzg. 2(1): 4. 1911; Kramer, Fl. Mal. ser. II. Pterid. 1(3): 236. Fig. 49. 1971. *L. repens* (Bory) Thw. f. *minor* (Thw.) Bedd., Ferns South. India 72. Pl. 214. 1865; Handb. Ferns Brit. India 74. 1883.

Rhizome long, scandent; scales golden yellow to honey-coloured, narrowly triangular, 2-25-seriate at base, uniseriate at apex. Fronds distant, 2-3 cm apart; rachis castaneous at base, stramineous above; lamina linear, 10-20 × 1.5-2 cm; pinnules 20-30 to a side, spreading, ascending, herbaceous, asymetrically elongate-triangular, bright green to olivaceous when dry, largest 8-12 × 3.5 mm, cuneate at base, gradually narrowed from base to apex, lower margin concave at the base but convex on the apical side, upper margin convex with 2-4 major incisions reaching down ½ to ⅔ of the pinnules, smaller lobes rounded at apex but larger ones again shallowly incised, pinnules of juvenile and sterile fronds not much incised. Pinnules in the basal region remote and reduced and the upper ones gradually reduced and confluent to the pinnatifid apex; veins simple to furcate. Sori intramarginal, one per lobe, indusium reflexed and often concealed at age, Spores trilete, 20-22 μ m, pale brown, smooth (Figs. 7-8).

Specimens examined: ASSAM: Ex Herb. *Gustav Mann* s. n., Accession no. 34299 (DD). Isotype of *L. repens* f. var. *minor* Thw., Sri Lanka: *Thwaites* 1389, Accession nos. 3955, 3956 (CAL). MALESIA: Java, *Zollinger* 3712 (CAL).

Distribution: India (Assam); Sri Lanka, Malesia.

L. malayensis Holtt., Gard. Bull. Str. Settl. 5: 69, f. 8. 1930; Rev. Fl. Malaya 2: 335. f. 194. 1954; Kramer, Fl. Males. ser. II, Pterid. 1(3): 217. 1971; Gard. Bull. Singapore 26(1): 33. 1972.

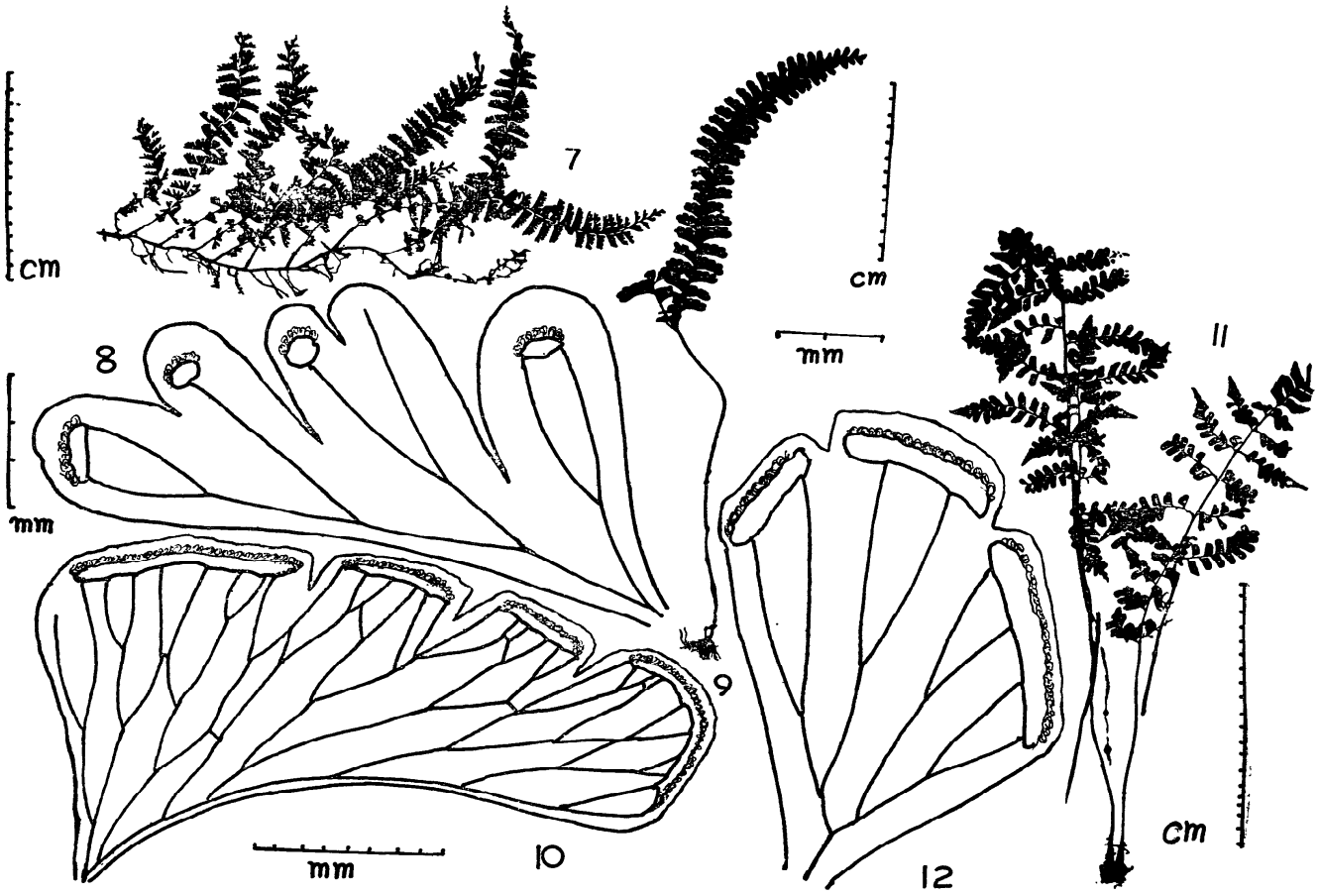
Rhizome short, creeping; scales brown, narrowly triangular, 5-seriate at base, long uniseriate above. Fronds caespitose; stipes stramineous; lamina pinnate, or bipinnate with one or two lateral pinnae; terminal pinna like the lateral ones. Pinnae/pinnules ascending, distant, acuminate at apex, herbaceous to chartaceous, pale to dark olivaceous when dry, spreading, rounded-subtrapeziform to rounded-subrectangular-ligulate in shape, lower margin straight to slightly concave, upper margin convex with blunt or rounded apex and 3-5 oblique incisions up to 1 mm deep, smaller pinnules with the upper edge entire; upper pinnules reduced, some denticuliform, confluent with the pinnatifid apex; veins occasionally anastomosing, rarely free. Sori intramarginal, interrupted by incisions, indusium thin, entire, greenish nearly reaching the margin, reflexed and concealed at maturity. Spores trilete, 20-25 μ m, pale-brown (Figs. 9-10).

