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Aeschynanthus reiekensis, a new species of Gesneriaceae from Mizoram, Northeast India

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ABSTRACT: A new species of Gesneriaceae, *Aeschynanthus reiekensis* is described and illustrated from the Mizoram state of Northeast India. It closely resembles *A. tengchungensis* W.T.Wang in having leathery, linear leaves and axillary to pseudoterminal inflorescences, but differs by its calyx characters, number of flowers per inflorescence, size of pistil and capsule and in the number of seed hilar appendages. It is also compared with two other closely allied species, *A. angustissimus* (W.T. Wang) W.T. Wang and *A. hookeri* C. B. Clarke which differs in having smaller size bracts, strongly oblique corolla mouth and tuft of hair being present inside the corolla. The pollen grains of the newly described species are monads, isopolar, small in size, prolate, circular to subangular amb and tricolporate with the exine microreticulate ornamentation. Based on the present data, the new species is provisionally assessed here as Critically Endangered (CR), according to IUCN Red List Categories and Criteria.

KEY WORDS: *Aeschynanthus angustissimus, Aeschynanthus hookeri*, *Aeschynanthus tengchungensis,* Indo-Burma Hotspot.

INTRODUCTION

Aeschynanthus Jack, commonly known as lipstick plant is a genus coming under the Gesneriaceae (subfamily Didymocarpoideae, tribe Trichosporeae, subtribe Didymocarpinae; Weber *et al*., 2013) with approximately 174 species. The genus includes mainly tropical or subtropical evergreen epiphytic herbs and shrubs, and rarely as lithophytes (Weber, 2004; GRC, 2022). *Aeschynanthus* is mainly distributed in India, southern and southwestern China, New Guinea, Solomon Islands and other Southeast Asian regions (Weber *et al*., 2013; Middleton, 2016).

In India, *Aeschynanthus* is mainly confined to eastern Himalayan region, with a few species reported from southern India and the Andaman Islands (Bhattacharyya and Goel, 2014).The first comprehensive treatment of the genus in India was given by Clarke (1884) in the *The Flora of British India* and reported 23 species. Although, Bhattacharyya and Goel (2014) reported 26 species from India, many species were subsequently treated as synonyms by Middleton (2007, 2009). Sinha and Datta (2016) reported 16 species from the Northeast India including two new additions, *A. angustioblongus* W.T.Wang (Wang, 1975) and *A. philippinensis* C.B. Clarke (Clarke, 1883). Möller *et al*. (2017) mentioned a total report of 18 species of *Aeschynanthus* from the Northeast India and even indicated the requirement of additional work in this genus from India. Taram and Borah (2021) recorded *A. lineatus* Craib (Craib, 1913) from Arunachal Pradesh, as a new addition to the Indian flora.

Being a part of Northeast India and the Indo-Burma hotspot, the Mizoram state has a rich biodiversity. In "Flora of Mizoram", Sinha (2012) reported nine species of *Aeschynanthus* from the state viz., *A. acuminatus* Wall. ex A.DC. (Candolle, 1845), *A. gracilis* Parish ex C.B.Clarke (Clarke, 1874), *A. maculatus* Lindl. (Lindley, 1841), *A. mannii* Kurz ex C.B.Clarke (Clarke, 1883), *A. masoniae* Kurz ex C.B.Clarke (Clarke, 1883), *A. parasiticus* (Roxb.) Wall. (Wallich, 1829), *A. parviflorus* (D.Don) Spreng. (Sprengel, 1827), *A. sikkimensis* (C.B.Clarke) Stapf. (Stapf, 1922) and *A. superbus* C.B.Clarke (Clarke, 1874). As a part of the ongoing revisionary study on the family Gesneriaceae of Mizoram state, authors from the Mizoram University (ML, SDK & SDY) across an interesting specimen of *Aeschynanthus* from Reiek Tlang in Mamit district of Mizoram. Concomitantly, the authors from the University of Calicut, Kerala (AMK & SN) visited the same locality as a part of the ongoing revision of Indian *Aeschynanthus*, and met with similar materials. Even though these specimens look very similar to *A. tengchungensis* W.T.Wang (Wang, 1984) and *A. angustissimus* (W.T.Wang) W.T.Wang (Wang, 1981), critical analysis of morphological characters and scrutiny of relevant literature and herbarium specimens in 10 herbaria including the digital ones revealed that they represent a hither to undescribed species, which is described and illustrated here as *A. reiekensis*.

