

An account of the genus *Lejeunea* (Marchantiophyta: Lejeuneaceae) in Thailand, including seven newly recorded species

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Abstract – An account of the *Lejeunea* species of Thailand with their distributional ranges in Thailand and worldwide is presented. Seven species are newly recorded to Thailand: *Lejeunea cocoes* Mitt., *L. lumbricoides* (Nees) Nees, *L. micholitzii* Mizut., *L. parva* (S.Hatt.) Mizut., *L. patersonii* (Steph.) Steph., *L. tamaspocsii* G.E.Lee and *L. umbilicata* (Nees) Nees. Illustrations of the newly recorded species and a map of the provinces of Thailand with numbers of *Lejeunea* species recorded are also provided.

***Lejeunea* / Thailand / Lejeuneaceae / new records**

INTRODUCTION

The genus *Lejeunea* Lib. with about three hundred currently accepted species is one of the largest genera in the family Lejeuneaceae (Marchantiophyta) (Lee, 2013). The genus exhibits a pantropical distribution and grows on bark, rocks, soil and on living leaves. The main characteristics of this genus are the hyaline papilla at the proximal side of the apical tooth of the lobule; ocelli absent; small, granular or homogeneous oil bodies; underleaves usually bifid (rarely entire), underleaf lobes upright; lobules occasionally reduced and with one tooth (rarely 2); epidermal cells of stem thin-walled and larger than the medullary cells; branches of the *Lejeunea*-type and gynoecia with lejeuneoid innovations. The circumscription of the genus has been considerably expanded in recent years due to the inclusion in *Lejeunea* of several groups which were previously treated as separate genera [see Lee (2013) for genera added to the synonymy of *Lejeunea*]. On the other hand, *Microlejeunea*, often treated within *Lejeunea*, is separated, not only by morphological characters (presence of basal ocelli at least in part of the leaves), but also by molecular evidence (Dong *et al.*, 2013). For this reason, *Lejeunea ulicina* (Taylor) Gottsche, *L. punctiformis* Taylor and *L. moniliata*

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Mizut. fell out from our treatment, as they are transferred to the genus *Microlejeunea*, as *Microlejeunea ulicina* (Taylor) A. Evans, *M. punctiformis* (Taylor) Steph., and *M. moniliata* (Mizut.) R.L.Zhu *et* Y.M.Weii (Wei & Zhu, 2013).

Eight species of *Lejeunea* have been previously reported for Thailand (Lai *et al.*, 2008; Akiyama *et al.*, 2011; He *et al.*, 2012). In the present study, we report seven further species of *Lejeunea*, i.e. *Lejeunea cocoos*, *L. lumbricoides*, *L. micholitzii*, *L. parva*, *L. patersonii*, *L. tamaspcsii* and *L. umbilicata*, which were recently collected in Thailand.

RESULTS AND DISCUSSION

Based on the literature and the present study (Table 1), the number of *Lejeunea* in Thailand is lower than that of the Peninsular Malaysia, India, Taiwan and Java. This suggests that the genus *Lejeunea* is understudied in Thailand. The numbers of species recorded for each province of Thailand are given in Figure 1. The numbers clearly indicate that collecting of the genus *Lejeunea* in Thailand has been very uneven. The majority of the species (12) were found in Nakhon Si Thammarat province, southern Thailand (Fig. 1), in other provinces only 1-3 species were recorded. We expect that further exploration of other provinces of Thailand will add many new species records. The 15 known *Lejeunea* species of Thailand are listed below in alphabetical order together with their distributional ranges. New records for Thailand are marked with an asterisk. For full descriptions, synonymy and type citations of the newly recorded species, and of the majority of the known ones, we may refer to Lee (2013).

Table 1. *Lejeunea* species recorded from Asia

Country	Number of species recorded	Reference
China	42	So & Zhu (1998), Zhu & So (1999)
India	31	Dandotiya <i>et al.</i> (2011)
East Malaysia (Sabah, Sarawak)	28	Lee (2013)
Java (Indonesia)	27	Söderström <i>et al.</i> (2010)
Taiwan	25	Wang <i>et al.</i> (2011)
Fiji	24	Söderström <i>et al.</i> (2011)
Japan	23	Yamada & Iwatsuki (2006)
Peninsular Malaysia	19	Lee (2013)
New Caledonia	18	Thouvenot <i>et al.</i> (2011)
Thailand	15	Lai <i>et al.</i> (2008), present study
Korea	11	Park & Choi (2008)
Hong Kong	10	So & Zhu (1996), Zhang & Corlett (2003)
Bhutan	9	Long & Grolle (1990)
Tonga	6	Söderström <i>et al.</i> (2012)
Singapore	3	Piippo <i>et al.</i> (2002)

***Lejeunea alata* Gottsche**, in Gottsche *et al.*, *Syn. Hepat.*: 406 (1845)

Distribution in Thailand: Chiang Mai (He *et al.*, 2012).

Range: Africa, tropical Asia, Pacific region (Zhu & So, 1999).

***Lejeunea anisophylla* Mont., *Ann. Sci. Nat., Bot.*, Sér. 2. 19: 263 (1843)**

Specimens examined: Ton Nga Chang waterfall area 25 km WSW of Hat Yai town, 85 m alt., 06°56.85'N, 100°14.06'E, 26 Oct 2012, *T. Pócs & G.E. Lee 1207/L* (EGR, UKMB); Pliu (Plew) Waterfall area 9 km E of Thung Song town, 185-212 m alt., 08°09.78'N, 99°45.59'E, 28 Oct 2012, *T. Pócs & G.E. Lee 1211/M* (EGR, PSU), *ibid.*, *G.E. Lee 2498, 2499* (UKMB, PSU); Soi Wangsilarak waterfall, 125 m alt., 29 Oct 2012, *G.E. Lee 2557, 2558* (UKMB, PSU); Klong Jang waterfalls on the W slope of Khao Men Mt., 150 m alt., 08°16.24'N, 99°38.67'E, 2 Nov 2012, *T. Pócs & A. Somadee 1218/D* (EGR, UKMB); on the ridge N of Khao Men resort, 5 km ESE of Chang Klang, 120-140 m alt., 08°19.93'N, 99°38.52'E, 4 Nov 2012, *T. Pócs 1222/A, 1222/B, 1222/C* (EGR, UKMB).

Habitat: On tree trunks, branches, tree bases, roots and rock.

