

A new record of the genus *Otolejeunea* (Hepaticae, Lejeuneaceae) in subtropical China

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Otolejeunea Grolle & Tix. (Lejeuneaceae, Hepaticae) is a small paleotropical genus. A total of 9 species including 1 in Australia, 5 in Asia, 2 in Madagascar and 1 in Brazil is known. *Otolejeunea semperiana* (Gottsche ex Steph.) Grolle is reported here as a new generic record for the Chinese bryoflora. The previously known northernmost localities for the genus and species were Vietnam and the Philippines respectively. The locality recorded here for China, Shuhaijinshan (ca. 24°31'N, 117°21'E), is the northernmost for the genus *Otolejeunea* and *O. semperiana* and the first ones from subtropical regions. A description and illustration of *O. semperiana* are provided, along with a distribution map of both *Otolejeunea* and *O. semperiana*. The new combination *O. schnellii* (Tix.) Zhu & So (*Allorgella schnellii* Tix.) is made.

Keywords: China, distribution, epiphyllous liverworts, Lejeuneaceae, *Otolejeunea semperiana*

Otolejeunea Grolle & Tix. was first described in Tixier (1980) based on a single species *Otolejeunea moniliata* Grolle from Madagascar. Grolle (1985) reduced the genus *Allorgella* Tix. to subgeneric level under *Otolejeunea* and thus expanded the generic range of the latter. Grolle (1985) accepted 7 species including an undescribed one later described by Tixier (1988) as *Otolejeunea rabenorii* Tix.

China has a rich liverwort flora with 147 genera of Hepaticae and Anthocerotae (Piippo 1990). Our recent studies on Chinese Lejeuneaceae have shown that *Otolejeunea* is a new generic record for Fujian and Hainan Provinces, represented by *Otolejeunea semperiana* (Gottsche ex Steph.)

Grolle. The range of *Otolejeunea* and *O. semperiana* has thus extended considerably northwards.

Otolejeunea semperiana (Gottsche ex Steph.) Grolle (Fig. 1)

Hausknechtia 2: 53. 1985.— *Prionolejeunea semperiana* Gottsche ex Steph., Spec. Hep. 5: 227. 1913. — Type: Philippines. Luzon, *Semper* 768 (G-14277, lectotypified by R. Grolle 1985).

Allorgella changiana Tixier, Nova Hedwigia 32: 619. 1980. — Type: Malaysia. Pahang, Cameron Highlands, *Tixier* 5195 (holotype, PC).

Allorgella hoertana Tixier, Nova Hedwigia 32: 618. 1980.

