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New or little known epiphyllous liverworts, XVIII. Records from the Bidoup-Núi Bà National Park, Vietnam, with the description of *Drepanolejeunea bidoupensis*, sp. nov.

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Résumé — Quelques épiphylles intéressantes ont récoltées pendant une exploration récente dans le Parc National Bidoup-Núi Bà, Vietnam central. Les 125 échantillons contiennent 185 feuilles couvertes de 54 espèces, dont 43 Lejeuneaceae, 5 Radulaceae, 2 Frullaniaceae, 2 Lepidoziaceae, 1 Plagiochilaceae et 1 Daltoniaceae. Parmi les échantillons *Cheilolejeunea ventricosa, Cololejeunea angustiflora* et *Drepanolejeunea tricornua* sont trouvé la première fois au Vietnam et une, *Drepanolejeunea (Rhaphidolejeunea) bidoupensis,* est décrite comme nouvelle pour science. La richesse spécifique de cette zone confirme la nécessité de poursuivre son exploration et de la protéger.

***Cheilolejeunea* / *Cololejeunea* / *Drepanolejeunea* / Lejeuneaceae / new species / species richness**

Abstract — Several interesting epiphylls were collected in recent surveys of bryophytes in Bidoup-Núi Bà National Park, Central Vietnam. Among the 125 samples containing 185 leaves covered by 54 species of which 43 belong to Lejeuneaceae, 5 to Radulaceae, 2 each to Frullaniaceae and Lepidoziaceae, finally a single species each to Plagiochilaceae and Daltoniaceae. Three of them, *Cheilolejeunea ventricosa, Cololejeunea angustiflora* and *Drepanolejeunea tricornua* proved to be new to Vietnam while one, *Drepanolejeunea (Rhaphidolejeunea) bidoupensis* is described, as new to science. This area with its high species richness has proven worth for protection and further exploration.

***Cheilolejeunea* / *Cololejeunea* / *Drepanolejeunea* / Lejeuneaceae / new species / species richness**

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INTRODUCTION

The bryoflora of Lâm Đồng Province in the Central Highlands region of Vietnam is relatively well known due to the intensive collecting activity of the late Pierre Tixier (Jovet-Ast & Tixier, 1958, 1959, 1962; Tixier, 1962, 1966, 1969, 1970a, b, 1974; see also Tixier, 1984). The areas around Đà Lạt city, especially the Lang Biang Highland, are well explored. However, the Bidoup-Núi Bà National Park (BNBNP) area at almost the same elevation is bryologically unknown. During 2010 and 2011 Thiện-Tâm Lương and Boon-Chuan Ho collected from the eastern part of BNBNP 125 epiphyllous samples containing 185 leaves, dominated by liverworts, well covering different altitudes of the montane forest area (Fig. 1). The senior author identified the material which included three species, *Cheilolejeunea ventricosa, Cololejeunea angustiflora* and *Drepanolejeunea tricornua* new to the flora of Vietnam and one, *Drepanolejeunea* (subgen. *Rhaphidolejeunea*) *bidoupensis* Pócs, new to science.

Description of the collecting areas

The Bidoup-Núi Bà National Park (12°00' to 12°19'N, 108°21' to 108°44'E) which lies within the administrative boundaries of Lâm Đồng province, southern Central Vietnam (Central Highlands) covers almost the entire Lâm Viên Plateau (Fig. 1). The national park has a diverse topography ranging from 700-2200 m with average elevation of 1500-1700 m and many mountain ranges above 2000 m. The three highest peaks are Bidoup (2287 m), Lang Biang (2167 m) and Hòn Giao (2060 m) (FREC-FIPI, 2008). BNBNP has a high elevation tropical

