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New or little known epiphyllous liverworts, VI. *Papillolejeunea* gen. nov. from Papua New Guinea

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Abstract. A new epiphyllous Lejeuneaceae genus, *Papillolejeunea* is described. It is a segregate of *Lejeunea*, characterized by a large, 2-4 celled, stout, papilla like first (distal) tooth on a well developed, inflated lobule, while the second (proximal) tooth is reduced, blunt, hidden with the usually involuted free lobule margin. Four new species are described within the genus. One, *Papillolejeunea balazsii*, forms the Section nov. *Papillolejeunea* and the type of the genus, characterized by large number of serially arranged mucilage cells on the dorsal surface and margin of the lobe, at the margin of amphigastria and on the perianth keels. Three further species, *Papillolejeunea candida*, *Papillolejeunea papuana* and *Papillolejeunea touwii* constitute the Section nov. *Candidae*, where no such dorsal and marginal glands occur. The distribution of the genus seems to be restricted to the mountainous area of New Guinea.

Introduction

The late Dr. Dénes Balázs (renown Hungarian geographer and traveller, 1924-1994), during his journeys has always collected bryophytes upon my request, including epiphyllous liverworts (full itinerary: Balázs 1995). All these specimens are now deposited in the Herbarium of Eger College (EGR).

So did he also during his first visit to Papua New Guinea, in September - October 1972. The author started to study his New Guinean collection in details during 1993. One of the epiphyllous Lejeuneaceae species collected in the Lavani Basin of the Southern Highlands District, was very conspicuous even under dissecting microscope, having serially arranged, pale warts on the dorsal

surface of its leaves. These warts proved to be mucilage secreting cells, present also at the leaf and underleaf margins. Such type of glands on the dorsal lobe surface are not known elsewhere in the Lejeuneaceae family.

The other striking feature of the plant is the special development of first (distal) lobule tooth (see Plate 3 a), which is papilliform, elongate, with blunt apex, consisting of two cells and standing perpendicular to the free lobe margin, which is usually involuted together with the blunt second (proximal) tooth. Such distal lobule tooth occurs among certain Cololejeuneae, e.g. in members of Subgenus *Cryptolejeunea* of *Cololejeunea*, (see Pócs et al. 1994: Fig. 3), or in a few *Diplasiolejeunea* species but is unknown among members of the Lejeuneae tribe. In *Lejeunea bidentula* Herz. from the

Himalaya and Yunnan however a broad lanceolate, multicellular first tooth is present (see Mizutani 1971: Fig.1) while in the American *Lejeuneacardotii* Steph. or in members of Subgenus *Chaetolejeunea* of *Lejeunea* (or *Rectolejeunea*) the whole lobule is transformed into a filiform tooth (see Schuster 1980).

The author, studying in 1994 the very rich epiphyllous materials of Rijksherbarium from Leiden (L) and of the Botanical Museum, University of Helsinki (H) from their 1981 bryological expedition, has found several more specimens of the above plant, all collected at high altitude mountain forests of Papua New Guinea (collecting sites described by Koponen & Norris, 1983).

Plants similar to the above, with the same lobule tooth configuration, but without mucilage secreting cells on the lobe and on amphigastria, were also found in the above collections. One species of them, as large as the above, possesses reflexed lobe margins, while an other one much smaller in size has flat lobe margins. A third one, large in size, but with smooth leaf margins and with 3 celled first tooth could also be differentiated. Finally four species were encountered, all bearing stout first (distal) and blunt second (proximal) lobule teeth, inflated lobule with involuted free margin. All have 5 keeled perianths developing on short lateral branches, innovating repeatedly at one side (*Taxilejeunea* type arrangement). The stem has 7 rows of cortical and 20-35 rows of medullary cells and *Lejeunea* type branching and innovations. The amphigastria are bifid, different size in the different species. Based on the above characters, a new genus: *Papillolejeunea*, is established, with two sections, Sectio *Papillolejeunea* and Sectio *Candidae* and with four new species: *Papillolejeunea balazsii* in the first section; *Papillolejeunea candida*, *Papillolejeunea papuana* and *Papillolejeunea touwii* in the second. The new genus is obviously related to the genus *Lejeunea*, but clearly differs by its stout, papilliform distal lobule tooth composed of 2-4 uniseriate cells developing on an inflated lobule with involuted margin and in one species by the mucilage cells on the leaf lobe, amphigastria and on the perianth keels.

New taxa

PAPILLOLEJEUNEA Pócs, gen.nov.
(Family Lejeuneaceae, Tribe Lejeuneae)

A genere *Lejeunea* dentibus distalibus lobuli papilliformibus pluricellularibus erectis et cellulis mucigenis dorsalibus differt. Typus generis: *Papillolejeunea balazsii* Pócs, Tropical Bryology 13: 3 (1997).

Epiphyllous or corticolous plants, dioicous or rarely autoicous, with *Lejeunea* type main branching. Stem 40-100 µm in diameter, with 20-35 medullary and 7 cortical cell rows, of which 2 are the ventral merophytes. Leaves 0.5-1.5 mm long, 0.5-1.5 mm wide, broadly ovate, with rounded apex. Lobulus with a 2-4 celled, papilliform first (distal) tooth, perpendicular to the usually involuted free lobule margin, with a hardly visible hyaline papilla at its inner proximal base. The second (proximal) tooth is blunt, usually hidden with the incurved margin or evanescent. The proximal lobe margin is fused to the stem by 1-2 rows of specialized cells (usually elongated parallel to the stem). Amphigastria bilobed, much wider than the stem. The five keeled perianths are born, like in the genus *Taxilejeunea*, on repeatedly innovating, short unilateral side branches (innovations of *Lejeunea* type starting with leaf). Spori unicellular, elongate-rectangular or irregular in shape, verruculose. Male branches develop on the main stem, with 5-10 pairs of antheridial bracts, each with 2 antheridia. Vegetative reproduction is not known. Three of the species seem be typically or truly epiphyllous in the sense of Gradstein (1996), while one (*Papillolejeunea papuana*) was collected on bark.

Papillolejeunea, Sectio nova

Facies dorsalis et margo lobi, margo amphigastrii et carinae perianthii cellulis mucosis pedicellatis gerentes. Typus sectionis: *Papillolejeunea balazsii* Pócs, Tropical Bryology 13: 3 (1997). Lobulus elongato-triangularis. Ratio longitudinis et latitudinis lobuli circa 2:1. Distantia dentis primi est cellulae 3-7 ab extremitate lobuli.

The dorsal surface and margin of the leaf lobe, the

underleaf margin and the perianth keels are covered by stalked mucilage cells (slime glands). The lobule is elongate triangular, about twice longer than broad. The distance between the tooth and the distal end of lobule comprises 3-7 margin cells.

Papillolejeunea balazsii Pócs, spec. nova
(see Plates 1-3 and Figs 1-2)

Planta epiphylla magna, caespites irregulariter ramosi, pallide virentes. Caules ad 40 mm longi, 85-140 μm crassi, cum foliis 1,5-2,4 mm lati. Folia imbricata, convexa, 1-1,6 mm longa, 0,8-1,5 mm lata, suborbiculata, lobulis elongato-triangularibus, inflatis marginibus incurvatis vel rariter planis. Superficies dorsalis et margo lobi cellulis mucosis verruculosa. Cellulae marginis lobi subquadratae, 10-15 μm in diametro. Cellulae medianes polygonales, isodiametricae vel elongatae, 15-30 μm in diametro, parietibus saepe incrassatis triangularibus vel nodulis intermediatis.

Dens primus (distalis) erectus, bicellularis, apice rotundatus vel attenuatus. Dens secundus (proximalis) obtusus, saepe incertus. Papilla hyalina basi interioris dentis primi affixa, saepe occulta. Amphigastria 0,25-0,5 mm longa et 0,3-0,5 mm lata, bifida, apicibus lobis acutis vel mucronatis, unicellularibus, margine dispersim cellulis mucosis tuberculata.

Planta dioica, perianthia sessilia in ramis lateralibus cum innovationis unilateralibus identidem evoluta, pyriformi, 5 carinata, margine cellulis mucosis irregulariter denticulata, 1,25 mm longa et 0,5 mm lata. Bractee et bracteolae breves, bilobatae. Sporae rectangulares vel irregulariter polygonales, 20 x 50 μm , superficie verruculosae, olivaceo-brunneae. Androecia ignota.

