

On the bryogeography of Western Melanesian Lejeuneaceae, with comments on their epiphyllous occurrence

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Abstract. The phytogeography of Western Melanesian (Papua New Guinea, West Irian and the Solomon Islands) Lejeuneaceae was studied on the basis of previous literature and the Huon Peninsula material from the Koponen-Norris expedition. The largest portion of the Lejeuneaceae belong to Western Melanesian and Malaysian endemics. The number of Western Melanesian endemic Lejeuneaceae (20.5 %) is, however, somewhat lower than generally in hepatics (38.2 %). This is apparently due to the large number of epiphyllous taxa in the Lejeuneaceae, a group especially widespread in lowland rainforests.

Introduction and material and methods

According to the present knowledge, Western Melanesia has a greater diversity of Lejeuneaceae than any other place in the world (Table 1). Only in Borneo is there a comparably rich flora. The number of Lejeuneaceae reported from Western Melanesia increased from 197 to 235 between 1983 and 1993 (Piippo 1994a). Eleven doubtful species, however, have been omitted from the present phytogeographical study (see Results).

This paper is based on previous literature: Bischler (1968), Bischler & Piippo (1991), Bonner (1963, 1978), Gradstein (1975, 1985, 1991), Gradstein & Buskes (1985), Gradstein & Terken (1981), Grolle (1966, 1967, 1968, 1982, 1985, 1986, 1987, 1988), Grolle & Piippo (1984, 1990), Jovet-Ast (1953, 1960, 1961), Long & Grolle (1990), Luo (1990), Menzel (1988), Miller et al. (1983), Mizutani (1963, 1964, 1965, 1967, 1968, 1970, 1972a, 1972b, 1973, 1975, 1976, 1977, 1978, 1979a, 1979b, 1980, 1981, 1982, 1984a, 1984b, 1984c, 1985, 1986a,

1986b, 1987, 1988, 1989, 1990), Mizutani & Piippo (1986), Onraedt (1991), Piippo (1986, 1990), Pócs (1984), Pócs et al. (1994), Scott & Bradshaw (1986), Tan & Engel (1986), Thiers (1987, 1988a, 1992), Thiers & Gradstein (1989), and Tixier (1980, 1985, 1988). Phytogeographical units are according to Hyvönen (1989) and Enroth (1991). Previous phytogeographical studies (Piippo et al. 1987, Enroth 1991, and Piippo 1992a, 1994b) have spoken of "endemics of New Guinea". In this paper, I broaden the coverage and speak of "endemics of Western Melanesia" to include also hepatics of the Solomon Islands.

The other part of this paper deals with epiphyllous taxa of Lejeuneaceae and especially their altitudinal ranges. This part is based totally on the Huon Peninsula material determined by M. Mizutani and T. Pócs. The material for the epiphyllous study is obtained from the collections of the Koponen-Norris expedition (Koponen & Norris 1983) in 1981 to the Huon Peninsula, Papua New Guinea. The methods of the expedition and details of the study area are presented by Koponen & Norris (1983).

The results of the Huon project are being published in *Annales Botanici Fennici* and *Acta Botanica Fennica*, with 55 papers now having been published or in press (the latest, on Western Melanesian Lejeuneaceae, is Pócs et al. 1994). Newer papers not included in the summary of Koponen et al. (1991) are Bischler & Piippo (1991), Piippo (1991, 1992b, 1993) and Pócs et al. (1994). Of the 708 species given for Western Melanesia by Grolle and Piippo (1984), 41 hepatic families with 90 genera and 440 species have been treated. Aneuraceae and *Bazzania* remain to be studied, and most of the Lejeuneaceae remain unpublished but with a large portion of the material already determined. *Leucolejeunea* was published by Grolle and Piippo (1990) and Pócs et al. (1994) has new records of

mainly epiphyllous taxa.

Results

1. Phytogeography of Western Melanesian Lejeuneaceae

Two hundred and thirty five species reported from Western Melanesia (see Piippo 1994a) include eleven dubious taxa, i.e. those collected in New Guinea by Ledermann, whose voucher specimens were destroyed in Berlin during the Second World War. These are *Archilejeunea falcifolia* Steph., *Ceratolejeunea ledermannii* Steph., *Drepanolejeunea decurviloba* Steph., *Leptolejeunea curvatifolia* Steph., *L. integristipula* Steph., *Otigoniolejeunea crenulata* Steph., *O. ledermannii* Steph., *Pycnolejeunea palmicola* Steph., *Strepsilejeunea hamatifolia* Steph., *S. novae-guineae* Steph., and *S. renistipula* Steph. Because these taxa are most probably synonymous, they have been omitted from this phytogeographical paper, leaving 224 species for comparison.

