STUDIES ON LEJEUNEACEAE SUBFAM. PTYCHANTHOIDEAE VI. A REVISION OF SCHIFFNERIOLEJEUNEA SECT. SACCATAE FROM ASIA

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SUMMARY

The originally monotypic eastern Malaysian genus *Schiffneriolejeunea* Verdoorn 1933 has now become a widespread, pantropical group of about fifteen species by the inclusion of species from the genus *Ptychocoleus* Trev. *nom. illeg.* Six species are known from Asia, three of which constitute the sect. *Saccatae* (Verdoorn) Gradst. & Terken *comb. nov.* These are the widespread *Schiffneriolejeunea tumida* (Nees) Gradst., the eastern Malaysian *S. cumingiana* (Mont.) Gradst. and *S. nymannii* (Steph.) Gradst. & Terken *comb. nov.* *Schiffneriolejeunea tumida* is a rather polymorphic species in which two not sharply defined varieties may be distinguished: *S. tumida* var. *tumida* with more or less involuted leaf margins, and *S. tumida* var. *haskarliana* (Gott.) Gradst. & Terken *comb. nov.* with plane margins.

The genus *Schiffneriolejeunea* was established by Verdoorn (1933) based on *S. omphalanthoides* Verdoorn, a robust "holostipous" species of Lejeuneaceae from the mountains of Celebes. *Schiffneriolejeunea omphalanthoides* is easily recognised by its rather long (up to 8 cm), sparsely branched, pendulous stems, which hang from branches of trees in upper montane forests, and by its narrow, bidentate leaf lobules which are completely hidden behind the very large, obcuneate underleaves. Five-keeled perianths are born on short-lateral *Lejeunea*-type branches, always without subfloral innovations. For a long time *S. omphalanthoides* was known only from the type locality (Celebes, Pik von Bonthain, leg. Warburg, FH) but recently collections have become available from other high mountain areas in eastern Malaysia, viz. New Guinea (Gradstein 1974) and Luzon, Philippines (Mizutani 1977).

In his classical treatment of the Asiatic *Ptychanthoideae*, Verdoorn (1934) juxtaposed *Schiffneriolejeunea* and the large pantropical, rather heterogeneous *Ptychocoleus* Trev. *nom. illeg.* (= *Frullanoides* Raddi). The senior author has shown recently (Gradstein 1974, 1975) that quite a number of species of *Ptychocoleus* Trev. are congeneric with *S. omphalanthoides* and should be transferred to the latter genus. Thus, *Schiffneriolejeunea* has now become a pantropical genus of about 15 species.

A total of 18 species of *Ptychocoleus* were recognised in Asia by Verdoorn (l.c.). Based on a study of the types, their placement should now be as follows:

1. *Ptychocoleus arcuatus* (Nees) Trev. ≡ *Acrolejeunea arcuata* (Nees) Grolle & Gradst.
2. *Ptychocoleus hians* Steph. = *Acrolejeunea arcuata* (Nees) Grolle & Gradst.
3. *Ptychocoleus cristilobus* Steph. ≡ *Caudalejeunea cristiloba* (Steph.) Gradst.
4. *Ptychocoleus pulopenangensis* (Gott.) Trev. ≡ *Schiffneriolejeunea pulopenangensis* (Gott.) Gradst.

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5. *Ptychocoleus grandiflorus* Herz. = *Schiffneriolejeunea pulopenangensis* (Gott.) Gradst.
6. *Ptychocoleus pycnocladus* (Tayl.) Steph. ≡ *Acrolejeunea pycnoclada* (Tayl.) Schiffn.
7. *Ptychocoleus mangaloreus* Steph. = *Schiffneriolejeunea pulopenangensis* (Gott.) Gradst.
8. *Ptychocoleus tjibodensis* Verdoorn ≡ *Acrolejeunea tjibodensis* (Verdoorn) Grolle.
9. *Ptychocoleus peradeniensis* (Mitt.) Steph. = *Schiffneriolejeunea tumida* (Nees) Gradst.
10. *Ptychocoleus validus* (Steph.) Verdoorn = *Schiffneriolejeunea nymannii* (Steph.) Gradst. & Terken.
11. *Ptychocoleus cumingianus* (Mont.) Trev. ≡ *Schiffneriolejeunea cumingiana* (Mont.) Gradst.
12. *Ptychocoleus haskarlianus* (Gott.) Steph. ≡ *Schiffneriolejeunea tumida* var. *haskarliana* (Gott.) Gradst. & Terken.
13. *Ptychocoleus tumidus* (Nees) Trev. ≡ *Schiffneriolejeunea tumida* (Nees) Gradst.
14. *Ptychocoleus sarawakensis* Steph. = *Schiffneriolejeunea tumida* (Nees) Gradst.
15. *Ptychocoleus fertilis* (Reinw., Bl., Nees) Trev. ≡ *Acrolejeunea fertilis* (Reinw., Bl., Nees) Schiffn.
16. *Ptychocoleus ustulatus* (Tayl.) Steph. = *Acrolejeunea fertilis* (Reinw., Bl., Nees) Schiffn.
17. *Ptychocoleus aulacophorus* (Mont.) Evans ≡ *Acrolejeunea aulacophora* (Mont.) Steph.
18. *Ptychocoleus brachiolejeuneoides* Verdoorn = *Mastigolejeunea recondita* (Steph.) Mizut.