MATERIALS AND METHODS

Specimens of *Aeschynanthus* were collected during extensive field surveys in different locations in Mizoram, including Reiek Tlang from 2018 to 2021 (Fig. 1). Relevant literature (Wang *et al*., 1998; Mendum, 1998, 1999, 2001; Mendum *et al*., 2001, 2006; Christie and

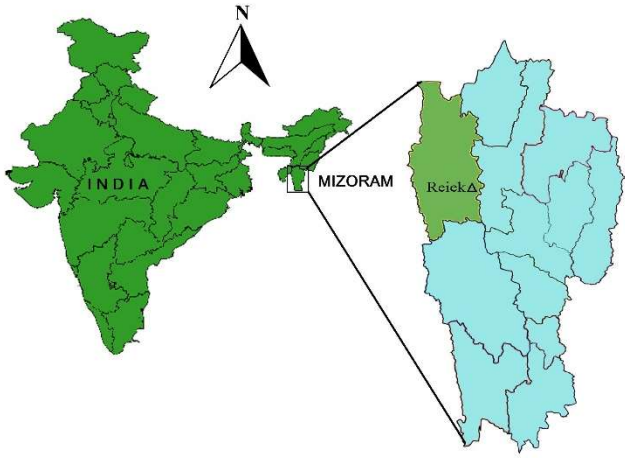

Fig. 1. Map of India showing the state of Mizoram and Mamit District with location of collection site of ***Aeschynanthus reiekensis*** M.Lalhlupuii, S.D.Khomdram & S.D.Yumkham

Mendum, 2002; Middleton, 2007, 2009, 2016; Sinha *et al*., 2012; Bhattacharyya and Goel, 2015; Sinha and Datta, 2016; Olimpos and Mansibang, 2021) including types and protologue of morphologically most similar species available in various herbaria (ARUN, ASSAM, BSHC, CAL, CALI, NEHU, E, K, NY, PE) were consulted to assess the existing recorded species, and for confirming the novelty of the species. Voucher specimens were deposited at ASSAM (Botanical Survey of India, Shillong), MZUH (Mizoram University Herbarium), MUMP (Manipur University Museum of Plants) and CALI (Calicut University Herbarium). The conservation status was assessed as per IUCN Red List Categories and Criteria (2022).

Microphotographs were taken by using LED–USB digital microscope (Cooling Tech, Jiangsu, China), DSC–W610 digital camera (Sony, Tokyo, Japan) and D5300DSLR camera (Nikon, Tokyo, Japan). Palynological studies were done from fresh pollens (Schlag-Edler and Kiehn, 2001). The sizes of pollen grains were expressed as Polar axis (P) × Equatorial axis (E) in micrometre (µm). Terminology given by Punt *et al*. (2007) and Halbritter *et al*. (2018) are used to describe the characters of pollens. For the micromorphological studies, seeds and pollen grains were dehydrated, critical point dried and mounted onto stubs coated with gold. The images were taken using field emission scanning electron microscope (JEOL, Freising, Germany).

TAXONOMIC TREATMENT

Aeschynanthus reiekensis M.Lalhlupuii, S.D.Khomdram & S.D.Yumkham ***sp. nov***.

Figs. 2–4

Type: INDIA. Mizoram, Mamit District, Reiek Tlang,23°40′58.2″ N 92°36′22.0″ E,1391.70 m elevation, 17 July 2018, *Margaret Lalhlupuii 128821* (holotype, ASSAM!; isotype, 0000512, MZUH!; isotype,000999, MUMP!).

Diagnosis: *Aeschynanthus reiekensis* can be easily distinguished from the morphologically most similar *A. tengchungensis,* in having fewer number of flowers per inflorescence (1–3), five-lobed calyx which are free or sometimes fused at base, tufts of hairs inside near the base of corolla tube, smaller capsules (23 cm long) and 2–4 seed hilar appendages. *A. reiekensis* also differs from the other two allied species, *A. angustissimus* and *A. hookeri* in having smaller bracts (c. 2 × 1 cm), strongly oblique corolla, and presence of tuft of glandular multicellular hairs inside the corolla.

