

EPIPHYLLOUS LIVERWORTS FROM BATANTA ISLAND (INDONESIA, WEST PAPUA) III

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The epiphyllous liverwort collection was continued after the Covid pandemic in 2023 at the low and medium elevations of Batanta Island in the tropical rainforest belt by the entomologist Tibor Kovács and his colleagues, which were identified by Tamás Pócs. The collection resulted in 35 species of which 9 liverworts proved to be new to Batanta Island along the species already known from the previous collections: *Cheilolejeunea trapezia*, *Cheilolejeunea vittata*, *Cololejeunea schmidtii*, *Cololejeunea tenella*, *Colura herzogi*, *Drepanolejeunea cyclops*, *Leptolejeunea maculata*, *Microlejeunea punctiformis*, and *Radula javanica*. Further three taxa are new even to science: *Cololejeunea tiberii*, *Cololejeunea touwii* subsp. *batantae* subsp. nov. and *Drepanolejeunea levicornua* var. *incurviloba* var. nov., which were described and illustrated by macro and microphotos. One previous identification was corrected. The results of 7 years of collecting activity resulting in 48 epiphyllous liverwort taxa known from Batanta Island are summarised.

Key words: Australasia, *Cololejeunea*, *Dendroceros*, *Drepanolejeunea*, Indonesia, New Guinea, new taxa

INTRODUCTION

T. Kovács and his colleagues in February 2023 collected at the most promising localities based on the records of previously collected epiphylls (Pócs and Kovács 2019, 2021). In the selection their dragonfly faunistic experience were also taken into account, being rich in species and aquatic and wet habitats. Several dragonfly species on Batanta Island were known only from these valley systems, such as *Argiolestes varga*, *Diplacina ismene*, *D. olahi*, *Nannophlebia amphicyllis*, *Selysioneura* sp. (see Kovács *et al.* 2015, 2016, 2021). On this base were selected the upper part of previously also investigated Warai (with 14 epiphylls and 29 dragonflies) and Tanjung Lampu valleys (16 epiphylls and 19 dragonfly species) and the upper, not yet seen section of Kalijakut Valley (12 epiphylls and 15 dragonfly species respectively) at 237–557 m elevation. From this altitude nobody collected there before. All these stream valleys run down from the central and highest part of the island, the Warai stream in the north in limestone bedrock and the two others in the south, carved in volcanic bedrock. From each locality about the double amount of host leaves were taken, compared to the previous collections (Table 1).

The localities of 2023 collecting activities were the following:

2023-16 (Figs 1–2). Indonesia, West Papua, Batanta Island, valley of Kalijakut River, between S 00° 52' 49.10", E 130° 38' 4.9" and S 00° 52' 32.94", E 130° 37' 40.75", 237–557 m a.s.l., 16.02.2023, T. Kovács, R. Horváth, P. Juhász, K. Sauyai, R. Sauyai.

2023-18 (Fig. 3). Indonesia, West Papua Batanta Island, valley of Tanjung Lampu River, between S 00° 54' 18.6", E 130° 36' 48.6" and S 00° 53' 43.0", E 130° 36' 38.5", 49–180 m a.s.l., 18.02.2023, T. Kovács, R. Horváth, P. Juhász, K. Sauyai, R. Sauyai.

2023-20 (Fig. 4). Indonesia, West Papua, Batanta Island, valley of Warai stream, between S 00° 50' 51.0", E 130° 35' 14.0" and S 00° 51' 11.6", E 130° 35' 20.0", 224–306 m a.s.l., 21.02.2023, T. Kovács, P. Juhász.

Table 1
to Batanta Island

Distribution of taxa in all localities, including also the previous records. In each column, below the name of localities are given all used locality codes. In the last three columns the records of previous and present publications are compared. Taxa marked by asterisk are recorded in this paper, as new