Our revision shows that six species of *Schiffneriolejeunea* are now to be recognised in Asia: the very common *S. pulopenangensis* and *S. tumida* (both also widespread in the Pacific area), the eastern Malaysian *S. cumingiana*, *S. nymannii* and *S. omphalanthoides*, and the common Afro-American *S. polycarpa* which has now become known from Ceylon. *Schiffneriolejeunea cumingiana*, *S. nymannii* and *S. tumida* seem to form a rather natural group by the tendency of their leaf lobules to become involuted or revoluted at the base, developing a small sac. These three species may therefore be placed in a separate section for which the name *Ptychocoleus* sect. *Saccatae* Verdoorn is available.

TAXONOMIC TREATMENT

Schiffneriolejeunea Verdoorn sect. **Saccatae** (Verdoorn) Gradst. & Terken *comb. nov.*

≡ PTYCHOCOLEUS Trev. sect. SACCATAE Verdoorn, Ann. Bryol. Suppl. 4: 137 (1934). TYPE SPECIES: *Ptychocoleus tumidus* (Nees) Trev. ≡ *Schiffneriolejeunea tumida* (Nees) Gradst.

= PTYCHOCOLEUS Trev. sect. MEDIAE Verdoorn, Ann. Bryol. Suppl. 4: 134 (1934) *syn. nov.* TYPE SPECIES: *Ptychocoleus peradeniensis* (Mitt.) Steph. = *Schiffneriolejeunea tumida* (Nees) Gradst.

KEY

1. Lobule with 3–4 teeth ..... 2. *S. cumingiana*
1. Lobule with 1–2 teeth 2
   2. Underleaves very broad, reniform, 2–3 × wider than long. Leaves ± flattened when moist, not squarrose ..... 3. *S. nymannii*
   2. Underleaves narrower, at most 1.5 × wider than long. Leaves ± squarrose when moist ..... 1. *S. tumida* 3
3. Ventral leaf margin and apex more or less involuted ..... *S. tumida* var. *tumida*
3. Leaf margins plane ..... *S. tumida* var. *haskarliana*

1. *Schiffneriolejeunea tumida* (Nees) Gradst., J. Hattori Bot. Lab. 38: 335 (1974); Gradstein & Inoue (1980) 28. Figure 1.

Ptychanthus tumidus Nees, Naturgesch. Eur. Leberm. 3: 213 (1838) ≡ *Phragmicoma tumida* (Nees) Nees & Mont., Syn. Hep.: 300 (1845) ≡ *Lejeunea tumida* (Nees) Mitt., J. Proc. Linn. Soc. Bot. 5: 111 (1861) *comb. illeg., non Lejeunea tumida* Mitt. 1855 ≡ *Ptychocoleus tumidus* (Nees) Trev., Mem. Reale Ist. Lomb. Sci. Mat. Nat., ser. 3, 4: 405 (1877) ≡ *Marchesinia tumida* (Nees) Kuntze, Rev. Gen. Pl. 2: 836 (1891) ≡ *Acrolejeunea tumida* (Nees) Schiffn. "Steph.," Hedwigia 33: 185 (1894). TYPUS: Malaysia, Pulo-Pinang, *Delessert* s.n. ex hb. Montagne (STR holo, G 15817, PC-MONT.).

Heterotypic synonyms:

Mastigolejeunea badia Gott. ex Steph., Spec. Hep. 4: 779 (1912) ≡ *Acrolejeunea badia* (Gott. ex Steph.) Steph. ex Verdoorn, Blumea 1: 230 (1934), *nom. inval, in synon.* ≡ *Ptychocoleus badius* (Gott. ex Steph.) Steph. ex Verdoorn, Ann. Bryol. Suppl. 4: 142 (1934), *nom. inval. in synon.* TYPUS: Solomon Is., Vanikoro, *Lesson* s.n. ex hb. Bescherelle (G holo not seen, BM, F).

Ptychocoleus borneensis Steph. ex Verdoorn, Ann. Bryol. Suppl. 4: 143 (1934), *nom. inval. in synon.* TYPUS: Borneo, Micholitz s.n. (G holo, FH).

Ptychocoleus grandifolius Steph., Spec. Hep. 5: 43 (1912). LECTOTYPUS: Solomon Is., *Micholitz* s.n. "c. per." (G 15624 holo).