Distribution in Thailand: Nakhon Si Thammarat (present study), (Miller *et al.*, 1983 as *L. borneensis*), (Zhu & Lai, 2003), Nakhon Ratchasima (Khorat) (Lai *et al.*, 2008), Chiang Mai: Doi Inthanon (Akiyama *et al.*, 2011).

Range: Widespread Paleotropical species distributed all over Subsaharan Africa and from Southeast Asia to the Pacific Islands (Pócs, 2010)

* ***Lejeunea cocoes* Mitt., *J. Proc. Linn. Soc., Bot.* 5: 114 (1861) **Figs 2-11****

The characteristic features of *L. cocoes* include the relatively small size of plant (less than 0.6 mm wide with leaves), the leaf cells with small or poorly developed trigones and without intermediate thickenings, the distantly arranged and small underleaves which is about as wide as the stem, and the leaf margin sometimes produce ribbon-like regenerants. The plant of *L. cocoes* is sometimes with strongly caducous leaves, however, this character is not seen in Thailand specimens. *Lejeunea cocoes* is very similar to *L. anisophylla* but the former is a dioicous plant. Furthermore, the former species are easily separated by the weakly 5-keeled perianth, the usually rounded laminal cells, and the presence of ribbon-like regenerants at the leaf margins (Lee, 2013).

Specimens examined: Khao Lung National Park, along the trekking trail to Krung Ching Waterfalls, 215 m alt., 30 Oct 2012, *G.E. Lee 2496* (UKMB, PSU), *ibid.*, 08°43.41'N, 99°40.09'E, *T. Pócs, K. U-Taynapuh & G.E. Lee 1217/F* (EGR, UKMB).

Habitat: On tree trunks and decaying wood.

Distribution in Thailand: Nakhon Si Thammarat (present study).

Range: Chagos Archipelago, India, Sri Lanka, China, Thailand, Peninsular Malaysia, Borneo (East Malaysia: Sarawak), Indonesia (Java), Papua New Guinea, Fiji (Mizutani, 1963; Seaward *et al.*, 2006; Pócs *et al.*, 2011).

***Lejeunea discreta* Lindenb., in Gottsche *et al.*, *Syn. Hepat.*: 361 (1845)**

Distribution in Thailand: Prachuap Khiri Khan (Chantanaorrapint *et al.*, 2004).

Range: India, Nepal, Bhutan, S-China, Cambodia, Japan, Korea, Malaysia, Indonesia, Philippines, Australia, New Guinea and New Caledonia (Zhu & So, 2001).

***Lejeunea flava* (Sw.) Nees, *Naturgesch. Eur. Leberm.* 3: 277 (1838)**

Specimens examined: Ron Phibun, area around the weather station in Kao Ramrome, 950 m alt., 27 Oct 2012, *G.E. Lee 2466, 2477* (UKMB, PSU).

Habitat: On tree trunk and leaf.

Distribution in Thailand: (Miller *et al.*, 1983), Nakhon Si Thammarat (present study), Chiang Mai (Kornochalert, 2006; Akiyama *et al.*, 2011).

Range: Widely distributed in temperate, subtropical and tropical regions (Zhu & Long, 2003).

* *Lejeunea lumbricoides* (Nees) Nees, in Gottsche *et al.*, Syn. Hepat.: 342 (1845) **Figs 56-65**

The distinguishing characters of *L. lumbricoides* are the apices of leaf lobe strongly recurved when dry or moist, the cordate base of underleaf (sometimes with auricle), the small leaf lobules, the large rectangular disc cell below the apical tooth, and the laminal cells with well-developed trigones and conspicuous intermediate thickenings (Lee, 2013).

Specimen examined: Khao Nan National Park, Sanyen summit, ca. 1200 m alt., 25 Jul 2011, *S. Chantanaorrapint* 2239 (PSU).

Habitat: On tree branches.

Distribution in Thailand: Nakhon Si Thammarat (present study).

Range: Thailand, Peninsular Malaysia, Borneo (East Malaysia: Sabah), Indonesia (Java, Amboina, Sulawesi, West Irian), Papua New Guinea, Solomon Islands, Fiji, Samoa (Schiffner, 1898; Mizutani, 1970; Grolle & Piippo, 1984; Chuah-Petiot, 2011; Lee, 2013).

* *Lejeunea micholitzii* Mizut., *J. Hattori Bot. Lab.* 33: 236 (1970) **Figs 12-20**

Lejeunea micholitzii is easily recognized by its small, reniform, distantly arranged and deeply bifid (3/4-4/5) underleaves with acute lobes, and its laminal cells with well-developed trigones and intermediate thickenings. Furthermore, the occurrence of two intermediate thickenings in the basal leaf cells between adjacent trigones and the obovoid perianth with a 2-3 cells long beak can also be used to distinguish this species. Superficially, *L. micholitzii* resembles *L. tuberculosa* and *L. wightii*, however, *L. micholitzii* differs mainly by having reniform and deeply bifid underleaves. *Lejeunea tuberculosa* is easily separated also by its mammillose perianth (Lee, 2013).

Specimen examined: Ron Phibun, area around the abandoned guesthouse in Khao Ramrome, 910 m alt., 29 Oct 2012, *G.E. Lee* 2527 (UKMB, PSU).

Habitat: On leaf.

Distribution in Thailand: Nakhon Si Thammarat (present study).

Range: Thailand, Vietnam, Peninsular Malaysia, Borneo (East Malaysia: Sabah), Philippines, Indonesia, New Guinea, New Caledonia, Vanuatu, Fiji, Tonga (Hürlimann, 1993; Zhu & Grolle, 2004; Lee, 2013).

* *Lejeunea parva* (S.Hatt.) Mizut., *Misc. Bryol. Lichenol.* 5: 178 (1971) **Figs 30-37**

Lejeunea parva is characterized by the small size of plants, the scarcely branched stem, the rarely reduced and large leaf lobules (up to 1/2 of the leaf lobe), and the suborbicular underleaves which are about 2 times as wide as the stem. According to Mizutani (1992) and So and Zhu (1998), the male bracteoles develop throughout the androecial shoot and the androecial shoot always has an apical vegetative continuation, a phenomenon occurring also in *L. curviloba*, *L. pallide-virens* and *L. konosensis*. However, most of the *Lejeunea* species have male bracteoles restricted at the base of androecial shoot. This feature is not observed in Thailand material due to the absence of male plants.