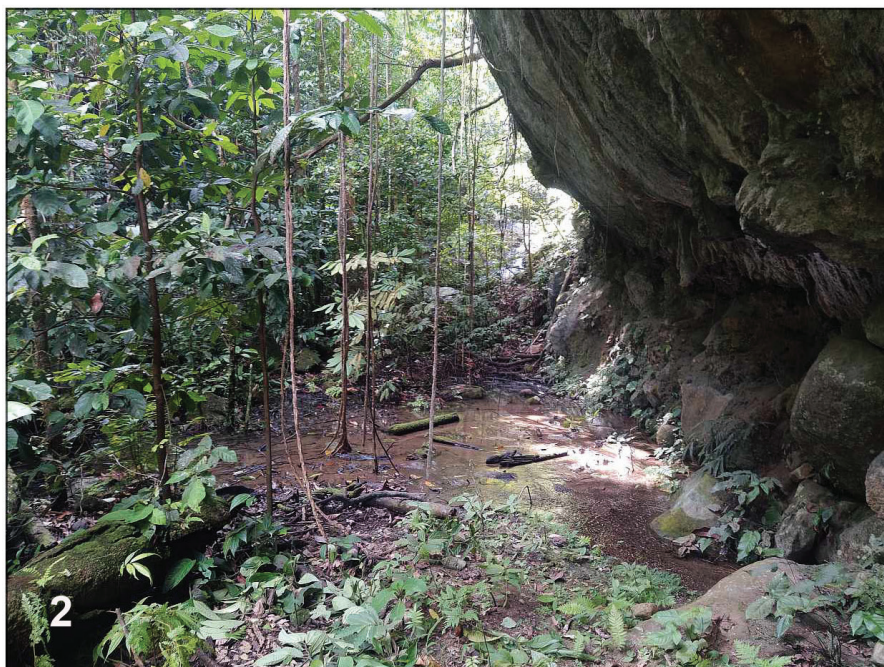
Taxon/Locality	Wailebet Stream 2020-9-b	Wailebet Stream 2018-10	Waibin 2019-18	Warmon 2017-6	Tanjung Lampu 2017-14	Kalijakut 2019-14	Warai 2019-21	Frequency in localities
<i>Caudatejeunea remiloba</i>	+	–	+	+	–	+	+	6
<i>Cheilejeunea intertexta</i>	–	–	–	+	–	–	–	1
* <i>Cheilejeunea trapezia</i>	–	–	–	–	–	–	–	1
* <i>Cheilejeunea vittata</i>	–	–	–	–	–	–	–	1
<i>Cololejeunea amphibola</i>	–	–	–	+	–	–	–	4
<i>Cololejeunea angustiflora</i>	–	–	–	+	–	–	–	1
<i>Cololejeunea appressa</i>	–	–	–	–	–	–	–	2
<i>Cololejeunea cordiflora</i>	–	–	–	–	–	–	–	1
<i>Cololejeunea equilabi</i>	–	–	–	+	–	–	–	4
<i>Cololejeunea falcata</i>	–	–	–	–	–	–	–	1
<i>Cololejeunea floccosa</i> var. <i>aurita</i>	–	–	–	–	–	–	–	2

Table 1 (continued)

Taxon/Locality	Wailebet Stream 2020-9-b	Stream Wailebet 2018-10	Waibin 2019-18	Warmon 2017-6 2019-9 2020-5	Tanjung Lampu 2017-14 2019-12 2020-10 and 2023-18	Kaijakut 2019-14 2020-11 and 2023-16	Warai 2019-21 2020-12 and 2023-20	Frequency in localities
<i>Cololejeunea hirta</i>	-	-	+	+	--	++	--	3
<i>Cololejeunea lanciloba</i>	-	-	-	+	--	--	--	1
<i>Cololejeunea obliqua</i>	-	-	-	-	+-	--	--	1
<i>Cololejeunea papillosa</i>	-	-	-	-	--	--	+-	1
<i>Cololejeunea planissima</i>	-	-	-	-	+-	--	--	1
* <i>Cololejeunea schmidtii</i>	-	-	-	-	-+	-+	--	2
<i>Cololejeunea streitmannii</i>	-	+	-	-	--	++	+-	3
* <i>Cololejeunea tenella</i>	-	-	-	-	--	-+	--	1
* <i>Cololejeunea tiberii</i>	-	-	-	-	-+	-+	--	2
* <i>Cololejeunea touwii batantae</i>	-	-	-	-	++	-+	+-	4
<i>Colura ari</i>	-	-	+	-	--	--	++	2
<i>Colura conica</i> var. <i>integra</i>	-	-	-	-	--	++	+-	2
* <i>Colura herzogi</i>	-	-	-	-	--	--	+-	1
<i>Colura imperfecta</i>	-	-	+	-	+-	--	--	2
<i>Colura tenuicornis</i>	-	-	+	-	--	--	--	1
<i>Dendroceros javanicus</i>	-	-	-	-	+-	--	+-	2
* <i>Drepanolejeunea cyclops</i>	-	-	-	-	--	-+	--	1
<i>Drepanolejeunea levicornua</i>	-	-	-	-	--	--	++	1
* <i>D. levicornua incurviflora</i>	-	-	-	-	--	--	+-	1
<i>Drepanolejeunea longicruris</i>	-	-	-	-	-+	-+	+-	3
<i>Drepanolejeunea pentadactyla</i>	-	-	-	-	++	++	++	3