HOLOTYPE: Papua New Guinea, Southern Highlands District, Koroba Subdistrict, 30-40 km W of Koroba in the Eastern Divide Mountains. Epiphyllous in very wet montane rainforest on the ridges around Lavani Basin, at 2900 m alt. Coll. D. Balázs NG-14 AA, 7.Sept.1972 (EGR). **PARATYPES:** Papua New Guinea, West Sepik Distr., Star Mts., Busilmin, between airstrip and Din River. Epiphyllous, at the edge and inside of dense forest at 1450-1550 m alt., 5°S, 141°05'E, A. Touw, 25-26. March 1975, 15002G(L), 15055V(L); Folongonom, near Papuan hunting camp, from

2100 to 2350 m. Epiphyllous in intact and in disturbed, secondary upper montane forest, 5°S, 141°05'E, A. Touw, 11-17. May 1975, 17570G(L), 17793B(L), 17817B(L, EGR, H), 18229(L), 18240A(L, EGR), 18243K(L), 18261N(L), 18342S(L); Morobe Prov. Lae Subdistrict, Zatar, SE of Boana, 6°25'S, 146°60'E. Ramicolous, on branches of *Psychotria* in mossy forest, P. van Royen & A.N. Miller 15669/b p.p. 25.Feb. 1963. Epiphyllous in montane rainforest on very steep S-facing ridge and on top of mountain W of Wantoap River ca. 11 km NNW of Wantoat, alt. 1950-2230 m, 6°03'S, 146°25'E (collection site no. 3f), T. Koponen 29848 p.p. 1 June 1981 (H); Morobe Prov. Epiphyllous in extensively cultivated garden area with scattered trees along trail from Selimbeng (Serembeng) down toward Bulum River, alt. 1200-1450 m, 6°29'S, 147°20'E (collection site 10k), D. H. Norris 59269 p.p.18. May 1981 (H, only one shoot on microslide).

Relatively large, dull green, epiphyllous plant with irregularly branching, 1.5-2.4 mm wide and up to 40 mm long shoots. Stem 85-140 μm thick, with 20-35 rows of narrow medullary cells and 7 rows of large cortical cells, of which 2 are the ventral merophytes. Leaves are strongly convave, imbricate, with elongate-triangular, inflated lobuli. The lobe cells at margin are subquadrangular, about 10-15 μm large while the median cells of lobe, lobule and of the amphigastria are isodiametric polygonal or slightly elongate, 15-30 μm large. The cells of the lobe, lobulus and amphigastrium have often incrassated walls, with triangular and intermediate thickenings. The free lobulus margin is usually incurved together with the blunt and weakly developed second (proximal) tooth. The first (distal) lobule tooth is stout, erect, perpendicular to the free lobule margin, consists of two cells and develops at 3-7 cells distance from the distal lobulus end. Its apical cell is round or attenuate. The often hardly visible hyaline papilla is attached to the inner proximal base of the first tooth. The proximal lobule margin is fused to the stem by 1-2 rows of smaller cells, which are elongate parallel to the stem. The lobule keel is smooth and slightly arched.

The most striking feature of the plant are the stalked mucilage cells (slime glands) on the dorsal surface and margin of the lobe, at the margin of amphigastria and along the perianth keels. These

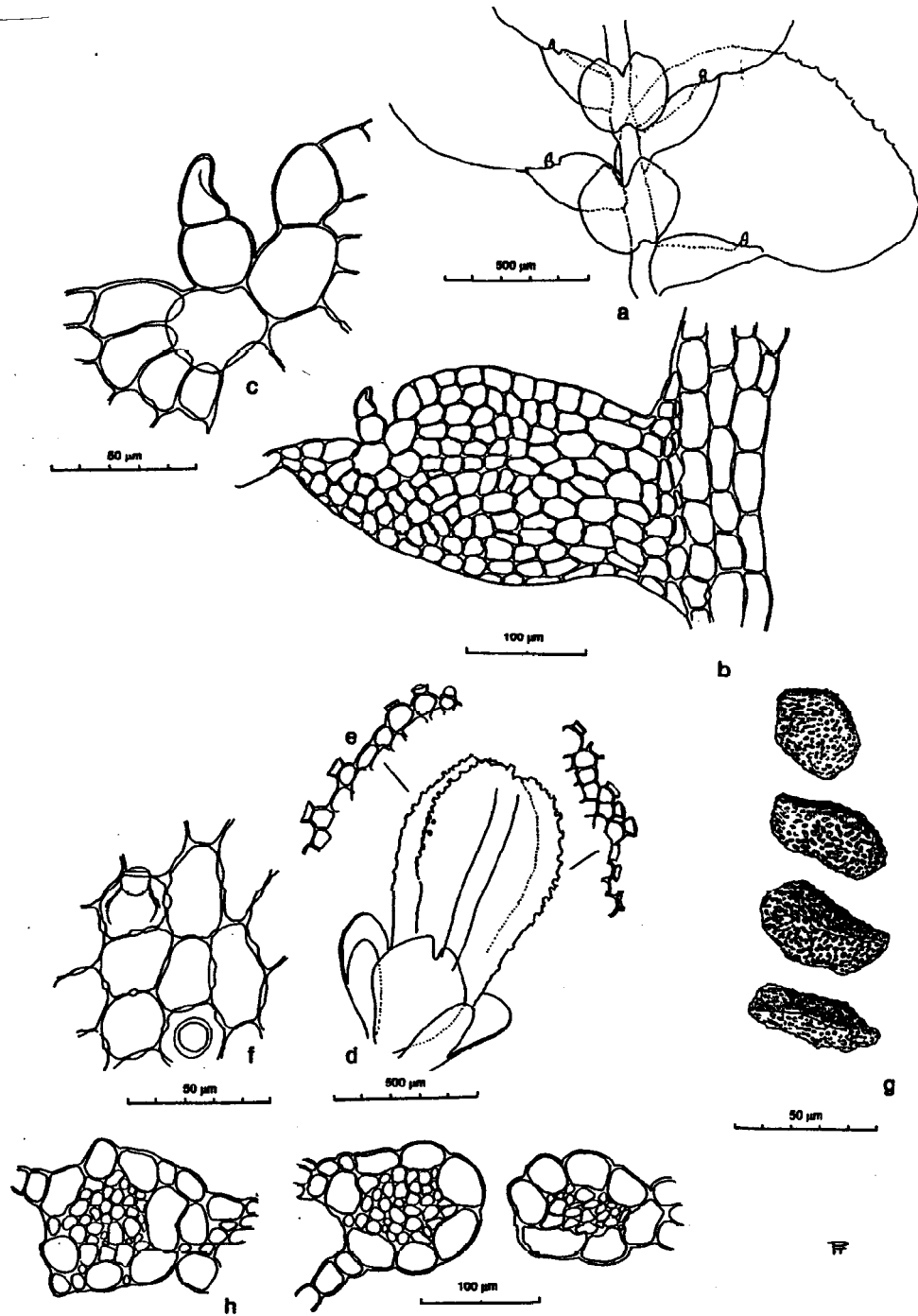


Plate 1. *Papillolejeunea balazsii* Pócs. a: Ventral view of plant. b: Lobule with exceptionally plane free margin, showing also the blunt second tooth. c: First (distal) and second (proximal) lobule tooth. d: Perianth subtended by bracts and bracteole. e: Perianth keel margins with stalked mucilage cells. f: Mucilage cells on the dorsal leaf surface and lobe cells with triangular and intermediate wall thickenings. g: Spores. h: Transversal sections of the stem. a-c drawn from the type and d-h from Touw 17793B.