If these doubtful taxa given above were included as endemic for Western Melanesia, the percentage of endemic Lejeuneaceae would be 24.15 (57 species). Now they form the second largest group with 46 species (20.54 %, Tables 2 and 3). The genera *Cololejeunea* and *Lopholejeunea* have the largest numbers of putative endemic species in Western Melanesia. About 26 % of the putative endemics belong to subfamily Ptychanthoideae (Table 14).

Species currently reported only from the Malesian region (see Tables 2 and 4) are the most numerous group in species. As many as 54 (24.12 %) species belong to this group at this preliminary state of knowledge. About half of the Malesian endemics belong to the genera *Cololejeunea*, *Colura*, *Drepanolejeunea* and *Lejeunea*. No endemic species of *Cheilolejeunea* have been found in

Malesia, and Ptychanthoideae form 22 % of all the Malesian endemics (Table 14).

The category Asian-Oceanian-Australian species can be divided into subcategories (see Hyvönen 1989, Enroth 1991). Forty species, i.e. 17.86 % are Asian-Oceanian (Tables 2 and 6). As many as half of the species seem to be restricted to Malesia and Oceania. Only 13 % are Ptychanthoideae (Table 14) and the most species rich genera are *Lejeunea* with 12 species and *Drepanolejeunea* with 6 species. Species that extend their ranges to Australia are much fewer (22), i.e. 9.82 % (Tables 2 and 7). None of these species are restricted merely to Malesia in Asia. 36 % of the taxa are Ptychanthoideae (Table 14). Asian-Australian species are only 8, i.e. 3.57 % (Tables 2 and 8), of which 37.5 % are Ptychanthoideae (Table 14). Twenty species, i.e. 8.93 % are SE Asian, and half of them belong to *Cololejeunea* (Tables 2 and 5). Most of the species are epiphyllous and only one belongs to Ptychanthoideae (Table 14). Paleotropical species are as many as 22, i.e. 9.82 % (Tables 2 and 10). At least 59 % of them occur as epiphylls and *Cololejeunea* is the richest genus. 31.8 % of the group belong to Ptychanthoideae (Table 14). Pantropical taxa are 11, i.e. 4.91 % (Tables 2 and 11), 45.5 % of which belong to Ptychanthoideae (Table 14). Transpacific species are only 3, i.e. 1.34 % (Tables 2 and 9).

2. Epiphyllous Lejeuneaceae of Western Melanesia

On the Huon Peninsula 84 species of Lejeuneaceae occur on tree, shrub or fern leaves (Table 12). Many of the taxa are obligate epiphylls such as many taxa of *Cololejeunea*, *Colura*, *Aphanolejeunea*, *Leptolejeunea*, *Drepanolejeunea*, and *Metzgeriopsis pusilla* Goebel. Some *Cheilolejeunea* and *Lejeunea* species occur both on tree trunks, branches and

leaves. The total number of Western Melanesian epiphyllous Lejeuneaceae is, however, higher than 84, but many species were unfortunately not encountered in the present material.

The most common epiphyllous species of Lejeuneaceae are (see Table 12): *Drepanolejeunea micholitzii* Steph., *Lejeunea cucullata* (Reinw. et al.) Nees, *L. exilis* (Reinw. et al.) Grolle, *Caudalejeunea recurvistipula* (Gott.) Schiffn., *Cheilolejeunea imbricata* (Nees) Hatt., *Cololejeunea goebelii* (Schiffn.) Schiffn., *Colura conica* (Sande Lac.) Grolle, and *Ceratolejeunea moniliata* Herz. Rather common species are also *Cheilolejeunea ceylanica* (Gott.) Schust. & Kachroo, *C. meyeniana* (Gott. et al.) Pócs, *Cololejeunea javanica* (Steph.) Mizut., *C. scabriflora* (Gott.) Schiffn., *Drepanolejeunea dentata* Steph., *D. spinoso-cornuta* Steph., *D. ternatensis* (Gott.) Steph., *D. thwaitesiana* (Mitt.) Steph., *Leptolejeunea maculata* (Mitt.) Schiffn. and *Tuyamaella serratistipa* Hatt. Epiphyllous Ptychanthoideae are rare, with only *Lopholejeunea eulopha* (Tayl.) Schiffn., *L. nigricans* (Lindenb.) Schiffn., *L. herzogiana* Verd., *L. dentifolia* Mizut. & Piippo, *Caudalejeunea cristiloba* (Steph.) Gradst., *C. reniloba* (Gott.) Steph., and *C. recurvistipula* were encountered in the present material.