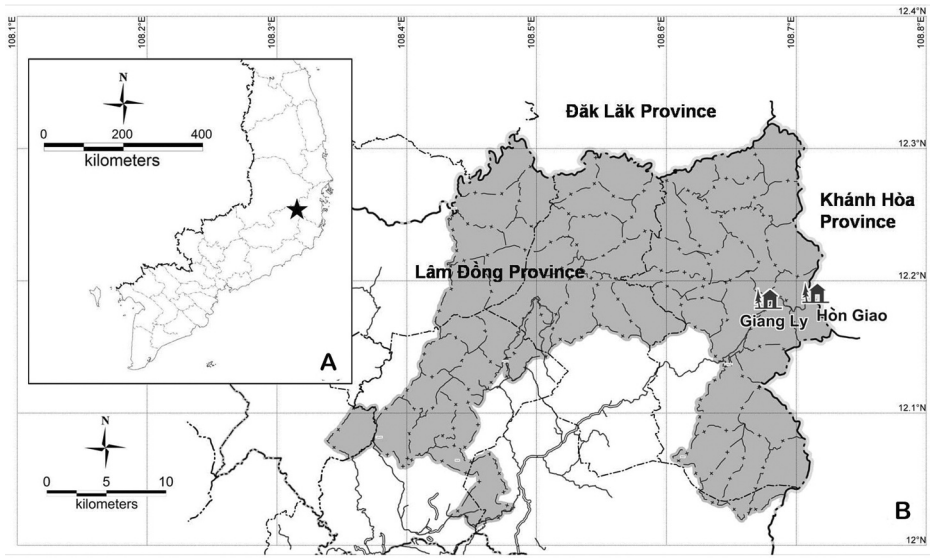


Fig. 1. A. Location of Bidoup-Núi Bà National Park in Vietnam (star). B. Map of Bidoup-Núi Bà National Park (shaded area) showing locations of Giang Ly and Hòn Giao field station. (*Source: Bidoup-Núi Bà National Park*).

climate with an average temperature of 18°C and humidity range of 75-85%. The average annual precipitation is 1755 mm, varying with altitude between 1650 and 3750 mm per year (Tixier, 1966), and September is the month with highest precipitation. There are three main types of forest in this national park, including needle-leaf forest, evergreen broadleaf forest and mixed needle-leaf and broadleaf forest (FREC-FIPI, 2008).

During our fieldtrips to BNBNP in the vicinity of Giang Ly and Hòn Giao field stations, the observed rich diversity of epiphyllous liverwort flora has instigated us to carry out an inventory of the epiphyllous bryophytes in the park. Giang Ly and Hòn Giao are located at the eastern border of BNBNP, which consists of many peaks over 1900 m, large slopes and several small tributaries upstream of Đa Nhim River. This area is dominated by montane evergreen mixed forest of Fagaceae, Lauraceae, Theaceae and gymnosperms such as *Fokienia hodginsii*, *Pinus kesiya* and *Pinus krempfii*. The area surrounding Giang Ly station is disturbed by activities of salmon fish farms but the evergreen broadleaf forest behind the station, where many epiphyllous bryophytes were collected, is still well-preserved. The forest of Hòn Giao, especially at elevation above 1800 m, is dryer with more exposed canopy and occupied by small trees below 15 m tall. The mixture of forest types apparently provides a complex of habitats supporting high bryophyte diversity.

RESULTS

During the fieldtrips at the different altitudes of montane rainforest, 125 samples were randomly collected altogether, containing 185 leaves densely covered by liverworts and some other leaves mostly by mosses. The identification of bryophyte covered leaves resulted in 54 species, of which 43 belongs to Lejeuneaceae (with one exception to subfamily Lejeuneoideae), 5 to Radulaceae, 2 each to Frullaniaceae and Lepidoziaceae, and 1 each to Plagiochilaceae and Daltoniaceae. The last one is a moss completely adapted to the epiphyllous life form and occurs intricately interwoven among the epiphyllous liverworts.

As it can be seen from Table 1, there are 8 species which occur in all altitudinal ranges, in which few occur with relatively high frequencies, like *Cololejeunea pseudostephanii, Drepanolejeunea thwaitesiana,* and *Leptolejeunea subdentata.* 29 species are restricted to the lower locality in Giang Ly, and 9 species occur only in the higher elevation mossy cloud forests of Hòn Giao. *Bazzania tridens*, *Drepanolejeunea bidoupensis, D. yunnanensis* and *Radula cavifolia* occur in Hòn Giao at both elevation ranges, but absent in Giang Ly. The species richness would be increased if more leaves are sampled, especially for the low altitude of Hòn Giao. Within each altitudinal ranges, only few (10 out of 54) species have high occurrences on 10 or more leaves, which is reflected by the high Shannon-Wiener evenness (E) values. The highest diversity can be observed in Giang Ly between 1481-1500 m altitude, both in terms of species richness (R=43) and Shannon-Wiener diversity index (H=3.09), but interestingly has similar evenness values with the other two elevation ranges.

Table 1. Enumeration of the epiphyllous species collected from Bidoup-Núi Bà National Park

The altitudinal distribution of each species is shown, together with the number of leaves on which they occur (p_i), and the frequency in the percentage of total number of leaves from the same altitudinal range. I: 1-20%, II: 21-40%, III: 41-60%. Species new to Vietnam are in bold face setting. Index numbers refer to the annotations below the table.