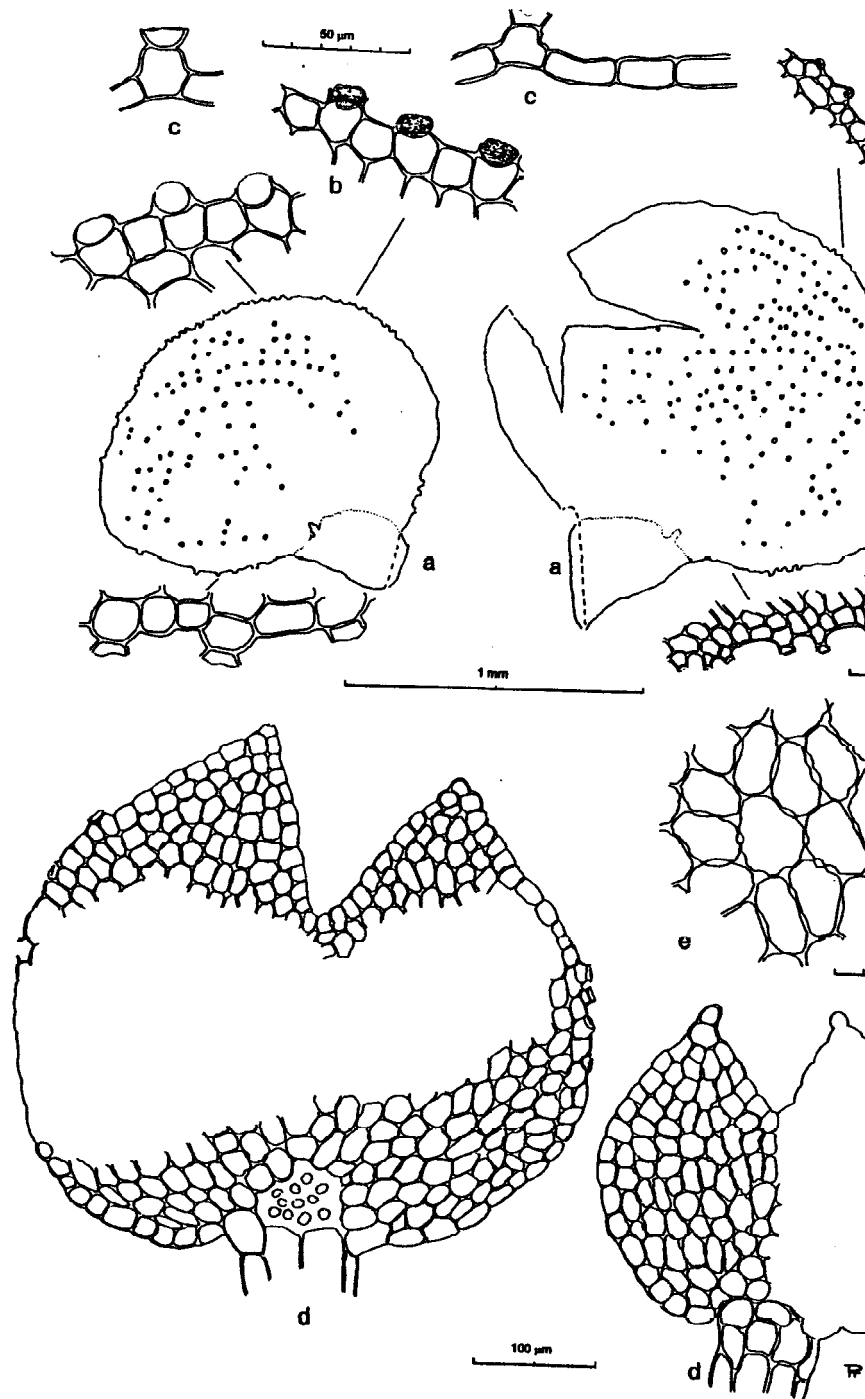


Plate 2. *Papillolejeunea balazsii* Pócs. a: Leaves (flattened). b: Mucilage cells from the lobe margin. c: Mucilage cells from the lobe surface, in transversal section. d: Amphigastria. e: Amphigastrium cells, with triangular and intermediate cell wall thickenings. All drawn from Touw 17793B.

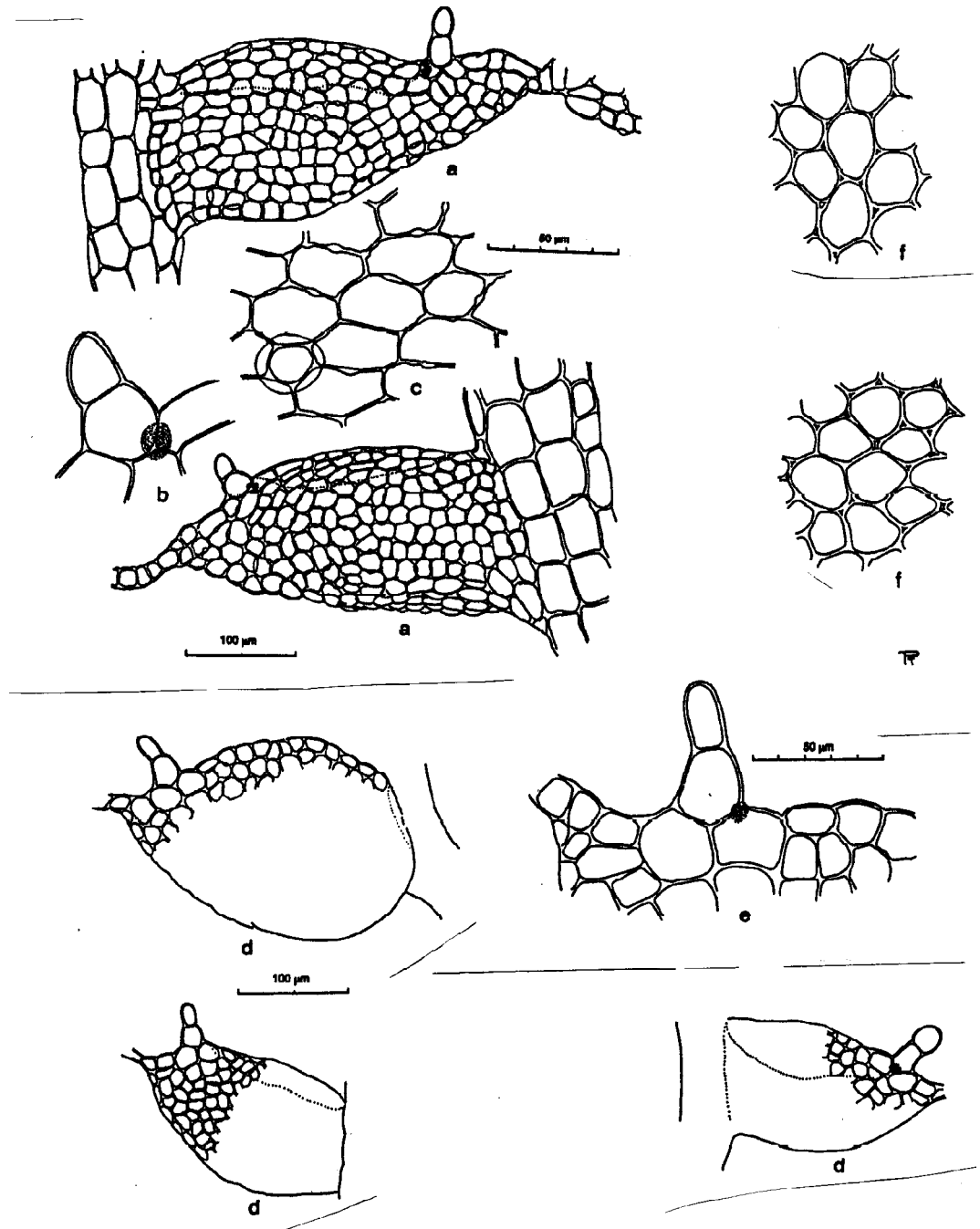


Plate 3. *Papillolejeunea balazsii* Pócs. a: Lobules with involute free margins. b: First (distal) lobule tooth with hyaline papilla. c: Lobule cells with intermediate wall thickenings and one mucilage cell seen from the ventral side. Drawn from the type.
Papillolejeunea candida Pócs. d: Lobules. e: First (distal) and rudimentary second (proximal) lobule teeth. f: Cell network of lobe. Drawn from the type.



Fig. 1: The type habitat of *Papillolejeunea balazsii* Pócs, Cloud forest dominated by *Pandanus* sp. at 2900 m altitude at the limestone rim of Lavani basin. (Phot. Dénes Balázs)

glands are conspicuous under dissecting microscope or can be seen even by a stronger hand lens, being paler than the leaf and causing wartiness on the upper leaf surface. The glands are arranged in parallel, irregular rows on the dorsal surface of the lobe (see Tab. 2 a). Their finer structure differs from that of the average slime papillae (see Tab. 1, fig. f and Tab. 2, figs. b, c), as they consist of a basal cell (stalk), which is a modified leaf cell, protruding conically from the surface. Each basal cell carries a gland cell, which has, at least at its lower half thickened wall. Its globose mucilage content is released in quite young stage of development and the crown shaped lower half of gland cell is then retained. Such type of mucilage cells on the dorsal surface of leaf lobes are not known elsewhere in Lejeuneaceae family and maybe not even in other liverworts. The amphigastria are slightly wider than long (0.25-0.4 x 0.3-0.5 mm) and 4-5 times wider than the stem, bifid with broadly acute, 10-16 cells wide lobes, ending in one cell. The sinus is quite open, V shaped. The margins bear a few scattered mucilage glands. The insertion line is reverse U shaped, in which sometimes a small rhizoid plate can develop. The plant seems to be dioicous. The pear shaped, 1.25 x 0.5 mm large perianths with 5 equal keels and 2 cells long beak are born on short side branches, which at one side repeatedly innovate (innovation of *Lejeunea* type), bearing 2-3 perianths serially, the way, as they occur in *Taxilejeunea*. The bilobed bracts have rounded apex, together with the bracteoles are short, not exceeding 2/5 of the perianth length. The olive-brown spores are subrectangular-polygonal in shape, verruculose on their surface, 20 x 50 µm large. Androecia were not seen.

