

Studies on Hong Kong *Cheilolejeunea* with two species new to China.

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Abstract. Five species of the genus *Cheilolejeunea* are reported from Hong Kong. Among them, *Cheilolejeunea osumiensis* (Hatt.) Mizut. and *Cheilolejeunea ryukyuensis* Mizut. are new to China. *Cheilolejeunea intertexta* (Lindenb.) Steph. is newly reported for China except Taiwan, and *Cheilolejeunea trifaria* (Reinw. et al.) Mizut. is documented for the first time for mainland China except Hainan and Taiwan. The detailed description and illustration of *Cheilolejeunea osumiensis* as well as the key to the five *Cheilolejeunea* species of Hong Kong are also presented.

Cheilolejeunea is a large and diverse genus in Lejeuneaceae. Most of the species in this genus are distributed in the subtropical and tropical regions while only a few species extend into the temperate regions. This genus can be recognized by (1) the imbricate leaf-lobes whose margin is entire, (2) the two-lobed underleaves and bracteoles, (3) the ovate or rectangular leaf-lobules whose apex bears an angular tooth consisting of 0-7 uniseriate cells, (4) the absence of ocelli in the leaf-lobe, (5) the obovate perianths with 3-5 smooth keels, (6) the hyaline papilla occurring on the distal side of the angular tooth of the leaf-lobule and (7) the 1-3(-5), large, grape-cluster

type oil bodies per leaf-cell. In Hong Kong the only genus which may be confused with *Cheilolejeunea* is *Lejeunea*, but that often has small oil-bodies, and a hyaline papilla proximal to the apical tooth.

In the past, the *Cheilolejeunea* flora of Hong Kong was poorly known, and only one species, *Cheilolejeunea imbricata* (Nees) Hatt., was reported by But and Gao (1991). Based on our recent survey of bryophytes, 5 species of *Cheilolejeunea* are present, even though Hong Kong is very small in its area (only 1062 km²). These species can be separated by the following key.

Key to species of *Cheilolejeunea* in Hong Kong

1. Innovation leaf sequence *lejeuneoid*; leaf-apices flat to incurved.....2

1. Innovation leaf sequence *pycno-lejeuneoid*; leaf-apices flat.....3

2. Male bracteoles restricted to the base of the androecium; apices of leaf-lobes rounded; oil bodies 2-3 per leaf-cell, spherical to elliptical....
.....*C. trifaria*

2. Male bracteoles present throughout the androecium; apices of leaf-lobes obtuse to acute; oil body 1 per leaf-cell, cashew-shaped.....
.....*C. osumiensis*

3. Leaf-lobule more than $\frac{1}{2}$ the length of the leaf-lobe; plants large, usually 1.5-2.1 mm wide with leaves *C. imbricata*

3. Leaf-lobule less than $\frac{1}{3}$ the length of the leaf-lobe; plants small, less than 1.4 mm wide with leaves4

4. Leaf-lobe orbicular; underleaf bilobed to $\frac{1}{3}$ - $\frac{1}{2}$, entire at margin; angular tooth of the leaf-lobule 1-celled, sometimes indistinct; plants 0.5-0.7 (0.8) mm wide with leaves ..*C. intertexta*

4. Leaf-lobe oblong; underleaf bilobed to $\frac{1}{2}$ - $\frac{3}{5}$; more or less wavy at margin; angular tooth of the leaf-lobule indistinct; plants 0.9-1.4 mm wide with leaves.....*C. ryukyuensis*

1. *Cheilolejeunea imbricata* (Nees) Hatt.

Local plants are extremely variable not only in size of plant and structure of stem but also in shape and structure of leaf-lobule. The leaf-lobules may be broadly to narrowly rectangular, the angular tooth of leaf-lobule triangular to linear (0-4 cells long and 1-2(3) cells wide at base), and the median tooth of leaf-lobule is usually absent, occasionally angular and blunt. In most local collections the stem has only 8-15 rows of epidermal cells, and the ventral merophyte may range from 2 to 4 cells in width.

In Hong Kong *C. imbricata* commonly occurs on tree-bark, rock surfaces and living leaves. This species is the most common member of the genus *Cheilolejeunea* in China. Until now, it has been known from Anhui, Fujian, Guangdong, Guizhou, Hainan, Taiwan, Xizang and Yunnan (Piippo 1990), and Zhejiang (Zhu et al. 1994a, 1994b). According to Thiers (1992), the total range of this species now includes Southeast Asia and the islands of the South Pacific.