Description: Epiphytic sub-shrubs, pendulous and branched. Stems 11 to 50 cm long, glabrous, smooth, rounded, green with a purple tinge when young, become straw coloured when old; nodes 3 to 8 in each branchlets, swollen; leaf scars prominent; internodes 2–4 cm long. Leaves opposite; petiole 4–8 mm long, glabrous; leaf blade 8–13 × 0.3–0.6 cm, linear, coriaceous, green above, pale beneath with vinaceous dots, glabrous, acuminate at apex, cuneate at base, entire to sub-entire at margins, sometimes recurved back and revolute when drying; midrib slightly sunken, lateral veins obscure. Cymes axillary, pseudo-terminal, 1–3 flowered; peduncle absent. Bracts 2, 2 × 1 mm, triangular, maroon, glabrous. Pedicels 0.8–1.6 cm long, green at base, maroon towards apex, glabrous. Calyx lobes 3–7 × 1–13 mm, lobes free or sometimes slightly fused of calyx tube (1.5–2.5 mm) at base, narrowly triangular to linear, glabrous, green flushed with maroon, acute-acuminate at apex, entire at margins. Corolla 2–2.9 cm long, tubular, strongly oblique mouth, inflated at middle; tube *c.* 1 mm broad at base, gradually widened towards the throat with 5–6 mm, orange to red, whitish yellow at base, sparsely to densely glandular puberulent except at base, yellow to pale red with a tuft of multicellular glandular hairs just above the base internally; lobes yellowish-orange to orange, arched with red on the rim internally, with a claret streak running down on the lower lobes, upper lobes unstreaked, each lobe *c*. 3 × 4 mm, not spreading or reflexed. Stamens 4, exserted at anthesis; anthers fused in 2 pairs, 1.5–3 × *c*.1 mm, purple or grey; pollen grey; anterior filament 3–3.3 cm long, inserted at 5–7 mm from corolla base; posterior filaments 2.5–2.8 cm long, inserted at 6–8 mm from corolla base; white at base and light purple higher up, glandular hairy. Staminode 1, *c*. 1 mm long. Disk 1–2 mm high, 5-crenate. Pistil 2–4.1 cm long; stipe 1–2 mm long, glabrous; ovary 0.5–1.5 cm long, linear, white to greenish white, glabrous, with sessile glands or minutely papillose; style 0.8–2 cm long, white, sparsely to densely glandular pubescent; stigma capitate, pink or purple, *c.* 2 mm across. Capsules 10–23 cm. Seeds 25–30 × 0.5–0.6 mm, apical appendage 1, 3.2–3.5 cm long, hilar appendages 2–4, 2.7–2.9 cm long; testa cells with straight orientation, strongly papillose; papilla 25–30 µm high.

Pollen grains: Monad; isopolar; small 17–19 µm × 10–12 µm; circular to subangular amb; prolate (P/E ratio