Table 1 (continued)

Taxon/Locality	Wailebet Stream 2020-9-b	Stream Wailebet 2018-10	Waibin 2019-18 2020-3	Warmon 2017-6 2019-9 2020-5	Tanjung Lampu 2017-14 2019-12 2020-10 and 2023-18	Kalijakut 2019-14 2020-11 and 2023-16	Warai 2019-21 2020-12 and 2023-20	Frequency in localities
<i>Lejeunea adpressa</i>	-	-	-	+	--	-+	++	3
<i>Lejeunea exilis</i>	-	-	-	-	--	--	++	1
<i>Lejeunea mitcholitzii</i>	-	-	-	-	-+	+-	+-	3
<i>Leptolejeunea elliptica</i>	-	-	-	+	++	--	-+	3
<i>Leptolejeunea epiphylla</i>	-	-	+	+	++	-+	+-	5
* <i>Leptolejeunea maculata</i>	-	-	-	-	--	-+	--	1
<i>Leptolejeunea tripuncta</i>	-	+	-	+	++	++	++	5
* <i>Lopholejeunea</i> sp.	-	-	-	-	-+	--	-+	2
<i>Metalejeunea cucullata</i>	-	-	-	-	++	-+	--	2
* <i>Microlejeunea punctiformis</i>	-	-	-	-	--	-+	-+	2
* <i>Microlejeunea</i> cf. <i>filicuspis</i>	-	-	-	-	--	--	-+	1
<i>Radula acuminata</i>	-	-	+	-	+-	--	--	2
* <i>Radula javamica</i>	-	-	-	-	--	--	-+	1
<i>Radula nymantii</i>	-	-	-	+	++	++	++	4
<i>Radula protensa</i>	-	-	+	+	+-	+-	+-	5
<i>Radula tjiobodensis</i>	-	-	-	-	--	-+	++	2
Number of all taxa	1	2	9	13	16 15	12 21	18 21	
					23	27	29	



Figs 1–2. Valley of Kalijakut River, 1: Waterfall on the main branch; 2: Side source of a tributary (photos by T. Kovács)



Fig. 3. Valley of Tanjung Lampu River. – Fig. 4. Valley of Warai stream (photos by T. Kovács)

DESCRIPTION OF THE NEW TAXA

Cololejeunea tiberii Pócs, *spec. nova*
(Figs 6–16)

Subgen. *Pedinolejeunea* Benedix ex Mizut., J. Hattori Bot. Lab. 24: 240 (1961)