Phragmicoma haskarliana Gott., Syn. Hep.: 299 (1845) ≡ *Lejeunea haskarliana* (Gott.) Spruce, Trans. & Proc. Bot. Soc. Edinburgh 15: 118 (1884) *"hasskarliana," comb. illeg., non Lejeunea haskarliana* Lehm., Pugillus 8: 26 (1844) ≡ *Acrolejeunea haskarliana* (Gott.) Schiffn., in Engler & Prantl, Natürl. Pflanzenfam. 1(3): 129 (1893) *ut "hasskarliana"* ≡ *Ptychocoleus haskarliana* (Gott.) Steph., Spec. Hep. 5: 44 (1912) *ut "hasskarliana"* ≡ *Schiffneriolejeunea haskarliana* (Gott.) Mizut. "Gradst.," J. Hattori Bot. Lab. 43: 134 (1977), *comb. inval. basion. non cit.* ut *"hasskarliana."* LECTOTYPUS: Java, *Hasskarl* 20 (B holo destroyed, isotypes in G 15638 & 15650, S, W—hb. Lindenberg nr. 6011, and ?FH (*Hasskarl* s.n.)). PARATYPUS: Java, *Hasskarl* 18 (G 14630, W—hb. Lindenberg nr. 6010).

Mastigolejeunea inflatilobula Steph., Spec. Hep. 6: 562 (1924), syn. *fide* Verdoorn (1934) 142.

Mastigolejeunea javanica Steph., Spec. Hep. 4: 778 (1912). TYPUS: Java, Tjipannas, *Fleischer* 13. VII. 1901 (G sub *Acro-Lejeunea javanica* St. n.sp.).

Lejeunea malaccensis Tayl., London Journ. Bot. 5: 392 (1846) ≡ *Ptychocoleus malaccensis* (Tayl.) Steph., Spec. Hep. 5: 47 (1912). TYPUS: Malaya, *Cantor* s.n. ex hb. Hooker (Holotype in FH-TAYL. not to be found, isotypes seen in BM, FH, NY, S, W).

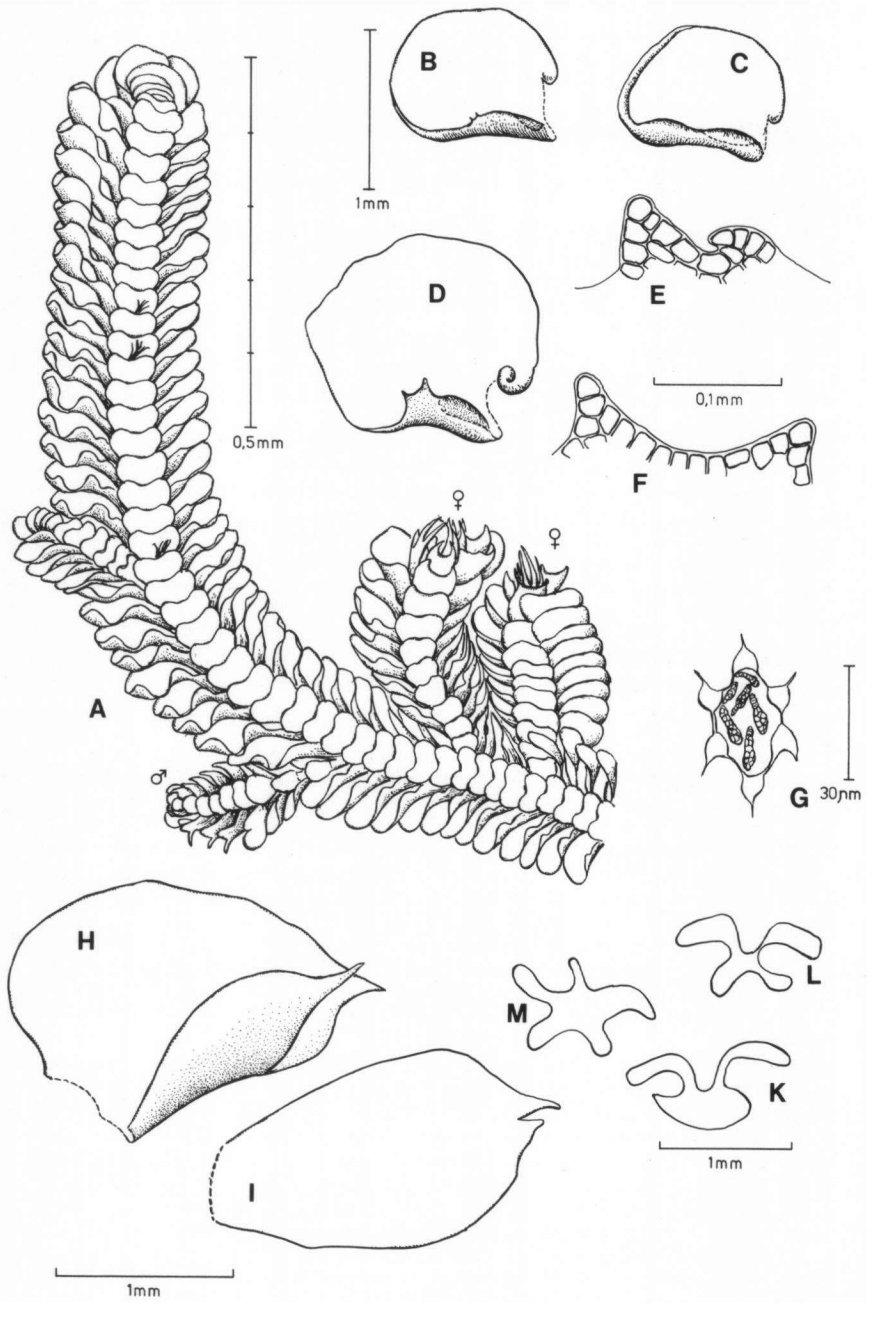
Acrolejeunea marquesana Steph., Hedwigia 34: 58 (1895) ≡ *Lejeunea* (subg. *Acrolej.*) *marquesana* (Steph.) Steph. in Bescherelle, J. Bot. 12: 4 (sep.) (1898) *ut "marquesiana"* ≡ *Ptychocoleus marquesanus* (Steph.) Steph., Spec. Hep. 5: 48 (1912). TYPUS: Marquesas Is., *Jardin* 395, ex hb. Berlin (G 15667 p.p.).

