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Leiomitra patriciana (Trichocoleaceae), a new species from Papua New Guinea

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Abstract – A new species of the family Trichocoleaceae, *Leiomitra patriciana* T. Katag., is described based on herbarium material collected from Papua New Guinea. The species is characterized by the following features: (1) the regularly to rather irregularly 1-pinnate ramification pattern; (2) sublongitudinal leaf insertion; (3) well-differentiated (anisophyllous) leaves and underleaves; (4) superficial cilia on the leaf disc; and (5) paraphyllia on the stem. A key to the species of *Leiomitra* is also provided.

Hepaticae / Liverworts / Marchantiophyta / New Guinea / Taxonomy

INTRODUCTION

The genus *Leiomitra* Lindb. (Trichocoleaceae) is a small genus including about 10 species (Söderström *et al.*, 2015) and distributed mainly from tropical and subtropical areas of Central and South America and of SE Asia (Hatcher, 1957; Katagiri & Deguchi, 2012). *Leiomitra* is distinguished from the other genera of the family (*Trichocolea* Dumort. and *Eotrichocolea* R.M. Schust.) by such characters as succubous leaf insertion, sublongitudinally inserted leaves, well-differentiated (anisophyllous) leaves and underleaves, poorly developed stem cortex, and presence of well-developed calyptra and perianth (see Katagiri & Deguchi, 2012 for comparison between genera). The bryophyte flora of Papua New Guinea has been becoming unveiled since Koponen & Norris (1983), but the liverwort diversity remains to be studied in several taxonomic groups. As for *Leiomitra* Katagiri & Deguchi (2012) gave a taxonomic study of SE Asian species and recognized three species in Papua New Guinea. In the course of taxonomic studies on the Trichocoleaceae worldwide, the present author found a New Guinean specimen of a plant with dense hairs, due to the presence of both superficial cilia on the leaf disc and paraphyllia on the stem. After detailed morphological examination of the material and comparison with other Southeast and tropical American species in the Trichocoleaceae, the author concluded that the New Guinean plant is a new species, *Leiomitra patriciana* T. Katag. A detailed morphological description of the species is provided with illustrations based on the type material. A taxonomic discussion of the species and a key to the species of *Leiomitra* are also provided.

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TAXONOMY

Leiomitra patriciana T. Katag., ***sp. nov.*** **Figs 1-10**

Similar to *Leiomitra breviseta*, but differs by the presence of stem paraphyllia.

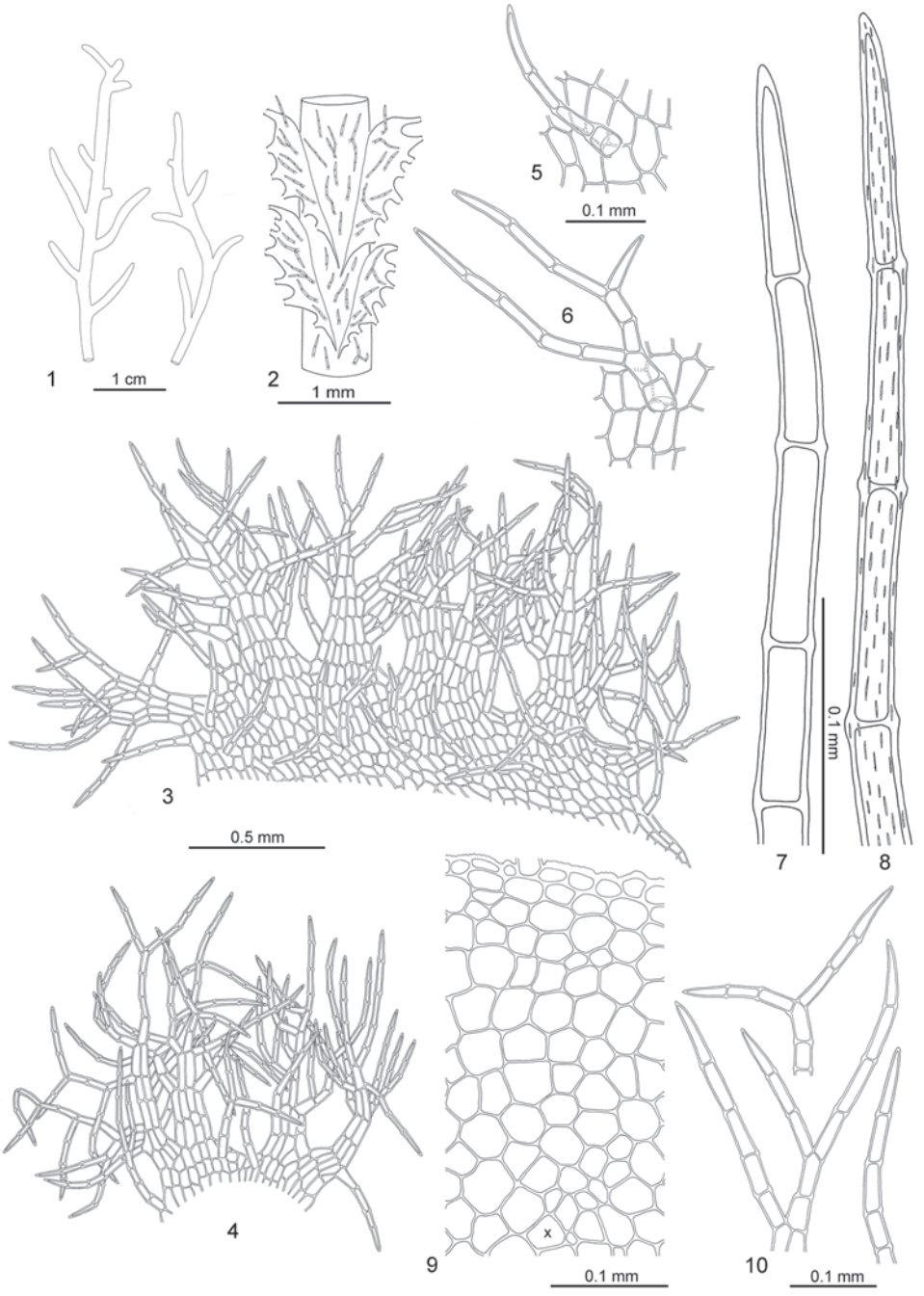
Typus: Papua New Guinea. Morobe Province, Wau, Mt. Kaindi, mossy forest of northern summit, 2350 m, 5-11 August 1981, *Geissler 7958* (holotype: G).