The species is dedicated to the author's late friend, dr. Dénes Balázs, the renowned geographer and traveller, who collected its holotype specimen. The distribution of the new species (and of the whole genus) seems to be restricted to the central mountain ranges of New Guinea (see Fig. 2), where it occurs in the wettest rainforest habitats between 1200 and 2900 m altitude, collected 12 times as epiphyllous and only once as ramicolous. The type locality (see Fig. 1), according to Balázs (in litt.) is a relatively open, very wet, upper montane rainforest in the cloud belt, affected by continuous mist. At the place of the collection the forest is

dominated by a giant *Pandanus* sp. The annual rainfall is estimated to be at least 3000-4000 mm per year. The very remote carstic Lavani Basin was visited by Europeans the first time in 1954 (Sinclair 1966, Balázs 1976).

The species seems to prefer hard, coriaceous leaves. Once it was collected (Touw No. 17793B) on the partly decaying leaves of *Pandanus* sp.

Candidae Pócs, Sectio nova

A sectione typica lobi, amphigastriis et perianthiis laevibus, sine cellulis mucosis et lobulis breve ovato-triangularibus vel rectangularibus differt. Ratio longitudinis latitudinisque lobulae haud excedens 1.5:1. Distantia dentis primi est cellulae 1-3 ab extremitate lobuli. Typus sectionis: *Papillolejeunea candida* Pócs, Tropical Bryology 12: 8 (1997).

The dorsal surface and margin of leaves, the amphigastria and perianths without stalked mucilage cells (slime glands). The lobule is short triangular-ovate or rectangular, its length never exceeds 1.5 of its width. The first tooth is at only 1-3 cells distance from the distal end of lobule.

Papillolejeunea candida Pócs, spec. nova (see Plates 3-4 and Fig. 3)

Planta epiphylla magnitudine parva, candida, caules vix ramosi, ad 8 mm longi, 40-50 µm crassi, cum foliis 0,9-1,2 mm lati. Folia contigua, plana, 0,5-0,6 mm longa et lata, ovoidea, lobulis ellipsoideis, inflatis margine incurvata vel plana. Superficies dorsalis laevis. Cellulae lobi et lobuli 20-35 µm in diametro, subisodiametricae parietibus aequaliter incrassatis triangulis parvis.

Dens primus (distalis) erectus, bicellularis, apice rotundatus. Dens secundus (proximalis) subnullus. Papilla hyalina basi interioris dentis primi affixa.

Amphigastria 0,16-0,2 mm longa et lata, caule triplo latiora, apicibus lobis obtusiusculis, unicellularibus, margine laevis. Cellulae lobi similes parietibus aequaliter leviterque incrassatae.

Planta dioica, perianthia sessilia in ramis laterali-bus cum innovationis unilateralibus, pyriformia, 5

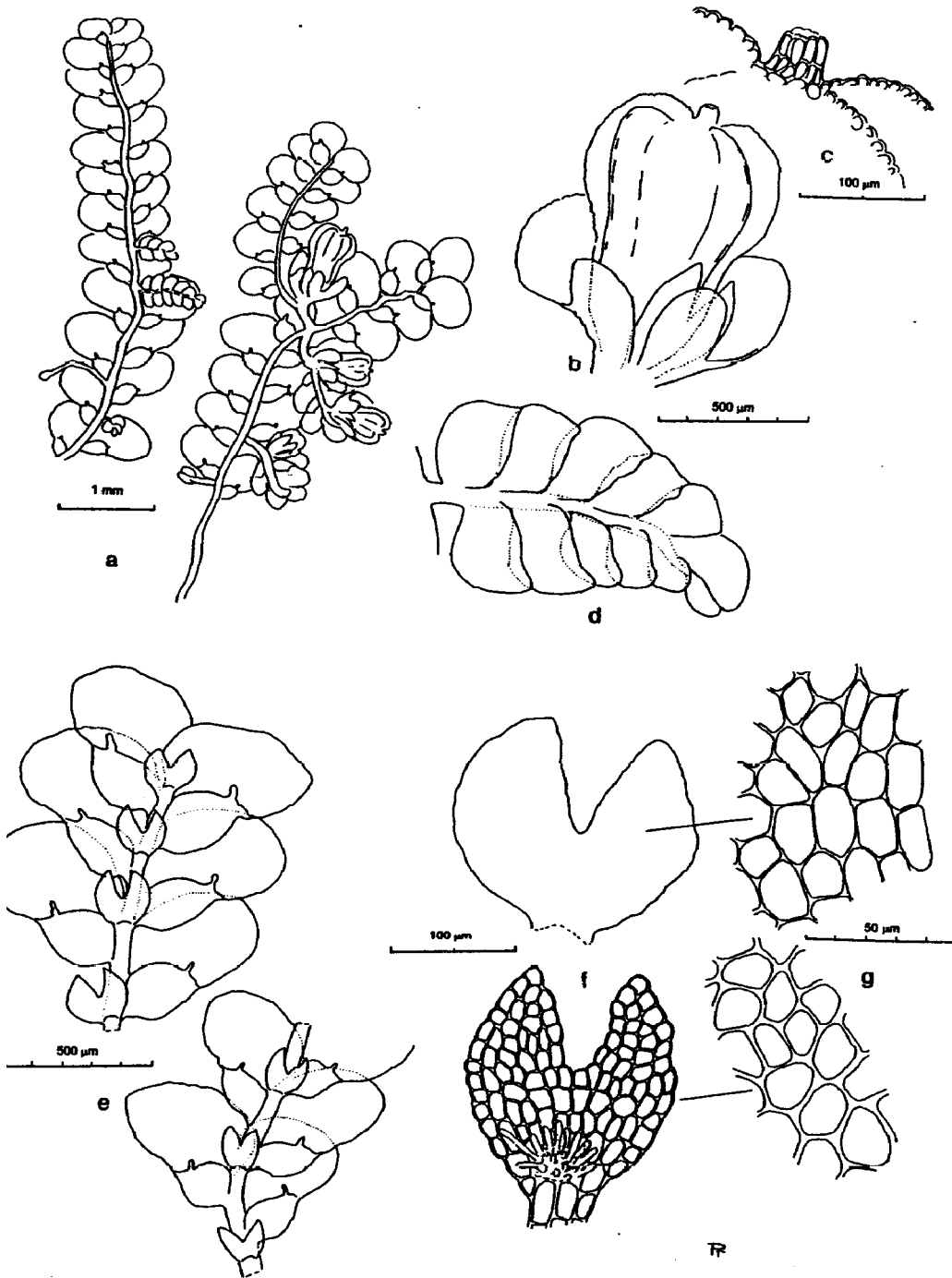


Plate 4. *Papillolejeunea candida* Pócs. a: Male and female plant (amphigastria not shown). b: Perianth with bracts and bracteole. c: Perianth apex. d: Male branch. e: Details of sterile plants, ventral view. f: Amphigastria. g: Amphigastrium cells. All drawn from the type.