Specimens examined: Khao Luang Nat. Park, Karome Waterfalls on the S slopes, 150-210 m alt., 08°22.37'N, 99°42.00'E, 2 Nov 2012, *T. Pócs* & *S. Somadee* 1219/A, 1219/X (EGR, UKMB); Tha Phae Waterfalls on the S slopes, 150 m alt., 08°21.73'N, 99°41.41'E, 8 Nov 2012, *T. Pócs* & *S. Somadee* 1225/B (EGR, UKMB); Thung Song, area around Nam Tok Plio Waterfalls, 185 m alt., 28 Oct 2012, *G.E. Lee* 2500 (UKMB, PSU); in the rocky stream valley below the Plio Waterfalls, 8 km E of Thung Song town, 140-160 m alt., 08°09.50'N, 99°45.36'E, 28 Oct 2012, *T. Pócs* & *G.E. Lee* 1212/M (EGR, UKMB); area around Kao Lek cave, 215 m alt., 31 Oct 2012, *G.E. Lee* 2549 (UKMB, PSU).

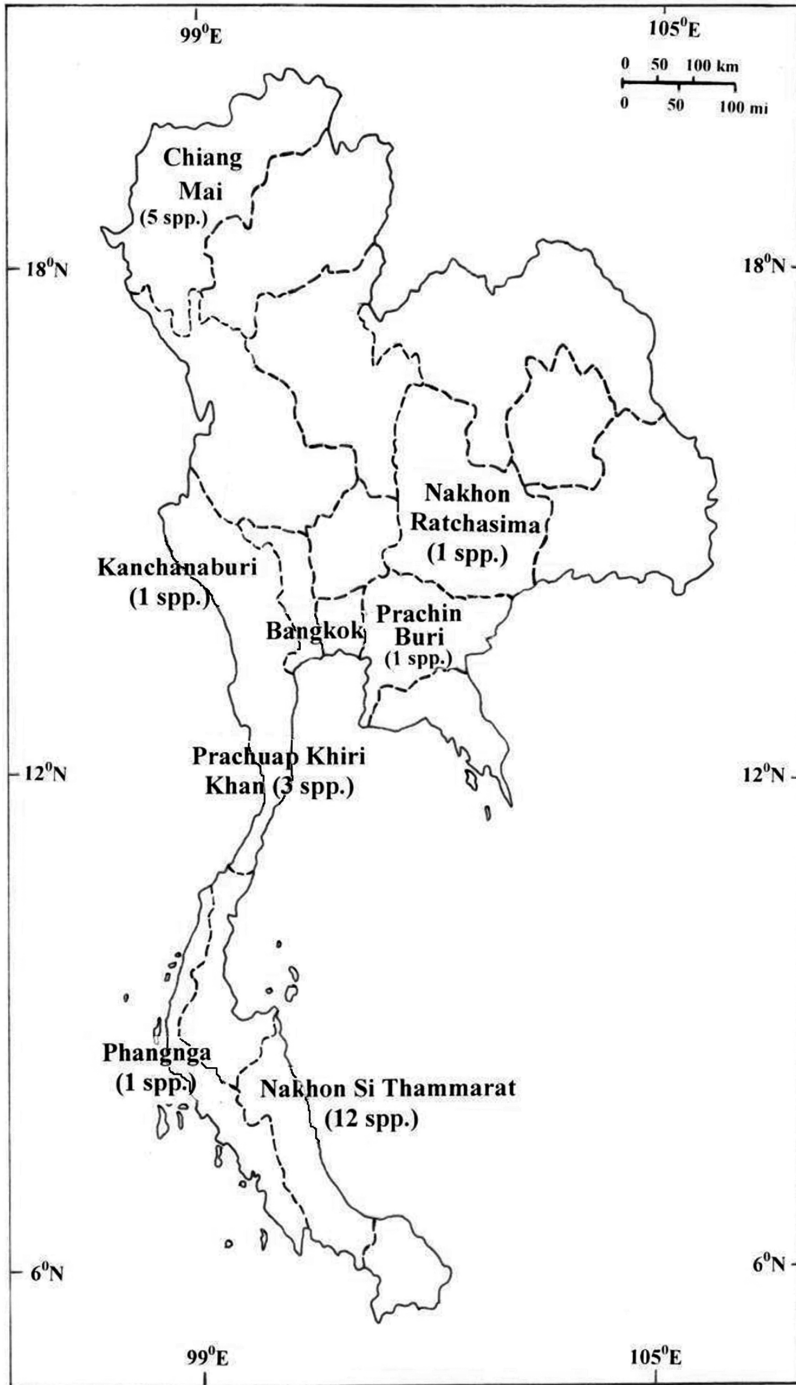
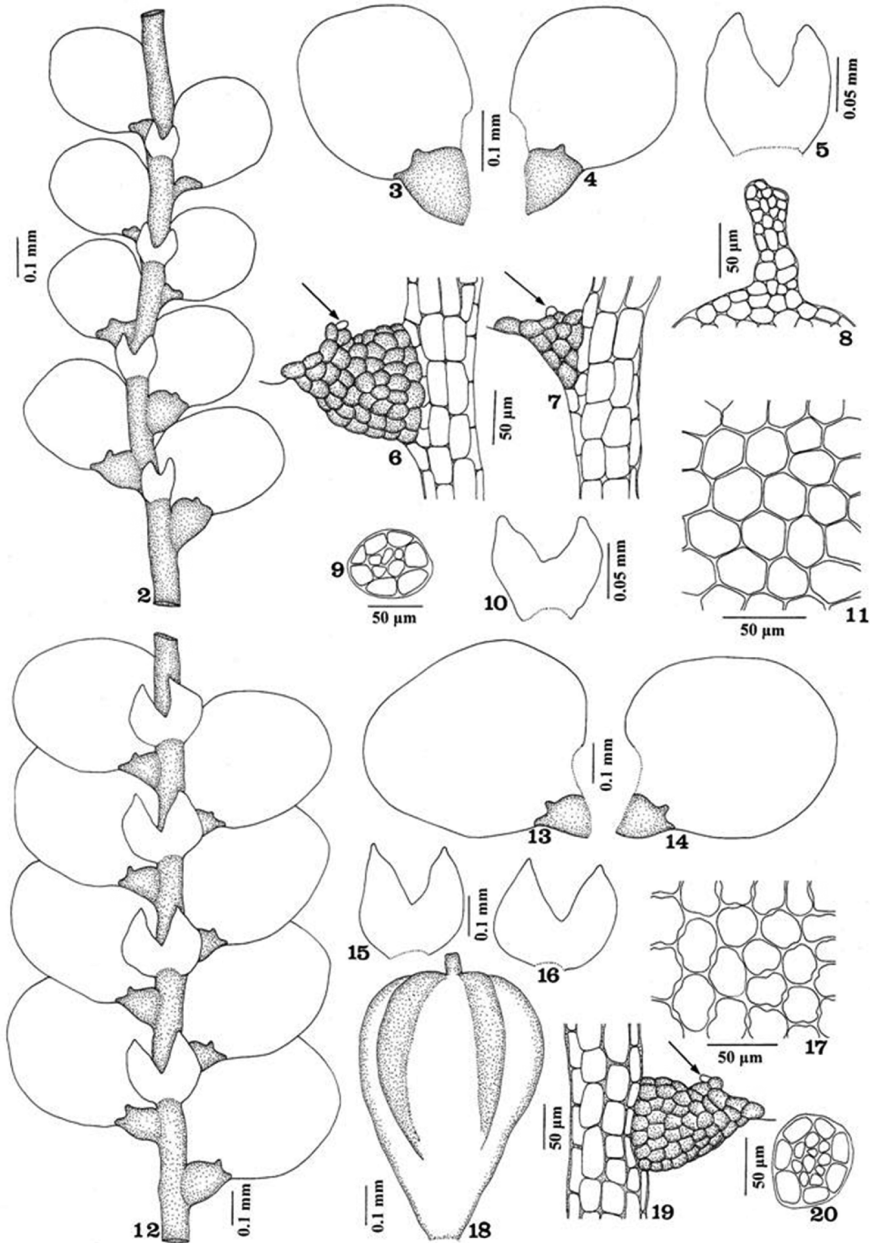
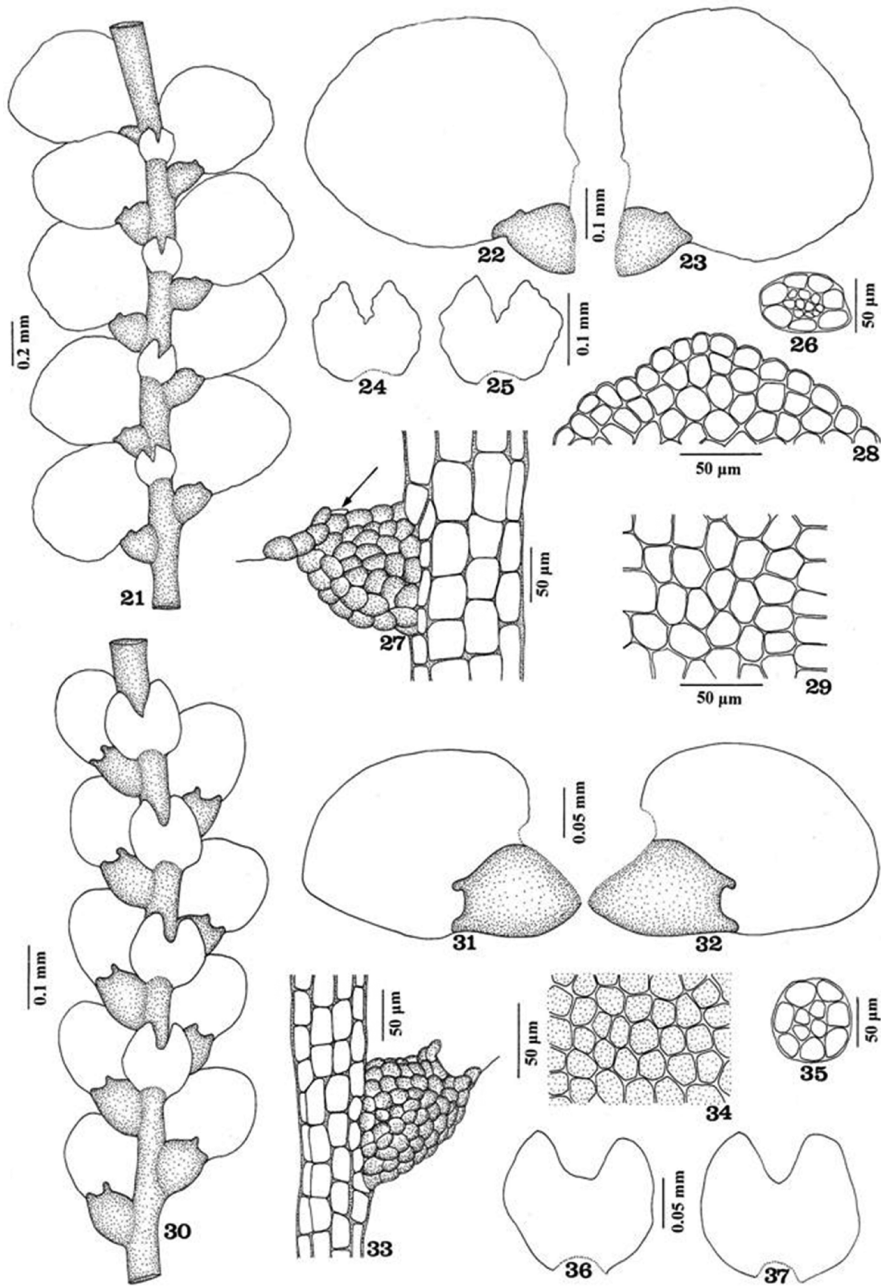