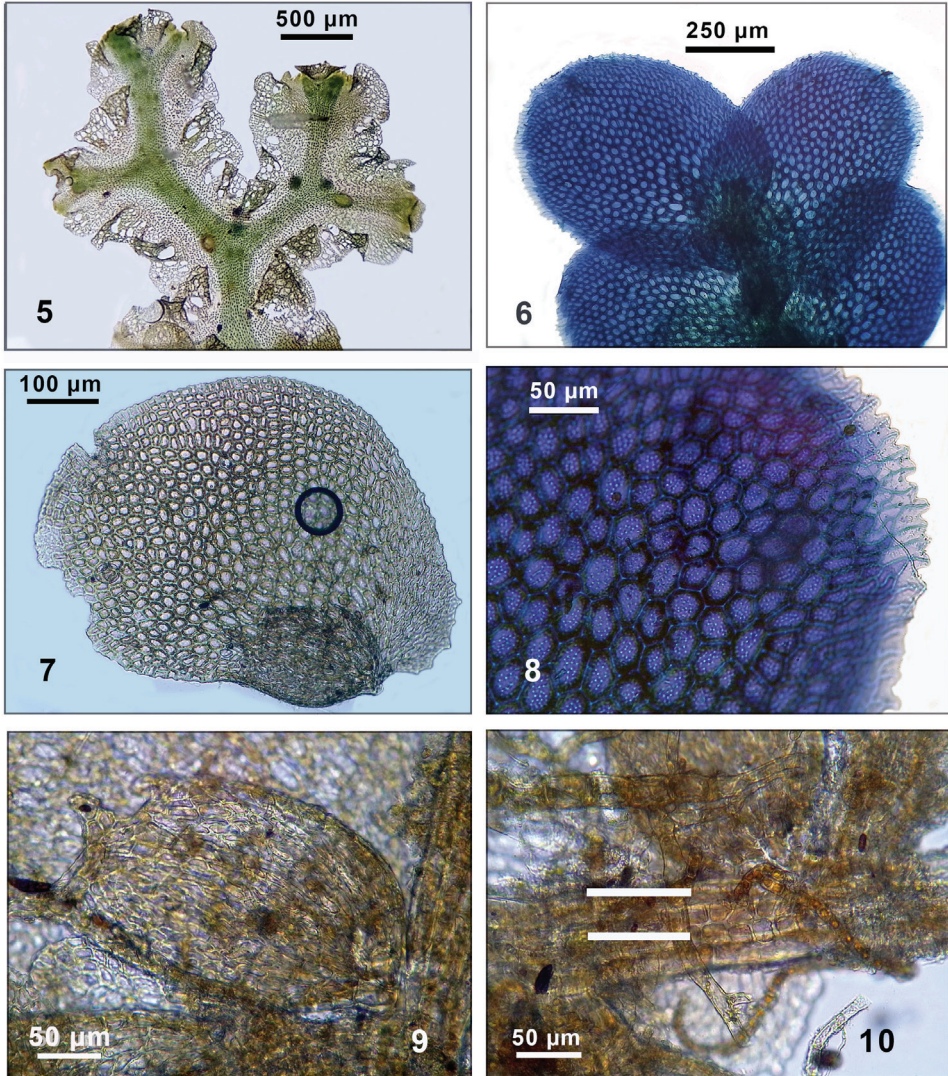
Diagnosis: *The new species is similar to Cololejeunea saroltae* Pócs (2012, *Acta Bot. Hung.* 54:160–164, figs. 55–75) from Fiji Islands in its ellipsoid leaf shape with the dentition of of *Allorgella*-type marginal cells down to the shoulders. It well differs by its ventral merophyte in two rows (one in *C. saroltae*), ligulate or saccate lobule with two teeth (only saccate with one tooth), ovate to linear male branches with 5–15 pairs of semi-imbricate bracts (globose to ellipsoid with 2–8 pairs of densely imbricate bracts) and by its obovate perianth (cordate in *C. saroltae*).

Type: Indonesia, West Papua, Batanta Island, upper valley of Warai stream, between S 00° 50' 51.0", E 130° 35' 14.0" and S 00° 51' 11.6", E 130° 35' 14.0", in collin tropical rainforest at 224–306 m, epiphyllous. ♂, ♀. Coll. T. Kovács and P. Juhász, (2023-20/A), 21.02.2023 (holotype: EGR, isotype: G).

Description: Desiccated plants pale yellowish green, forming irregularly shaped, slightly branched colonies up to 10 mm length, strongly appressed to the host (dicotyledonous shrub or bamboo) leaf surface. Shoots 1.2–1.4 mm wide, stems 40–80 µm thick, with two cells wide ventral merophyte with slightly thickened walls, 6–7 rows of cortical and one row of medullary cells. Leaves subimbricate, ellipsoidal, slightly asymmetric, with 1–2 cells wide hyaline or with undifferentiated, just smaller than average, chlorophyllose cells, both cases forming dentate or denticulate, *Allorgella*-type margin all around the 700–800 µm long and 400–650 µm (30–32 cells) wide lobe. Laminal cells isodiametric or elongated hexagonal, 30–50 µm long and 25–30 µm wide, at margin somewhat smaller. Cell walls with small, Y shaped trigones and 1–2(–3) intermediate thickenings. Cuticle tuberculate with 20–40 dot like tuberculae per cell. Lobule of about 1/3 lobe length, ligulate of or saccate and bidentate, elongate-ovate in shape with elongate rectangular cells. The first lobule tooth straight, consisting of 3–5 cells, the second one falcate, shorter, formed only by 1–3 cells. Hyaline papilla at the proximal base of the first tooth.