Specimens examined - Hong Kong, Tai Mo Shan, *So 95109*; Yung Shue O, *So & Zhu 94727L46*. (HKBU-Baptist University Herbarium, HSNU).

2. *Cheilolejeunea osumiensis* (Hatt.) Mizut. (Fig. 1)

This species was first described as *Eusomolejeunea osumiensis* by Hattori (1944). Mizutani (1961) reduced it to a synonym of *Cheilolejeunea ontakensis* (Steph.) Hatt. Later, *Cheilolejeunea osumiensis* (Hatt.) Mizut. was revived by Mizutani (1980) in accordance with the male bracteoles occurring throughout the androecium. Local material basically agrees with Hattori's original description as well as that of Mizutani (1982) except for some characters such as shape of oil body and size of plant. The following is a detailed description and illustration of this species, based on living, field-collected material from Hong Kong.

Autoicous, plants yellowish green, up to 15 mm long, 0.6-1.46 mm wide with leaves, growing appressed to tree-bark, rock and decaying logs, sometimes loosely on some mosses. Stems 0.08-0.1 mm in diameter, irregularly branched, transverse section of stem 5-6 cells in diameter, cortical cells 7(8), oblong or quadrate, thick-walled, about 2432 m, medullary 7-10 in number, about $\frac{1}{6}$ - $\frac{1}{3}$ the cortical cell in size. Rhizoids numerous, fasciculate, from the base of the underleaf. Leaves imbricate, horizontally to obliquely spreading, leaf-lobe slightly falcate, oblong-ovate, 0.63-0.70 mm long and 0.43-0.49 mm wide, margin entire, apex obtuse or acute, usually incurved, marginal cells 12-168-12 m, median cells 14-21 16-26 m, trigones small to moderately large, walls thin, intermediate

