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The genus *Ephemeropsis* (Daltoniaceae, Bryophyta) in Thailand

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ABSTRACT

A taxonomic study of the genus *Ephemeropsis* K.I.Goebel in Thailand is presented, based on the herbarium specimens and field survey. Only one species is recognized in the country, namely *E. tjibodensis* K.I.Goebel. Detailed description, line drawings, and SEM photographs are provided.

KEYWORDS: bryophyte, Daltoniaceae, *Ephemeropsis*, epiphyllous moss, Thailand.

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INTRODUCTION

Ephemeropsis K.I.Goebel is a small genus of mosses recently placed in the family Daltoniaceae (Buck et al., 2004; Frey & Stech, 2009). The genus contains only two species: *E. tjibodensis* K.I.Goebel and *E. trentepohlioides* (Renner) Sainsbury, distributed mainly in tropical Asia and Australasia (Bartlett & Iwatsuki, 1985; Frey & Stech, 2009; Pressel & Duckett, 2009). The genus is easily separated from other genera of the family by having very reduced gametophytes that do not produce rhizoids, having a persistent alga-like protonema, and is usually growing on living leaves or sometimes on twigs (Győrffy, 1915; Bartlett & Iwatsuki, 1985; Pressel & Duckett, 2009).

Few reports of *Ephemeropsis* in Thailand have been published, probably due to the scarcity of bryological surveys in this country (Sukkharak & Chantanaorrapint, 2014). One species has been reported: *E. tjibodensis* (Dixon, 1932, 1935; Akiyama et al., 2011; Pócs & Podani, 2015). The purpose of the present paper is to summarize current knowledge of the genus *Ephemeropsis* within the framework of the study and floristic treatment of the bryophyte flora of Thailand.

MATERIALS AND METHODS

This study is based on fresh specimens collected throughout Thailand as well as herbarium specimens housed in BKF, CMU, HYO and PSU. Morphological and anatomical details were studied using stereo and compound microscopes. The distinctive characters of the species were illustrated with the aid of an Olympus drawing tube. Mature sporophytes were dissected and mounted on double-stick cellophane adhesive tape affixed to stubs and examined with a FEI Quanta 400 scanning electron microscope. In addition, distribution and ecological data were compiled.

DESCRIPTION

Ephemeropsis tjibodensis K.I.Goebel, Flora 76: 116. 1892; Fleischer, Ann. Jard. Bot. Buitenzorg 22: 68. 1901; Musc. Buitenzorg 3: 945. fig. 168. 1908. Type: Indonesia. Java, Tjibodas, 1450-2000 m, *Fleischer s.n.*, (holotype **M**; isotype **H**). Figs. 1–2.

Plants usually epiphyllous, very small in size, greenish brown. *Protonemata* persistent with very reduced gametophytes, with spreading, irregular branches, consisting of main axes (caulonemata) and 3 types of side branches (chloronemata, bristales, and hepteres (Pressel & Duckett, 2009)) about 19–30 µm diameter with narrower side branches. *Caulonemata* greenish brown to dark brown, sparing branched with elongate cells, 80–130 × 19–30 µm,

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thick walled, having fewer chloroplast than chloronemata cells. *Chloronemata* narrower than caulonemata, light green to yellowish green, with spreading branches with short cells, 20–40 × 10–15 µm, thin walled. Mature protonema producing numerous bristles emerging above the chloronemal mat. *Bristles* or vertical spines yellowish brown, 700–900 µm long, erect with elongate cells, 80–100 × 18–29 µm. *Hapteres* or rhizoid-like structures adherent to substratum, with short cells less than 120 mm long, simple or sparingly branched. *Asexual reproduction* by gemmae produced at the tips of mature chloronemal filaments or attenuated main axes; gemmae fusiform (5–7 celled), uniseriate, 150–200 µm long.

Autoicous. *Perigonial* leaves, yellowish green to reddish brown, broadly ovate, 0.6–2.5 mm long, 0.5–0.8 mm wide, acute, entire to slightly dentate; antheridia 50–80 µm long. *Perichaetial* leaves yellowish green, similar to perigonial leaves; archegonium not seen. *Seta* slender, yellowish green to green, 1–1.2 mm long, smooth. *Capsule* ovoid-oblong, horizontal, 150–250 µm long, operculum long rostrate; peristome double; outer peristome teeth 16, orange to reddish brown, lanceolate-triangular, narrowly furrowed, outer surface with transverse striations, inner surface with well developed ventral lamellae from base to tip; inner peristome as long as outer, with tall basal membrane. *Calyptra* mitriform, slightly hairy above, strongly fringed with hairs at the base. *Spores* greenish, rounded, 0.8–1 µm in diameter, nearly smooth.

