

Two Species of *Cololejeunea* (Family Lejeuneaceae) Newly Recorded in Taiwan

臺灣產疣鱗蘚屬(細鱗蘚科)2個新紀錄種

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Abstract

Forty-eight species of the genus *Cololejeunea* (Lejeuneaceae) were reported from Taiwan. This paper describes and illustrates *C. platyneura* and *C. subkodamae* as two new distributional records in Taiwan, and provides information on their habitats and distribution.

摘要

疣鱗蘚屬隸屬於細鱗蘚科，臺灣本屬原記載有48種。本文增加2個新紀錄種，假肋疣鱗蘚及擬兒玉氏疣鱗蘚(新擬中名)，文中附有此2種新紀錄種之形態描述、圖片及棲地與分布等資料。

Key words: *Cololejeunea*, *C. platyneura*, *C. subkodamae*, liverworts, Taiwan

關鍵詞：疣鱗蘚、假肋疣鱗蘚、擬兒玉氏疣鱗蘚、蘚類、臺灣

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Introduction

Cololejeunea is a large pantropical genus, represented in Taiwan by 48 species occurring from lowland to montane forest at ca. 2,500 m in elevation (Piippo 1990; Yang 2009, Wang *et al.* 2011, Ellis *et al.* 2013). It is characterized by (1) plants small to medium, yellowish green, pale green, whitish green to dull green, (2) stems usually zig-zag, branching of *Lejeunea*-type, (3) absence of underleaves, (4) leaf lobes spreading, ovate, obovate to narrowly lanceolate, insertion very short (only a few cells), apex rounded to acute-acuminate, margins entire to denticulate, often with seriate ocelli and/or hyaline marginal cells, (5) cells thin-walled, sometimes sigmoid, cuticle smooth or papillose-tuberculate, (6) oil-bodies hyaline or finely granular, (7) leaf lobules small or large, with a very narrow insertion to the stem, usually inflated and with a long keel, sometimes reduced or flattened with a short keel, apex with (0-)1-2 teeth, the hyaline papilla situated on the proximal base of the first tooth, but frequently displaced internally, or rarely on the tip of the first tooth, (8) perianths inflated 5-keeled or flattened 4- or 2-keeled,

smooth or papillose, (9) vegetative reproduction by multicellular, disciform gemmae from the leaf surfaces (Gradstein *et al.* 2001; Yang 2009).

Our recent studies on genus *Cololejeunea* of Taiwan revealed two interesting taxa from Orchid Island. After consulting herbarium material and relevant literature (Herzog and Noguchi 1955; Mizutani 1961, 1966 & 1986; Tixier 1985; Zhu and So 1998; Zhu and So 2001; Yang 2009), they were identified as *C. platyneura* (Spruce) A. Evans and *C. subkodamae* Mizut., both new distributional records for the liverwort flora of Taiwan. We provide a brief description supplemented with illustrations and information on their habitats and local distribution.

Taxonomic Treatment

Cololejeunea platyneura (Spruce) A. Evans,
Mem. Bot. Club. 8: 172. 1902.

Cololejeunea usambarica E. W. Jones, Trans.
Brit. Bryol. Soc. 2: 434. 1954; nom. illeg.

Cololejeunea astyla Mizut., J. Hattori Bot. Lab.
29: 156. 1966.

假肋疣鱗蘚

Fig. 1

Description:

Plants small, brown to dark brown when dried. Stems up to 10 mm long, 60–80 μm in diameter, with leaves 0.78–0.98 mm wide, irregularly branched; ventral merophyte of the stem 1-cell wide; rhizoids numerous, in tufts. Leaves imbricate to contiguous, obliquely spreading; lobes oblong, 0.41–0.51 mm long, 0.31–0.37 mm wide; apex rounded or sometimes obtuse, flat to slightly incurved, margins subentire or denticulate caused by dorsal papillae. Cells of leaf lobes thin-walled; trigones distinct, intermediate thickenings sometimes present; marginal cells 21–26 \times 12–19 μm , median cells 21–35 \times 17–23 μm ; and basal cells 38–45 \times 16–24 μm . Cuticle papillose, except the basal part of leaf lobe and forming a vitta-like area. Leaf lobules oblong to ovate, 1/4–1/3 as long as the lobe, inflated; free lateral margin bordered with 4–6 elongated cells; apex truncate to slightly constricted, the first tooth unicellular and the second tooth indistinct, hyaline papilla usually at the proximal side of the first tooth, sometimes situated near the inner base of first tooth; keel slightly arched. Stylus absent. Androecia not seen. Gynoecia on a short lateral branch; female bracts smaller than stem leaves, the lobe oblong, 0.36–0.39 mm long, 0.1–0.12 mm wide, the lobule 2/3–6/7 the length of the lobe, oblong with an acute apex. Perianth pyriform, inflated, 4-keeled, immature. Asexual reproduction by discoid gemmae on the ventral surface of leaf lobe; mature gemmae not seen.

Habitat:

Cololejeunea platyneura is a pantropical epiphyllous species. It grows on leaves of vascular plant in forest at 400–2,270 m in elevations (Mizutani 1966; Tixier 1985; Zhu and So 1998; Zhu and So 2001). Both specimens collected from Orchid Island were epiphytic, growing on tree barks and rotten wood, and often creeping on other bryophytes in the tropical monsoon forests at 300–552 m in elevations.

Distribution:

Africa, Brazil, China, Malaysia, and Vietnam (Mizutani 1966; Tixier 1985; Zhu & So 1998). New to Taiwan.

Specimens examined :

Taitung County: Orchid Island, Mt. Hongtou, on tree bark, mixed with *Lejeunea excils*, *Lopholejeunea subfusca*, *Radula acuminata*, *Frullania aoshimensis*, and *Taxithelium* sp., at ca. 300–552 m in elevations, 22°02' N, 121°31' E, 14 Aug. 1997, *Chih-Hsiung Hou BT-1940a* (TAIE, TUNG). Orchid Island, Mt. Hongtou, on rotten wood, mixed with *Lejeunea wightii*, *Lophlejeunea nigricans*, *L. eulopha*, *Metalejeunea cucullata*, *Radula* sp. and *Taxithelium* sp., at 300–552 m in elevations, 22°02' N, 121°31' E, 14 Aug. 1997, *Chih-Hsiung Hou BT-1999a* (TAIE, TUNG).

Remarks:

Cololejeunea platyneura belongs to subgenus *Cololejeunea* judged by the plants loosely appressed to the substratum, leaf cell

with dorsal papillae, inflated perianth with 4 keels, and the absence of distinct ocelli. It is readily distinguishable from all other congeners by (1) a vitta-like area in the basal part of leaf lobe, (2) stylus is absent, and (3) hyaline papilla is usually situated on the proximal side of the first tooth. *Cololejeunea platyneura* is a widely distributed pantropical species with diverse morphological variations. Taiwanese material is larger in both the plant body and cells size; otherwise, the diagnostic characters agree with the detailed descriptions and illustrations given by Mizutani (1966, as *C. astyla*), Tixer (1985, as *C. usambarica*) and Zhu and So (1998).

Cololejeunea subkodamae Mizut., J. Hattori Bot. Lab. 60: 448. 1986.

擬兒玉氏疣鱗蘚

Fig. 2

Description:

Plants minute, pale brown to yellowish brown when dried. Stems up to 3 mm long, 46–51 μm in diameter, with leaves 0.37–0.48 mm wide, irregularly branched. Leaves loosely imbricate to contiguous, obliquely spreading; lobes ovate, 0.20–0.26 mm long, 0.13–0.17 mm wide; apex obtuse or acute, slightly incurved, margin densely spinose. Cells of leaf lobes thin-walled; trigones indistinct and intermediate thickenings absent; marginal cells 7–10 \times 5–8 μm , median cells 8–13 \times 8–12 μm , basal cells 16–27 \times 11–14 μm ; dorsal protrusion spinose. Leaf lobules ovate, 1/2–2/3 as long as the lobe, inflated, ventral surface spinose, free lateral margin incurved, bordered with 3–4 elongated cells; apex 2-toothed, teeth crossing each other or

approximate, first tooth 1–2 cells long, 1 cell wide, second tooth 1-celled, about 3 times as long as wide, a hyaline papilla on inner surface of the base of first tooth; keel arched, spinose. Sexual and asexual reproduction organs not seen.