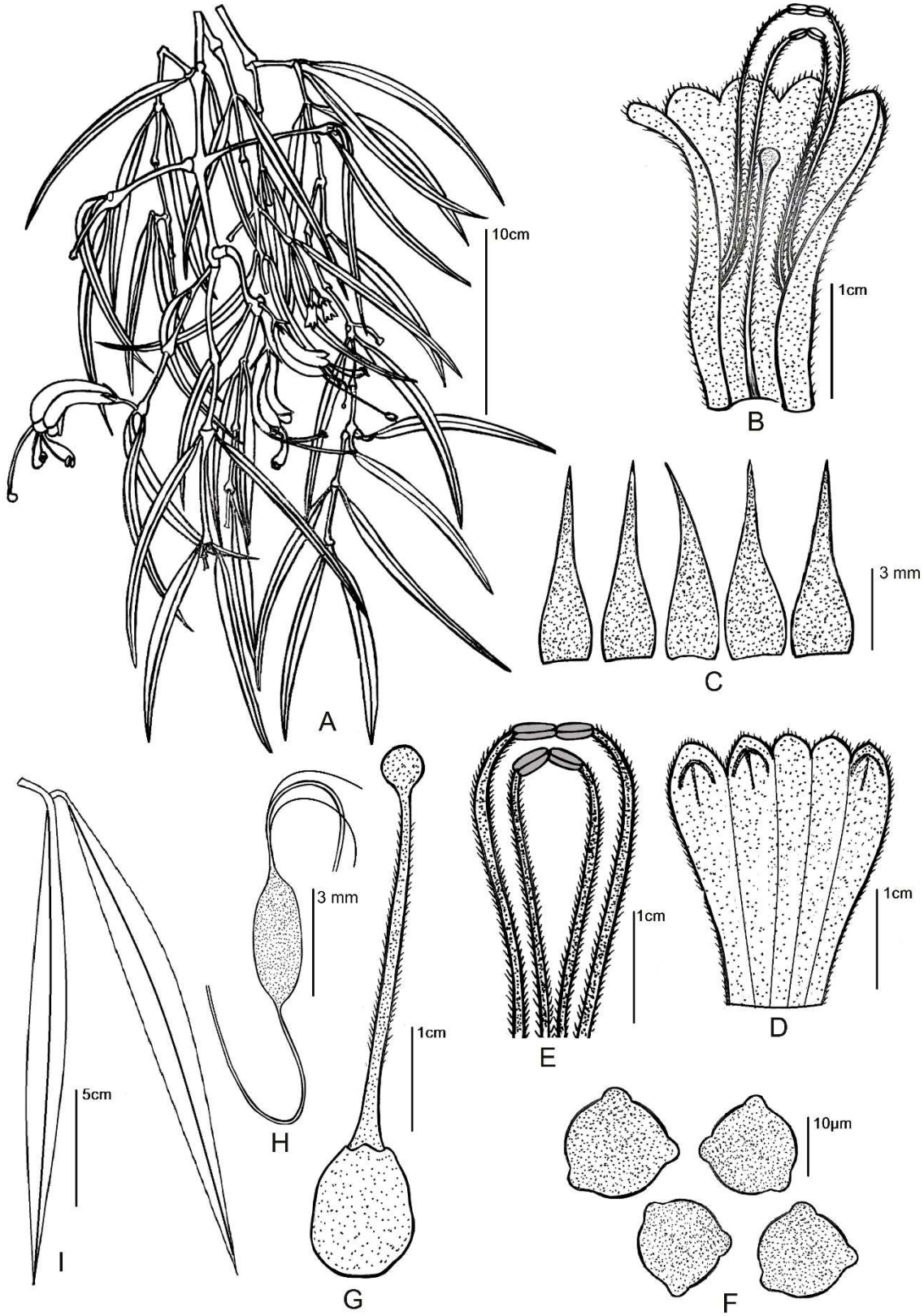

Fig. 2. ***Aeschynanthus reiekensis*** M.Lalhlupuii, S.D.Khomdram & S.D.Yumkham **A.** Flowering twig; **B.** Flower opened; **C.** Calyx; **D.** Opened corolla showing streaks; **E.** Stamens showing hairs with fused anthers; **F.** Pollen (polar view); **G.** Gynoecium with hairy style; **H.** Seeds showing apical and hilar appendages; **I.** Opened capsule.