Plants light brown in aged herbarium material, (2.0-)2.5-3.5(-4.8) cm long, 0.5-1.0(-1.5) cm wide including branches, with regularly to rather irregularly 1-pinnate branches reaching 0.5-1.0(-2.0) cm long. **Stems** with paraphyllia, 1.0-1.5(-2.0) mm wide with leaves, (0.5-)0.6-0.7(-0.8) mm thick, (18-)22-24(-26) cells in diam.; cortex with small, thick-walled cells of a single layer, with striate-verrucose epidermis; paraphyllia dense on dorsal side, usually absent or rarely present on ventral side. **Rhizoids** not seen. **Leaves** succubous, strongly imbricate, slightly asymmetrical, (1.0-)1.2-1.4(-1.6) mm long, (2.0-)2.5-3.0(-3.2) mm wide, sublongitudinally inserted, 6-8(-9)-lobed; disc (4-)5-7(-9) cells high, with superficial cilia; superficial cilia 6-10 (-14) on median and marginal parts of disc on adaxial face, (0-)2-3(-4) on marginal part of disc on abaxial face; cells of disc oblong to rectangular, striate- to papillate-verrucose, thick-walled, (40-)50-75(-85)×25-30 (-35) μm; cilia subulate and linear, (2-)3-5(-6) cells long; cells of cilia striate-verrucose, thick-walled, (50-)70-90(-110)×(9-)12-15(-18) μm, septa dilated; distal end of terminal cells with heavily to moderately thickened wall; terminal cells of cilia as long as penultimate cells. **Underleaves** much smaller than lateral leaves, symmetrical, 0.7-1.0 mm long, 1.4-1.6 mm wide, transversely inserted, 4(-6)-lobed; disc of underleaves shorter than that of lateral leaves, 1-2 cells high, with 1-2(-4) superficial cilia on its median and marginal parts on adaxial face; cells of underleaves similar to those of lateral leaves. **Oil bodies** unknown. **Reproductive structures and sporophytes** unknown.

Etymology: Named in honor of Dr. Patricia Geissler (1947-2000), the collector of the type material and in recognition of her significant contributions to our knowledge of bryophyte diversity and systematics.

DISCUSSION

Leiomitra patriciana is characterized by (1) the regularly to rather irregularly 1-pinnate ramification pattern, (2) sublongitudinal leaf insertion, (3) the superficial cilia on the leaf disc, and (4) the paraphyllia on the stem. It is unique within the genus in that it has both superficial cilia on leaf disc (Figs 5-6) and paraphyllia on the stem (Fig. 10). Judging from its morphological characters, it is closely related to *Leiomitra breviseta* (Steph.) R.M. Schust., a common Southeast Asian species. *L. breviseta* and *L. patriciana* show similar leaf cilia morphology and have superficial cilia on the median and marginal parts of the leaf disc (Fig. 3). However, *L. breviseta* is easily distinguished from *L. patriciana* by the absence of stem paraphyllia (Katagiri & Deguchi, 2012). Another Southeast Asian species, *Leiomitra merrillana* (Steph.) T. Katag., also has superficial cilia on the leaf disc but they are restricted to the disc margin (Katagiri & Deguchi, 2012). Among the *Leiomitra* species, the presence of stem paraphyllia is a rather common morphological character, and is shared by the four Central and South American



Figs 1-10. *Leiomitra patriciana*. **1.** Habits. **2.** Part of stem, dorsal view. **3.** Leaf. **4.** Underleaf. **5-6.** Superficial cilia on leaf disc. **7-8.** Apices of cilia, ornamentation shown at right. **9.** Part of stem cross-section (cross marks the center). **10.** Stem paraphyllia from stem. All from *Geissler 7958* (G-00064787, holotype).

species, *Leiomitra hirticaulis* R.M. Schust., *Leiomitra paraphyllina* Spruce, *Leiomitra robusta* (Steph.) R.M. Schust., and *Leiomitra smaragdina* Hässel. However, these four species lack superficial cilia on the leaf disc (Spruce, 1885; Hatcher, 1957; Fulford, 1963; Schuster, 2001; Hässel de Menéndez, 2002).