Species	*Giang Ly*	*Hòn Giao*	
Altitude in m	1481-1500	1633-1717	1717-1828
Number of leaves	114	26	45
Species richness (R) = Number of species	43	15	23
Shannon-Wiener diversity index (H)	3.09	2.26	2.52
Shannon-Wiener evenness (E)	0.82	0.84	0.80
Bazzania fauriana (Steph.) S. Hatt.			1 / **I**
Bazzania tridens (Reinw. *et al.*) Trev.		1 / **I**	1 / **I**
Cheilolejeunea ceylanica (Gottsche) R.M. Schust. et Kachroo	1 / **I**		1 / **I**
Cheilolejeunea trapezia (Nees) Kachroo et R.M. Schust	21 / **I**	2 / **I**	1 / **I**
***Cheilolejeunea ventricosa* (Schiffn.) X.L. He**[1]	1 / **I**		2 / **I**
Cololejeunea amoena Benedix[2]	1 / **I**		
***Cololejeunea angustiflora* (Steph.) Mizut.**[3]	3 / **I**		
Cololejeunea appressa (A. Evans) Benedix	1 / **I**		
Cololejeunea diaphana A. Evans	3 / **I**		
Cololejeunea floccosa (Lehm. et Lindenb.) Schiffn.	7 / **I**		
Cololejeunea haskarliana (Lehm. et Lindenb.) Schiffn.		2 / **I**	
Cololejeunea inflata Steph.	2 / **I**		
Cololejeunea inflectens (Mitt.) Benedix	2 / **I**		
Cololejeunea lanciloba Steph.	3 / **I**		
Cololejeunea pseudostephanii Tixier[4]	32 / **II**	15 / **III**	18 / **II**
Cololejeunea sigmoidea Jovet-Ast & Tixier[5]	14 / **I**	1 / **I**	1 / **I**
Cololejeunea sintenisii (Steph.) Pócs	4 / **I**		
Cololejeunea sphaerodonta Mizut.[6]			1 / **I**
Cololejeunea verrucosa Steph.	1 / **I**	1 / **I**	2 / **I**
Colura acroloba (Mont. ex Steph.) Ast	3 / **I**		
Colura superba (Mont.) Steph.	4 / **I**		
***Drepanolejeunea (Rhaphidolejeunea) bidoupensis* Pócs, sp. nov.**		2 / **I**	
Drepanolejeunea (Rh.) commutata Grolle et R.L. Zhu	1 / **I**		
Drepanolejeunea (Rh.) fleischeri (Steph.) Grolle et R.L. Zhu	1 / **I**		
Drepanolejeunea (Rh.) foliicola Horik.	4 / **I**		
Drepanolejeunea (Rh.) spicata (Steph.) Grolle et R.L. Zhu	25 / **II**		
Drepanolejeunea (Rh.) yunnanensis (P.C. Chen) Grolle et R.L. Zhu		2 / **I**	14 / **II**
Drepanolejeunea angustifolia (Mitt.) Grolle			2 / **I**
Drepanolejeunea dactylophora (Nees *et al.*) Schiffn.	1 / **I**	12 / **III**	14 / **II**

Table 1. Enumeration of the epiphyllous species collected from Bidoup-Núi Bà National Park

Species	*Giang Ly*	*Hòn Giao*	
Drepanolejeunea nymanii Steph.	1 / **I**		
Drepanolejeunea pentadactyla (Mont.) Steph.	3 / **I**	3 / **I**	4 / **I**
Drepanolejeunea thwaitesiana (Mitt.) Steph.	32 / **II**	3 / **I**	7 / **I**
***Drepanolejeunea tricornua* Herzog**[7]	6 / **I**		
Ephemeropsis tjibodensis K.I. Goebel[8]	15 / **I**		
Frullania alstonii Verd.[9]	1 / **I**		2 / **I**
Frullania apiculata (Reinw. *et al.*) Nees	1 / **I**		
Lejeunea apiculata Sande Lac.	1 / **I**		
Lejeunea flava (Sw.) Nees			1 / **I**
Leptolejeunea apiculata (Horik.) S. Hatt.	1 / **I**		
Leptolejeunea balansae Steph.	4 / **I**		
Leptolejeunea subdentata Schiffn. ex Herzog	3 / **I**	3 / **I**	1 / **I**
Leptolejeunea elliptica (Lehm. et Lindenb.) Schiffn.	7 / **I**	3 / **I**	
Leptolejeunea maculata (Mitt.) Schiffn.	9 / **I**		12 / **II**
Lopholejeunea eulopha (Taylor) Schiffn.			1 / **I**
Metalejeunea cucullata (Reinw. *et al.*) Grolle	2 / **I**		
Metzgeria furcata (L.) Dumort.	1 / **I**	1 / **I**	
Plagiochila sp.	1 / **I**		
Ptychanthus striatus (Lehm. et Lindenb.) Nees	1 / **I**		
Radula acuminata Steph.	25 / **II**		
Radula assamica Steph.	4 / **I**		
Radula cavifolia Hampe		2 / **I**	5 / **I**
Radula gedeana Gottsche ex Steph.			1 / **I**
Radula javanica Gottsche	2 / **I**		
Tuyamaella molischii (Schiffn.) S. Hatt. var. *molischii*	7 / **I**		