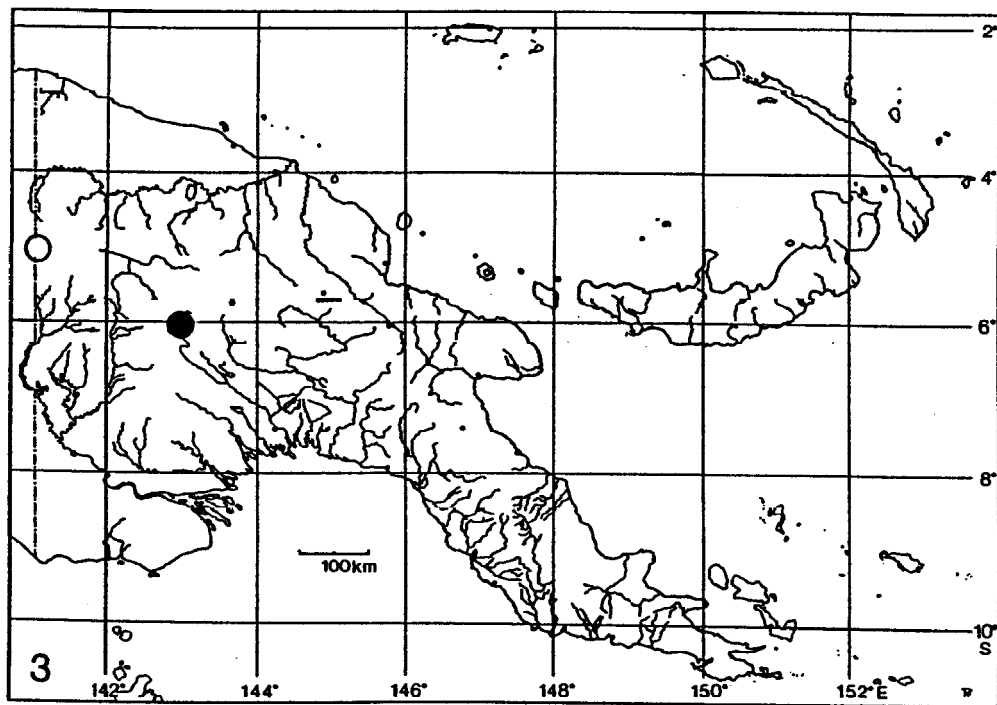
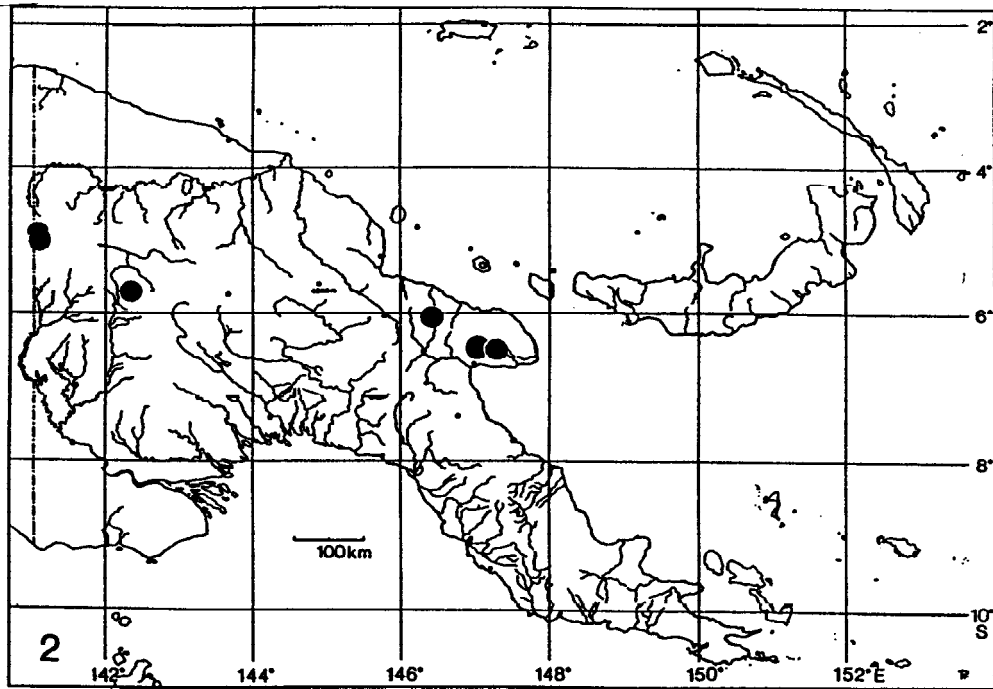


Fig. 2: The distribution of *Papillolejeunea balazsii* Pócs.

Fig. 3: The distribution of *Papillolejeunea candida* Pócs (both rings) and of *Papillolejeunea touwii* Pócs (open ring, where it occurs together with *P. candida*).

carinata, margine leviter crenulata. Bracteae et bracteolae bifidae, mediocres. Androecia lateralia, 2-7 jugata.

HOLOTYPUS: Papua New Guinea, Southern Highlands District, Tari Subdistrict, northern slopes of Mt. Kerewa, c. 6°S, 143°E. Epiphyllous on *Spiridens reinwardtii* growing on tree trunk, in mixed secondary forest at 2940 m alt, rich in epiphytic mosses and climbing bamboo. C. Kalkman 4694Bd (L, part of specimen on microslide). **PARATYPE:** Papua New Guinea, West Sepik District, Star Mts. near Fologonom, at 2300-2350 m alt., c. 5°S, 141°05'E. Upper montane forest above Papuan hunting camp. Epiphyllous on old leaves of *Pandanus* sp. c. 1.5 m above the forest floor, mixed with the Type of *Papillolejeunea touwii* spec. nov. and with some other Lejeuneaceae. A. Touw 17793Qb (L).

Small, white, translucent epiphyllous plant with poorly branched, maximum 8 mm long and 40-50 µm thick stems and 0.9-1.2 wide shoots. Leaves ovate, flat, contiguous, with ellipsoid, at the free margin usually incurved, inflate lobules. Dorsal lobe surface smooth, lobe and lobule cells throughout 20-35 µm in diameter, subisodiametric or slightly elongate, with weakly and evenly incrassate walls and small trigones. The first (distal) tooth is stout, erect, consists of two cells, with rounded apex, at 1-2 cells distance from the lobule end. The second (proximal) tooth is evanescent or blunt, incurved with the lobule margin. The hyaline papilla small, attached to the inner base of first tooth. Amphigastria 0.16-0.2 mm long and wide, lobes 6-10 cells broad, with obtuse, attenuate apex ending in one cell. Amphigastrium cells with slightly, evenly incrassate walls, without or with very small trigones. The sinus is wide V or U shaped. Amphigastrium insertion slightly arched, sometimes with a weak rhizoid disc.

Dioicous, the perianths are sessile on short side branches with repeated innovation on one side. Bracts with rounded apex, with bracteoles bilobed, medium sized, not or slightly exceeding the half length of the pyriform, 5 carinate perianth. Perianth keels slightly crenulate by the protruding cell walls. Beak 2 cells long.

The male branches are lateral on the main stem, almost perpendicular to it, with 2-7 pairs of

antheridial bracts.

Papillolejeunea touwii Pócs, spec. nova
(see Plates 5-6 and Fig. 3)

Planta epiphylla magna, irreguliter pinnatifida, caespites 2-4 cm in diametro, caules 2-3 cm longi, 100-140 µm crassi, cum foliis 1,3-2 mm lati. Folia imbricata, plana sed margine anteriore anguste reflexa. Superficies dorsalis laevis. Lobuli lato-triangularis, inflati. Cellulae lobi et lobuli 18-33 µm, subisodiametricae parietibus vix incrassatis triangulis subnullis.

Dens primus (distalis) bicellularis, apice rotundatus. Dens secundus (proximalis) obtusus, cum margine libero lobuli incurvus. Papilla hyalina magna, ad basim interiorem dentis primi affixa.

Amphigastria 0,25-0,4 mm longa et lata, caulie quadruplo latiora, lobi et sinus obtusi. Cellulae amphigastrii 20-30 µm, subisodiametricae parietibus triangulis lenticulisque valde incrassatae.

Planta dioica vel autoica, perianthia sessilia in ramis lateralibus cum innovationibus unilateribus, pyriformia, 5 carinata, 1 mm longa. Bracteae et bracteolae magnae, bilobatae, acutiusculae. Androecia Rami masculi laterales reflexi, 6-10 jugati, bracteae cum 2 antheridiis.

HOLOTYPUS: Papua New Guinea, West Sepik District, Star Mts. near Fologonom, at 2300-2350 m alt., c. 5°S, 141°05'E. Upper montane forest above papuan hunting camp. Epiphyllous on old leaves of *Pandanus* sp. c. 1.5 m above the forest floor, mixed with the Paratype of *Papillolejeunea candida* spec. nov. and with some other Lejeuneaceae. A. Touw 17793Qa (L, ISOTYPE EGR). **PARATYPES:** Papua New Guinea, near the Holotype, epiphyllous in undergrowth of open secondary forest on steep montane slope between Ok Din river and Papuan hunting camp, at 2100-2130 m alt. A. Touw 18243D (L, EGR), 18261U (L).

Relatively large, epiphyllous, in herbarium pale yellowish green plant, forming 2-4 cm broad patches on coriaceous or on hard leaves (e.g. *Pandanus*). The stems are 2-3 cm long, irregularly pinnately branching. Stem diameter 100-140 µm, medullary cells 20-25, cortical cells 7 of which 2 are ventral merophyta. Shoot width with leaves 1.3-2 mm.