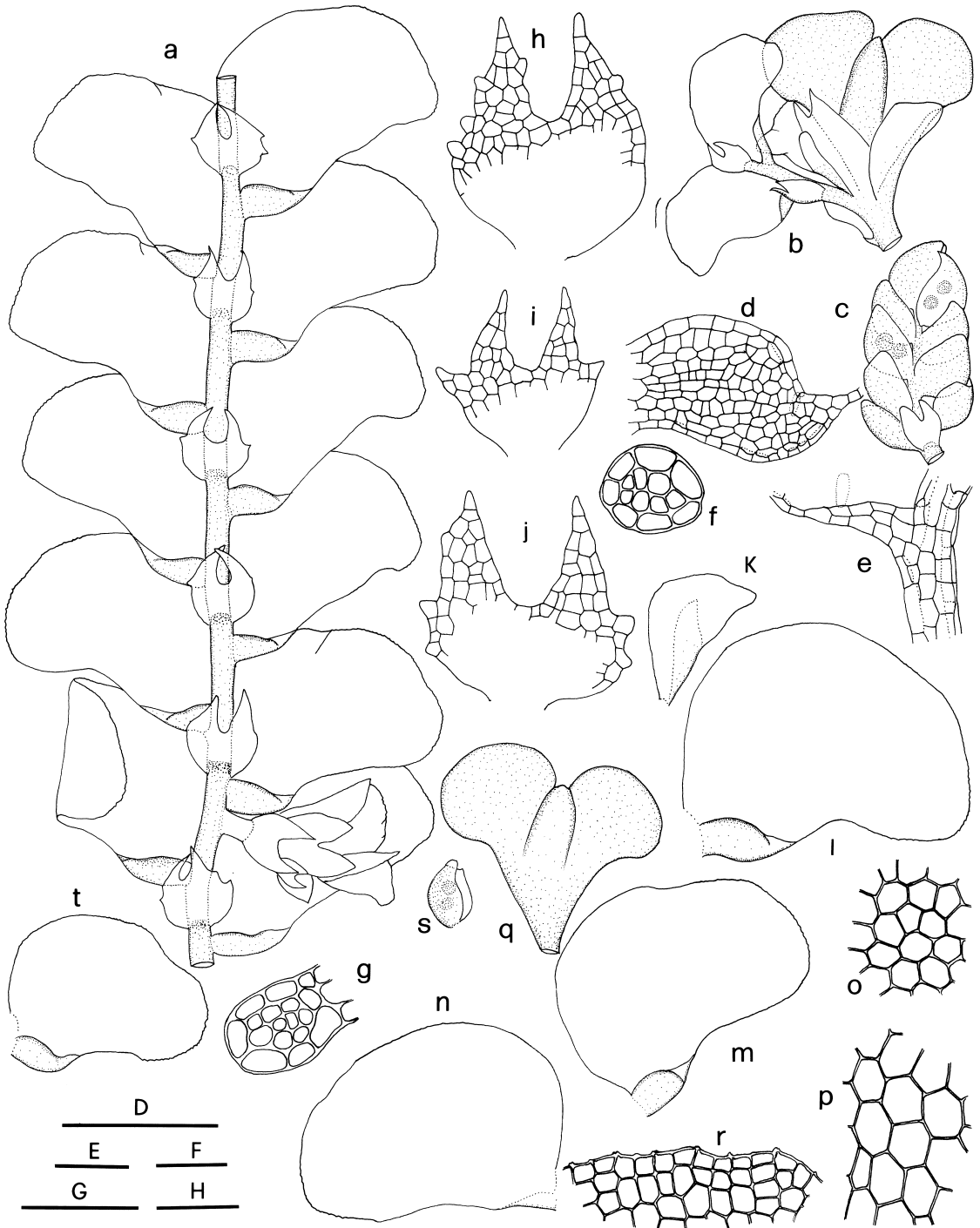


Fig. 1. *Otolejeunea semperiana* (Gottsche ex Steph.) Grolle (from Zang 594). — a: Portion of plant, ventral view. — b: Female inflorescence, ventral view. — c: Male inflorescence, ventral view. — d: Leaf lobule. — e: Leaf lobule and portion of stem, ventral side. — f, g: Cross-sections of stem. — h–j: Underleaves. — k: Female bract. — l–n, t: Leaves (l, m, t in ventral view). — o: Median cells of leaf lobe. — p: Basal cells of leaf lobe. — q: Perianth, ventral side. — r: Marginal cells of leaf lobe. — s: Male bract. — Scales: D = 0.1 mm (f, g, o–r), E = 0.25 mm (a), F = 0.25 mm (b, c, k, s, q), G = 0.1 mm (d, e, h–j), H = 0.25 mm (l–n, t).

Allorgella noertana Tixier, Nova Hedwigia 32: 617. 1980. — Type: Indonesia. Java, Tjibodas, *Tixier 4928* (holotype, PC; isotype, JE).