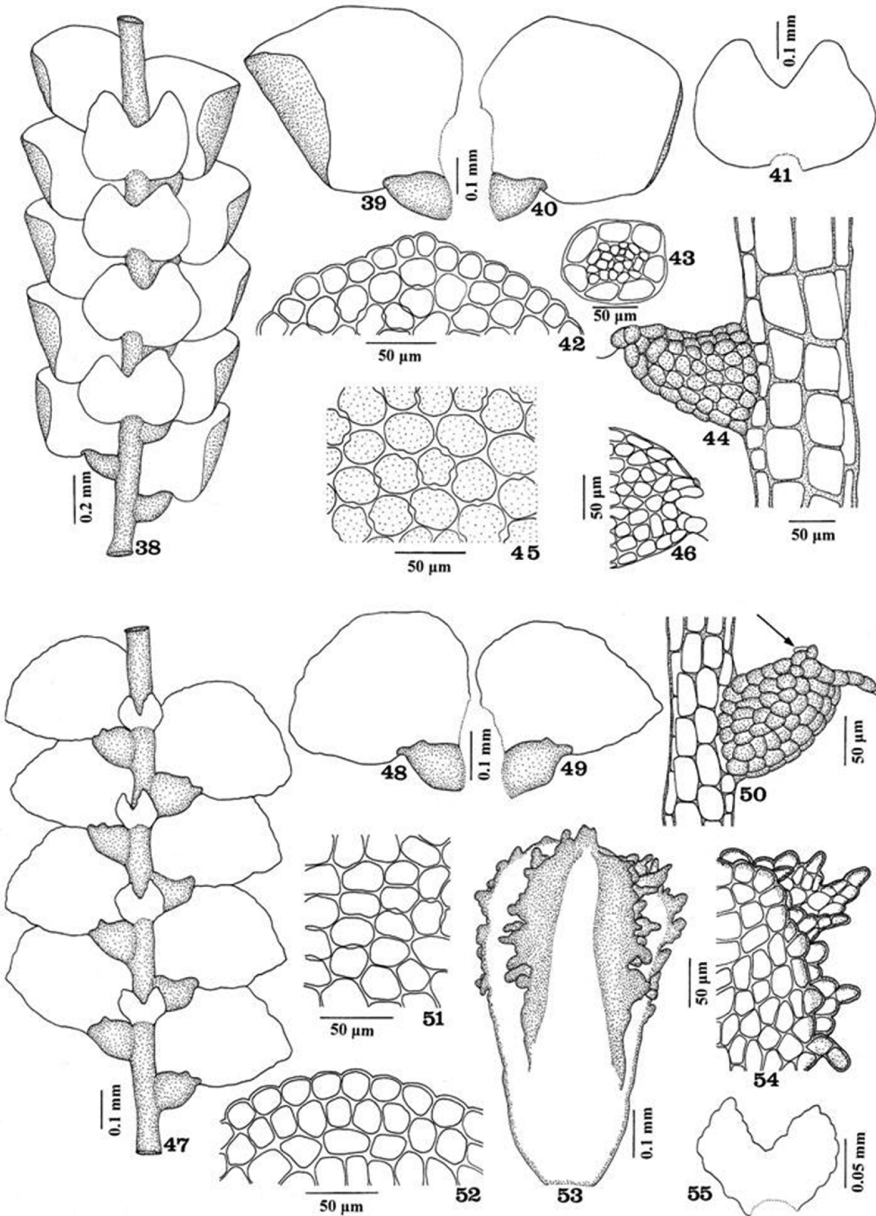
Fig 1. Map of Thailand showing the number of *Lejeunea* species reported for the provinces of Thailand.