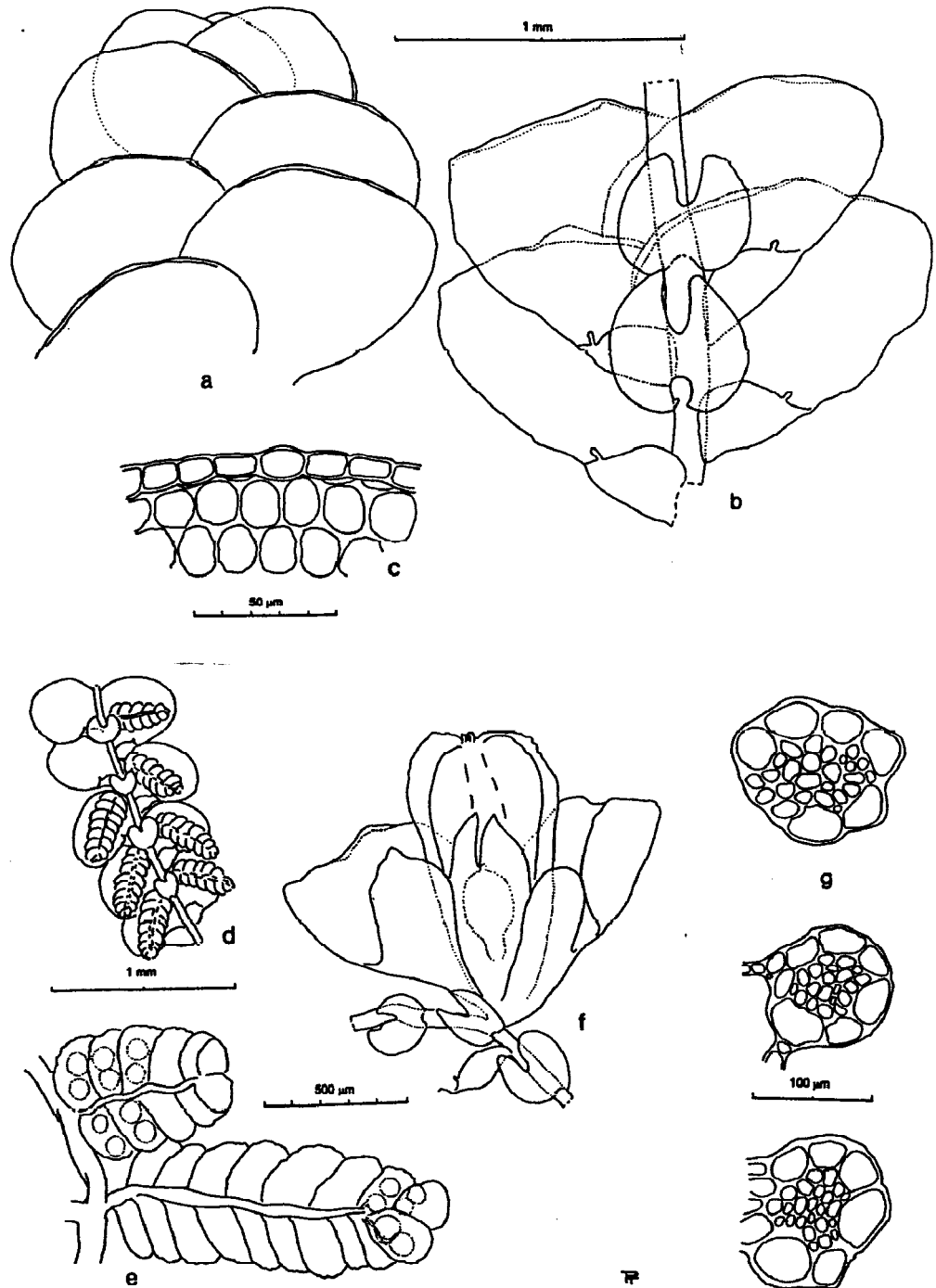


Plate 5. *Papillolejeunea touwii* Pócs. a: Dorsal and b: ventral view of the plant. c: Antical lobe margin, dorsal view. d: Male plant. e: Male branches. f: Perianth subtended by bracts and bracteole. g: Stem transversal sections. All drawn from the type.

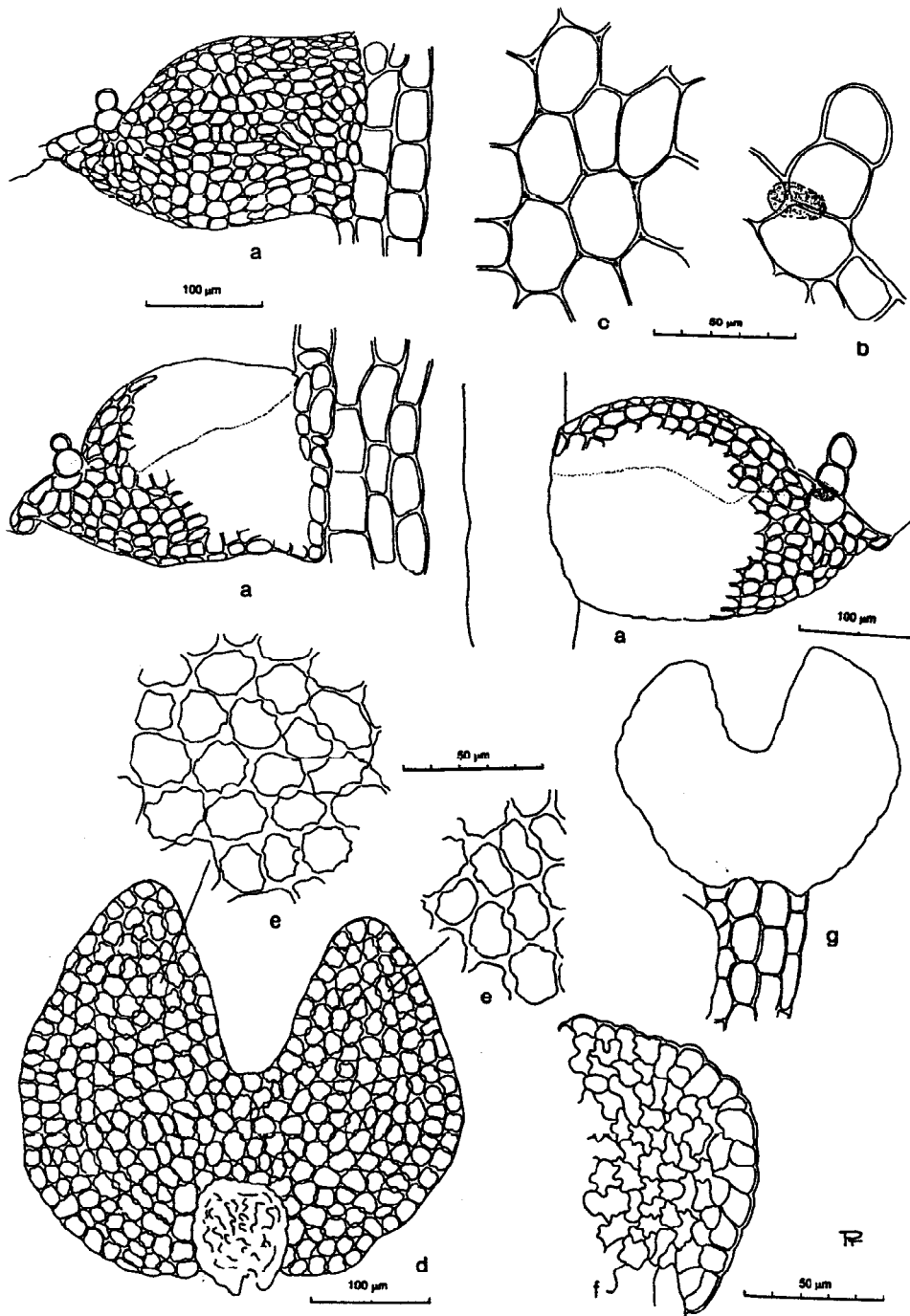


Plate 6. *Papillolejeunea touwii* Pócs. a: Lobules. b: First (distal) lobule tooth. c: Lobe cells. d: Amphigastrium. e: Amphigastrium cells. f: Right half of the rhizoid plate (from the amphigastrium shown on e). All drawn from the type.