Otolejeunea changiana (Tix.) Engel & Tan, Journ. Hattori Bot. Lab. 60: 319. 1986, *syn. nov.*

Plants pale yellowish in dried condition, strongly appressed to living leaves. Stems 66–88 μm wide, 1.20–1.68 mm wide with leaves, irregularly branched, transverse section of 7 cortical cells (16–30 \times 12–19 μm) and 7–9 medullary cells (10–18 \times 8–14 μm). Rhizoids numerous, tufted, hyaline, at the base of underleaves, rhizoid disc usually developed, always wider than long. Asexual reproduction not seen. Leaves imbricate to contiguous, diverging from stem at an angle of 60–75°, flattened, but usually somewhat pleated. Leaf lobes ovate, \pm falcate, 0.60–0.85 mm long and 0.40–0.65 mm wide, apex rounded, rarely rounded–obtuse, margins nearly entire to irregularly denticulate, denticulations *Allorgella*-type (formed by cell wall thickenings of two adjacent cells rather than projecting cells, cf. Thiers 1992). Leaf lobules long-ovate, usually inflated, 0.20–0.27 mm long and 0.05–0.12 mm wide, sometimes poorly developed to entirely reduced, free margins usually \pm inrolled, apex obliquely truncate, without distinct teeth, keel widely arched, hyaline papilla large, long-oblong, 13–34 \times 7–12 μm , situated at the middle of apical free margin of leaf lobule and in the inner side of leaf lobule, but standing at apical free margin of leaf lobule if leaf lobules are poorly developed and reduced. Leaf cells thin-walled, without distinct trigones and intermediate thickenings, marginal cells of leaf lobe quadrate to rectangular, 11–18 \times 7–13 μm , median cells 15–24(–30) \times 14–22 μm , basal cells 24–30 \times 16–26 μm , cuticle smooth. Vitta absent. Underleaves remote, ovate in outline, 0.19–0.24 mm long and 0.18–0.24 mm wide, usually longer than wide, 3(–4) times as wide as stem, bilobed to 0.5(–0.6) of their length, sinus usually U-shaped, lateral margins entire to serrulate, rarely spinose, apex acute, terminal cell twice as long as wide, 20–40 \times 10–16 μm , insertion arched.

Autoicous. Male inflorescence terminal, on short branches, bracts 2–5 pairs, ca. 0.27 mm long, 0.14 mm wide, bract lobule as long as bract lobe, antheridia 2 per bract, 15–20 μm in diameter, bracteoles 1–2, only present at base of branch. Female inflorescence on very short branches, al-

ways with one pycnolejeuneoid innovation, bracts ovate to spatulate, asymmetrical, \pm falcate, 0.40–0.46 mm long and 0.20–0.25 mm wide, rounded to obtuse, rarely obtuse-acute at apex, bract lobules ligulate, 0.67–0.80 of bract lobe length, margins entire, obtuse, sometimes acute at apex, keels 0.3–0.5 bract lobe length, bracteole bilobed to 0.2–0.5 of bracteole length, apices acute. Perianth emergent, compressed, with 2 large, auriculate lateral keels and 1–2 blunt ventral keels (sometimes indistinct), margins entire. Elaters and spores not seen.

Illustrations: Grolle 1985: Abb. 1; Tixier 1980: fig. 5 as *Allorgella noertana* (originally *A. hoertana*); Tixier 1980: fig. 6 as *A. changiana*.

The characteristic features of *Otolejeunea* are (1) pycnolejeuneoid innovation, (2) compressed, smooth perianth with 2 auriculate or horn-shaped keels, (3) \pm falcate leaves, (4) presence of marginal denticulations of *Allorgella*-type in most species, (5) usually a large hyaline papilla which is either proximal or situated at the middle of apical free margin of leaf lobule and in the inner side of leaf lobule, and (6) bilobed underleaves with entire to spinose lateral margins. The genus could be confused with *Lejeunea* Libert, but can be distinguished by its pycnolejeuneoid innovation and falcate leaves. In addition, the marginal denticulations of *Allorgella*-type are absent in *Lejeunea*, but present in most species of *Otolejeunea*.

