

THE LIVERWORT GENUS *MARCHANTIA* L. (MARCHANTIOPHYTA: MARCHANTIOPSIDA) IN SINGAPORE, WITH A NEW SPECIES RECORD

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ABSTRACT. — The historical records of the genus *Marchantia* in Singapore are reviewed. A recent collection and identification of historical unidentified herbarium specimens reveal two distinct native species occurring in Singapore, namely *Marchantia acaulis* Stephani and *Marchantia emarginata* Reinw., Blume & Nees. Unintentional destruction and extermination threatens the one surviving population of each of the two *Marchantia* species. Conservation efforts by the authorities are called upon to prevent the local extinction of both species.

KEY WORDS. — new record, Singapore, liverwort, *Marchantia*

INTRODUCTION

Marchantia L. (Marchantiaceae) is a prominent genus of liverworts comprising of some 36 species worldwide (Bischler, 1998). It is almost cosmopolitan, occurring in regions with humid climates in moist to wet habitats. Species of *Marchantia* are opportunists and early colonisers of newly opened habitats, and often occur in anthropogenic habitats, especially abundant in cultivated farmland.

Within the evolutionary lineage of complex thalloid liverworts or class Marchantiopsida, only *Marchantia*, *Cyathodium* Kunze (Cyathodiaceae), and *Riccia* L. (Ricciaceae), are known to occur naturally in Singapore (Pippo et al., 2002a), each with only one or two species. Gemma cups or cupules (rounded cup-like structures on the dorsal face of the thallus) are almost always present in plants of *Marchantia* (Fig. 1), and easily distinguishes the genus from both *Cyathodium* and *Riccia*, which lack gemma cups. Within each gemma cup are several green and disc-like asexual reproductive structures called gemmae (Fig. 1).



Fig. 1. Dichotomous branching gametophytes of *Marchantia emarginata*, showing gemma cups on the dorsal side of the thallus, containing bright green gemmae for asexual propagation. Scale bar = 5 mm. (Photograph by: Boon-Chuan Ho).

The first published record of *Marchantia* in Singapore was reported from MacRitchie Reservoir by Johnson (1958), who referred to the plants as *Marchantia geminata* Reinw., Blume & Nees. Forty years later in 1998, plants of *Marchantia* were re-collected from concrete walls of a storm-drain in MacRitchie Reservoir Park in a survey of liverworts of Singapore. The collection is identified instead as *Marchantia acaulis* Stephani (Piippo et al., 2002a; 2002b). The earlier report of *Marchantia geminata* by Johnson (1958) was assumed to be a misidentification of *Marchantia acaulis*; unfortunately, no specimen collected or identified by Johnson could be located in the Herbarium, University of Malaya (KLU), Herbarium, Singapore Botanic Gardens (SING) or Herbarium, Raffles Museum of Biodiversity Research, National University of Singapore (SINU), for verification.

In 2000, I discovered another population of *Marchantia* in Singapore, found near the vicinity of the back entrance of the military camp at Bukit Gombak, at the former Hillview Avenue public housing estate. The identity of the plants was assumed to be *Marchantia acaulis*, since Piippo et al. (2002a; 2002b) concluded that only a single species of *Marchantia* occurs in Singapore. With only two known populations in Singapore, *Marchantia acaulis* has been included in the national red list of threatened species in the nationally endangered category (Tan & Ho, 2008). This species also occurs in Sri Lanka, Peninsular Malaysia, Sumatra, Java, Borneo, and Sulawesi (Bischler-Causse, 1989).

In 2005, a species of *Marchantia* was introduced into the Evolution Garden at the Singapore Botanic Gardens (Wong & Chin, 2006). The source and origin of the introduced plants are unknown (Nura Abdul Karim, pers. comm., 17 Apr. 2013). Identification of this *Marchantia* species was never attempted.

MATERIAL AND METHODS

Two *Marchantia* specimens recently collected from various localities in Singapore were compared with herbarium specimens deposited in SING and SINU. Identifications follow the work of Bischler-Causse (1989). All newly acquired specimens were deposited in SING.

RESULTS AND DISCUSSION

A new population of *Marchantia* species was recently discovered in an abandoned well near the Bukit Timah Nature Reserve. Upon verifying its identity, it proved to be a different species from *Marchantia acaulis*, and a second species record of the genus for Singapore. Morphological features of the stalked male and female receptacles, call antheridiophores and archegoniophores, respectively, are critical for species identification of *Marchantia*. These structures, which are associated with sexual reproduction, have not been observed in local populations of *Marchantia*. The *Marchantia* plants in Singapore appear to limit themselves largely to asexual propagation by gemmae, fragmentation, and branching (see also Johnson, 1958). Identification of species has to depend on the more challenging vegetative characters, such as the appendage of median scales, found on the ventral face of the thallus (Fig. 2).

In *Marchantia acaulis*, the ovate appendage of median scales has margins irregularly toothed with unicellular teeth (Figs. 3C, D). This is in agreement with the reported specimen from MacRitchie Reservoir Park (A. Juslén 720, 15 Nov. 1998, SINU). The scale appendages of the newly collected specimen (B.-C. Ho 13-201) have instead marginal teeth partly consisting of two to three cells. The marginal teeth are often curved downwards, with the terminal cell often paler in colour (Figs. 3A, B). These features are distinctive for *Marchantia emarginata* Reinw., Blume & Nees, a widespread species occurring from sea-level to 1,500 m throughout Malesia.