Annotations to Table 1

1. ***Cheilolejeunea ventricosa* (Schiffn.) X.L. He**. The taxonomic position was clarified quite recently by He (1995, 1999). A relatively rare (East African -) Indomalesian species known from Mauritius, China (Yunnan, Hong Kong), Malaysia (Penang), Singapore, Indonesia (Moluccas), Papua New Guinea, Australia (Queensland) (Pócs & Tóthmérész, 1997; Zhu & So, 1999; Zhu & Lai, 2005; Zhu *et al.*, 2002; Pócs & Streimann, 2006). New to Vietnam.

2. ***Cololejeunea amoena* Benedix.** A rare species only once reported from the lowland rainforests of Hu'o'ng So'n district of northern central Vietnam (Pócs *et al.*, 1967). Known distribution: Vietnam, Cambodia, Philippines (Mindanao), Malaysia (both peninsular part

and Sabah), Indonesia (Java). Gradstein (2011) treated it as a questionable synonym of *C. floccosa* (Lehm. & Lindenb.) Schiffn.

3. ***Cololejeunea angustiflora* (Steph.) Mizut.** This species with interesting morphology and with many synonyms was treated in detail by Zhu *et al.* (2002). It is generally rare although can be locally common. It is known from China (Taiwan), Indonesia (Kalimantan Barat), Malaysia (Malay Peninsula and Sabah), Papua New Guinea, New Caledonia (Zhu & So, 2002), from the Fiji Islands (Pócs *et al.*, 2011) and new to Vietnam.

4. ***Cololejeunea pseudostephanii* Tixier.** A Vietnamese endemic species hitherto known only from the neighboring Lang Biang Mountains (Tixier, 1969) and apparently abundant in BNBNP. It is somewhat similar to *Cololejeunea stephanii* (Schiffn.) Benedix with its wide vitta and hooked first lobule tooth, but well distinguished by its autoicy and the lack of wide hyaline margin. Instead, a single row of thick walled, narrow cells borders the lobe, more or less perpendicular to the margin.

5. ***Cololejeunea sigmoidea* Ast *et* Tixier.** A widespread species, with semi-hyaline margin formed by sigmoid cells and very small lobule consisting only of 1-2 cells. It is distributed from India through Thailand, Cambodia, Vietnam, China (Taiwan), Japan (Ryukyu), Java to Borneo (Zhu & So, 1998, 2001, map on Fig. 3). Exceptionally, we have found two specimens possessing beside the reduced lobules a few complete, ovate-orbicular lobules with two teeth (collecting no. *BD511-107& BD511-108*). This raises the question, whether *Cololejeunea rotundilobula* (P.C. Wu & P.J. Lin) Piippo, differing mostly by this character, is an independent species or falls within the variability of *C. sigmoidea*.

6. ***Cololejeunea sphaerodonta* Mizut.** A species known from China (Yunnan), Borneo and Vietnam according to Zhu & So (2001). We agree with the latter authors that *Cololejeunea sphaerodontoides* Tixier, differing from *C. sphaerodonta* only by the length of vitta (Tixier, 1969), does not deserve recognition at the species level.

7. ***Drepanolejeunea tricornua* Herzog.** This species is characterized among the "thwaitesiana" group of related species (Mizutani, 1990) by its very large ocelli, much exceeding the size of average lobe cells. Hitherto known only from Indonesia (Java, Seram), Malaysia (Sarawak), Papua New Guinea (Mizutani, 1990) and from the Fiji Islands (Pócs *et al.*, 2011). New to Vietnam which extends significantly its northernmost occurrence.