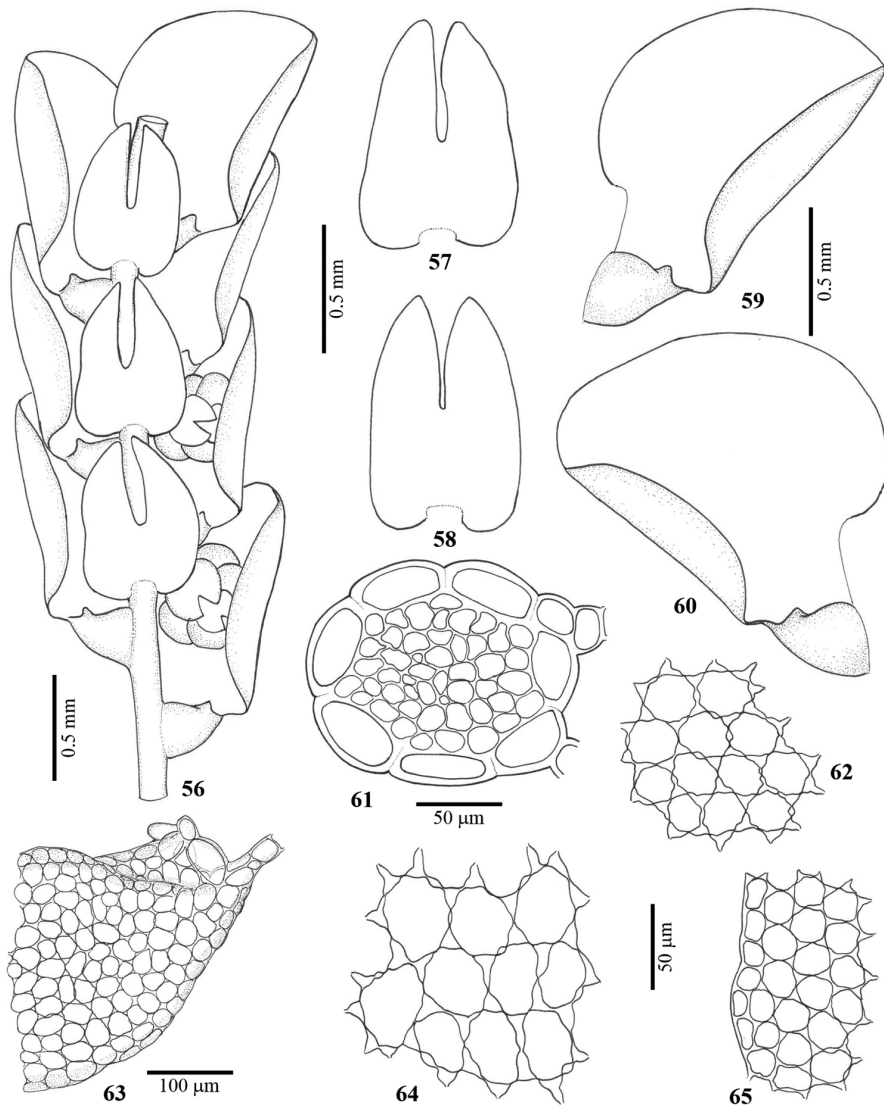
Figs 2-20. **2-11. *Lejeunea cocoes* Mitt.** (G.E. Lee 2496, UKMB, PSU). **2.** Part of plant in ventral view; **3-4.** Leaves; **5, 10.** Underleaves; **6.** Stem portion and leaf lobule (hyaline papilla shown by arrow); **7.** Stem portion and reduced leaf lobule (hyaline papilla shown by arrow); **8.** Leaf with ribbon-like regenerants; **9.** Cross-section of stem; **11.** Median cells of leaf lobe. **12-20. *Lejeunea micholitzii* Mizut.** (G.E. Lee 2527, UKMB; PSU). **12.** Part of plant in ventral view; **13-14.** Leaves; **15-16.** Underleaves; **17.** Median cells of leaf lobe; **18.** Perianth; **19.** Stem portion and leaf lobule (hyaline papilla shown by arrow); **20.** Cross-section of stem.