Two other unidentified specimens of *Marchantia* collected from Singapore were found in SING. Both specimens were collected more than a hundred years ago by H. N. Ridley from Napier Road (H. N. Ridley, 22 Mar. 1908) and Pasir Panjang (H. N. Ridley 445, 1896). These two populations probably did not survive the development at the two sites. Interestingly, these two specimens are also identified here as *Marchantia emarginata* based on the morphology of the scale appendage. The population of *Marchantia* in the Singapore Botanic Gardens' Evolution Garden, identified here as *Marchantia emarginata* (B.-C. Ho 13-205), eight years after its introduction is shrinking and slowly being overtaken by other bryophytes as the condition of the Evolution Garden becomes shadier due to the maturation of the surrounding trees. Furthermore, a recent visit (6 May 2013) to the site of *Marchantia acaulis* at Hillview Avenue revealed that this species has completely disappeared, probably due to the upgrading of the military camp fencing, which is just above the drainage where plants of *Marchantia* was found more than 10 years ago. All natural occurring populations in Singapore have been found in microhabitats with constantly high humidity and partial shade, often growing on slanting to vertical surfaces of concrete or rocks. Perhaps, growing on such vertical surfaces would avoid competition from other plants, which would otherwise be taking over the *Marchantia* in more favourable, equally moist microhabitats.



Fig. 2. Ventral side of *Marchantia emarginata* thallus, showing the rows of purplish scales and felt-like tomentum (rhizoids) on the older parts. Scale bar = 5 mm. (Photograph by: Boon-Chuan Ho).

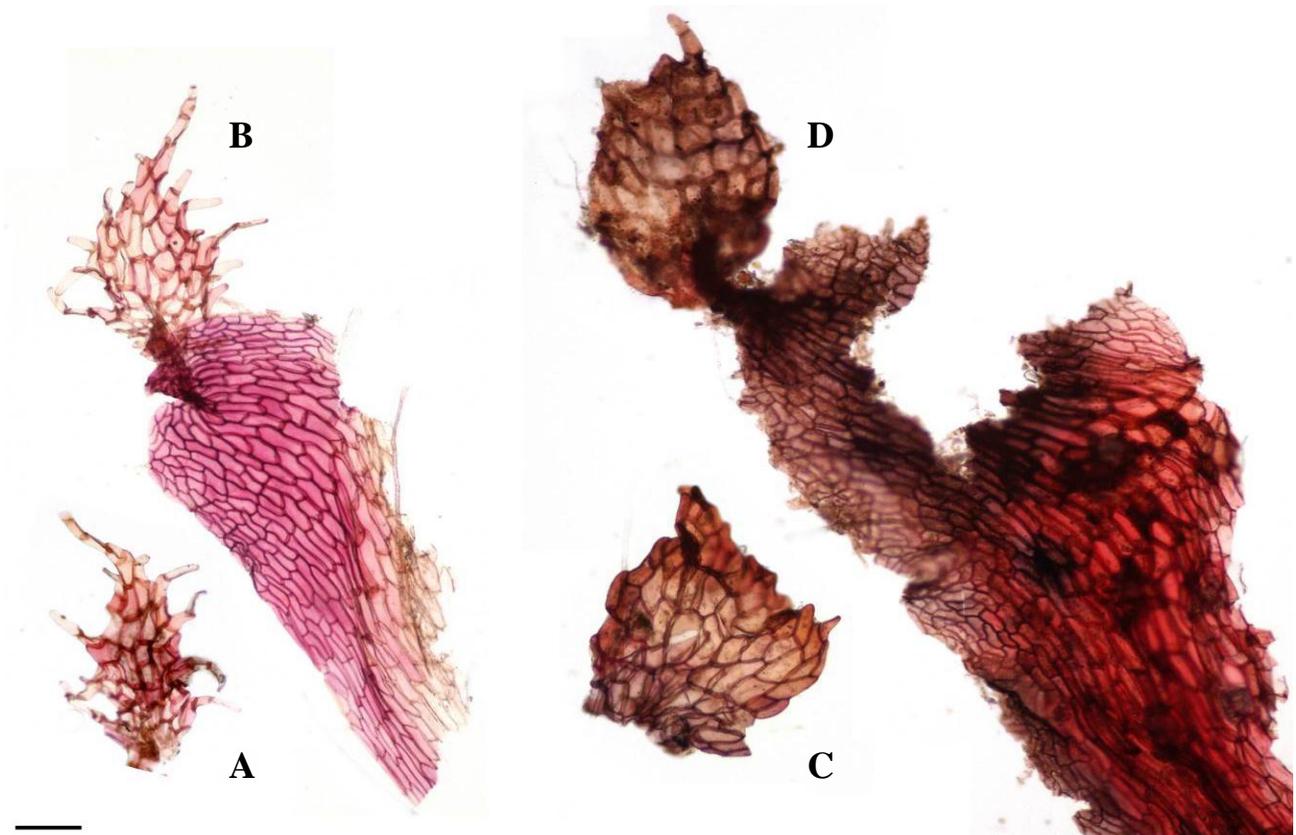


Fig. 3. *Marchantia emarginata*: A, detached appendage of median scale; B, median scale with intact appendage at its apex (both from B.-C. Ho 13-201, SING). *Marchantia acaulis* Stephani: C, detached appendage of median scale; D, median scale with intact appendage (note broken part at top right corner of scale; both from A. Juslén 720, SINU). Scale bar = 100 μ m. (Photograph by: Boon-Chuan Ho).

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