Otolejeunea comprises 9 species, including 5 in Asia, 1 in Australia, 1 in Brazil and 2 in Madagascar (Table 1). Grolle (1985) divided the genus into three subgenera based predominantly on the morphological features of perianth, vitta, innovation and marginal denticulations of leaf. The subgenus *Allorgella* now includes 7 species, and the other two subgenera are still monotypic, as shown in Table 1. The Brazilian species was originally described by Tixier (1991) as *Allorgella schnellii* Tix. *Allorgella* is currently recognized as a subgenus of *Otolejeunea*, and the necessary new combination is made here.

Otolejeunea schnellii (Tix.) Zhu & So, *comb. nov.* — Basionym: *Allorgella schnellii* Tix., Candollea 46: 299. 1991. Holotype: Brésil. Région de Manaus, *R. Schnell 9312* (PC, not seen).

The New Caledonian *Otolejeunea schmidii* (Tix.) Grolle is most closely related to *O. sem-*

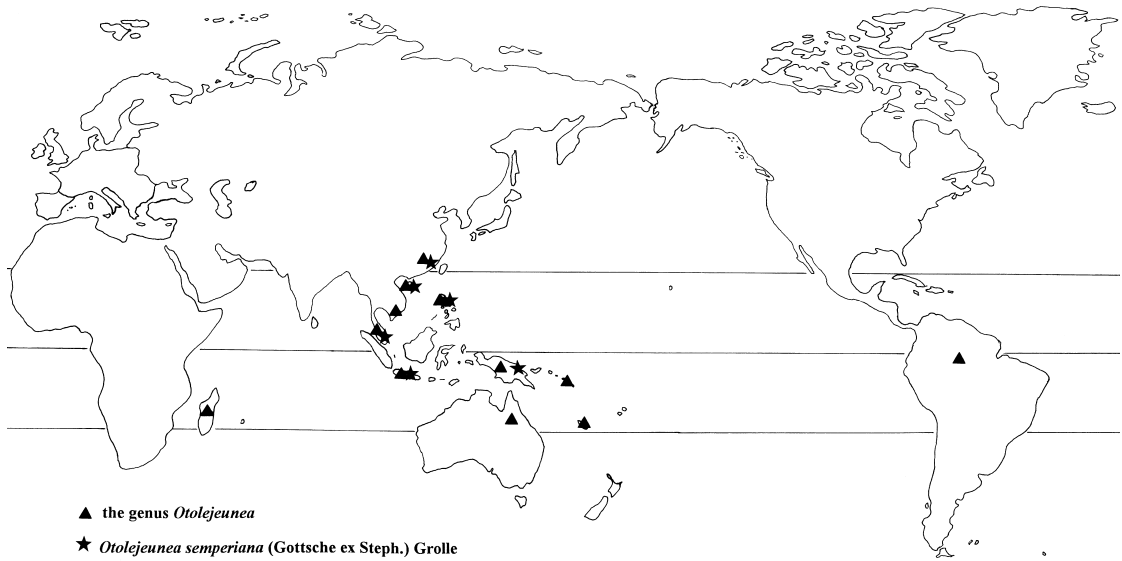


Fig. 2. Distribution of the genus *Otolejeunea* Grolle & Tix. and *Otolejeunea semperiana* (Gottsche ex Steph.) Grolle. Modified from Grolle (1985) and Tixier (1994).

periana. Typical plants of *O. semperiana* can be distinguished from *O. schmidii* by the nearly entire underleaves and strongly inrolled free margins of fully developed leaf lobules, as noted by Grolle (1985) and Thiers (1992). The Chinese plants are somewhat atypical, because the underleaf margins are usually dentate, and the leaf lobule varies from poorly developed to entirely reduced, especially in the Hainan material. It seems not easy to separate the two species. Based on our observations, however, the morphology of underleaf can be used in separating them. In *O. semperiana* the underleaf is usually longer than wide, and its base is attenuate to obtuse, but in *O. schmidii* the underleaf is wider than long, and

its base usually truncate, and somewhat auriculate. *Otolejeunea semperiana* is somewhat similar to *Otolejeunea rabenorii*, but the latter lacks innovation, has almost entire underleaves and large, never inrolled free margin of leaf lobule. *Otolejeunea semperiana* also resembles the Australian *O. australiensis* Thiers in the perianth and leaf lobule structure as well as margins of leaves, and both species have dentate underleaves. However, *O. semperiana* differs in having an innovation.