Figs 21-37. **21-29.** *Lejeunea patersonii* (Steph.) Steph. (*G.E. Lee* 2525, UKMB, PSU). **21.** Part of plant in ventral view; **22-23.** Leaves; **24-25.** Underleaves; **26.** Cross-section of stem; **27.** Stem portion and leaf lobule (hyaline papilla shown by arrow); **28.** Apical cells of leaf lobe; **29.** Median cells of leaf lobe. **30-37.** *Lejeunea parva* (S.Hatt.) Mizut. (*T. Pócs & S. Somadee* 1219/A, EGR, UKMB). **30.** Part of plant in ventral view; **31-32.** Leaves; **33.** Stem portion and leaf lobule; **34.** Median cells of leaf lobe; **35.** Cross-section of stem; **36-37.** Underleaves.



Figs 38-55. **38-46.** *Lejeunea umbilicata* (Nees) Nees (*G.E. Lee* 2462, UKMB, PSU). **38.** Part of plant in ventral view; **39-40.** Leaves; **41.** Underleaves; **42.** Apical cells of leaf lobe; **43.** Cross-section of stem; **44.** Stem portion and leaf lobule; **45.** Median cells of leaf lobe; **46.** Upper part of leaf lobule when flattened (hyaline papilla shown in gray). **47-55.** *Lejeunea tamaspoecii* G.E. Lee (*G.E. Lee* 2526, UKMB, PSU). **47.** Part of plant in ventral view; **48-49.** Leaves; **50.** Stem portion and leaf lobule (hyaline papilla shown by arrow); **51.** Median cells of leaf lobe; **52.** Marginal cells of leaf lobe; **53.** Perianth; **54.** Cells of perianth keel; **55.** Underleaves.



Figs 56-65. *Lejeunea lumbricoides* (Nees) Nees (*S. Chantanaorrapint* 2239, PSU). **56.** Part of plant in ventral view; **57-58.** Underleaves; **59-60.** Leaves; **61.** Cross-section of stem; **62.** Median cells of leaf lobe; **63.** Leaf lobule; **64.** Basal cells of leaf lobe; **65.** Marginal cells of leaf lobe.

Habitat: On tree trunks, rock, cliffs and soil over rock.

Distribution in Thailand: Nakhon Si Thammarat (present study).

Range: Thailand, China, Singapore, Taiwan, Japan, Korea (Mizutani, 1961; Zhu & So, 2001; Piippo *et al.*, 2002).

* *Lejeunea patersonii* (Steph.) Steph., *Sp. Hepat.* 5: 784 (1915) **Figs 21-29**

In the orbicular and contiguous leaf lobes, *L. patersonii* resembles *L. wightii*, however, the former has very small and distantly arranged underleaves and the margin of leaf lobes are strongly crenulate. Furthermore, the keels of the perianth of *L. patersonii* are slightly 2-winged and the wings with 1-2 cells wide (Lee, 2013).

Specimens examined: Ron Phibun, area around the abandoned guesthouse in Kao Ramrome, 910 m alt., 29 Oct 2012, G.E. Lee 2525 (UKMB, PSU). Thung Song, area around Nam Tok Plio Waterfalls, 185 m alt., 28 Oct 2012, G.E. Lee 2501 (UKMB, PSU).

Habitat: On tree trunks.

Distribution in Thailand: Nakhon Si Thammarat (present study).

Range: Thailand, Peninsular Malaysia, Indonesia (Borneo, Sulawesi), Philippines, Papua New Guinea, New Ireland, New Caledonia, Vanuatu, Fiji, Samoa, Micronesia, Tahiti (Miller *et al.*, 1983; Hürlimann, 1989).

Lejeunea riparia Mitt., *J. Proc. Linn. Soc., Bot.* 5: 113 (1861)

Distribution in Thailand: Chiang Mai [Reed & Robinson, 1967; Sornsamran & Thaitong, 1995; Doi Inthanon (Akiyama *et al.*, 2011)].

Range: Sri Lanka, Thailand (Bapna & Kachroo, 2000).

Lejeunea sordida (Nees) Nees, *Nat. Eur. Leberm.* 3: 278 (1838)

Specimens examined: Pliu (Plew) Waterfall area 9 km E of Thung Song town, 185-212 m alt., 08°09.78'N, 99°45.59'E, 28 Oct 2012, T. Pócs & G.E. Lee 1211/B, 1211/D (EGR, UKMB); Krung Ching waterfall, near PhiTam village, 190-240 m alt., 08°43.41'N, 99°40.09'E, 31 Oct 2012, T. Pócs, K. U-Taynapuh & G.E. Lee 1217/F (EGR, UKMB), *ibid.*, G.E. Lee 2491, 2492, 2494, 2495 (UKMB, PSU); Khao Luang Nat. Park, Karome Waterfalls on the S slopes, 150-210 m alt., 08°22.37'N, 99°42.00'E, 2 Nov 2012, T. Pócs & S. Somadee 1219/W (EGR, UKMB); Nam Tok Sikiet Nat. Park, Si Keed waterfalls area, 100 m alt., 09°00'N, 99°46.32'E, 3 Nov 2012, T. Pócs & S. Somadee 1220/M, 1220/N, 1220/L (EGR, UKMB).

Habitat: On tree trunks, decaying wood, cliffs and soil over rock.

Distribution in Thailand: Nakhon Si Thammarat (present study), Phangnga (Thaithong, 1984), Prachuap Khiri Khan (Chantanaorrapint *et al.*, 2004).

Range: Widespread in Southeast Asia, Australasia and in the Pacific (Zhu & So, 2001).

* *Lejeunea tamsapocsii* G.E.Lee, *Polish J. Bot.* 58(1): 69 (2013) **Figs 47-55**

Lejeunea tamsapocsii is a newly described species previously known from Malaysia (Lee & Gradstein, 2013) and now also found in Southern Thailand. The most outstanding feature of *L. tamsapocsii* is the 2-winged perianth and the wings sometimes with 2-celled cilia. Other characteristic features of this species are the asymmetrical leaf lobes with arched dorsal margin and straight to slightly curved ventral margin and with a narrowly rounded apex, the small, distant underleaves with coarsely crenulate margins, and the rough cuticle covered by minute papillae.

The type material of this species was collected on tree trunk. In Thailand, it was found growing on twigs (Lee, 2013).

Specimen examined: Ron Phibun, area around the abandoned guesthouse in Kao Ramrome, 910 m alt., 29 Oct 2012, *G.E. Lee 2526* (UKMB, PSU).

Habitat: On twigs.

Distribution in Thailand: Nakhon Si Thammarat (present study).

Range: Thailand, Peninsular Malaysia, Borneo (Sabah) (Lee, 2013).