Habitat:

Cololejeunea subkodamae usually grows on tree trunks, tree branches, tree bases, tree roots, rocks, boulders, decaying logs, and on leaves of ferns and seed plants in forest (Mizutani 1986). In China (Fujian, Guizhou, and Zhejiang), it grows only from the leaves of herbs and small shrubs in moist forests at 400–1,250 m in elevations (Zhu and So 2001). In Taiwan, the specimens were collected from the fern fronds and climbers in the tropical monsoon forests of Orchid Island at 300–552 m in elevations.

Distribution:

China and Japan (Mizutani 1986; Zhu and So 2001). New to Taiwan.

Specimens examined :

Taitung County: Orchid Island, Mt. Hungtou, on climber, creeping on other bryophytes, mixed with *Lejeunea laii*, *L. wightii*, *L. excils*, *Cheilolejeunea ceylanica*, *Lopholejeunea subfusca*, *Radula* sp. and *Trichosteleum* sp., at 300–552 m in elevations, 22°02' N, 121°31' E, 14 Aug. 1997, *Chih-Hsiung Hou BT- 1957a* (TAIE, TUNG). Orchid Island, Mt. Hungtou, on leaves of fern [*Meringium denticulatum* (Sw.) Copel.], mixed with *Cololejeunea geobelii* and *C. sigmoidea*, at 552 m in elevation, 22°03'10" N,

121°32' 5"E, 14 Aug. 1997, *Chih-Hsiung Hou BT-2325a* (TAIE, TUNG).

Remarks:

Cololejeunea subkodamae is characterized by (1) the spinose ventral surface of leaf lobule, (2) the obtuse or acute apex of leaf lobe, (3) the densely spinose margin of leaf lobe, and (4) the two teeth of leaf lobule usually crossing each other or approximate. It belongs to subgenus *Cololejeunea*, and may be confused with *C. spinosa* (Horik.) Pandé & Misra, but the latter differs in its smooth ventral surface of leaf lobule, and two teeth of leaf lobule never crossing each other. *Cololejeunea kodamae* Kamim. occurs in Yilan County, Taiwan (Ellis *et al.* 2013), also with spinose ventral surface of leaf lobule, and is closely related to *C. subkodame*. However, the lobular teeth are distant from each other, and the second tooth is as long as wide in *C. kodamae*. According to Mizutani (1986) and Zhu and So (2001), the finding of this species on Mt. Hongtuo, Orchid Island, Taiwan (22°02' N, 121°31' E) represents an extension of its southern range of the distribution.

Key to the Species of *Cololejeunea* subg. *Cololejeunea* in Taiwan (Yang 2009, modified)

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| <p>1. Leaf lobe with a vitta-like area in the basal part; stylus absent..... <i>C. platyneura</i></p> <p>1. Leaf lobe without a vitta-like area in the basal part; stylus usually present.....2</p> <p>2. Dorsal protrusion of leaf cells spinose3</p> <p>2. Dorsal protrusion of leaf cells shortly cylindrical or semispherical6</p> <p>3. Leaf lobule spinose on ventral surface4</p> | <p>3. Leaf lobule smooth on ventral surface5</p> <p>4. First and second teeth of leaf lobule distant from each other, second tooth short, about as long as wide.....<i>C. kodamae</i></p> <p>4. First and second teeth of leaf lobule crossing each other or approximate, second long, about 3 times as long as wide<i>C. subkodamae</i></p> <p>5. First and second teeth of leaf lobule distant from each other; vitta like ocelli weakly developed <i>C. spinosa</i></p> <p>5. First and second teeth of leaf lobule usually crossing each other or approximate; ocelli absent <i>C. haskarliana</i></p> <p>6. Leaves usually falcate; hyaline papilla at the proximal side of the base of first tooth.....
..... <i>C. tenella</i></p> <p>6. Leaves not or slightly falcate; hyaline papilla on the inner surface of the base of first tooth...7</p> <p>7. First tooth of leaf-lobule acute.....8</p> <p>7. First tooth of leaf-lobule hammer-shaped or rounded.....9</p> <p>8. Leaf lobes with an acute to obtuse apex, base of dorsal margin nearly entire; vitta like ocelli absent<i>C. shikokiana</i></p> <p>8. Leaf lobes with a rounded to rounded-obtuse apex, base of dorsal margin often spinose-dentate; vitta like ocelli usually weakly developed..... <i>C. schmidtii</i></p> <p>9. Leaf lobe obovate, apex sometimes with 1-5 minute teeth; perianth nearly smooth
..... <i>C. dozyana</i></p> <p>9. Leaf lobe broadly ovate, apex without teeth; perianth strongly papillose<i>C. macounii</i></p> |
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Literature Cited