Leaves imbricate, wide triangular ovate, sometimes subacute, length and width 0.8-1 mm. with base widely exceeding the stem. The most characteristic feature of the species is the narrowly reflexed antical lobe margin, which is well visible under dissecting microscope. The reflexed upper margin mostly consists only of 1-2 cell rows (see Plate 5 c), but sometimes much broader. The dorsal lobe surface is smooth, the lobe and lobule cells are 18-33 μm large, subsodiametric, at the margin subrectangular, evenly and slightly thickened with almost no triangles.

The lobule is short triangular, inflated, with a first (distal) tooth consisting of two round cells, stout and almost perpendicular to lobule margin, with a large hyaline papilla at its inner base and develops at 2-3 cells distance from the end of lobulus. The second (proximal) tooth is blunt and hidden by the mostly incurved lobule margin.

The amphigastria are very large, 0.25-0.4 mm long and wide, about four times wider than the stem. The lobes are blunt, 10-12 cells wide, with broadly rounded apex formed by more than one cell. Amphigastrium cells are 20-30 μm in diameter with strongly incrassate walls, bulging triangles and intermediate thickenings. The insertion line is reversed U shaped. The sinus is V or U shaped. A rhizoid plate often present, consisting of cells with thin, wavy walls.

Dioicous or rarely autoicous. The pear shaped, 1 mm long perianths are sessile on short, innovating side branches. The bracts and bracteole are relatively large, reaching $\frac{3}{4}$ length of the perianth, with apiculate lobes. The male branches develop densely (one branch per leaf) on the main stem, backwards reflexed, consisting of 6-10 pairs of male bracts, each with 2 antheridia. The new species is dedicated to its collector, Dr. Andries Touw (L), renown researcher of the Asian bryoflora.

Papillolejeunea papuana Pócs, spec. nova
(See Plates 7-8)

Planta ramicola magna, vix ramosa, caules 8-12 mm longi, 80-140 μm crassi, cum foliis 1,25-1,75 mm lati. Folia imbricata, plana, superficies dorsalis laevis. Lobuli ovatae vel rectangulares, inflati. Cellulae lobi ad marginem rectangulares, diametro 11-18 μm , in centro subsodiametricae, diametro 19-21 μm . Cellulae lobuli 18-33 μm , polygonales

parietibus vix incrassatae triangulis subnullis.

Dens primus (distalis) tricellularis (rariter bi-, vel quandricellularis), apice rotundatus. Dens secundus (proximalis) obtusus, cum margine libero lobuli incurvus. Papilla hyalina mediocria, ad basim interiorem dentis primi affixa.

Amphigastria cauli quadruplo seu quintuplo latiora, 0,35-0,5 mm longa et 0,45-0,6 mm lata, lobi et sinus acuti. Cellulae amphigastrii 18-32 μm latae, elongatae-hexagonales parietibus triangulis lenticulisque vix incrassatae.

Planta sterilis, caetera ignota.

HOLOTYPUS: "Austr.-New Guinea", Wiesenthal sine num. et dat. (L ex GRO No 9597). According to the introductory volume of Flora Malesiana (van Steenis-Kruseman 1950) Franz Wiesenthal was a German missionary, whose main collecting activity between 1910 and 1943 was centred in the former Kaiser-Wilhelmsland, what is at present the NE part of Papua new Guinea, where he visited many areas (in litt. B.O. van Zanten).

Relatively large, corticolous, in herbarium pale whitish green to yellowish plant forming mats on the bark. The stems are 8-14 mm long, with very few short side branches of *Lejeunea* type. Stem diameter 80-140 μm , with 24-34 medullary cells and 6-8 cortical cells, of which 2 are ventral merophytes. Shoot width with leaves 1.25-1.75 mm. Leaves imbricate, wide ovate with rounded apex, 0.8 mm long and 0.6 mm wide, with their base slightly exceeding the stem. The dorsal lobe surface is smooth. Its marginal cells are subrectangular, 11-18 μm , central cells of the lobe 18-21 μm large, subsodiametric, evenly and slightly thickened with small trigones and intermediate thickenings. The lobule is ovate or rounded rectangular, inflated. The most characteristic property of the species is the first (distal) tooth consisting of three (rarely two or four) round cells in one row, directed at 45-70° outwards from the stem (directed forwards by the other species). The hyaline papilla develops at its inner base. The other unique feature is, that the tooth is separated always only by one cell from the distal lobulus end. The second (proximal) tooth is blunt and evanescent, hidden by the involute lobule margin.

The amphigastria are large, four to five times wider than the stem and wider than long, length 0.35-0.5 mm, width 0.45-0.6 mm. Its lobes are acute, 12-15

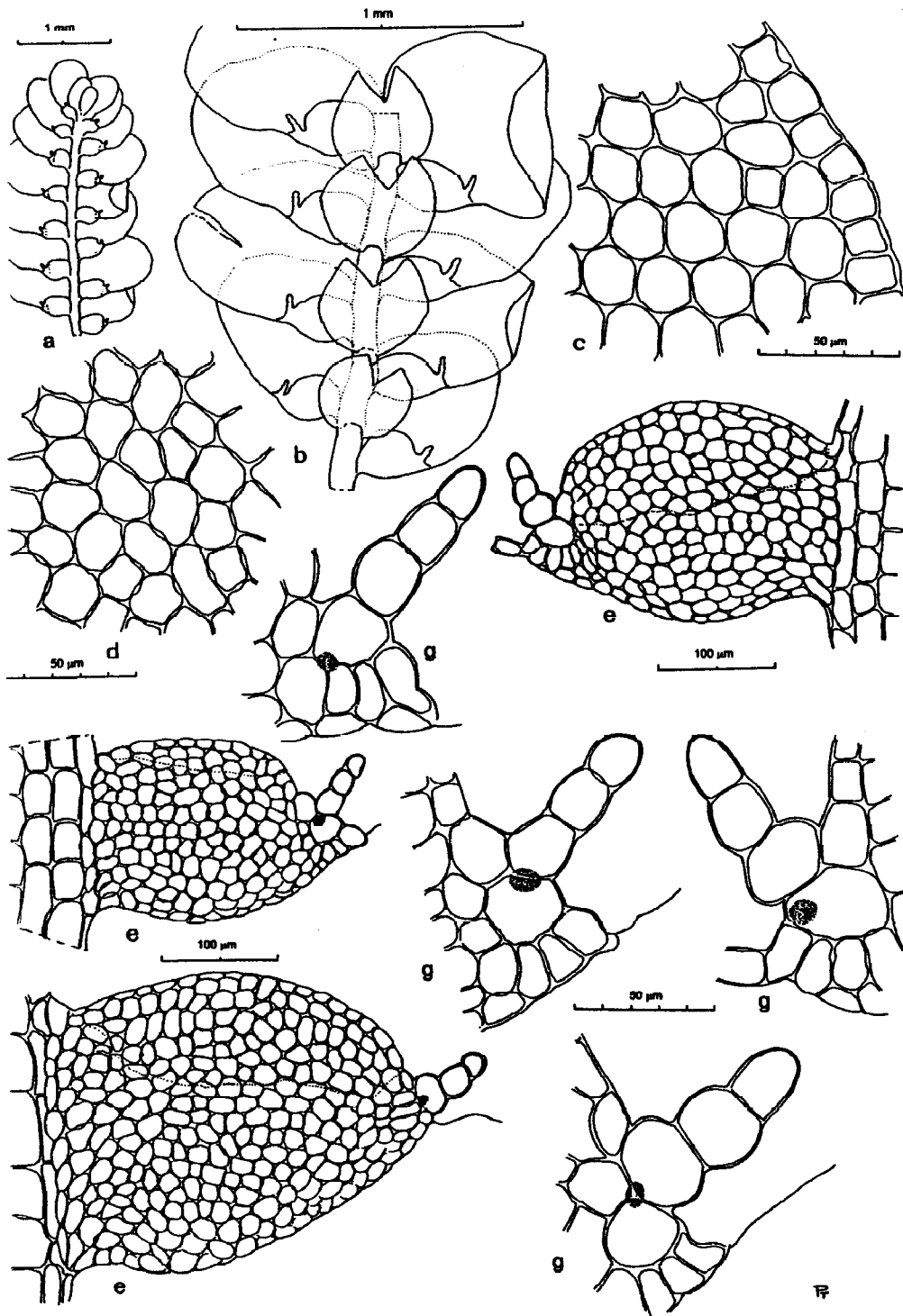


Plate 7. *Papillolejeunea papuana* Pócs. a: Habit of plant (amphigastria not shown). b: Ventral view of plant. c: Lobe cells. d: Lobule cells. e: Lobules of different size. g: First (distal) lobule teeth. All drawn from the type.