Although *L. patriciana* lacks the reproductive characters that are important for distinguishing genera in the family Trichocoleaceae, the following vegetative characters are typical of *Leiomitra* (Katagiri & Deguchi, 2012): (1) the regularly to rather irregularly1-pinnate ramification pattern (Fig. 1); (2) the 1-layered stem cortex (Fig. 9); (3) the sublongitudinal leaf insertion (Fig. 2); and (4) the well-differentiated (anisophyllous) leaves and underleaves in which the leaf disc is 3-4 times higher than that of the underleaf (Figs 3-4). Based on these characters, this author concludes that the species belongs to the genus *Leiomitra*. Further morphological investigations of additional material and molecular phylogenetic studies are needed to provide a more complete morphological concept of the species, and to clarify the interspecific relationships among *Leiomitra* species. *Leiomitra* now contains 14 species which are separated in the following key.

KEY TO THE SPECIES OF *LEIOMITRA*

1. *Acromastigum*-type branches present; gynoecia restricted to very short lateral branches (subg. *Brachygyna*); Dominica (Schuster, 2001) ..... *L. mastigophoroides* R.M. Schust.
1. *Acromastigum*-type branches absent; gynoecia present on stem (subg. *Leiomitra*) 2
   2. Stem paraphyllia present 3
   2. Stem paraphyllia absent 7
3. Superficial cilia present from leaf disc; Papua New Guinea ..... *L. patriciana* T. Katag.
3. Superficial cilia absent from leaf disc 4
   4. Leaf disc 1-2 cells high; Chile, Argentina (Hässel de Menéndez, 2002) ..... *L. smaragdina* Hässel
   4. Leaf disc more than 4 cells high 5
5. Leaves weakly asymmetric, divided to into 6-8 densely ciliate lobes; Colombia (Hatcher, 1957) ..... *L. robusta* (Steph.) R.M. Schust.
5. Leaves strongly asymmetric, divided into 4-5 sparsely ciliate lobes 6
   6. Leaf disc 6-8 cells high; Antilles, Central America-Ecuador (Hatcher, 1957) ..... *L. paraphyllina* Spruce
   6. Leaf disc 4-5 cells high; Venezuela (Schuster, 2001) ..... *L. hirticaulis* R.M. Schust
7. Superficial cilia present on leaf disc 8
7. Superficial cilia absent on leaf disc 10
   8. Superficial cilia present on median and marginal parts of leaf disc; cells of leaf cilia (2-)4-6 cells long; New Guinea Islands, Solomon Islands (Katagiri & Deguchi, 2012) ..... *L. breviseta* (Steph.) R.M. Schust.
   8. Superficial cilia restricted to marginal part of leaf disc 9

9. Cells of leaf cilia (3-)6-10(-12) cells long; perianth with superficial cilia, lobed to ca. 1/3 of its height; SE Asia (Katagiri & Deguchi, 2012) .... *L. merrillana* (Steph.) T. Katag.
9. Cells of leaf cilia (3-)4-6(-7) cells long; perianth without superficial cilia, lobed to ca. 1/2 of its height; New Zealand (Engle & Glenny, 2008) .... *L. lanata* (Hook.) R.M. Schust.

10. Leaf lobes with the cilia recurved; Brazil-Chile-Argentina, Tierra del Fuego, Juan Fernandez (Hatcher, 1957; Hässel de Menéndez, 2002) .... *L. elegans* (Lehm.) Hässel
10. Leaf lobes with the cilia not recurved 11

11. Stem more than 1 mm wide including leaves 12
11. Stem less than 1 mm wide including leaves 13

12. Leaf disc usually 1-3 cells high; Central and South America (Hatcher, 1957) ..... *L. tomentosa* (Sw.) Lindb.
12. Leaf disc to 6 cell high; Antilles, Juan Fernandez (Hatcher, 1957) .... *L. elliottii* (Steph.) R.M. Schust.

13. Distal end of terminal cells of leaf cilia with evenly to slightly thickened wall; leaf disc 3-4 cells high; Philippines, Papua New Guinea (Katagiri & Deguchi, 2012) ..... *L. capillata* Lindb.
13. Distal end of terminal cells of leaf cilia with moderately to heavily thickened wall; leaf disc 4-5 cells high; Central and South America (Hatcher, 1957) .... *L. flaccida* Spruce

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