Acrolejeunea novaeguineae Steph., Denkschr. Akad. Wiss. Wien, Math. Nat. Kl. 81: 295 (1907) ≡ *Acrolejeunea novaeguineae* Steph., Hedwigia 28: 165 (1889), *nom. inval.* (Art. 43 ICBN) ≡ *Ptychocoleus novaeguineae* (Steph.) Steph., Spec. Hep. 5: 49 (1912). TYPUS: Australia, Queensland, Trinity Bay, *Sayer* s.n., 1866 ex hb. Melbourne (G 15681 holo, BM).

Lejeunea peradeniensis Mitt., J. Proc. Linn. Soc. Bot. 5: 111 (1861) ≡ *Phragmicoma peradeniensis* (Mitt.) Sande Lac., Ann. Mus. Bot. Lugd. Batav. 1: 307 (1864) ≡ *Acrolejeunea peradeniensis* (Mitt.) Schiffn., Consp. Hep. Archip. Ind.: 286 (1898) ≡ *Ptychocoleus peradeniensis* (Mitt.) Steph., Spec. Hep. 5: 54 (1912). TYPUS: Ceylon, Peradeniya, ad arbores, *Gardner* 1474 (NY holo, BM, FH, K). The type is a mixture of *S. tumida* and *S. pulopenangensis*, but Mitten's description and his original illustration accompanying the holotype clearly indicate that the present synonymy is correct.

Acrolejeunea rechingera Steph., Denkschr. Akad. Wiss. Wien, Math. Nat. Kl. 85: 195 (1910) ≡ *Ptychocoleus rechingeri* (Steph.) Steph., Spec. Hep. 5: 52 (1912). TYPUS: Solomon Is., Bougainville, Bucht von Kieta, *Rechinger* 4590 (G 15763 holo, W).

Brachiolejeunea retusa Horik., J. Sci. Hiroshima Univ., ser. B, div. 2, 2: 258 (1934), syn. *fide* Amakawa (1960) 363.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Ptychocoleus samoanus Steph., Spec. Hep. 5: 53 (1912). TYPUS: Samoa, *Rechinger* s.n. (G 15764).

Ptychocoleus sarawakensis Steph., Spec. Hep. 5: 53 (1912). TYPUS: Borneo, Sarawak, *Micholitz* s.n. (G 15766 holo, FH).

Ptychocoleus setaceus Steph., Spec. Hep. 5: 54 (1912). TYPUS: Samoa, Savaii, Matantu, on stems of *Terminalia*, *Reinecke* 24 p.p. ("Fl. Samoensis"), IX. 1894, mixed with *Acrolejeunea aulacophora* and *Lopholejeunea* sp. (G 15801 holo, BM, FH, GRO, M).

Ptychocoleus squarrosifolius Steph., Spec. Hep. 5: 55 (1912). TYPUS: Borneo, Sarawak, Lundu, *Micholitz* s.n. (G 15808 holo).

Ptychocoleus sumatranus Steph., Spec. Hep. 5: 54 (1912) syn. *fide* Verdoorn (1934) 138.

Plants autoicous or dioicous, medium-sized to rather robust, up to 6 cm long, 2.5–3 mm wide, growing appressed to the substrate, green to yellowish-brown when living, becoming dull brown upon drying. Stem 0.25–0.35 mm in diam, in transverse section with 20–30 cortical cells surrounding 50–70 medullary cells, the cortical cells slightly larger than the medullary cells (especially dorsally), with brownish pigmented walls. Branching irregularly pinnate, the branches short and *Lejeunea*-type (often sexual) or long, vegetative *Frullania*-type.

Leaves densely imbricated, clasping the stem when dry, when moistened spreading and becoming squarrose, the dorsal insertion line covering the entire length of the merophyte. Lobe suborbicular to ovate, 1.2–1.8 × 1–1.5 mm, the dorsal base auriculate ("appendiculate"), the apex rounded, the margins entire, plane, concave or more or less rolled inwards especially along the ventral and apical margin, the ventral margin much shorter than the dorsal margin, making a wide margin (ca 150°) or an almost straight line with the keel; keel almost straight, at an angle of 45°–60° with the axis. Median lobe cells elongated-hexagonal, 25–35 × 15–20 μm, arranged in diverging rows, becoming larger towards lobe base and slightly smaller towards the margin; trigones medium-sized, becoming larger towards the lobe base, the intermediate thickenings variable in number (almost absent or 1–2 per cell in the longer cell walls). Oil bodies 4–8 per cell, rather coarsely granulose-papillose (*Calypogeia*-type).