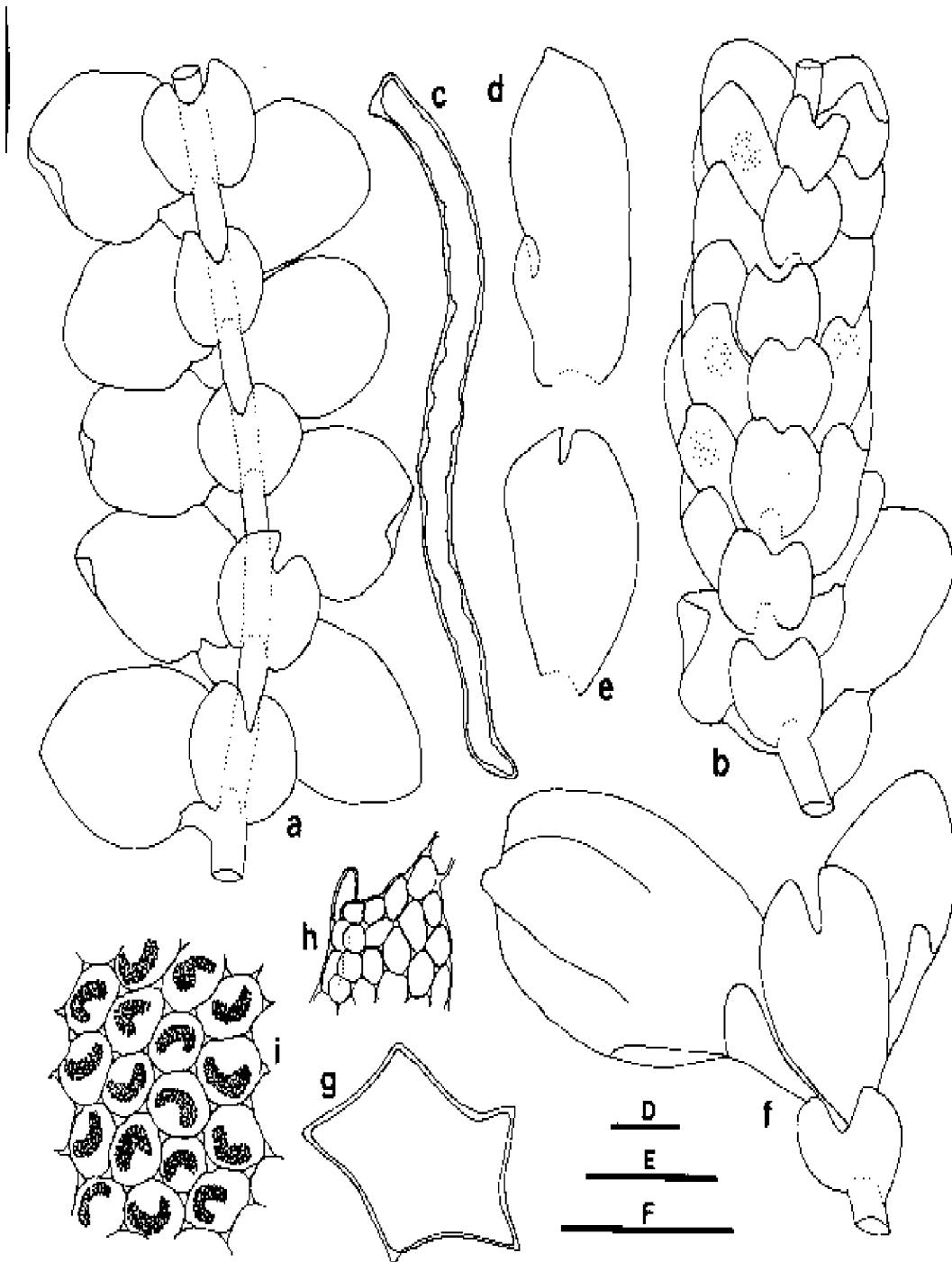


Fig.1. *Cheilolejeunea osumiensis* (Hattori) Mizut. - a. Portion of sterile plant, ventral side. - b. Portion of plant with a male inflorescence, ventral side. - c. Elater. -d. Female bract. -e. Female bracteole. -f. Female inflorescence, ventral side. -g. Transverse section of perianth. -h. Apex of leaf-lobule. -i. Median cells of leaf-lobe, showing oil bodies. All from *So & Zhu 95428L3*. Scales: D=0.025 mm (c,h,i). E=0.5 mm (a). F=0.4 mm (b, d-g).

thickenings absent, basal cells 26-3016-26 m, vitta completely absent, cuticle of leaf smooth or slightly mammillose. Leaf-lobule ovate, strongly inflated, free margin somewhat inrolled, about $\frac{1}{5}$ - $\frac{1}{3}$ as long as the leaf-lobe, apex constricted, angular tooth 1(2) cells long, keel straight or slightly arched. Underleaves usually remote, 2-4 times as wide as the stem, orbicular, 0.18-0.32 mm long and wide, bilobed to about $\frac{1}{3}$ the length, sinuses narrow or obtuse, insertions sinuate. Oil bodies in the cells of leaf and perianth wall 1 per cell, cashew-shaped 12-214-5.3 m, of the grape-cluster type, globules small, 0.6-2(3) m in diameter, oil bodies in the cells of stem epidermis 1-6 per cell, elliptical or cashew-shaped, 4-610-14 m. Androecium on long branch, usually with or without apical innovation, sometimes lateral on stem with apical innovation. Male bract(2)4-5(9) pairs, closely imbricate, about 0.3 mm long and wide, bract-lobule ovate, about $\frac{2}{3}$ - $\frac{3}{4}$ as long as the length of bract-lobe, apex round or truncate, bracteoles occurring throughout the androecium, 0.18-0.21 mm long and wide. Gynoecium usually on a long branch, innovation leaf sequence lejeuneoid, with 1-2 subfloral innovations, bract-lobe oblong-ovate, 0.56-0.65 mm long and 0.24-0.33 mm wide, bract-lobule oblong or linear, 0.25-0.31 mm long and 0.074-0.083 mm wide, bracteoles about 0.66 mm long and 0.33 mm wide, slightly bilobed. Perianth obovate, 0.58-1.1 mm long and 0.41-0.72 mm wide, 5keeled, dehiscing from the apex downward by 4 valves when mature. Elaters linear, 8 per capsule in number, with sinuately-thickened walls, about 0.19 mm long and 17 m wide. Seta articulate, about 0.9 mm long (usually with 11 articulations). Spores not seen.

Hattori (1944, 1951) illustrated and described the oil body of this species, based on Japanese materials. According to his original illustration (1994), the oil body is elliptical to oblong, 1-3 per leaf-cell. However from his description and illustration in 1951, the oil body is mulberry-shaped, about 2010 m or 18-217 m, 1-2 per leaf cell. After examining a lot of living materials, the oil body was found to be cashew-shaped, always 1 per leaf-cell. Obviously *Cheilolejeunea osumiensis* can easily be distinguished from other members of *Cheilolejeunea* in Hong Kong by the unique shape of the oil body.