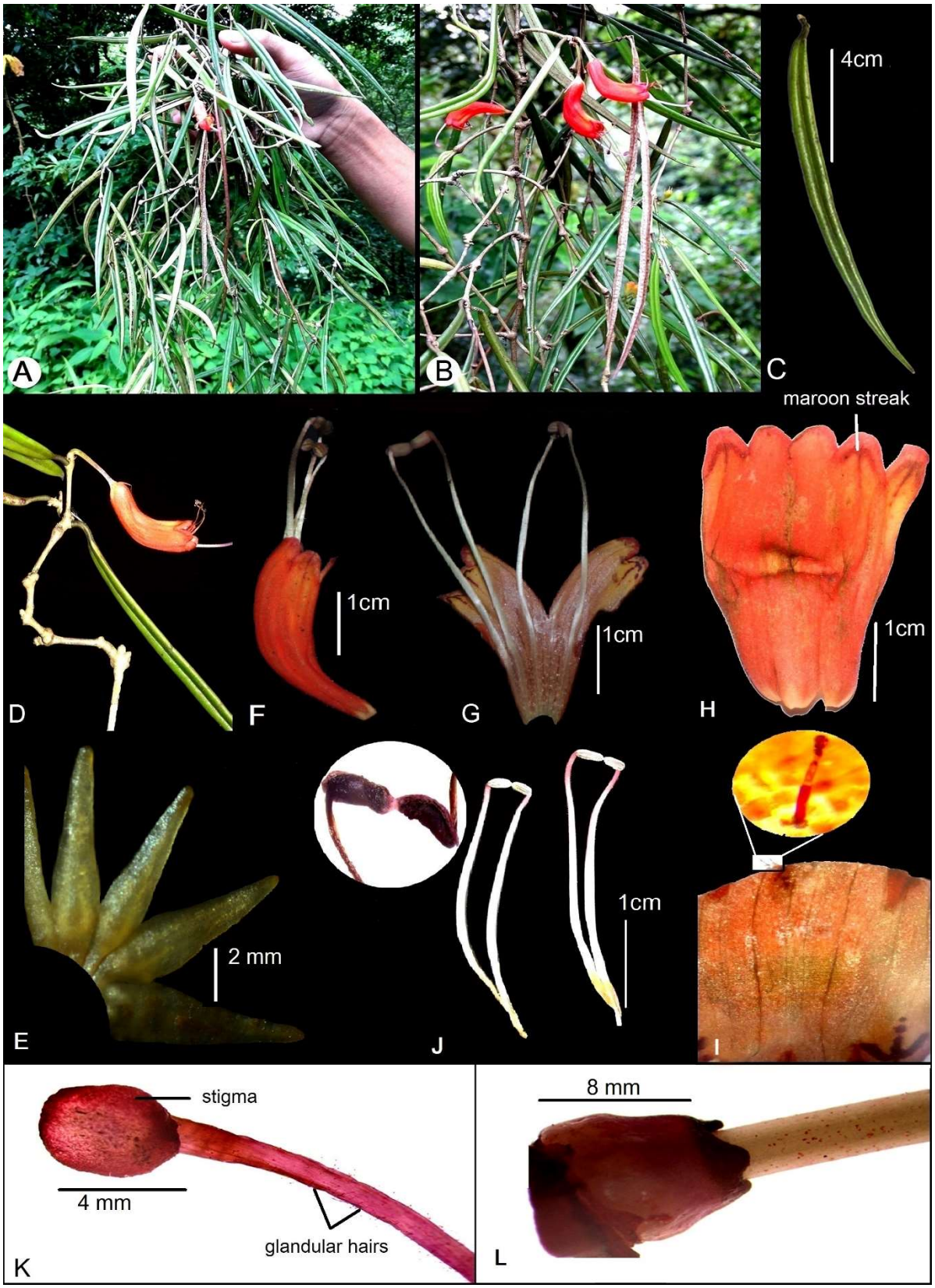

Fig. 3. ***Aeschynanthus reiekensis*** M.Lalhlupuii, S.D.Khomdram & S.D.Yumkham **A-B.** Habit; **C.** Leaf; **D.** Flowering twig; **E.** Calyx; **F.** Mature Flower **G.** Fully opened flower; **H.** Opened corolla showing maroon streaks; **I.** Inner corolla base showing glandular hairs; **J.** Stamen pairs showing fused anthers; **K.** Part of pistil showing glandular hairs on style; **L.** Ovary.