Probably dioicous, antheridia on short, ovate to linear side branches with 4 to 15 pairs of bracts, which can possess a lobe smaller than normal leaves and a uniseriate hyaline margin. Gynoecia sometimes alternating with leaves, on short side branches consisting only of a pair of reduced leaves and a pair of linear female bracts with narrow, acute lobules almost as long as the lobes with rounded apex. Perianth hardly exceeds in length the perichaetial leaves, obovate, with smooth dorsal side and with a smooth, low ventral keel and short, 1–3 cells high beak. Perianth wall formed by 15–30 µm size, iso-

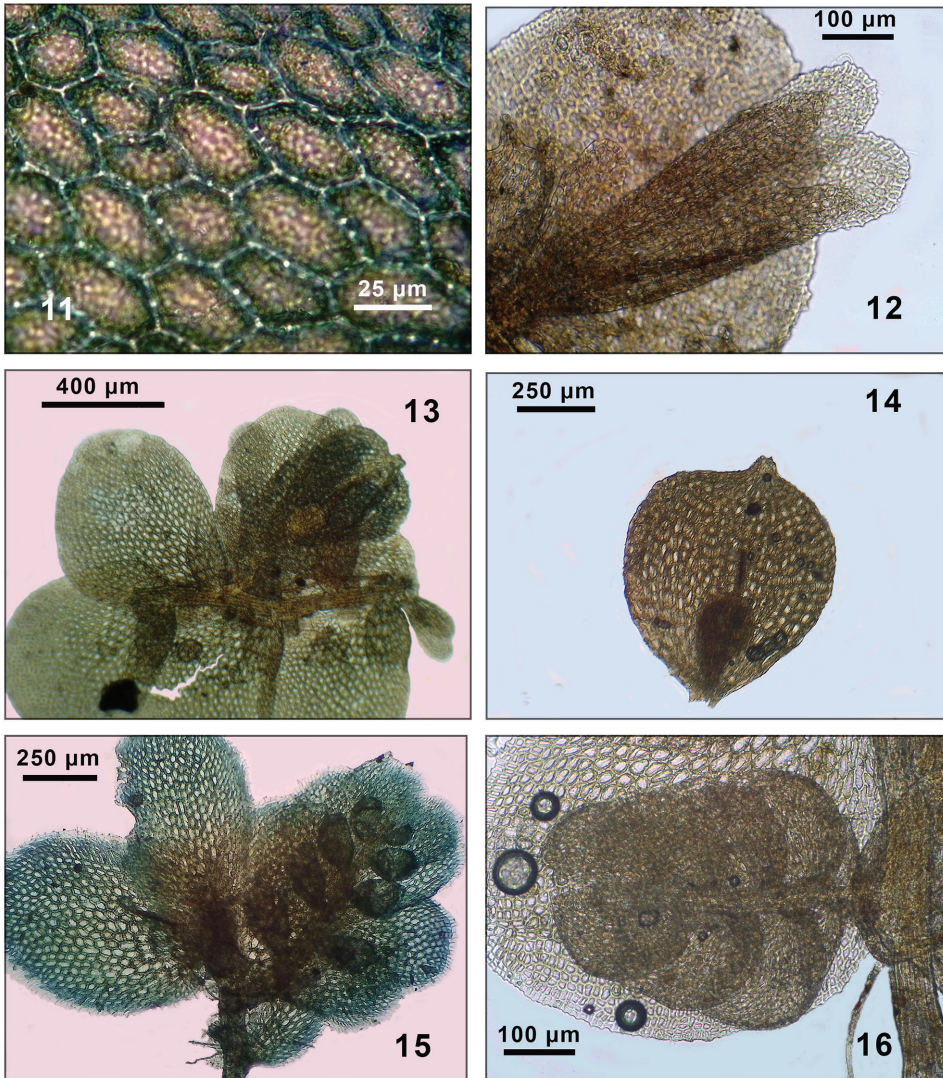
diametric or oblong, rectangle cells with evenly incrassate walls. Sporophyte unknown. A few juvenile disciform gemmae consisting of 26–28 cells were observed on both lobe surfaces.