Cheilolejeunea osumiensis closely resembles *C. khasiana* (Mitt.) N. Kitag., which is known from Hunan, Shangxi and Yunnan (Piippo 1990), Sichuan and Zhejiang (Zhu 1992, unpubl.) in China. The two species have the following features in common: (1) the ovate lobes whose apex is acute or obtuse, and usually incurved, (2) the small, ovate leaf-lobule with a small angular tooth, (3) the small to moderately large trigones of leaf-cells and (4) the slightly bilobed underleaves. However, *C. khasiana* differs primarily from *C. osumiensis* in that the male bracteoles are present only at the base of androecium, and the perianth bears 2-3 keels.

Cheilolejeunea osumiensis, new to Hong Kong and China, was previously recorded only from Japan. The range of this species has now extended consi

derably southward. In Hong Kong *C. osumiensis* usually occurs in large patches on rocks, tree-bark and decaying logs, but it may sometimes be associated with *Lejeunea flava*. This species appears to be rare because it was found at one locality cited below.

Specimens examined. - Hong Kong, Tai Mo Shan peak, 950m. *So & Zhu 95428L3, 95425L12* (HKBU, HSNU).

3. *Cheilolejeunea trifaria* (Reinw. et al.) Mizut.

Local plants are relatively small, usually 0.7-0.8 mm wide with leaves. The oil body of this species is 2-3 per leaf-cell, round or elliptical, 6-16 m in diameter or 10-16 4-6 m. Because the underleaves may vary in size and shape, some poorly developed plants are easily confused with *Cheilolejeunea intertexta*. But, *C. trifaria* is readily separated from the latter by (1) the deeply sinuate insertion of underleaf, (2) the more or less incurved apex of leaf-lobe, (3) the shortly bilobed underleaves, (4) the scarcely branched stem and (5) the large trigones of leaf-cells. Furthermore, one essential difference lies in their innovation leaf sequence. *Cheilolejeunea trifaria* has lejeuneoid innovation sequence, whereas that in *C. intertexta* is

pycnolejeuneoid.

Cheilolejeunea trifaria is a rather uncommon species in Hong Kong, previously reported in China only from Hainan (Lin et al. 1992) and Taiwan (Mizutani 1972). Locally this species grows on rock together with several moss species, but occasionally also on living leaves. The known range of this species now includes Africa, Bonin Is., Borneo, Ceylon, Java, New Guinea, Philippines, Ryukyu, Sumatra, South and Central America, Tahiti, Thailand (Mizutani 1982), and China.

Specimens examined. - Hong Kong, Tai Mo Shan, *So 951092*; (HKBU, HSNU); North of Kadoorie Garden, *So & Zhu 95501L9* (HKBU, HSNU).

4. *Cheilolejeunea intertexta* (Lindenb.) Steph.

Although the present species is one of the common species of the genus *Cheilolejeunea* in most tropical regions, it is apparently uncommon in Hong Kong. In local material the angular tooth of leaf-lobule varies greatly. In most specimens it consists of only 1 cell, but sometimes completely absent or indistinct. Locally *C. intertexta* usually grows on tree-bark and rock in partial shade at low altitude, and usually forms a large mat on the substrate. This species is here reported for the first time for China except Taiwan. Outside China, it is known from Africa, Amboina, Ceylon, Japan, Micronesia, Philippines, Samoa, Sumatra and Tahiti (Mizutani 1982).

Specimen examined. - Hong Kong, Saikung, *So & Zhu 95418L6* (HKBU, HSNU).

5. *Cheilolejeunea ryukyuensis* Mizut.

This species is relatively common in Hong Kong, usually found on living leaves and tree-bark in shaded habitats. Local material agrees with Mizutani's original description. The oil body is well developed, elliptical, 6-1616-29m, 2-3 per leaf-cell. *Cheilolejeunea ryukyuensis* is easily confused with *C. intertexta*, and the differentia-

tion between extreme forms of the two species can indeed be very difficult. *Cheilolejeunea intertexta* can be separated from *C. ryukyuensis* by the more or less falcate, orbicular leaves, and the smaller, slightly bilobed underleaves whose lateral margin is not undulate.

Cheilolejeunea ryukyuensis is newly reported for Hong Kong and China. The known distribution of this species now includes Japan (Mizutani 1982) and Hong Kong.

Specimens examined. - Hong Kong, Tai Lam Wu, *So & Zhu 94802L11* (HKBU, HSNU); Tai Mo Shan, *So & Zhu 941228L15* (HKBU, HSNU).

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