Epiphylls are most common in rainforests, but they are common also in moss forests. The most common epiphylls listed above often endure somewhat or even heavily disturbed habitats, even though they are clearly most common in primeval rain forests. Some species occur even in gardens: *Ceratolejeunea moniliata*, *Cololejeunea javanica*, *C. peculiaris* (Herz.) Bened., *C. vesicaria* (Sande Lac.) Schiffn., *Drepanolejeunea micholitzii*, and *D. ternatensis* (see Hyvönen et al. 1987, Norris 1990).

On the Huon Peninsula epiphyllous Lejeuneaceae occur at altitudes of 200 - 2900 m (Fig. 1). Many species seem to be common from 500 up to 1700 m. They

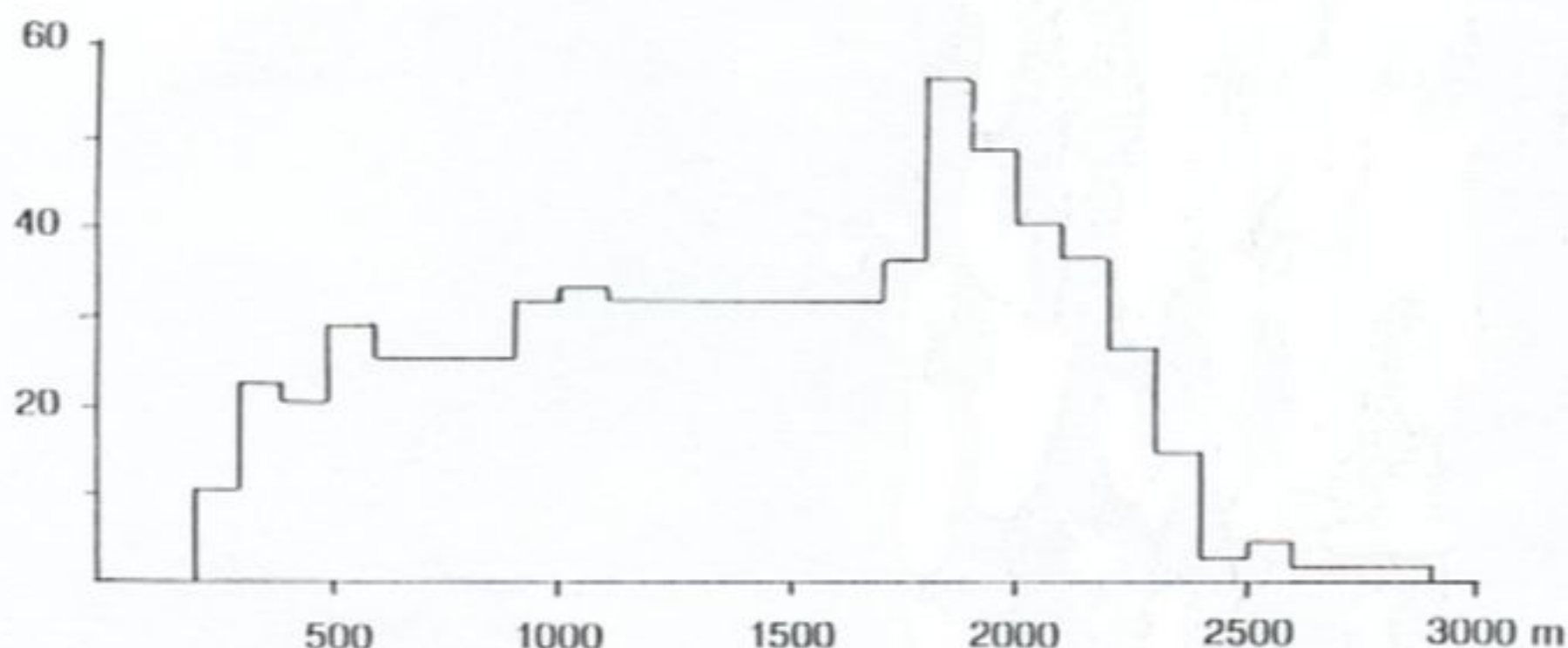


Fig. 1. Altitudinal ranges of Western Melanesian epiphyllous Lejeuneaceae. Vertical axis = number of species, horizontal axis = altitudes in metres.