Specimens examined: ANDAMAN & NICOBAR ISLANDS: Great Nicobar: South Nicobars, Shompen village, ± 75 m, 23.7.1976, *Balakrishnan* 3978 (PBL); Island Hill forests, ± 120 m, 26.7.1976, *Balakrishnan* 4037A (PBL).

Distribution: India (Andaman & Nicobar Islands), Malay Peninsula, Malesia.

L. malayensis Holtt. comes very near to *L. cultrata* (Willd.) Sw. but can be easily distinguished by its pinnae/pinnules being deeply lobed with blunt apex and sori interrupted against pinnae/pinnules shallowly lobed with pointed apex and sori almost continuous in *L. cultrata* (Willd.) Sw.

L. chienii Ching, Sinen. 1: 4. 1929; Icon. Fil. Sin. 1: t. 19. 1930; Kramer, Gard. Bull. Singapore 26(1): 19. Fig. 7, 1972. *L. tenera* Dryand. var. *chienii* (Ching) Tardieu & Christensen Fl. Gen. I-C, 7: 127. 1939. *Schizoloma chienii* (Ching) Tardieu, Amer. Fern. J. 48: 34. 1958.



Figs. 7-12. 7-8. *Lindsaea glandulifera* v.A.v.R., 7. Habit, *Gustav Mann* s. n. (DD). 8. Fertile pinnule, *Thwaites* 1389. 9-10. *L. malayensis* Holtt., 9. Habit, *Balakrishnan* 4037A (PBL). 10. Fertile pinnule. 11-12. *L. chienii* Ching, 11. Habit *Toppin* 6242 (CAL). 12. Fertile pinnule.

Rhizome short, creeping; scales castaneous, lanceolate, 4-seriate at base, uniseriate at apex. Fronds tufted; stipes shining reddish-brown to castaneous, longer than lamina. Lamina bipinnate to tripinnate in the basal region, with 1-5 pairs of lateral pinnae, thin but firm in texture, dark green, deltoid-oblong; terminal leaflet narrowly triangular, not like the lateral pinnae. Pinnae narrowly triangular, rhombic or trapezoidal, acute or shortly acuminate, contiguous, ascending; pinnules variable in size and shape, *viz.*, elliptic, rhombic to trapeziform, dimidiate, subsessile; basal acroscopic pinnule cuneate, flabellate; sterile pinnules with dentate margins; veins free, 2 or 3 times forked. Sori intramarginal, interrupted by incisions; indusium erose, reflexed at maturity and upper part peeled off. Spores trilete, 20-25 μ m, verrucose (Figs. 11-12).

Specimens examined: BURMA: Nuereng Wan, 4000 ft, Jan. 1912, *Toppin* 6242 (CAL); Dazn uka, 1400 ft, Dec. 1911, *Toppin* 4216 (CAL); upper Irrawadi, April 1891, *Blewitt* s. n., Accession no. 5401 (CAL).

Distribution: Burma, Japan, Taiwan, China, Indo-China, Thailand.

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