Thailand.— NORTHERN: Chiang Mai [Doi Inthanon National Park, 15 ha Plot, near check point 2, 27 Dec. 2008, *Akiyama et al. 37* (**HYO**); 31 Dec. 2008, *Akiyama et al. 250* (**HYO**); 14 Jan. 2010, *Printarakul 2685* (**CMU**, **HYO**)]; SOUTH-WESTERN: Prachuap Khiri Khan [Huai Yang Waterfall National Park, Khao Luang Mt, ca 1200 m alt, 16 May 2011, *Chantanaorrapint 2425* (**PSU**)] SOUTH-EASTERN: Chanthaburi [Khao Soi Dao Wildlife Sanctuary, 8 Apr. 2012, *Chantanaorrapint et al. 961* (**PSU**)]; PENINSULAR: Phangnga [Takua Pa, Si Phangnga National Park, Ton Dang waterfall, 2 Mar. 2015, *Juengprayoon 228* (**BKF**, **PSU**); 9 Oct. 2015, *Juengprayoon 592*, *593*, *594*, *595*, *596* (**BKF**, **PSU**); Mueang Phangnga, Sa Nang Manora Forest Park, 11 Oct. 2015, *Juengprayoon 600*, *601* (**BKF**, **PSU**)]; Trang [Khao Chetyot Mt., 2 May 2014, *Chantanaorrapint & Promma 3789D* (**PSU**); *Juengprayoon 161*, *162*, *163*, *164*, *165*, *166* (**BKF**, **PSU**); 3 May 2014, *Juengprayoon 171* (**BKF**, **PSU**)]; Yala [Betong, Ban Chulabhorn Pattana 10, 3 July 2014, *Juengprayoon 181*, *182* (**BKF**, **PSU**)]; Narathiwat [Waeng, Hala-Bala Wildlife Research Station, 2 Jan. 2016, *Juengprayoon 694* (**BKF**, **PSU**)].

Distribution.— Widespread in tropical Asia and the Pacific including Thailand, Vietnam, Laos, Malaysia, Indonesia (Sumatra, Java, Boneo), Philippines. New Guinea, New Caledonia, Fiji and northern Queensland (Bartlett & Iwatsuki, 1985; Pócs, 2007; Pressel & Duckett, 2009).

Habitat and ecology.— In Thailand, *E. tjibodensis* were found growing associated with the members of Lejeuneaceae and *Radula* spp., on living leaves or sometimes on twigs in lowland to montane forests, between 50 and 1700 m altitude.

Ephemeropsis tjibodensis is characterized by the presence of bristles or vertical spines on a well-developed protonema, the occurring of fusiform gemmae, and the smooth setae. In contrast, the protonema of *E. trentepohlioides* has no vertical spines, and produces globose gemmae. Moreover, its setae are slightly scabrous (Bartlett & Iwatsuki, 1985).

Based on geographical localities from field surveys, herbarium specimens, and data from published literature (Dixon, 1932, 1935; Akiyama *et al.*, 2011; Pócs & Podani, 2015), the peninsular region of the country exhibits a great diversity of species (Fig. 3).