Figs 5–10. Fig. 5. Thallus end of *Dendroceros javanicus* (Nees) Gott. et al., ventral view. From 2023-18, a new locality of the recent collection. – Figs 6–10. *Cololejeunea tiberii* Pócs, sp. nov.: 6 = Shoot with hyaline lobe margins and ligulate lobules; 7 = Leaf without hyaline margin and with saccate lobule, ventral view; 8 = Lobe part with *Allorgella*-type hyaline margin and lobe cells with tuberculate cuticle. Dorsal view; 9 = Lobule; 10 = Stem with two cells wide ventral merophyte (marked by light strips). All *C. tiberii* pictures from the type. (Photos by T. Pócs)

Etymology: named after its collector, Tibor Kovács. (Tibor is the Hungarian equivalent of Latin Tiberius).

Distribution: Seems to be a West Papua species.



Figs 11–16. *Cololejeunea tiberii* Pócs, sp. nov.: 11 = Lobe cell walls with Y shape triangles and multiple intermediate thickening. Tuberculose cuticle; 12 = Female bracts; 13 = Gynoecium; 14 = Perianth; 15 = Male branch with leaf-like bracts; 16 = Male branch with hypostatic bracts. All from the type. (Photos by T. Pócs)

Other specimen examined: Indonesia, West Papua, Batanta Island, valley of Kalijakut River, between S 00° 54' 49.10", E 130° 38' 4.9" and S 00° 52' 32.94", E 130° 37' 40.75", in collin tropical rainforest at 237–557 m, epiphyllous. Coll. T. Kovács, R. Horváth, P. Juhász, K. Sauyai, R. Sauyai (2023-16/B), 16.02.2023 (paratype: EGR).

Cololejeunea touwii* Pócs subsp. *batantae* Pócs, *subspec. nova
(Figs 17–20)

Subgen. *Leptocolea* (Spruce) Schiffn. in Engler and Prantl., Nat. Pflanzenfam. 1(3): 122 (1913)

Diagnosis: *Differs from Cololejeunea touwii Pócs et Piippo (Acta Bryolich. Asiatica 4: 101–102, fig. 14, 2011) by its acutely papillose upper leaf surface and perianth wings, while in subsp. touwii the surface of leaf cells is completely smooth and the perianth wings are only crenulate. Other features (ventral merophyte in one row, contiguous leaf arrangement, ellipsoidal, subsymmetric leaf shape, lobule, male and female perichaetium, perianth shape and gemmae) are identical with those of subsp. touwii. The morphological difference together with allopatric distribution justifies the subspecific rank of the new taxon.*

Type: Indonesia, West Papua, Batanta Island, valley of Kalijakut River, between S 00° 54' 49.10", E 130° 38' 4.9" and S 00° 52' 32.94", E 130° 37' 40.75", in collin tropical rainforest at 237–557 m, epiphyllous. ♂, ♀. Coll. T. Kovács, R. Horváth, P. Juhász, K. Sauyai, R. Sauyai (2023-16/A), 16.02.2023 (holotype: EGR).

Distribution: Western New Guinean endemic subspecies, seems to be widespread on Batanta Island. It was already mentioned in our first paper on Batanta epiphylls under the name of *Cololejeunea* cf. *touwii* (Pócs and Kovács 2019). Subsp. *touwii* occurs in eastern (Papua) New Guinea and in the Solomon Islands.