8. ***Ephemeropsis tjibodensis* K.I. Goebel.** Although there are other facultative epiphyll mosses too in the collected material (Meteoriaceae on 8, Sematophyllaceae on 4 leaves out of 17 in Giang Ly area of the same elevation range), *Ephemeropsis* is the only obligate epiphyll in the sense of Pócs (1996). A widespread Indomalesian-Pacific species with a distribution from Sri Lanka to Fiji Islands (see map in Pócs, 2007). In Vietnam the species is known from Benom da Treu (*Tixier 15.03.1959,* BM and EGR ex PC) and the Lang Biang Mts. in central Vietnam (voucher: *Tixier 15.02.1959,* EGR ex PC) (Tixier, 1970; Pócs, 2007). For its occurrence elsewhere in Indochina (Thailand, Cambodia, Laos) see Tan & Iwatsuki (1993). Its persistent golden brown wefts of the protonemata are a typical feature of epiphyllous communities in the study area, although sporophytes are relatively rare.

9. ***Frullania alstonii* Verd.** Two specimens were collected from different altitudinal zones. One of them, from the range of 1717-1835 m, agrees in all aspects with Verdoorn's original description and with the specimens in EGR collected in Vietnam, but the one from the range of 1481-1486 m has caducous leaves on flagelliform shoots, which is the key distinguishing character of the recently described *Frullania pseudoalstonii* Tsudo et J. Haseg. (2006). Other characters of our specimen, such as the lobules, which are inclined to the stem and the underleaves which are small and distant, fully agree with a normal *F. alstonii.* Therefore we consider both specimens from Bidoup-Núi Bà National Park to belong to the latter. Caducous leaves seem not to be a good character to distinguish *F. pseudoalstonii*.

Description of the new species

Drepanolejeunea was first established by Spruce (1884), as a subgenus of *Lejeunea*, and later lifted to independent generic rank by Schiffner (1893). The genus is at present the fourth largest one in the family Lejeuneaceae, currently

containing about 110 accepted species (Gradstein & da Costa, 2003; He & Zhu, 2011; He *et al.*, 2012). *Drepanolejeunea* is characterized by (i) the transverse section of stem consisting of 7 cortical cells and 3 medullary cells, (ii) the presence of ocelli at least at the base of leaf lobe, (iii) the leaf lobules with proximal hyaline papilla, (iv) the erect to widely divergent lobes of underleaves, (v) the inflated perianths usually with various projections, (vi) the pycnolejeuneoid leaf sequence of gynoecial innovation and (vii) asexual reproduction by means of cladia or caducous leaves (Herzog, 1930; Bischler, 1964; Grolle & Zhu, 2000; Zhu & So 2001; He *et al.*, 2012).