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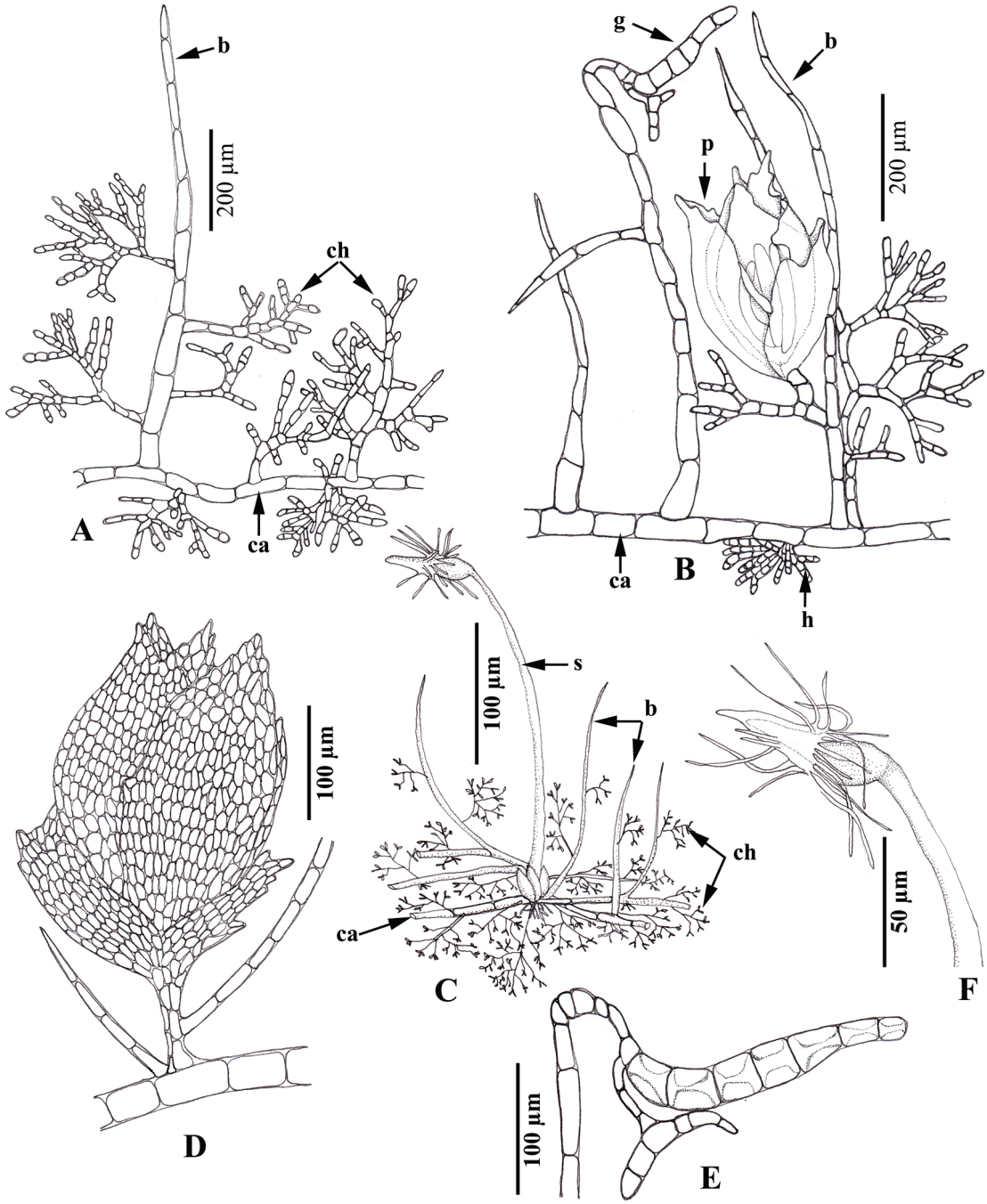

Figure 1. *Ephemeropsis tjibodensis* K.I.Goebel. A. Protonema showing caulonema (ca) or main axis, chloronema (ch) filaments, and bristle (b) or ventral spine; B. Protonema with gemma (g), perigonium (p), and heptera (h); C. Protonema with sporophyte (s); D. Capsule with calyptra; E. Perigonium (andoecium); F. Gemma. All from *Juengprayoon 228* (BKF, PSU). Drawn by W. Juengprayoon.