altitudes than other hepatic endemics (Piippo 1994b) or even hepatics in general (see Enroth 1991). On the Huon Peninsula no epiphylls occur above 2900 m, an altitude previously reported as the upper limit of epiphylls in the tropics apparently because of frosts (Pócs 1982, Gradstein & Pócs 1989). According to Frahm (1990), the existence of epiphyllous liverworts in lowland rainforests, where epiphytes are rare, is a worldwide but difficult to explain phenomenon. The lower endemism figure for Lejeuneaceae can be partly explained by the more widespread nature of lowland elements in the tropics (cf. Schuster 1983). Many epiphyllous taxa are also monoicous and therefore may have better means for dispersal (cf. Gradstein & Pócs 1989).

The percentage of Malesian endemics in Lejeuneaceae is at the present state of knowledge higher than the number of such endemics in hepatics and mosses. The reason for this is obvious when one compares the distribution of Lejeuneaceae, especially other subfamilies than the Ptychanthoideae, with the distribution of the rainforests (Pócs 1977, Richards 1984, Gradstein & Pócs 1989, Thiers 1990, Gradstein 1991).

Asian-Oceanian-Australian Lejeuneaceae

endemics are more numerous than in hepatics in general (Table 13). One possible explanation is the lack of revisional work taking into consideration taxa both from Australia, Pacific Islands and Asia. Because of the work by Gradstein and Thiers (1989) and Thiers (1987, 1988a, 1992) with the Australian hepatic flora, our knowledge of the Lejeuneaceae in Australasia is now known better than earlier. The low figure in both hepatics in general and the Lejeuneaceae for Asian-Australian taxa confirms, however, a distinctly closer affinity of hepatics from Western Melanesia with Malaysia than to Australia (cf. Piippo 1992a). This phenomenon is seen also in *Marchantia*, whose Western Melanesia flora, after revision, has distinct affinities with Malaysia (cf. Piippo 1992a: 30).

Due to the effective dispersal or of the relict nature of some species, typical feature for the Lejeuneaceae is the large portion of paleotropical taxa. Ptychanthoideae are most common among the pantropical, paleotropical, Asian-Oceanian-Australian taxa and especially among the Asian-Australian taxa (Table 14). According to Gradstein (1991), Ptychanthoideae is an ancient group of Lejeuneaceae which presumably

are most abundant, however, at 1700-2200. There are almost no epiphylls over 2500 m, and none above 2900 m.

Discussion

The hepatic flora of SE Asia outside of Western Melanesia is still very incompletely surveyed. Therefore floristic comparisons given in the present study are only preliminary. The bryogeography of mosses, hepatics and the Lejeuneaceae are compared in the Table 13. Western Melanesian endemics are the largest group of the phytogeographical elements in mosses and hepatics in general, but not in the Lejeuneaceae. The figure of the Lejeuneaceae (20.5%) is, however, more similar to that of mosses (18.0%) than to that of the other hepatics (38.2%). Endemic hepatics in general are richest between 1500 and 3500 m and they are most common between 2200 - 2600 m (Piippo 1994b). As seen from Fig. 1, the epiphyllous Lejeuneaceae, which form a large portion of all the Lejeuneaceae, are most numerous in species between 1700 and 2200 m and they are common also at elevations down to 300 m. In other hepatics there are many high altitude endemics even though they are most common at rainforest altitudes. The epiphyllous Lejeuneaceae, mainly Cololejeuneoideae and Lejeuneoideae, are clearly more common at low altitudes than other hepatic endemics (Piippo 1994b) or even hepatics in general (see Enroth 1991). On the Huon Peninsula no epiphylls occur above 2900 m, an altitude previously reported as the upper limit of epiphylls in the tropics apparently because of frosts (Pócs 1982, Gradstein & Pócs 1989). According to Frahm (1990), the existence of epiphyllous liverworts in lowland rainforests, where epiphytes are rare, is a worldwide but difficult to explain phenomenon. The lower endemism figure for Lejeuneaceae can be partly explained by the more widespread nature of lowland

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Gondwanaland.