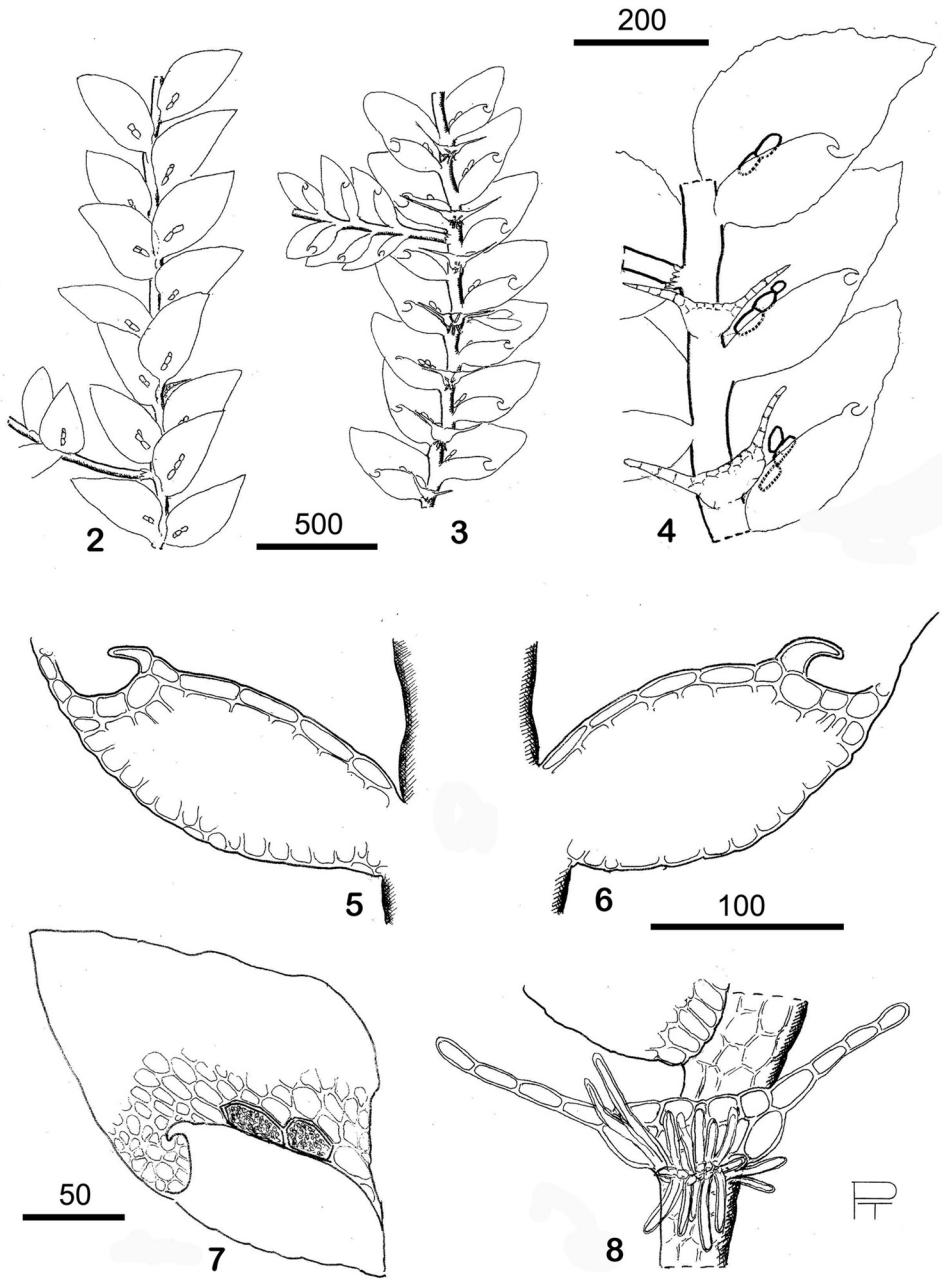
The genus *Drepanolejeunea* is subdivided into several subgenera. The subgenus *Rhaphidolejeunea* (Herzog) Grolle & R.L. Zhu is one among them, characterized by the linear, very divergent underleaf lobes, strongly curved apical lobule tooth and small leaf cells with firm walls lacking trigones and intermediate thickenings (Herzog, 1943; Bischler; 1968; Grolle & Zhu, 2000). *Rhaphidolejeunea* Herzog (1943) was described as an independent genus, revised by Bischler (1968) who accepted eight species, all but one distributed in the Southeast Asian realm and centered in the Indochinese Peninsula, except for the Amazonian *R. polyrhiza* (Nees) Bischl. (see maps of Bischler, 1968: 65). Later on, two new species were assigned to the genus (Grolle, 1974, Wu & Lou, 1978). Recently, Grolle & Zhu (2000) reduced *Rhaphidolejeunea* to a subgenus of *Drepanolejeunea,* introduced useful morphological characters distinguishing the taxa and added another new species. As the final result of their work, 11 species are known worldwide in this group with their highest diversity in southern China and the adjacent Indochinese Peninsula (7 spp.). Five of these occur in Bidoup-Núi Bà National Park (Table 1). To these, the new species described below is added.