Lobule ovate-rectangular, 0.35–0.7 × 0.2–0.3 mm, ¼–⅔ × lobe length, inflated along the keel, the free margin more or less inrolled (sometimes twice!) in the basal half of the lobule to form a closed sac, near the apex with (1–)2 teeth, the teeth variable in size, sometimes consisting of only one cell and barely discernible, sometimes large, triangular and clearly visible *in situ*, the first tooth often larger than the second tooth.

FIGURE 1. *Schiffneriolejeunea tumida* (Nees) Gradst. A. habitat (var. *haskarliana*). B–C. leaves (var. *tumida*). D. leaf (var. *haskarliana*). E. lobule teeth (var. *tumida*). F. lobule teeth (var. *haskarliana*). G. median leaf cell showing oil bodies (var. *haskarliana*). H–I. female bract and bracteole (var. *haskarliana*). K–M. cross sections of the perianth (var. *haskarliana*).
A from Samoa, *Schultze-Motel* 3153a. B, E from the type of *S. tumida*. C from the type of *Ptychocoleus sarawakensis* Steph. D, F, H–I, K–M from the type of *S. tumida* var. *haskarliana*. H from Samoa, *Schultze-Motel* 3821.

Underleaves imbricated, transversally obovate-obcordate, 3–5 × wider than the stem, 0.6–1.4 × 0.4–1.1 mm, the apex truncate but often recurved and seemingly retuse, the margins plane or rolled outwards, the bases cuneate, rounded or auriculate, the line of insertion arched, 0.2–0.4 mm deep.

Androecia on short lateral, *Lejeunea*-type branches, the bracts strongly inflated, hypostatic, smaller than vegetative leaves, in 3–11 series, each bract enveloping two antheridia. Gynoecia terminating short lateral branches, without innovations, the bracts in 3–6 series, becoming larger towards the perianth; inner bracts suberect, strongly concave, with margins plane or incurved, bifid to ½, ca 1.2–1.8 (–2.5) mm long, the lobule about as long as the lobe or shorter (up to ⅔); lobe suborbicular with minutely apiculate to elongated acuminate apex, the sinus narrow and acute, the lobule lanceolate, with acuminate apex and margins entire or with a few coarse teeth; inner bracteole obovate-subrectangular to suborbicular, about as long as the bract, ± gibbose, the margins plane or slightly recurved, entire or toothed above, the teeth variable, few and coarse or numerous and fine, the apex emarginate to bifid up to ⅙, the sinus narrow or rather wide, the lobes acute-acuminate. Perianth ca 1.5–2 mm long, obovate-obpyriform, never stipitate, immersed or exserted, with 3–5 inflated, smoothly rounded keels in the upper half and a short, inconspicuous beak.

Sporophyte with an articulate seta consisting, in cross section, of 16 outer cells and 4 inner cells. Capsule valves with a golden-brown fenestrate layer of thickening on the inner side, and 36 elaters (9 per valve), the elaters 300–400 μm long and ca 15 μm wide, each with one pale, sometimes rudimentary spiral. Spores angular, 40–50 μm in diam, green, their outer surfaces covered with numerous papillae and 6–8 rosettes made up of triangular spines.

Notes: Schiffneriolejeunea tumida is a very common epiphytic species occurring throughout Indomalaysia and the Pacific region, at altitudes ranging from sea level to 2000 m. A single record has become available recently from the Seychelles (Grolle 1978). It is usually found on bark of dead or living trees in forests, gardens, along roadsides, etc., but may also be seen on boulders and, rarely, on living leaves.

The species is easily distinguished by the leaves, which become squarrose when moistened and have lobules which are rather narrowly involuted (rarely revoluted!) with, especially in the lower half, a closed sac at the base, and have a bidentate apex. The female bracts and bracteoles are usually entire, but in some collections they tend to become denticulate, especially the inner bracteole. The size of the plants, as well as of the lobule teeth, varies remarkably, as was already noted by Verdoorn (1934), and in many specimens, especially in those with inrolled ventral leaf margins, the teeth become almost invisible. The degree of inrolling of

the leaf margin is another character in which much variation is observed, and previously this character was used as the main criterion to distinguish *Ptychocoleus haskarlianus* (margin plane) from *P. tumidus* and *P. sarawakensis* (margins involuted, especially ventrally and apically). Sometimes the underleaf margins are also voluted, but much less consistently than the leaf margins. Although we have long hesitated to distinguish the forms with or without involuted leaf margins as separate taxa, because of the presence of intermediates, we have finally come to the conclusion that it is possible to base two varieties on this single character: *Schiffneriolejeunea tumida* var. *tumida* for plants which have more or less involuted leaf margins (especially ventrally, sometimes also apically, in extreme forms also partly dorsally) and Schiffneriolejeunea tumida var. haskarliana[1] (Gott.) Gradst. & Terken, *comb. nov.* (*Phragmicoma haskarliana* Gott., Syn. Hep.: 299 (1845)) for the plants in which the leaf margins are plane, also ventrally. The var. *haskarliana* is apparently the most widespread variety, being common in Indomalaysia and the Pacific region, whereas the var. *tumida* is found only in Indomalaysia. Sometimes the two varieties are found growing together in the field, e.g. on Borneo (colls. *Mizutani*, NICH) where var. *tumida* is particularly common and shows extreme inrolling of the margins. Such forms were described as *Ptychocoleus sarawakensis* Steph.