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TABLE 1. Comparison of Western Melanesian Lejeuneaceae flora with other regions (partly according to Thiers 1990)

<u>Region</u>	<u>Source</u>	<u>No. of spec.</u>
Western Melanesia	Pócs et al. 1994	235
Borneo	Menzel 1988	232
Columbia	Gradstein & Hekking 1979	204
China	Piippo 1990, 1992	197
Philippines	Tan & Engel 1986	165
Australia	Thiers 1990	122
Costa Rica	Herzog 1951	118
East Africa	Bizot & Pócs 1974, 1979	66
Japan	Mizutani 1961	64

North America Schuster 1980	63	in Western Melanesia - 46 species / 20.54 %
New Zealand Hamlin 1972	45	<i>Acrolejeunea pycnoclada</i> (Tayl.) Schiffn. subsp. <i>latistipula</i> Gradst. <i>Aphanolejeunea ciliata</i> Pócs <i>A. morobensis</i> Pócs <i>Calatholejeunea lamii</i> Mizut. <i>Cololejeunea angustibracteata</i> Schiffn. <i>C. angustiflora</i> (Steph.) Mizut. <i>C. cardiocalyx</i> (Schiffn.) Schiffn. & Steph. <i>C. floccosa</i> (Lehm. & Lindenb.) Schiffn. var. <i>auriculata</i> Tix. <i>C. kopenhagenii</i> Pócs <i>C. quadridentata</i> (Hatt.) Grolle <i>Colura pallida</i> Steph. <i>C. schusteri</i> Grolle <i>Dicranolejeunea inoueana</i> Mizut. & Piippo <i>Drepanolejeunea lyrata</i> Grolle <i>D. tuyamae</i> Hatt. <i>D. yulensis</i> Steph. <i>Harpalejeunea pinaundensis</i> Grolle <i>Lejeunea lancistipula</i> (Steph.) H. A. Miller et al. <i>L. parallela</i> Schiffn. <i>Leptolejeunea minima</i> Herz. <i>L. minutistipula</i> Steph. ex Herz. <i>Leucolejeunea gradsteinii</i> Grolle & Piippo <i>L. lorigana</i> (Steph.) Mizut. <i>L. suprema</i> Grolle & Piippo <i>Lopholejeunea acutifolia</i> Mizut. & Piippo <i>L. dentifolia</i> Mizut. & Piippo <i>L. evansiana</i> Verd. <i>L. latilobula</i> Verd. <i>L. pullei</i> Verd. <i>Microlejeunea erectifolia</i> Spruce <i>M. kopenhagenensis</i> Pócs <i>Otolejeunea streimannii</i> Grolle <i>O. zantenii</i> Grolle <i>Phaeolejeunea inermis</i> (Steph.) Mizut. <i>Pycnolejeunea fitzgeraldii</i> Steph. <i>P. grossiloba</i> Steph. <i>Rhaphidolejeunea bischlerae</i> Grolle <i>Siphonolejeunea schiffneri</i> (Steph. ex Schiffn.) Herz. <i>Spruceanthus macrostipulus</i> (Steph.)
TABLE 2. Bryogeography of Western Melanesian Lejeuneaceae		
No. of spec. %		
1. Endemics of Western Melanesia 46 20.54		
2. Endemics of Malesian region 54 24.12		
3. SE Asian species 20 8.93		
4.1 Asian-Oceanian 40 17.86		
4.2 Asian-Oceanian-Australian 22 9.82		
4.3 Asian-Australian 8 3.57		
5. Transpacific 3 1.34		
6. Paleotropical 22 9.82		
7. Pantropical 11 4.91		
TABLE 3. Endemic taxa of Lejeuneaceae		

Gradst.
S. pluriplicatus (Steph.) Gradst.
Stenolejeunea morobensis Grolle
Taxilejeunea giulianettii Steph.
T. nymanii Steph.
T. stephanii Eifrig
Thysananthus appendiculatus (Steph.)
 Steph.
T. mollis Steph.
Trachylejeunea englishii Steph.