Trigones and intermediate thickenings are rather variable in *Otolejeunea semperiana*, very distinct in the lectotype from the Philippines, but almost absent in the Chinese and other specimens cited in the present paper.

Table 1. The species, subgenera and distribution of *Otolejeunea* Grolle & Tix.

Species	Subgenus	Distribution	Sources
<i>O. australiensis</i> Thiers	<i>Allorgella</i>	Australia	Thiers (1992)
<i>O. hoana</i> (Tix.) Grolle	<i>Allorgella</i>	Vietnam	Grolle (1985)
<i>O. moniliata</i> Grolle	<i>Otolejeunea</i>	Madagascar	Grolle (1985), Tixier (1980)
<i>O. rabenorii</i> Tix.	<i>Allorgella</i>	Madagascar	Tixier (1988)
<i>O. schmidii</i> (Tix.) Grolle	<i>Allorgella</i>	New Caledonia	Grolle (1985)
<i>O. schnellii</i> (Tix.) Zhu & So	<i>Allorgella</i>	Brazil	Tixier (1991)
<i>O. semperiana</i> (Gottsche ex Steph.) Grolle	<i>Allorgella</i>	China, Malasian region	Piippo (1994), present study
<i>O. streimannii</i> Grolle	<i>Phoxolejeunea</i>	Papua New Guinea, Solomon Islands	Pócs <i>et al.</i> (1995)
<i>O. zantenii</i> Grolle	<i>Allorgella</i>	New Guinea	Pócs <i>et al.</i> (1995)

In the genus *Otolejeunea*, oil bodies are known only in *O. schmidii*, in which they are of the botryoidal type, 30–40 per cell, $5\text{--}7 \times 2\text{--}3 \mu\text{m}$, composed of distinct granules (Furuki & Higuchi 1996). However, Furuki and Higuchi (1996: 73, plate IV: 1) illustrated only about 3–5 oil bodies per cell.

Otolejeunea semperiana has previously been known from Malaysia, Indonesia, the Philippines and Papua New Guinea (Grolle 1985). The previously known northernmost locality for the genus *Otolejeunea* and *O. semperiana* was Vietnam and the Philippines (Grolle 1985, Tixier 1994) respectively. Up to this point, Shuhaijinshan (ca. $24^{\circ}31' \text{N}$, $117^{\circ}21' \text{E}$) is the northernmost locality for this genus and species, as shown in Fig. 2. This species seems to be very rare in China, only 2 epiphyllous specimens collected at about a 400-m altitude above sea level have been obtained. However it is highly probable that this species can be found in Taiwan and other parts of southern China.

Specimens examined. — **China.** Fujian Prov., Min Nan, Nanjing, Shuhaijinshan (ca. $24^{\circ}31' \text{N}$, $117^{\circ}21' \text{E}$), *Zang 594* (HSNU, IFP, KUN-7467). Hainan Prov., Diaoluoshan, Mengshuilingchang (ca. $18^{\circ}41' \text{N}$, $110^{\circ}0' \text{E}$), *Li 05561* (HSNU, SHM). **Indonesia.** Java, Tjibodas, 1 400 m, *Tixier 4960* (PC), paratype of *Allorgella noertana*. *Ibid.*, no altitude, *Nyman* (G-17964, G-17965, G-14278), syntype of *Prionolejeunea semperiana*. **Philippines.** Luzon, Nueva Vizcaya, *Macgregor 20218 p.p.* (JE).

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