***Drepanolejeunea* (Subgen. *Rhaphidolejeunea*) *bidoupensis* Pócs, sp. nov. Figs 2-15**

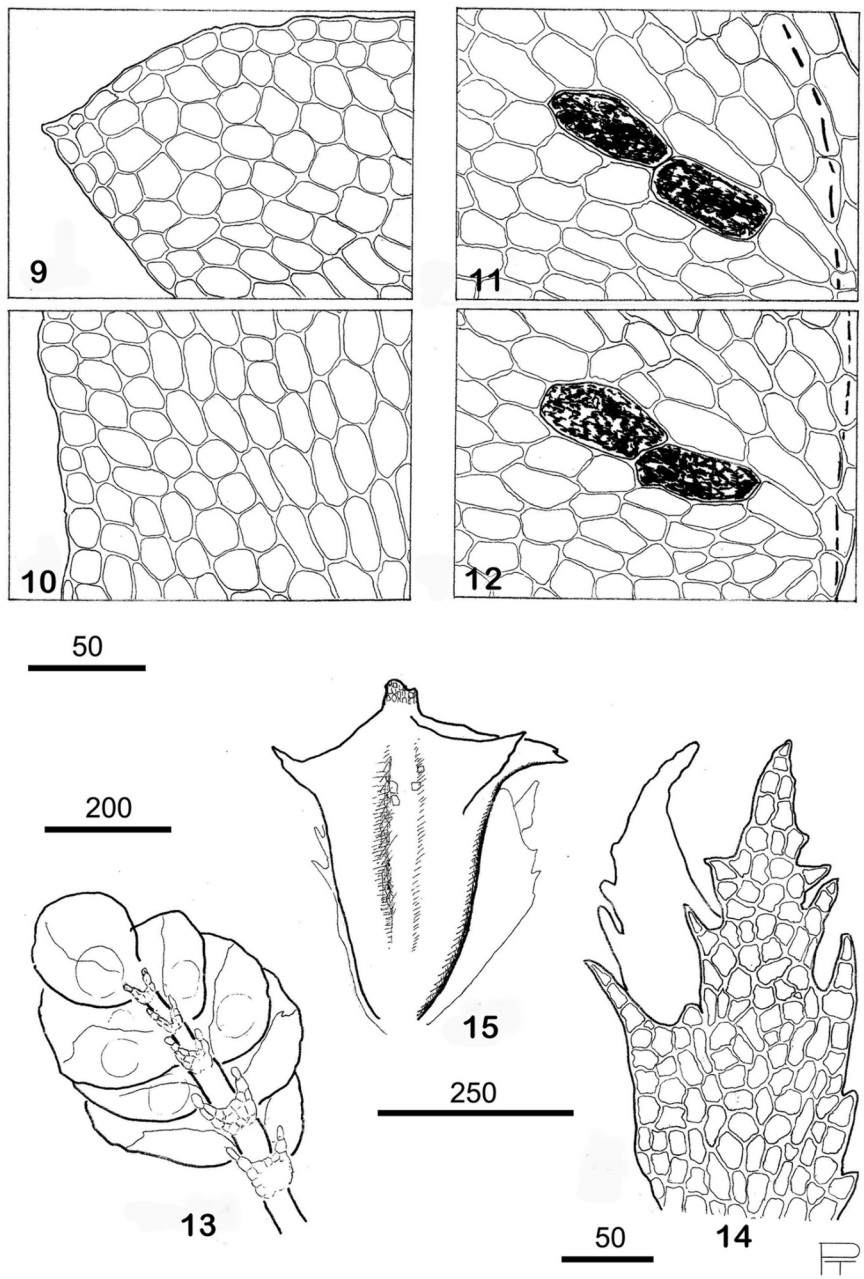
TYPE: VIETNAM, Central Highlands region, Lâm Đồng Province, Bidoup-Núi Bà National Park , trail from Hòn Giao station towards 1st peak of Mt. Hòn Giao, epiphyllous in shaded, humid mixed tropical montane forest at 1633-1717 m alt., 12°11.184-356'N, 108°42.818-889'E, 17 May 2011, *T.T. Luong & B.C. Ho BD 511-115* (Holotype: EGR, Isotype: HUS).

PARATYPE: VIETNAM, Central Highlands region, Lâm Đồng Province, Bidoup-Núi Bà National Park , trail from 1st peak of Mt. Hòn Giao to 2nd peak, epiphyllous in shaded, humid mixed tropical montane forest, near small streams, 1717-1835 m alt., 12°11'33.39-41.4"N, 108°42'42.04-43.09"E, 17 May 2011, *T.T. Luong & B.C. Ho BD 511-140* (HUS, EGR).

Epiphyllous, forms patches of 1-2 cm diameter, in herbarium yellowish green. Shoots up to 12 mm length and 0.5-0.75 mm width, regularly unipinnate with *Lejeunea*-type branches. Stems 30-50 μm thick, with a two cells wide ventral merophyte. Leaves loosely imbricate to distant, mostly contiguous, with at an angle of 45-70° to the stem, lobe almost symmetric, triangular-ovate with acute apex, 320-500 × 160-260 μm, margins entire to irregularly denticulate. Lobe cells isodiametric or elongate rectangular or pentagonal with relatively thin (1-2 μm thick) walls, small concave trigones and very rare intermediate thickenings towards the base. Lobe cell size 8-16 × 8-12 μm at margin, 24-28 μm at middle and 16-45 × 12-20 μm at base. Suprabasal ocelli usually 2 (rarely 3), moniliate, 45-50 × 20-30 μm with yellowish brown cell content in dry plants. Their coloration disappears with time. Lobules elongate ovate, reaching or exceeding half the lobe length, their free lateral margin often incurved, with one row of 4 strongly