TABLE 4. Endemic species of Lejeuneaceae of Malesian region - 54 species / 24.12 %

Acrolejeunea arcuata (Nees) Grolle & Gradst.
A. tjibodensis (Verd.) Grolle & Gradst.
Calatholejeunea paradoxa (Schiffn.)
 Goebel
Cheilolejeunea gigantea (Steph.) Schust.
 & Kachroo
C. lindenbergii (Gott.) Mizut.
C. occlusa (Herz.) Kodama & Kitag.
C. paroica Mizut.
Cololejeunea angulata (Steph.) Mizut.
C. dozyana (Sande Lac.) Schiffn.
C. javanica (Steph.) Mizut.
C. pseudostipulata (Schiffn.) Bened.
C. stephanii Bened.
C. vesicaria (Sande Lac.) Schiffn.
Colura clementis Grolle
C. crenulata Grolle
C. junghuhniana (Steph.) Steph.
C. karstenii Goebel
C. speciosa Jov.-Ast
Dicranolejeunea javanica Steph.
Diplasiolejeunea jövet-astiae Grolle
D. patelligera Herz.
Drepanolejeunea blumii (Steph.) Schiffn.
D. dentata Steph.
D. fissicornua Steph.
D. levicornua Steph.
D. longicornua (Herz.) Mizut.
D. nymanii Steph.
D. spinoso-cornuta Steph.
D. tricornua Herz.
Harpalejeunea constricta Grolle

Lejeunea dimorpha Kodama
L. fleischeri (Steph.) Mizut.
L. herzogii Mizut.
L. kinabalensis Mizut.
L. microstipula Steph.
L. mizutanii Grolle
L. molkenboeriana Sande Lac.
L. nymanii Steph.
Leptolejeunea dentistipula Steph.
L. serrulata Herz.
Lopholejeunea herzogiana Verd.
L. recurvata Mizut.
L. wiltensii Steph.
Mastigolejeunea recondita (Steph.)
 Mizut.
M. truncata Mizut.
Otolejeunea semperiana Grolle
Pictolejeunea mizutanii Grolle
Pycnolejeunea cavistipula (Steph.)
 Mizut.
Rhaphidolejeunea longicruris (Steph.)
 Herz.
Schiffneriolejeunea nymanii (Steph.)
 Gradst. & Terken
S. omphalanthoides Verd.
Stenolejeunea thallophora (Eifrig)
 Schust.
Thysananthus minor Verd.
Trocholejeunea crassicaulis (Steph.)
 Mizut.
Tuyamaella serratistipula Hatt.

TABLE 5. SE Asian species of Lejeuneaceae - 20 species / 8.93 %

Acrolejeunea fertilis (Reinw. et al.)
 Schiffn.
Aphanolejeunea angustiloba Horik.
A. grossepapillosa Horik.
Cololejeunea desciscens Steph.
C. equialbi P. Tix.
C. falcatoides Bened.
C. hirta Steph.
C. leonidens Bened.
C. madothecoides (Steph.) Bened.
C. peculiaris (Herz.) Bened.
C. pseudofloccosa (Horik.) Bened.
C. schmidtii Steph.

C. triapiculata (Herz.) Tix.
Colura meijeri Jov.-Ast
Drepanolejeunea thwaitesiana (Mitt.)
 Steph.
Lejeunea catanduana (Steph.) H. A.
 Miller et al.
L. eifrigii Mizut.
L. leratii (Steph.) Mizut.
Pycnolejeunea grandiocellata Steph.
Tuyamaella angulistipa (Steph.) Schust.
 & Kachroo

TABLE 6. Asian-Oceanian species of
 Lejeuneaceae (if only in Malesia *)
 - 40 species / 17.86 %

Caudalejeunea recurvistipula (Gott.)
 Schiffn.
Ceratolejeunea moniliata Herz.
 * *Cheilolejeunea cookiensis* (Steph.)
 Schust. & Kachroo
 * *C. germanii* (Besch. & Spruce) Grolle
C. mariana (Gott.) Thiers & Gradst.
Cololejeunea cordiflora Steph.
C. hasskarliana (Lehm. & Lindenb.)
 Steph.
C. longifolia (Mitt.) Bened.
Colura corynephora (Nees et al.) Trev.
 * *C. imperfecta* Steph.
 * *C. pluridentata* Jov.-Ast
Drepanolejeunea dactylophora (Gott. et
 al.) Schiffn.
 * *D. intermedia* Zwickel
D. pentadactyla (Mont.) Steph.
 * *D. serricalyx* Herz.
D. tenera Goebel
D. teysmannii Gott. et al.
Lejeunea albescens (Steph.) Mizut.
 * *L. asperula* (Steph.) Mizut.
 * *L. crenulata* (Schiffn.) Steph.
 * *L. cuculliflora* (Steph.) Mizut.
 * *L. exilis* (Reinw. et al.) Grolle
 * *L. gracilis* Steph.
 * *L. lumbricoides* (Nees) Nees
L. micholitzii Mizut.
 * *L. microloba* Tayl.