***Lejeunea tuberculosa* Steph., *Spec. Hepat.* 5: 790 (1915)**

Specimen examined: Ron Phibun, area around the abandoned guesthouse in Kao Ramrome, 910 m alt., 29 Oct 2012, *G.E. Lee 2530* (UKMB, PSU).

Habitat: On leaf.

Distribution in Thailand: Nakhon Si Thammarat (present study), Kanchanaburi (Lai *et al.*, 2008), Chiang Mai: Doi Inthanon (Akiyama *et al.*, 2011).

Range: Widespread in Tropical Africa, India, Nepal, Bhutan, S-China, Thailand, Peninsular Malaysia, Borneo (Sabah), Indonesia, Philippines (Zhu & So, 2001).

* ***Lejeunea umbilicata* (Nees) Nees, *Nova Acta Acad. Caes. Leop. Carol. German. Nat. Cur.* 19: 472 (1843)** **Figs 38-46**

Lejeunea umbilicata is easy to identify with certainty when fertile. The eplicate perianths without beak and the reniform underleaves can serve to separate this species from its allies. However the Thailand materials are sterile and had more strongly crenulated leaf margins than the typical *L. umbilicata*. The crenulated margin is extremely similar to *L. kinabalensis*, but the latter can be distinguished by the suborbicular underleaves with cordate base, the small leaf lobule with flat free margin and the obovoid perianth with 3 cells long beak.

Specimens examined: Ron Phibun, area around the weather station in Kao Ramrome, 950 m alt., 27 Oct 2012, *G.E. Lee 2462, 2463, 2470* (UKMB, PSU); summit of Mt. Khao Ramrone 8 km NW of Ron Phibun town, on a sharp ridge behind the telecommunication tower, 930-945 m alt., 08°14.28'N, 99°48.32'E, *T. Pócs, S. Chantanaorrapint & G.E. Lee 1209/K* (EGR, UKMB).

Habitat: On tree trunks.

Distribution in Thailand: Nakhon Si Thammarat (present study).

Range: Thailand, Peninsular Malaysia, Borneo (Sabah, Sarawak), Indonesia, Philippines, Japan, New Guinea, New Caledonia, Fiji, Samoa, Caroline and Mariana Islands (ELPT database).

***Lejeunea wightii* Lindenb., *Syn. Hepat.*: 379 (1845)**

Specimens examined: Ron Phibun, area around the abandoned guesthouse in Kao Ramrome, 910 m alt., 29 Oct 2012, *G.E. Lee 2531* (UKMB, PSU); Mt. Khao Lek, abandoned iron mines near Huai Phan village, 220 m alt., 08°46.56'N, 99°43.41'E, 31 Oct 2012, *T. Pócs, K. U-Taynapuh & G.E. Lee 1216/A* (EGR, UKMB), *ibid.*, *G.E. Lee 2548* (UKMB, PSU); Khao Lung Nat. Park, Tha Phae waterfalls on the S slopes, 150 m alt., 08°21.73'N, 99°41.41'E, 8 Nov 2012, *T. Pócs & S. Somadee 1225/A* (EGR, UKMB).

Habitat: On tree trunks.

Distribution in Thailand: Nakhon Si Thammarat (present study), Prachin Buri (Hattori & Mizutani, 1969; Sornsamran & Thaitong, 1995), Prachuap Khiri Khan (Chantanaorrapint *et al.*, 2004), Chiang Mai: Doi Inthanon (Akiyama *et al.*, 2011).

Range: Widespread in Southeast Asia from Sri Lanka to Indonesia, Malaysia, Philippines and Taiwan; also recorded from Caroline and Samoa. (Miller *et al.*, 1983; Tan & Engel, 1986; Chuah-Petiot, 2011).

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REFERENCES

- AKIYAMA H., FURUKI T., SRI-NGERNYUANG K. & KANZAKI M., 2011 – Alphabetical list of bryophytes occurring in a 15 ha long-term monitoring plot at Doi Inthanon, Northern Thailand. *Bryological research* 10: 153-164.
- BAPNA K.R. & KACHROO P., 2000 – *Hepaticology of India I-II*. Udaipur & Delhi, Himanshu, pp. 439, 491.
- CHANTANAORRAPINT S., BOONKERD T. & THAITHONG O., 2004 – Checklist of bryophytes at the summit of Khao Luang, Hui Yang Waterfall National Park, Prachuap Khiri Khan Province, Thailand. *Natural history bulletin of the Siam Society* 52(2): 163-179.
- CHUAH-PETIOT M.S., 2011 – A checklist of Hepaticae and Anthocerotae of Malaysia. *Polish botanical journal* 56m: 1-44.
- DANDOTIYA D., GOVINDPYARI H., SUMAN S. & UNIYAL P.C., 2011 – Checklist of the bryophytes of India. *Archive bryology* 88: 1-126.
- DONG S., SCHÄFER-VERWIMP A., PÓCS T., FELDBERG K., CZUMAJ A., SCHMIDT A.R., SCHNEIDER H. & HEINRICHS J., 2013 – Size doesn't matter - recircumscription of *Microlejeunea* (Lejeuneaceae, Porellales) based on molecular and morphological evidence. *Phytotaxa* 85: 41-55.
- GROLLE R. & PIIPPO S. 1984 – Annotated catalogue of Western Melanesian bryophytes, I. Hepaticae and Anthocerotae. *Acta botanica fennica* 125: 1-86.
- HATTORI S. & MIZUTANI M., 1969 – Studies in the flora of Thailand 59. Hepaticae. *Dansk botanisk arkiv* 27: 91-98.
- HE Q., ZHU R.-L., CHANTANAORRAPINT S., KORNOCHALERT S. & PRINTARAKUL N., 2012 – *Drepanolejeunea laciniata* (Lejeuneaceae), a new species from Thailand. *Cryptogamie, Bryologie* 33: 291-298.
- HÜRLIMANN H., 1993 – Hepaticae aus dem Gebiete des südlichen Pazifik XII. *Bauhinia* 11(1): 3-17.
- KORNOCHALERT S., 2006 – *Diversity of bryophytes at Khun Chang Khian Village, Doi Suthep-Pui National Park, Chiang Mai Province*. Master's Thesis. Department of Biology, Graduate School, Chiang Mai University. (unpublished, in Thai).
- LAI M.J., ZHU R.-L. & CHANTANAORRAPINT S., 2008 – Liverworts and hornworts of Thailand: An updated checklist and bryofloristic accounts. *Annales botanici fennici* 45: 321-341.
- LEE G.E., 2013 – A systematic revision of the genus *Lejeunea* Lib. (Marchantiophyta: Lejeuneaceae) in Malaysia. *Cryptogamie, Bryologie* 34: 381-484.
- LEE G.E. & GRADSTEIN S.R., 2013 – Distribution and habitat of the Malaysian species of *Lejeunea* (Marchantiophyta: Lejeuneaceae), with description of *Lejeunea tamaspocsi* sp. nov. *Polish botanical journal* 58: 59-69.
- LONG D.G. & Grolle R., 1990 – Hepaticae of Bhutan II. *Journal of the Hattori botanical laboratory* 68: 381-440.
- MILLER H.A., WHITTIER H.O. & WHITTIER B.A., 1983 – Prodrum Flora Hepaticarum Polynesiae. *Bryophytorum bibliotheca* 25: 1-423.
- MIZUTANI M., 1961 – A revision of Japanese Lejeuneaceae. *Journal of the Hattori botanical laboratory* 24: 115-302.
- MIZUTANI M., 1963 – On some Indian species of the family Lejeuneaceae described by W. Mitten. *Journal of the Hattori botanical laboratory* 26: 171-184.
- MIZUTANI M., 1979 – Notes on the Lejeuneaceae 2. Some peculiar Asiatic species in Rijksherbarium, Leiden. *Journal of the Hattori botanical laboratory* 46: 357-372.
- MIZUTANI M., 1992 – Notes on the Lejeuneaceae. 17. *Lejeunea curviloba* and its related species from Japan. *Journal of the Hattori botanical laboratory* 71: 123-132.
- PARK K.W. & CHOI K., 2008 – *New list of bryophytes in Korea*. Korea, Korea National Arboretum, 173 p.