Figs 2-8. *Drepanolejeunea* (subg. *Rhaphidolejeunea*) *bidoupensis* Pócs. **2.** Habit, dorsal view. **3-4.**Habit, ventral view. **5-6.** Lobules in ventral view. **7.** Leaf with moniliate ocelli, ventral view. **8.** Amphigastrium with rhizoids, ventral view. Scale bars in μm. All drawn from the type: T.T Luong & B.C. Ho BD 515-115.



Figs 9-15. *Drepanolejeunea* (subg. *Rhaphidolejeunea*) *bidoupensis* Pócs. **9.** Apical lobe cells. **10.** Median and marginal lobe cells. **11-12.** Basal lobe cells with moniliate ocelli. **13.** Male branch with bracteoles occurring through the whole length of androecial spike. **14.** Female bract. **15.** Perianth with bracts (bracteole removed). Scale bars in μm. All drawn from the type: T.T. Luong & B.C. Ho BD 515-115.

elongate rectangular marginal cells which continues distally with 1-2 isodiametric or short rectangular cells. Underleaves with narrow, acute, one cell wide lobes of 4-6(-7) cells length, spreading from the stem at an angle of 45-95°.

Dioicous. Androecia on stalked lateral branches or terminal on longer side branches, forming an ellipsoid ovate spike of 350-500 × 500-600 μm, with 3-5 pairs of male bracts. Their lobules are distant, not covering each other. Antheridia one per bract. Male bracteoles bilobed to ¾ their length with 2-3 cells long and one cell wide lobes, U-shaped with their lobes parallel to the stem, occurring through the whole length of androecial spike. Gynoecia on short side branches, with one pycnolejeuneoid innovation. Female bracts and bracteoles approaching the perianth length, fused at their base, bilobed to half their length, with pinnately serrate lobes. Perianth sessile, without stipe, obconic, 450-700 μm long and 250-260 μm wide without the horns. Horns of various size, ca. 100 μm long, acute, horizontally spreading from the top of mature perianth and often ending in two teeth. Beak stout, up to 32 μm (2-4 cells) long. Cladia present.

Etymology: The species is named after its locality in Bidoup-Núi Bà National Park.

Distribution: Only known from the Central Vietnam highlands.

Related taxa: The characteristic combination of narrow angle of leaf position, the near symmetric triangular-ovate leaf shape with acute apex, the two (or three) moniliate ocelli at one cell distance from the leaf base, the long lobules reaching or exceeding the half lobe length, the four elongated lobe marginal cells, the presence of male bracteoles throughout the androecium, the relatively high perianth beak and the gynoecial innovation makes this species unique among the other members of subgenus *Rhaphidolejeunea*. *Drepanolejeunea bidoupensis* is rather well distinguishable from the similar *D. foliicola* and *D. commutata* by its subsymmetric triangular-ovate lobes, by its lobule more than half of the lobe length, by its one cell wide underleaf lobes and by the presence of subgynoecial innovation. Further difference from *D. foliicola* is that the male bracteoles are present throughout the androecium, while *D. foliicola* has only 1-2 basal bracteoles.

DISCUSSION

The southern part of the Central Highlands, in which bryologically the best explored are the surroundings of Đà Lạt city with Lang Biang Highland, together with Bidoup-Núi Bà National Park, holds more than 120 known liverworts species (Pócs, 1965; Tixier, 1966, 1969, 1970), one of the highest diversity areas for bryophytes in Vietnam, representing some 20% of the whole known hepatic flora of the country. Thus, this area is worth giving intensive protection and needs further exploration. Concerning its epiphyllous vegetation, the two localities in BNBNP, sampled by the authors should be considered rich with their species number between 15 and 43, comparable in species richness with those studied by Tixier (1966) at the same altitudes in other parts of the Central Highlands. The number of species on individual leaves varied between 2 and 8, the latter number indicating high diversity according to Pócs & Tóthmérész (1997). Further statistical analysis is not possible due to the fact that the leaves with relative rich epiphyllous cover were randomly collected along existing forest trails in different number.

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