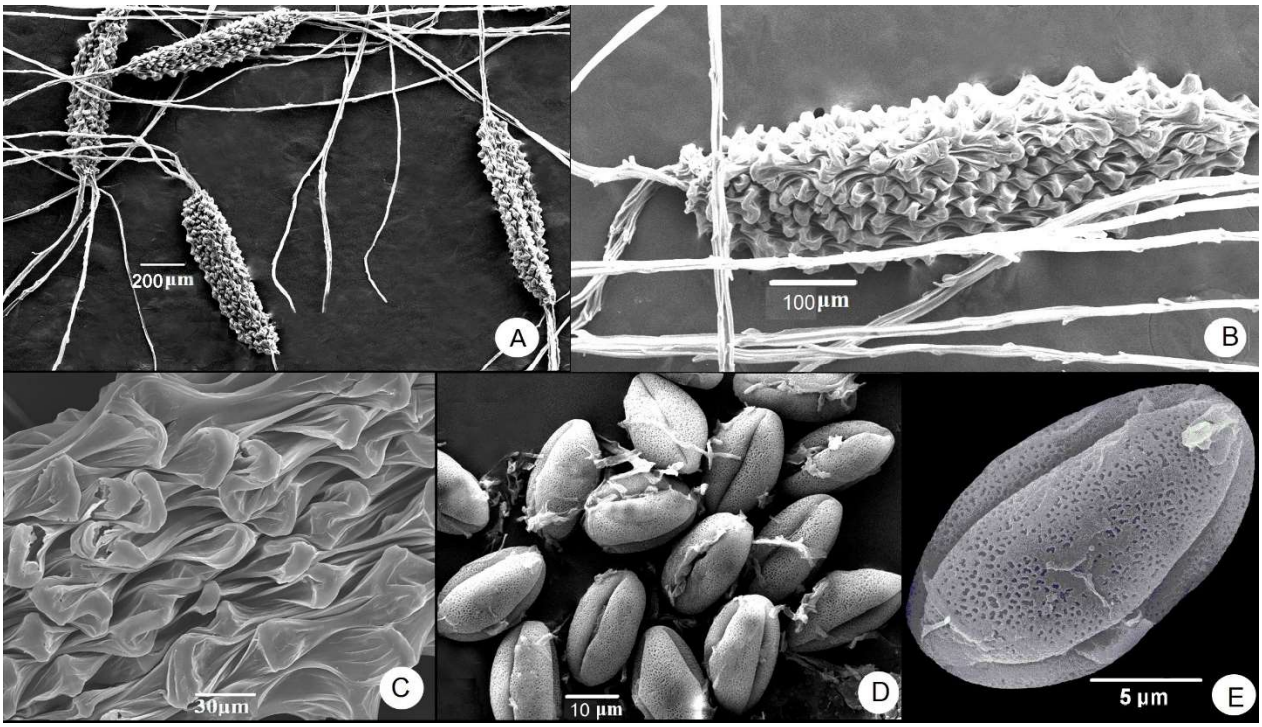

Fig. 4. SEM photograph of ***Aeschynanthus reiekensis*** M.Lalhlupuii, S.D.Khomdram & S.D.Yumkham, sp. nov.; **A.** Seeds with apical and hilar appendages; **B.** Enlarged seed; **C.** Seed testa; **D.** Pollen grains (equatorial view); **E.** Enlarged pollen grain (equatorial view).

between 1.4–1.9); tricolporate; ectoaperture long and tapering; exine microreticulate.

Distribution: So far collected only from the type locality, Reiek Tlang.

Habitat and ecology: Reiek Tlang is a part of community protected forest and a tourist spot located in the Northwest of Mizoram state in Mamit district. It covers an area of 25 km^2 and is situated about 29 km from Aizawl. The area is part of tropical wet semi-evergreen forest, with an average altitude of 900 m above sea level. The rainfall averages between 200–250 cm annually and the temperature varies between 20°C to 28°C. In Mizoram, epiphytes represent about 10.56% of the total recorded plants (Lalzarzovi and Lalnuntluanga, 2017). A small population of *A. reiekensis* was growing at altitudes between 1288–1391.70 m above sea level, as an epiphyte on *Castanopsis tribuloides* (Sm.) A.DC. (Fagaceae) which is locally known as *Thingsia*.

Phenology*:* Flowering from July to November and fruiting from September to December.

Vernacular name: In Mizo language, *Aeschynanthus* are commonly known as '*Hnahchhah'* which means 'thick leaf'.

Etymology*:* The species is named after the type locality '*Reiek'* which is a famous mountainous tourist spot located in Mizoram state (Northeast India).