Select specimens examined: SEYCHELLES: *Norkett* 17365c (hb Grolle, U). CEYLON: *Onraedt* 76.L.3329 (hb Grolle, hb Onraedt, U). SIKKIM: *Griffith* s.n. (G, K). ANDAMAN IS.: *Mann* div. colls. (BM, G, H, PC, S). NICOBAR IS.: *Kurz* s.n. (BM). THAILAND: *Tagawa & Kitagawa* 1329, 1409 (G); *Touw* 11285 (L). MALAYA: *Kurz* s.n. (BM,G). SINGAPORE: *Fleischer* 353 (NY). BANGKA: *Kurz* s.n. (BM). SUMATRA: *Schiffner* s.n., Hep. Sel. Crit. Verdoorn 272 (G, H, L, M, U); *Sipman* 6899 (U). JAVA: *Schiffner* s.n., Hep. Sel. Crit. Verdoorn 270, 271, 277 (BM, G, H, JE, L, M, MY, S, U, W). BORNEO: Kalimantan, *Meijer* 1558, 1579a, 1937, 2085a (L); Sarawak, *Richards* 2679 (K); Sabah, *Mizutani* 3027, 3085, 3086, 3247, 3948, 3949 (NICH). PHILIPPINES: Luzon, *Iwatsuki & Sharp* 13813, 17284, 16472 (NICH); Negros, *Merrill*, Bur. Sci. 6782 (PC); Mindanao, *Zwickey* 356, 593 (NICH, COLO). CELEBES: *Riedel* s.n. (BM, G, W). AMBON: *Zippel* s.n. (L). NEW GUINEA: West Irian, *van Zanten* 175a, 184 (JE, L); Papua, *Schuster* 67–5861, 5862 (JE). AUSTRALIA: Queensland, *Sayer* s.n. (G, BM). SOLOMON IS.: *Micholitz* s.n. (BM, G, JE). NEW CALEDONIA: *Hürlimann* 1951, 2012, 2189, 2247a, 2248, 2269a, 2274, 2660, 2827 (hb Hürlimann, U). NEW HEBRIDES: *Joly* s.n. (G). TONGA: *Hürlimann* 808a (hb Hürlimann, U). SAMOA: *Rechinger* 2729, 3191, 3200 (W); *Schultze-Motel* 3153a, 3821 (B, JE, U). CAROLINE IS.: Kusaie, *Pashinsou* s.n. (G). SOCIETY IS.: Tahiti, *Hürlimann* T 1213 (hb Hürlimann, U). MARQUESAS IS.: Nuku Hiva, *Jardin* 395 (G).

Schiffneriolejeunea tumida has furthermore been reported from Okinawa, Japan (Amakawa 1960, sub nom. *Ptychocoleus hasskarlianus*) and probably from Vietnam (Pócs 1965, sub nom. *Ptychocoleus cumingianus*, collection not seen).

2. *Schiffneriolejeunea cumingiana* (Mont.) Gradst., J. Hattori Bot. Lab. 38: 335 (1974). Figure 2, A–B

Phragmicoma cumingiana Mont., London J. Bot. 4: 7 (1848/January) ≡ *Lejeunea cumingiana* (Mont.) Mitt., J. Proc. Linn. Soc. Bot. 5: 111 (1861) ≡ *Ptychocoleus*

[1]Usually spelled *"hasskarliana,"* but the original spelling *"haskarliana"* is to be retained. The full synonymy of this taxon is given under the species.