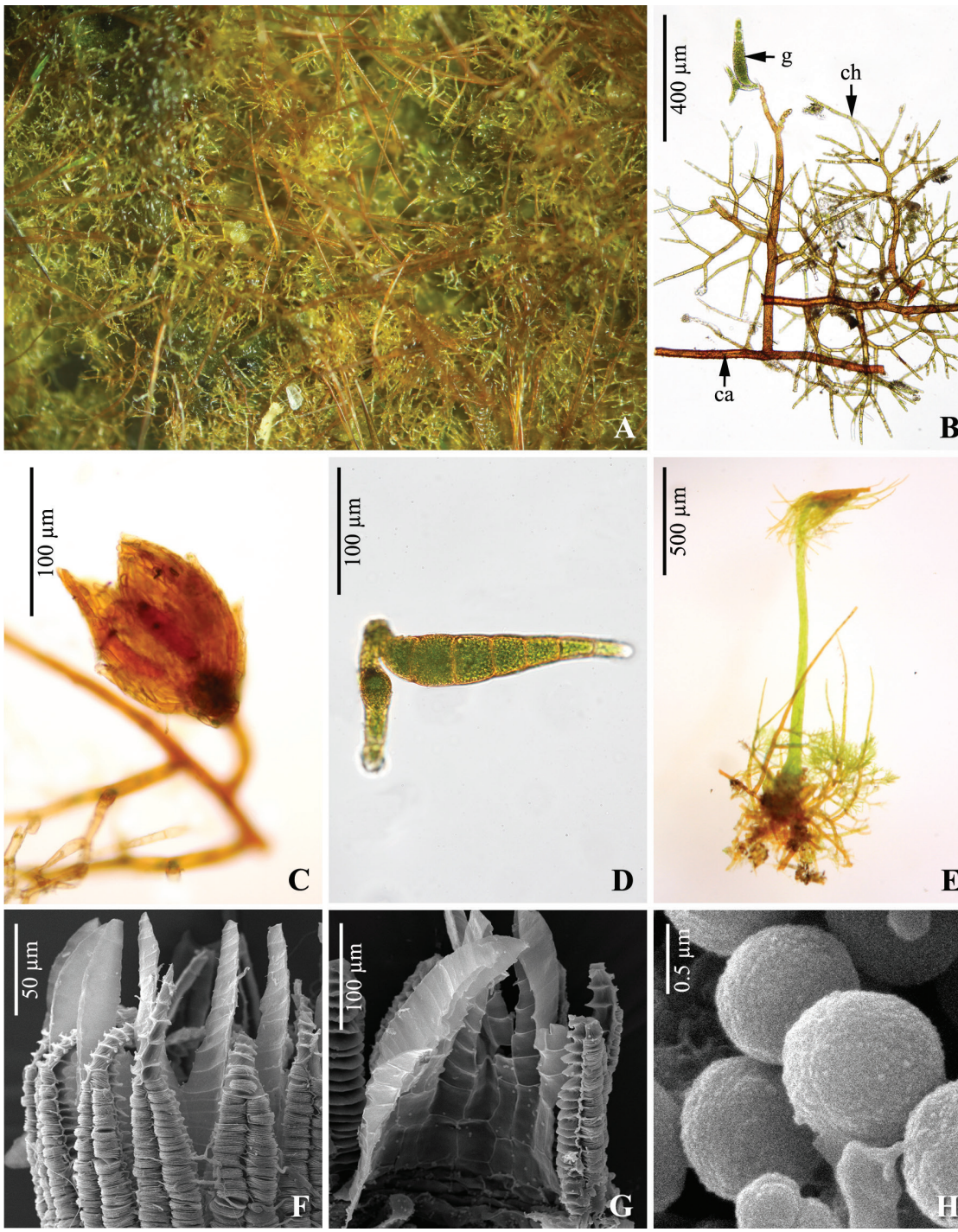

Figure 2. Light (LM) and scanning electron micrographs (SEM) of *Ephemeropsis tjibodensis* K.I.Goebel. A. Habit; B. Protonemata showing caulonema (ca), chloronema (ch), and gemma (g); C. Perigonium; D. Gemma; E. Sporophyte; F–G. SEM micrographs of peristome, F. Exostome, G. Endostome; H. Spores. Photographed by W. Juengprayoon.

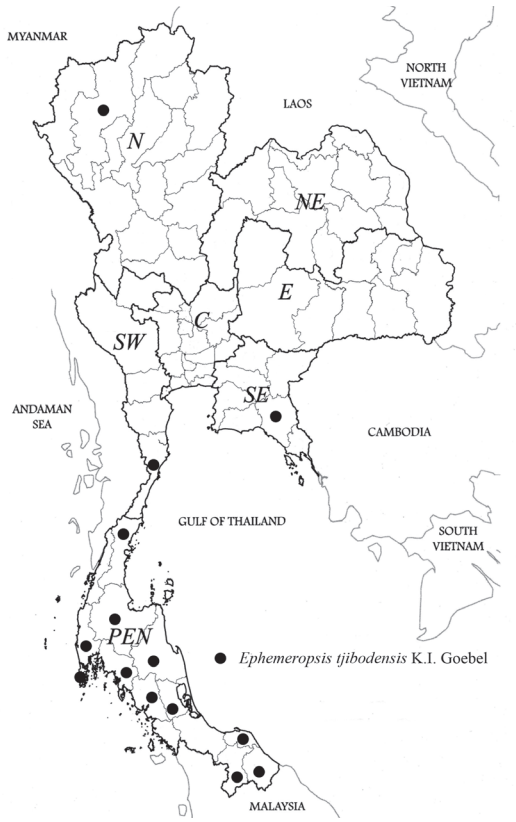

Figure 3. Distribution of *Ephemeropsis tjibodensis* K.I.Goebel in Thailand. Thai Floristic regions: N= Northern, NE= North-Eastern, E= Eastern, SE= South-Eastern, C= Central, SW= South-Western, PEN= Peninsular.

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