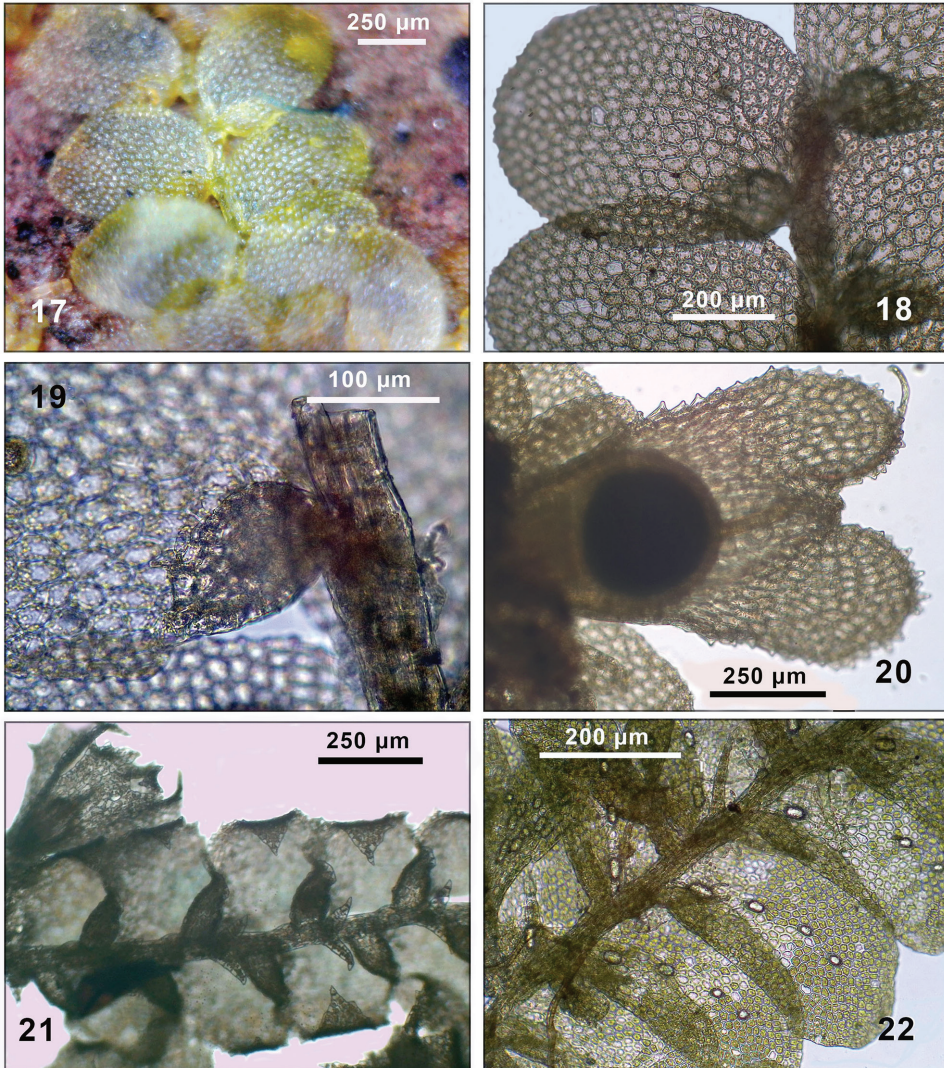
Other specimens examined: Indonesia, West Papua, Batanta Island, upper valley of Warai stream, between S 00° 50' 51.0", E 130° 35' 14.0" and S 00° 51' 11.6", E 130° 35' 20.0", in collin tropical rainforest at 224–306 m, epiphyllous. Coll. T. Kovács, P. Juhász, (2023-18/B), 18.02.2023 (paratype: EGR); the same place. Coll. T. Kovács, P. Juhász (2023-20/B), 20.02.2023 (paratype: EGR).

Drepanolejeunea levicornua* Steph. var. *incurviloba* Pócs, *var. nova
(Fig. 21)

Subgen. *Pristolejeunea* Grolle, J. Hattori Bot. Lab. 40: 193 (1976)

Diagnosis: *Differs from Drepanolejeunea levicornua Steph. (Sp. Hepat. 5: 347, 1913) by in dry and wet states equally strongly recurved distal part of leaf lobe. For this reason is never closely appressed to the host leaf surface. It can occur at the same localities as subsp. levicornua and in all other aspects similar to it.*

Type: Indonesia, West Papua, Batanta Island, upper valley of Warai stream, between S 00° 50' 51.0", E 130° 35' 14.0" and S 00° 51' 11.6", E 130° 35' 20.0", in lowland tropical rainforest at 224–306 m, epiphyllous. Coll. T. Kovács and P. Juhász (2023-20/C), 21.02.2023 (holotype: EGR).