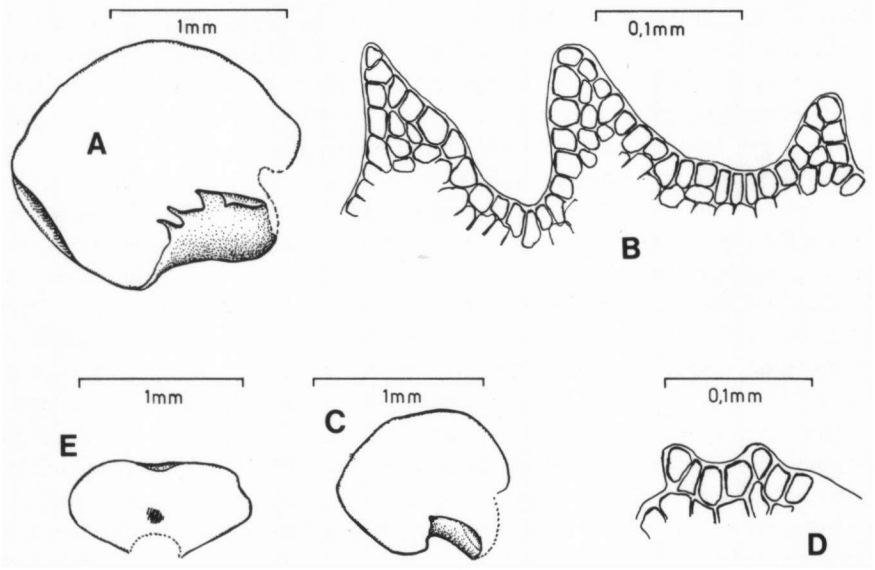

FIGURE 2. A–B. *Schiffneriolejeunea cumingiana* (Mont.) Gradst. A. leaf. B. lobule teeth. C–E. *Schiffneriolejeunea nymannii* (Steph.) Gradst. & Terken. C. leaf. D. lobule teeth. E. underleaf. A–B from the type of *S. cumingiana*. C–E from New Guinea, *Schuster* 67-5862a.

cumingianus (Mont.) Trev., Mem. Reale Ist. Lomb. Sci. Mat. Nat., ser. 3, 4: 405 (1877) ≡ *Marchesinia cumingiana* (Mont.) Kuntze, Rev. Gen. Pl. 2: 836 (1891) ≡ *Acrolejeunea cumingiana* (Mont.) Schiffn., Consp. Hep. Archip. Ind.: 283 (1898). TYPUS: Philippines, *Cuming* 2189 (PC-MONT. holo, BM, G 15576).

Heterotypic synonym:

Acrolejeunea luzonensis Steph., Hedwigia 34: 57 (1895) ≡ *Ptychocoleus luzonensis* (Steph.) Steph., Spec. Hep. 5: 47 (1912). TYPUS: Philippines, Luzon, *Micholitz* s.n. (G 15663 holo).

Plants autoicous or dioicous, medium-sized to rather robust, up to 5 cm long and 3 mm wide, growing appressed to the substrate, brownish when dry. Stem 0.2–0.3 mm in diam, the branching as in *Schiffneriolejeunea tumida*.

Leaves densely imbricated, clasping the stem when dry, when moistened spreading and becoming squarrose. Lobe orbicular to subovate, 0.9–1.6 × 0.9–1.3 mm, the dorsal base auriculate, the apex rounded, the ventral and apical margin usually rolled inwards, the ventral margin forming an almost straight line with the keel; cells as in *S. tumida*, but intermediate thickenings rare. Lobule obscure, hidden by the inrolled ventral margin of the lobe, when spread out ovate-rectangular, 0.5–0.6 × 0.2–0.35 mm, the free margin nearly always rolled outwards in the basal half of the lobule, sometimes subsequently becoming inrolled again but never forming a closed sac, near apex with 3–4 large teeth, the teeth 5–12 (!) cells long, narrow triangular, each tooth tapering into a uniseriate point of 2–3 cells, the 3rd (4th) tooth often smaller than the others.

Underleaves imbricated, transversally obovate-obcordate, 0.6–0.9 × 0.4–0.65 mm, the apex truncate or recurved-retuse, the margins plane or recurved, the bases cuneate or rounded, sometimes auriculate, the insertion line arched.

Gametoecia as in *Schiffneriolejeunea tumida.*

Notes: Schiffneriolejeunea cumingiana was confused by Verdoorn (1934) and most other authors with the very common *S. tumida,* especially with its var. *haskarliana.* The type collection of *S. cumingiana* (Philippines, *Cuming* 2189, PC-MONT.) is very different from *S. tumida,* however, by the presence of three, instead of two, lobule teeth. Moreover, the free margin of the lobule is revoluted near the base instead of involuted and, consequently, does not develop a closed sac. Otherwise the two species are quite similar. The size of the lobule teeth in *S. cumingiana* varies although they never become as small as in *S. tumida.* An extreme form in this respect is the specimen from Borneo (Pulau Laut, *Meijer* 3265, L), which has four very large, conspicuous teeth up to 12 cells long! Three to four lobule teeth may also be found in the common Indomalaysian *S. pulopenangensis,* but the species is easily distinguished from *S. cumingiana* (and from *S. tumida*) by the leaves and lobules being flattened, not squarrose when moist. *Schiffneriolejeunea cumingiana* is thus far only known from eastern Malaysian islands, where it occurs epiphytically not far from the coast, probably at low elevations only.

Specimens examined: BORNEO: Pulau Laut, *Meijer* 3625 (L). CELEBES: Tambea, *Westenberg* s.n. (GRO); Mondeodo, *Eyma* 3729 (GRO). PHILIPPINES: without loc., *Cuming* 2189, type (FH-TAYL., G, NY, PC-MONT., W); Luzon, *Micholitz* s.n. (G); Dapitan, *Micholitz* s.n. (G); Mindoro, *Micholitz* s.n. (G); Papahog Is., Tawi Tawi group, *Bartsch* 169a (NICH); Palawan, Tay Tay, *Merrill* s.n., Bur. Sci. 1692 (FH). CERAM: *Dörfler* s.n. (S). NEW GUINEA: Doom Is. near Sorong, *van Hellendoorn* 98b (L).