- PIIPPO S., HE X.-L., JUSLÉN A., TAN B., MURPHY D.H. & PÓCS T., 2002 — Hepatic and hornwort flora of Singapore. *Annales botanici fennici* 39: 101-127.
- PÓCS T., 2010 — On some less known *Lejeunea* (Lejeuneaceae, Jungemanniopsida) species in tropical Africa. East African Bryophytes, XXVII (With 9 plates). *Beihefte zur Nova Hedwigia* 138: 99-116.
- PÓCS T., SASS-GYARMATI A., NAIKATINI A., TUIWAWA M., BRAGGINS J., S. PÓCS & VON KONRAT M., 2011 — New liverwort (Marchantiophyta) records for the Fiji Islands. *Telopea* 13: 455-494.
- REED C.F. & ROBINSON H., 1967 — Contribution to the bryophytes of Thailand I. *Phytologia* 15: 61-70.
- SCHIFFNER V., 1898 — *Conspectus hepaticarum Archipelagi Indici*. Batavia, Staatsdruckerei, 382 p.
- SEAWARD M.R.D., ELLIS L.T., PÓCS T., WIGGINTON M.J., 2006 — Bryophyte flora of the Chagos Archipelago. *Journal of bryology* 28: 11-19.
- SÖDERSTRÖM L., GRADSTEIN S.R. & HAGBORG A., 2010 — Checklist of the hornworts and liverworts of Java. *Phytotaxa* 9: 53-149.
- SÖDERSTRÖM L., HAGBORG A., PÓCS T., SASS-GYARMATI A., BROWN E., VON KONRAT M. & RENNER M., 2011 — Checklist of hornworts and liverworts of Fiji. *Telopea* 13: 405-454.
- SÖDERSTRÖM L., HAGBORG A. & VON KONRAT M., 2012 — The friendly islands - A checklist of hornworts and liverworts of Tonga. *Polish botanical journal* 57: 129-135.
- SO M.L. & ZHU R.-L., 1996 — Studies on Hong Kong Hepatics II. Notes on some newly recorded liverworts from Hong Kong. *Tropical bryology* 12: 11-19.
- SO M.L. & ZHU R.-L., 1998 — On six species of the genus *Lejeunea* in China, including one new species. *The bryologist* 101: 137-143.
- SORNAMRAN R. & THAITHONG O., 1995 — *Bryophytes in Thailand*. Bangkok, Office of Environment Policy and Planning, OEPP Biodiversity Series vol. 2., 234 p.
- TAN B.C. & ENGEL J.J., 1986 — An annotated checklist of Philippine Hepaticae. *Journal of the Hattori botanical laboratory* 60: 283-355.
- THAITHONG O., 1984 — Bryophytes of the mangrove forest. *Journal of the Hattori botanical laboratory* 56: 85-87.
- THOUVENOT L., GRADSTEIN S.R., HAGBORG A., SÖDERSTRÖM L. & BARDAT J., 2011 — Checklist of the liverworts and hornworts of New Caledonia. *Cryptogamie, Bryologie* 32: 287-390.
- WANG J., LAI M.J. & ZHU R.-L., 2011 — Liverworts and hornworts of Taiwan: An updated checklist and floristic accounts. *Annales botanici fennici* 48: 369-395.
- WEI Y.M. & ZHU R.-L., 2013 — Transfer of two Asiatic taxa from *Lejeunea* to *Microlejeunea* (Lejeuneaceae, Marchantiophyta). *Cryptogamie, Bryologie* 34: 307-311.
- YAMADA K. & IWATSUKI Z., 2006 — Catalog of the Hepatics of Japan. *Journal of the Hattori botanical laboratory* 99: 1-106.
- ZHANG L. & CORLETT R.T., 2003 — Phytogeography of Hong Kong bryophytes. *Journal of biogeography* 30: 1329-1337.
- ZHU R.-L. & GROLE R., 2004 — Nomenclatural notes on *Cheilolejeunea inaequitexta* and *C. trapezia* (Lejeuneaceae, Hepaticae). *Acta botanica fennici* 41: 445-447.
- ZHU R.-L. & LONG D.G., 2003 — Lejeuneaceae (Hepaticae) from several recent collections from Himalaya. *Journal of the Hattori botanical laboratory* 93: 101-115.
- ZHU R.-L. & SO M.L., 1999 — Additions of Lejeuneaceae taxa to the hepatic flora of Yunnan, China. *Annales botanici fennici* 36: 219-229.
- ZHU R.-L. & SO M.L., 2001 — Epiphyllous liverworts of China. *Beihefte zur nova Hedwigia* 121: 1-418.
- ZHU R.-L. & LAI M.J., 2003 — Epiphyllous liverworts from several recent collections from Taiwan, Thailand and Vietnam. *Cryptogamie, Bryologie* 24: 265-270.