* *L. parvisaccata* (Steph.) Steph.
 * *L. patersonii* (Steph.) Steph.
L. umbilicata (Nees) Gott. et al.
 * *Lepidolejeunea graeffei* (Jack & Steph.)
 Schust.
 * *L. integristipula* (Jack & Steph.) Schust.
Leptolejeunea amphiophthalmia Zwickel
 * *L. lancifolia* (Mitt.) Steph.
L. subacuta Steph. ex Evans
Mastigolejeunea repleta (Tayl.) Steph.
Metzgeriopsis pusilla Goebel
 * *Microlejeunea atsuana* Steph.
Phaeolejeunea latistipula (Schiffn.)
 Mizut.
 * *Thysananthus comosus* Lindenb.
T. convolutus Lindenb.

TABLE 7. Asian-Oceanian-Australian
 species of Lejeuneaceae - 22 species/
 9.82 %

Archilejeunea polymorpha (Sande Lac.)
 B. Thiers & Gradst.
Caudalejeunea cristiloba (Steph.) Gradst.
C. reniloba (Gott.) Steph.
Cheilolejeunea falsinervis (Sande Lac.)
 Kachroo & Schust.
C. imbricata (Nees) Hatt.
C. meyeniana (Gott. et al.) Pócs
Cololejeunea goebelii (Gott. ex Schiffn.)
 Schiffn.
C. wightii Steph.
Colura acroloba (Mont. ex Steph.) Jov.-
 Ast
C. ari (Steph.) Steph.
C. conica (Sande Lac.) Goebel
Drepanolejeunea ternatensis (Gott.)
 Steph.
D. vesiculosa (Mitt.) Steph.
Harpalejeunea filicuspis (Steph.) Mizut.
Lejeunea discreta Lindenb.
L. sordida (Nees) Nees
Leptolejeunea maculata (Mitt.) Schiffn.
Mastigolejeunea ligulata (Lehm. &
 Lindenb.) Schiffn.
M. virens (Aongstr.) Steph.
Schiffneriolejeunea cumingiana (Mont.)

Gradst.
S. tumida (Nees) Gradst.
Thysananthus fruticosus (Lindenb. & Gott.) Schiffn.

TABLE 8. Asian-Australian species of Lejeuneaceae - 8 species / 3.57 %

Archilejeunea planiuscula (Mitt.) Steph.
Caudalejeunea lessonii Steph.
Cheilolejeunea incisa (Gott.) Schust. & Kachroo
C. longidens (Steph.) Kachroo & Schust.
C. vittata (Steph. ex Hoffm.) Schust. & Kachroo
Drepanolejeunea obliqua Steph.
Lejeunea armitii (Steph.) Steph.
Mastigolejeunea undulata Gradst. & Grolle

TABLE 9. Transpacific species of Lejeuneaceae - 3 species / 1.34 %

Cheilolejeunea trifaria (Reinw. et al.) Mizut.
Cololejeunea scabriflora (Gott.) Schiffn.
Diplasiolejeunea cavifolia Steph.

TABLE 10. Paleotropical species of Lejeuneaceae (* = not in Australia, _ = not in India, Ð = not in Africa) - 22 species / 9.82 %

Acrolejeunea aulacophora (Mont.) Steph.
 * *A. pycnoclada* (Tayl.) Schiffn.
 * *Ceratolejeunea belangeriana* (Gott.) Steph.
Cheilolejeunea ceylanica (Gott.) Schust. & Kachroo
C. intertexta (Lindenb.) Steph.
 * *C. appressa* (Evans) Bened.
C. floccosa (Lehm. & Lindenb.) Schiffn.
 _ *C. inflectens* (Mitt.) Bened.
 Ð *C. lanciloba* Steph.
C. peraffinis (Schiffn.) Schiffn.

*_ *Colura superba* (Mont.) Steph.
 * *Drepanolejeunea angustifolia* (Mitt.) Grolle
 _ *D. micholitzii* Steph.
 *_ *Lejeunea alata* Gott.
Lepidolejeunea bidentula (Steph.) Schust.
 * *Leptolejeunea epiphylla* (Mitt.) Steph.
 *_ *L. vitrea* (Nees) Schiffn.
 * *Lopholejeunea applanata* (Reinw. et al.) Schiffn.
 * *L. javanica* (Nees) Schiffn.
Ptychanthus striatus (Lehm. & Lindenb.) Nees
 _ *Thysananthus retusus* (Reinw. et al.) B. Thiers & Gradst.
T. spathulistipus (Reinw. et al.) Lindenb.