- Ellis, L.T., H. Bednarek-Ochyra, R. Ochyra, M. J. Benjumea, L. V. Saïš, R. Caparrós, F. Lara, V. Mazimpaka, M. V. Dulin, R. Garilleti, N. Gremmen, P.-L. Grundling, P. Heras, M. Infante, S. Huttunen, M. S. Ignatov, T. Korvenpää, M. Lebouvier, R. I. Lewis Smith, S.-H. Lin, J.-D. Yang, A. Linström, V. Plášek, J. A. Rosselló, J. Sawicki, J. van Rooy, V. R. Smith. 2013. New national and regional bryophyte records, 35. *Journal of Bryology* 35(2): 129–139.
- Gradstein S. R., S. P. Churchill and N. Salazar-Allen. 2001. Guide to the Bryophytes of Tropical America. *Memoirs of New York Botanical Garden* 86: 174–178.
- Herzog, T. and A. Noguchi. 1955. Beitrag zur Kenntnis der Bryophytenflora von Formosa und den benachbarten Inseln Botel Tabago und Kwashyoto. *Journal of the Hattori Botanical Laboratory* 14: 29–70.
- Mizutani, M. 1961. A revision of Japanese Lejeuneaceae. *Journal of the Hattori Botanical Laboratory* 24: 115–302.
- Mizutani, M. 1966. Epiphyllous species of Lejeuneaceae from Sabah (North Borneo). *Journal of the Hattori Botanical Laboratory* 29: 153–170.
- Mizutani, M. 1986. Note on the Lejeuneaceae. 11. *Cololejeunea spinosa* and its related species in Japan. *Journal of the Hattori Botanical Laboratory* 60: 439–450.
- Piippo, S. 1990. Annotated catalogue of Chinese Hepaticae and Anthocerotae. *Journal of the Hattori Botanical Laboratory* 68: 1–192.
- Tixier, P. 1985. Contribution à la Connaissance des Cololejeunoideae. *Bryophytorum Bibliotheca* 27: 1–439.
- Wang, J., M.-J. Lai and R.-L. Zhu. 2011. Liverworts and hornworts of Taiwan: an updated checklist and floristic accounts. *Annales Botanici Fennici* 48: 369–395.
- Yang, J.-D. 2009. Liverworts and Hornworts of Taiwan I. Lejeuneaceae. Endemic Species Research Institute, Nantou, Taiwan.
- Zhu, R.-L. and M.-L. So. 1998. Note on the taxonomy and distribution of *Cololejeunea platyneura* (Hepaticae, Lejeuneaceae). *Annales Botanici Fennici* 35: 229–232.
- Zhu, R.-L. and M.-L. So. 2001. Epiphyllous liverworts of China. *Nova Hedwigia Beiheft* 121: 1–418.