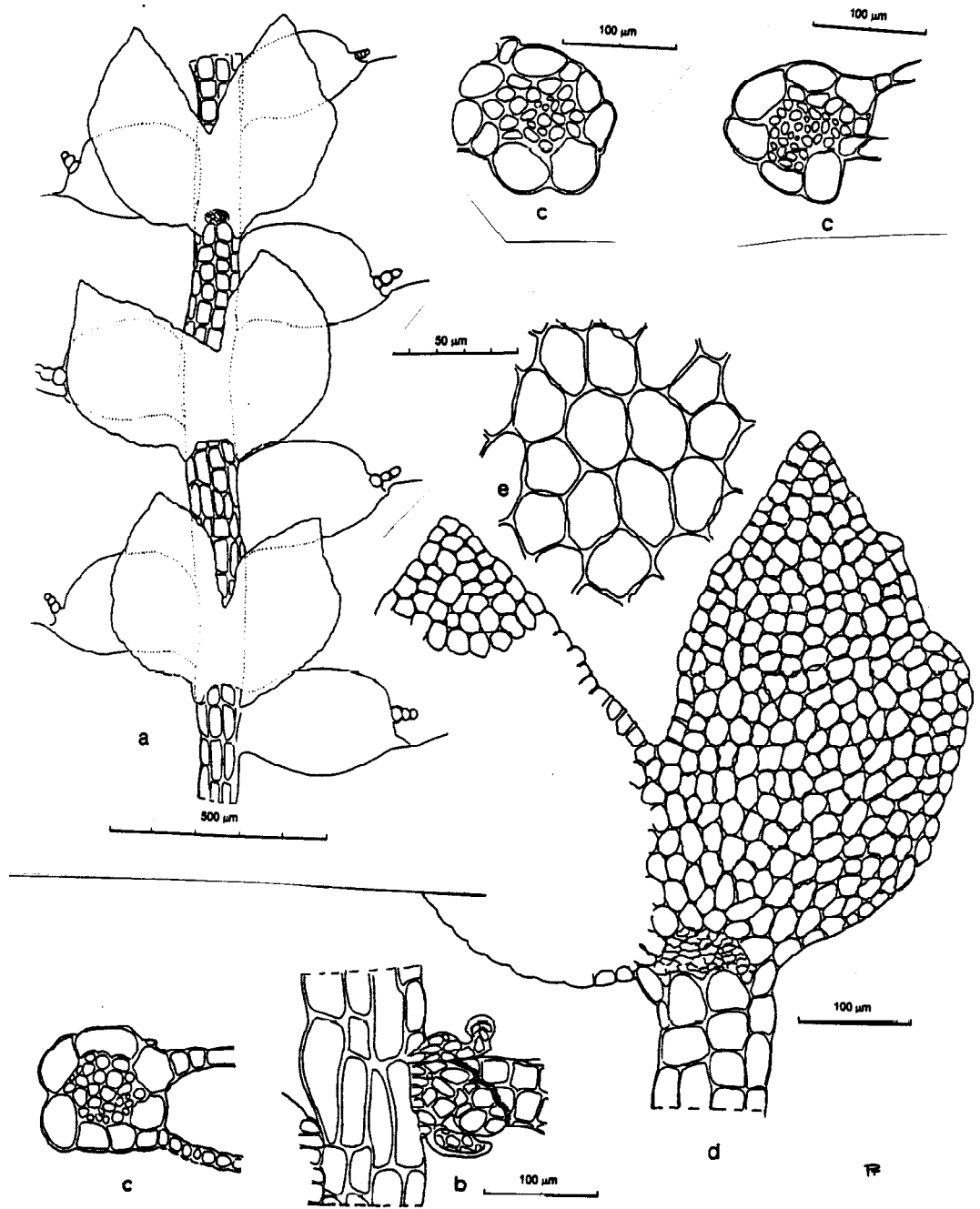


Plate 8. *Papillolejeunea papuana* Pócs. a: The arrangement of amphigastria and lobules on the stem. b: *Lejeunea* type branching with collar. c: Stem transversal sections. d: Amphigastrium. e: Amphigastrium cells. All drawn from the type.

cells wide. Amphigastrium cells are 18-32 μm in diameter, elongated hexagonal with slightly incrassate walls, small triangles and intermediate thickenings. The insertion line is reversed U, while the sinus is narrow or wide V shaped. A small rhizoid plate seldom develops. Sterile.

Discussion

The new genus *Papillolejeunea* is obviously a derivate and segregate of the genus *Lejeunea*, but differentiated on the island of New Guinea by stable characters. The inflated lobule with involute free margin associated with a stout, perpendicular first tooth seems to be the result of parallel evolution occurring in different genera of Lejeuneaceae, maybe associated with epiphyllous life style in perhumid montane rainforest climates. The four above described species are distinct and can be separated from each other by the following key:

1. Dorsal and marginal slime glands (stalked mucilage cells) present on the leaf lobe and on the margin of amphigastria and perianth keels, visible as pale warts by the dissecting microscope. Large, dull green plant with often more than 2 mm wide shoots. Leaf lobule elongate triangular, about twice longer than broad. The first tooth is separated by 3-7 margin cells from the distal end of lobulus. Both leaf and amphigastrium cell walls often (not always) with triangular and intermediate thickenings Sectio *Papillolejeunea*: *Papillolejeunea balazsii*

1. Slime glands absent. Plants of various size, but the lobule length never exceeds the 1.5 lobule width. The first tooth is separated by only 1-3 cells from the distal end of lobulus. Sectio *Candidae*.....2

2. Small, translucent, white plant with about 1 mm stem width and maximum 1 cm length. Leaves with flat upper (free) margin. Lobe and lobule cell walls evenly and slightly thickened. Lobe 18-20 cells wide. Bracts and bracteoles about half perianthium length. The amphigastria about 3 stem width wide, their lobes subacute, 6-10 cells

broad. Rhizoid disc not observed. Bracts and bracteole about half length of the 0.6-0.8 mm long perianth *Papillolejeunea candida*

2. Large, pale green, opaque plants with 1.25-2 mm stem width and 1-3 cm length. Leaf lobe 30-40 cells wide. The amphigastria are very large, 4-5 stem width, with lobes of 11-15 cells width.3

3. The upper leaf margin reflexed narrowly upwards (well visible by dissecting microscope). The first lobule tooth is formed always by 2 cells, directed forward and separated from the distal end of lobule by 2-3 (-4) margin cells. Leaf cells not, but the amphigastrium cell walls are strongly incrassate with nodular triangles and intermediate thickenings. Amphigastrium lobes 12-15 cells wide with rounded apex ending in more than one cells. Sinus U shaped. The 1 mm long perianths are subtended by large, subacute bracts (of 3/4 perianth length) *Papillolejeunea touwii*

3. The leaf margin plane throughout. The first lobule tooth is formed normally by 3 (very rarely 2 or 4) cells arranged in one row, directed 45-70° outward from the stem and separated by only one (very seldom by 2) cells from the distal lobule end. Amphigastrium lobes acute, ending in one cell only. Sinus narrow or wide V shaped. *Papillolejeunea papuana*

Concerning distribution, *Papillolejeunea* seems to be an endemic genus of upland New Guinea, restricted mostly to the mountain ranges above 2000 m altitude. According to our present knowledge *P. balazsii* is known in several localities from the Star Mountains to the Huon Peninsula (see Fig.2), *Papillolejeunea candida* became known from two disjunct localities within the central mountain range, while *Papillolejeunea touwii* is restricted to a relatively small area within the Star Mountains, but there seems to be abundant (see Fig. 3). Although the exact distribution of *Papillolejeunea papuana* is not known, its type specimen originates definitely from Papua New Guinea. Piippo et al. (1987) and Enroth (1990)

have concluded, that 48% of the Hepaticae are endemic in New Guinea and that most endemic species in Western Melanesia occur above 1500 m altitude and according to Piippo (1994) most occur in the montane rain forests. The uplift of the New Guinean highland began in the late Oligocene and continued in the Miocene, providing dispersal routes for Laurasian and Gondwanalandic plants (Raven & Axelrod 1972, Schuster 1982), but this uplift also isolated large mountain areas providing ample space for speciation and evolution of endemic taxa. Although New Guinea is really rich in endemic species, the rate of generic endemism among hepatics is low. The reason is probably the relatively young age of the uplands hence short time for evolution. From this point of view, the discovery of a new endemic genus has great significance.

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