3. Schiffneriolejeunea nymannii (Steph.) Gradst. & Terken, *comb. nov.*

Figure 2, C–E

Archilejeunea nymannii Steph., Spec. Hep. 4: 730 (1911). TYPUS: Papua New Guinea, "Kaiser Wilhelmsland: Sattelberg," *Nyman* s.n., 1899 (G holo, FH).

Heterotypic synonyms:

Mastigolejeunea valida Steph., Spec. Hep. 4: 772 (1912) *"superae"* pro err., fide *l.c.* p. 824 ≡ *Ptychocoleus validus* (Steph.) Verdoorn, Ann. Bryol. Suppl. 4: 136 (1934).

Ptychocoleus longispicus Steph., Spec. Hep. 5: 46 (1912). TYPUS: Borneo, Sarawak, "Suan," *Micholitz* s.n., 1894 (G holo, FH). [The locality has also been incorrectly cited for the Philippines cf. Stephani, Spec. Hep. 4: 772]

Ptychocoleus flaccidus Steph., Spec. Hep. 5: 43 (1912). TYPUS: New Guinea, without loc., *Micholitz* s.n. (G 15621, 15622).

Plants dioicous, medium-sized to rather small, up to 3 cm long and about 2 cm wide, growing appressed to the substrate, brownish when dry. Stem 0.18–0.25 mm in diam, the branching as in *S. tumida.*

Leaves densely imbricated, clasping the stem when dry; when moistened spreading but not/hardly becoming squarrose. Lobe ovate, 1.2–1.5

× 0.8–1 mm, the dorsal base not/weakly auriculate, the apex rounded plane or slightly incurved, the margins entire, not incurved, the ventral margin sometimes crispate-undulate, forming a sharp angle of ca 90°–130° with the keel; median cells ca 25 × 16 μm, the trigones rather small and the intermediate thickenings rather frequent, 1–2 per cell on the longer walls.

Lobule ± narrowly rectangular, 0.5 × 0.2 mm, the free margin near the base ± inrolled and saccate, sometimes only weakly so, near the apex with 1–2 very small, one-celled, erect or incurved teeth which are separated about three or four cells from each other.

Underleaves imbricated reniform, 0.9–1.4 × 0.5–0.6 mm, 5–6 × stem width, the apex truncate to recurved-retuse, the margins plane or weakly recurved, the bases cuneate or rounded, not or minutely auriculate, the insertion line arched.

Androecia as in *Schiffneriolejeunea tumida*. Gynoecia terminating short lateral, *Lejeunea*-type branches, rarely with an innovation of the *Radula*-type (then archegonium not fertilized!), the bracts and bracteoles in two series only, much larger than leaves and underleaves, with entire margins; inner bracts strongly concave, spreading above, the inner bract wider than long, very slightly bifid only, ca 1.8 mm long, the margins curved upwards and widely enveloping the perianth, the lobule subequal to the lobe, their apices ± narrowly obtuse and the sinus very shallowly obtuse; inner bracteole almost orbicular, ca 1.5 mm long, deeply concave with incurved margins which are enveloping the perianth, the apex rounded to minutely bifid.

Perianth obpyriform, ca 1.8 mm long, weakly exserted, with 5 inflated, smoothly rounded keels in the upper half and a short inconspicuous beak about 3 cells long.

Notes: Schiffneriolejeunea nymannii is an apparently rare eastern Malaysian species, thus far only known from a few localities in the lower mountains of New Guinea (up to 1500 m) and Sarawak, Borneo. The species habitually resembles small phases of *S. tumida* from which is differs, however, by the leaves which remain ± flattened when moist instead of becoming squarrose. In this respect, *S. nymannii* approaches *S. pulopenangensis*. Other differences separating *S. nymannii* from *S. tumida* are: 1) the ± ovate leaves with plane sometimes crispate-undulate ventral margins, long and narrow lobules with minute teeth and, most characteristically, the sharp angle between the ventral leaf margin and the keel (angle much wider in *S. tumida*); 2) the much broader, reniform underleaves, and 3) the very different gynoecium, which has only two series of bracts and bracteoles (3–6 in *S. tumida*), minutely bifid bracts with obtuse apices (± acuminate in *S. tumida*) and a broader, almost orbicular bracteole, which is much more strongly concave as to closely

envelop the inflated perianth (as in *Acrolejeunea pycnoclada* and *Schiffneriolejeunea pappeana*!).

Specimens examined: in addition to the type specimens from the Stephani herbarium cited above, only a single specimen of *Schiffneriolejeunea nymannii* has become available—Papua New Guinea: Wau Distr., Kunei Creek, near Edie Creek SSW of Wau, *Schuster* 67-5862a, 25.V.1967 (JE).

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