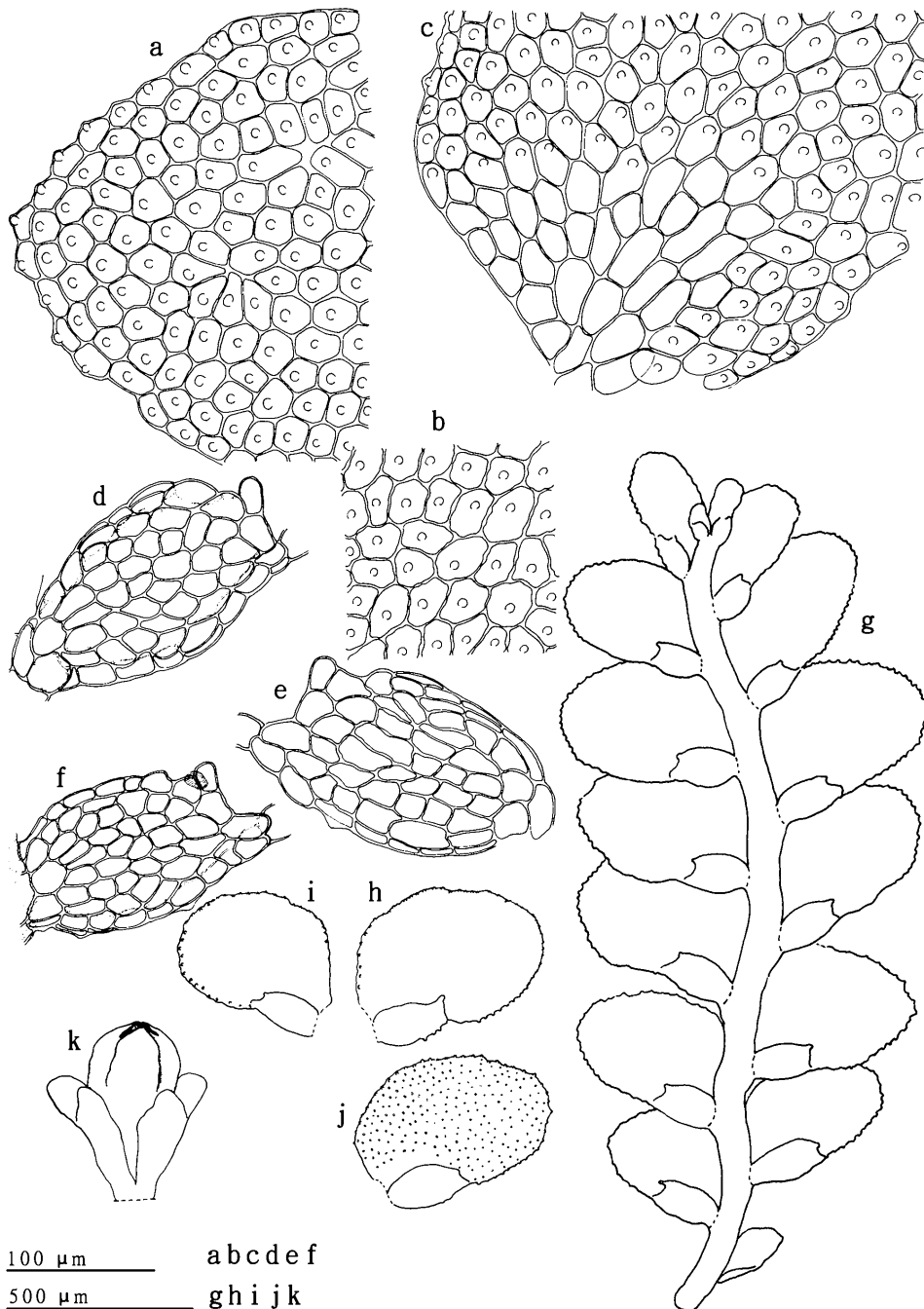


Fig. 1. *Cololejeunea platyneura* (Spruce) A. Evans a. Cells of leaf apex. b. Median cells of leaf lobe. c. Basal cells of leaf lobe. d–f. Leaf lobules. g. Portion of the plant, ventral view. h–j. Leaves. k. Gynoecium, ventral view, immature. (All drawn from *Chih-Hsiung Hou BT-1940a*).