Figs 17–22. Fig. 17–20 = *Cololejeunea touwii* subsp. *batantae* Pócs, subsp. nov.: 17 = Habit, seen on the dead host leaf surface, dorsal view; 18 = Leaves, dorsal view; 19 = lobule and stem with one row of ventral merophyte; 20 = Acutely papillose, two winged perianth. All from the type. – Fig. 21 = *Drepanolejeunea levicornua* var. *incurviloba* Pócs, var. nov., Habit, ventral view. From the type. – Fig. 22 = *Drepanolejeunea cyclops* (Sande Lac.) Grolle et R.-L. Zhu, Shoot, ventral view. From 2023-16 (macro and microphotos by T. Pócs)

Distribution: sympatric with var. *levicornua*, till now found only at the type locality.

ENUMERATION OF OTHER TAXA NEW TO BATANTA ISLAND

The nomenclature follows Söderström *et al.* (2016).

Marchantiophyta

Cheilolejeunea trapezia (Nees) R. M. Schust. et Kachroo – 2023-16. Very variable concerning stem width, lobule shape and lobule tooth length. These different variations before were described under many binomials (e.g. Thiers 1992). Most of them fell in synonymy (Zhu and Grolle 2004). Although the phylogenetic classification of the genus by molecular methods was already done (Ye *et al.* 2015), some problems still remained to resolve. – Palaeotropic species, widely distributed in Asia and the Pacific, rare in Africa (Pócs *et al.* 2019).

Cheilolejeunea vittata (G. Hoffm.) R. M. Schust. et Kachroo – 2023-16. An easily recognisable species related to the previous, but distinct by several cells broad vitta in the postical half of the lobe. – Malesian species with scattered distribution in mountainous areas (Zhu and So 2001).

Cololejeunea schmidtii Steph. – 2023-16, 2023-18. A small species characterised by obtuse leaves without a true vitta but with large, hemispherical papillae on lobe surface and short but sharp dentition on the antical lobe shoulder and on the keel. – Widespread from China and Japan through Indochina and the Philippines and New Guinea to Fiji Islands. Well illustrated in Zhu and So (2001: 334, fig. 125).

Cololejeunea tenella Benedix – 2023-16. Brownish in dry state, with falcate, papillose leaves. Lobe with pseudovitta. Easy to overlook because its small size. – Widespread Indomalaysian-Pacific species (Thiers 1988, Pócs and Piippo 2011).

Colura herzogi Jov.-Ast – 2023-20. A species easily recognisable by its two median basal valve cells, by the acute papillae of lobule and perianth keels and by the regularly dentate lobe margin. – Common in Java and recently found in New Guinea (Jovet-Ast 1954, Pócs 2013). Probably more widespread Malesian species, just overlooked.

Drepanolejeunea cyclops (Sande Lac.) Grolle (Fig. 22) – 2023-16. Member of subgenus *Rhaphidolejeunea* (Herzog) Grolle et R. L. Zhu, characterised by its broadly rounded lobe with 3–4 ocelli in a longitudinal series. – Previously known from Java, Peninsular Malaysia and Sabah. New to the whole of New Guinea. The species is very well illustrated also by Bischler (1968: 75, fig. III).

Leptolejeunea maculata (Mitt.) Schiffn. – 2023-16. Formerly the species was characterised by the oblong-ovate, serrate leaves with constricted bases and large trigones and intermediate thickenings of lobe cells (Grolle 1976, Zhu and So 2001). Modern investigations reinstated other formerly described species from the different continents. – The true *L. maculata* is widespread in tropical Asia and Australasia. In Africa is substituted by the vicariant *Leptolejeunea schiffneri* (Steph. ex Schiffn.) Steph. and in the Neotropics by *L. convexistipa* Bischl. (Bechteler *et al.* 2017, Shu *et al.* 2021).

Microlejeunea punctiformis (Taylor) Steph. – 2023-16; 2023-20. Among the other Asian species is recognisable from its small, orbicular to ovate leaf shape with lobules almost equalling the lobe length and by the narrow, 2–3 cells wide underleaves. Indomalesian-Australasian species (Zhu and So 2001, Long and Rubasinghe 2014).

Radula javanica Gottsche – 2023-20. Generally, it has no gemmae and its quadrate lobule only partly covers the stem. – Common Indomalesian-Pacific species (Yamada 1979), occurring also in the Neotropics (Gradstein 2021) and perhaps Pantropical.

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