TABLE 11. Pantropical species of Lejeuneaceae (* = not in Australia, Ð = not in Africa) - 11 species / 4.91 %

* *Colura tenuicornis* (Evans) Steph.
Lejeunea caespitosa Lindenb.
L. cucullata (Reinw. et al.) Nees
L. flava (Sw.) Nees
 Ð *Leptolejeunea elliptica* (Lehm. & Lindenb.) Schiffn.
Leucolejeunea xanthocarpa (Lehm. & Lindenb.) Evans
Lopholejeunea eulopha (Tayl.) Schiffn.
L. nigricans (Lindenb.) Steph.
L. subfusca (Nees) Steph.
Mastigolejeunea auriculata (Wils.) Schiffn.
Stictolejeunea balfourii (Mitt.) E. W. Jones

TABLE 12. Epiphyllous Lejeuneaceae on the Huon Peninsula. No. = number of collections

	No.
<i>Aphanolejeunea ciliata</i>	1
<i>A. angustiloba</i>	1
<i>A. grossepapillosa</i>	

1		
<i>A. morobensis</i>	2	
<i>Caudalejeunea recurvistipula</i>		27
<i>C. reniloba</i>	3	
<i>Ceratolejeunea belangeriana</i>	3	
<i>C. moniliata</i>		20
<i>Cheilolejeunea ceylanica</i>		15
<i>C. falsinervis</i>		2
<i>C. imbricata</i>		28
<i>C. lindenbergii</i>	1	
<i>C. meyeniana</i>		10
<i>C. occlusa</i>	3	
<i>C. trifaria</i>	1	
<i>C. vittata</i>	8	
<i>Cololejeunea ciliata</i>		1
<i>C. cordiflora</i>		7
<i>C. equialbi</i>	1	
<i>C. goebelii</i>	26	
<i>C. hasskarliana</i>	9	
<i>C. hirta</i>	1	
<i>C. javanica</i>	16	
<i>C. koponenii</i>		1
<i>C. lanciloba</i>		1
<i>C. peculiaris</i>		1
<i>C. peraffinis</i>		8
<i>C. pseudofloccosa</i>		1
<i>C. scabriflora</i>		15
<i>C. schmidtii</i>		1
<i>C. vesicaria</i>		2
<i>Colura acroloba</i>	2	
<i>C. ari</i>	1	
<i>C. conica</i>	20	
<i>C. imperfecta</i>		1
<i>C. meijeri</i>	2	
<i>C. ornata</i>	2	
<i>Drepanolejeunea dactylophora</i>		1
<i>D. dentata</i>	13	
<i>D. fissicornua</i>		1
<i>D. intermedia</i>		6
<i>D. laevicornua</i>	2	
<i>D. longicornua</i>	8	
<i>D. micholitzii</i>		53
<i>D. serricalyx</i>		1
<i>D. spinoso-cornuta</i>		10
<i>D. tenera</i>	1	
<i>D. ternatensis</i>		13
<i>D. teysmannii</i>		2
<i>D. thwaitesiana</i>	18	
<i>D. vesiculosa</i>		4
<i>Harpalejeunea constricta</i>		1
<i>H. filicuspis</i>		1
<i>Lejeunea alata</i>	2	
<i>L. albescens</i>		2
<i>L. catanduana</i>	2	
<i>L. cucullata</i>		32
<i>L. dimorpha</i>		4
<i>L. discreta</i>	8	
<i>L. exilis</i>	26	
<i>L. flava</i>	2	
<i>L. herzogii</i>	1	
<i>L. kinabalensis</i>	3	
<i>L. leratii</i>	1	
<i>L. lumbricoides</i>	4	
<i>L. umbilicata</i>		2

TABLE 14. The proportion of subfamily Ptychanthoideae in Western Melanesia. a = proportion of ptychanthoid species of the phytogeographical element in question (%), b = proportion of ptychanthoid species of the whole Lejeuneaceae flora (226). - For details, see the text.

	a	b
Endemics of Western Melanesia	26.1	5.4
Endemics of Malesian region	22.2	5.4
SE Asian species	5.0	0.5
Asian-Oceanian	12.5	2.2
Asian-Oceanian-Australian	36.4	3.6
Asian-Australian	37.5	1.3
Transpacific	-	-
Paleotropical	31.8	3.1
Pantropical	45.5	2.2