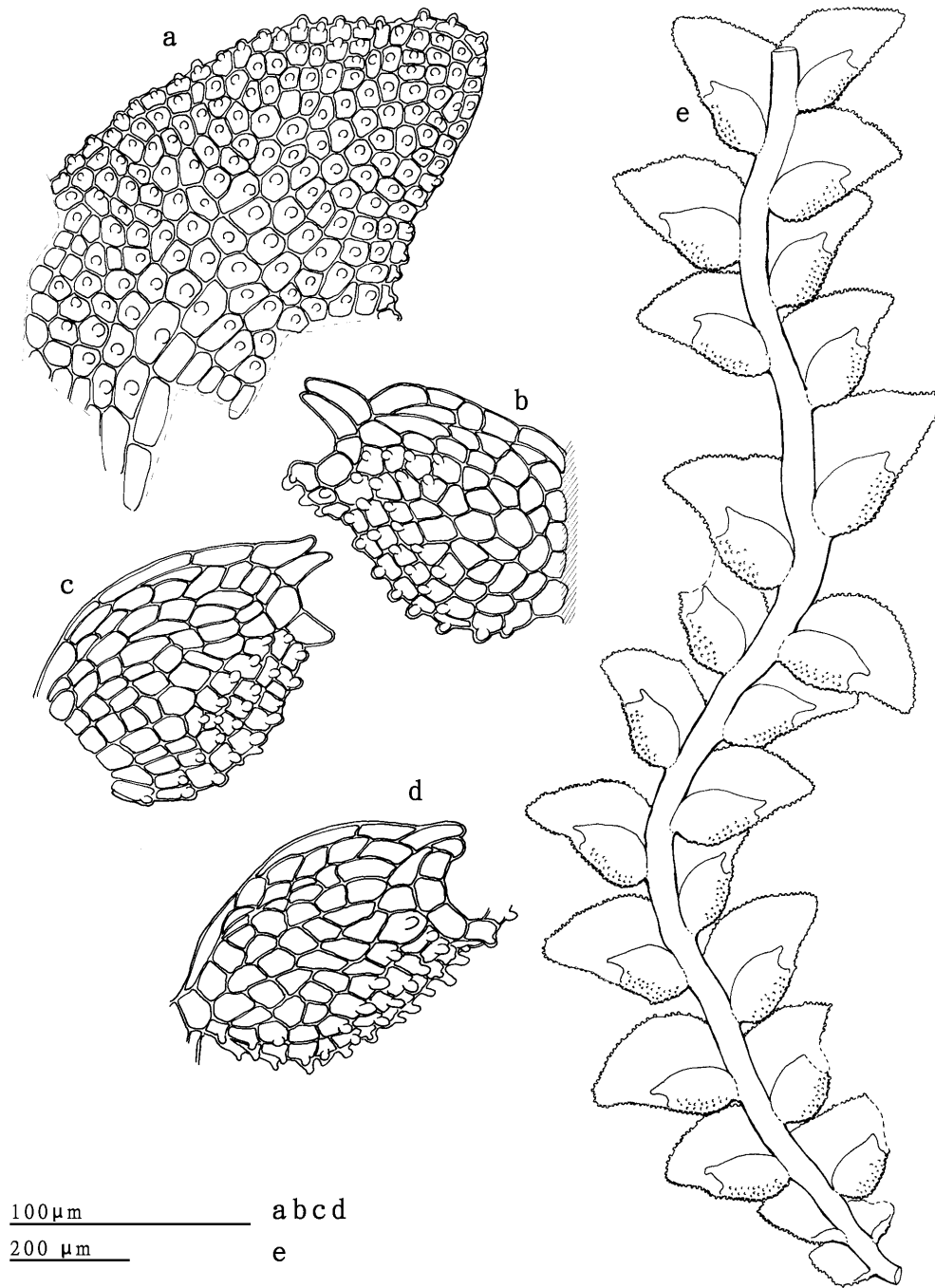


Fig. 2. *Cololejeunea subkodamae* Mizut. a. Cells of leaf lobe, dorsal view. b–d. Leaf lobules. e. Ventral view of a portion of sterile plant. (All drawn from *Chih-Hsiung Hou BT-1957a*).