Conservation status: The species is collected from the type locality at Reiek Tlang (Mamit district) located at Reiek forest, a part of community protected forest zone in Mizoram. The area was surveyed for more than three years and we found a population of few plants growing as epiphytes on the host tree, *Castanopsis tribuloides* (Sm.) A.DC. The area of occupancy is assumed to be less than 10 km^2. The collection site is one of the most important tourist destinations in the state, very near to Aizawl city (*c.* 29 km) and hence several developmental activities are expected in this area in the future. Further surveys in other likely areas are required to estimate the extended occurrence of the new species. Based on the available data, it is provisionally assessed here as Critically Endangered (CR) according to the criteria B2ab (ii, iii) c (ii, iii); D of IUCN Red List Categories and Criteria (IUCN 2022).

Additional specimens examined: ***Aeschynanthus reiekensis*** M.Lalhlupuii, S.D.Khomdram & S.D.Yumkham**:** INDIA, **Mizoram**, Mamit district, Reiek Tlang, 23°41′04.2″ N, 92°36′23.5″E, 1288 m, 02 October 2021, *M.K. Akhil*, *Krishnapriya M.P.*, *Harishma K.H.*, *Santhosh Nampy 186431* (CALI!). ***Aeschynanthus angustissimus*** (W.T. Wang) W.T.Wang: **CHINA**. **Medog Xian**, 3 Aug 1974, *Qinghai Xizang Expedition 3948* (E00062760, E00062761 digital image!). ***Aeschynanthus hookeri*** C.B.Clarke: **INDIA**. **Arunachal Pradesh**, Nongpoh, 13 March 1932, *R. Sharma 9934* (ASSAM). **Manipur**, Senapati, above Liye village, 2460m, 2 June 2005, *A. A. Mao 109095* (ASSAM). **Meghalaya**, Khasia–Jaintia hills, 31 May 1965, *N. P. Balakrishnan* 42257 (ASSAM). **Nagaland**, Banraw forest, 342 m, 7 February 1999, *A.A. Mao 101982* (ASSAM). ***Aeschynanthus tengchungensis*** W.T.Wang: **CHINA**. **N.W. Yunnan**, 2134 m June 1924, *George Forrest 24499* (E00087190 digital image!).

Notes: The presence of tufts of multicellular glandular hairs inside the lower half of the corolla tube is a key character to distinguish one of the widespread species *Aeschynanthus parasiticus* (Roxb.) Wall. Middleton (2009)

Table 1. Comparison of diagnostic characters of ***Aeschynanthus reiekensis***, ***A. tengchungensis***, ***A. hookeri*** and ***A. angustissimus***.

Characters	*A. reiekensis*	*A. tengchungensis*	*A. hookeri*	*A. angustissimus*
Stem	Nodal knots prominent, grows in zig-zag manner	Nodal knots not prominent, grows slightly in zig-zag manner	Nodal knots and zig-zag growth absent	Nodal knots not prominent and zig-zag growth absent
Leaves	8–13 × 0.4–0.6cm; leaf blade linear	17–23 × 0.8–3cm; leaf blade linear to narrowly oblanceolate or narrowly elliptic	7–9 × 2.3–4 cm; leaf blade narrowly elliptic to oblong	6.5–12.2 × 0.4–0.7 cm; leaf blade linear to narrowly oblanceolate
Petiole	4–8 mm	5–10 mm	6–10 mm	2–3 mm
No. of flowers per cyme	1–3	1–14	4–10	1–4
Bract	Maroon, 2 × 1 mm	Green tinged purple, 5 × 2 mm	Green, 5–9 × 1.5–3 mm	Red, 16–18 × 5–8mm
Peduncle	Absent	Absent	Absent	5.2–10 cm
Pedicel	8–16 mm, glabrous	3–6 mm, puberulent	10–15 mm, glabrous	8–18 mm, glabrous
Calyx	0.4–0.7 cm, green flushed with maroon, both surfaces glabrous, 5-lobed throughout the length	0.5 cm, green tinged purple, outside sparsely puberulent, 5-lobed from above to middle	1–1.3 cm, red or purple, outside glabrous, 5-lobed from above to middle	1.2–1.8 cm, red, outside glabrous, 5-lobed from base
Corolla	Orange to red, 2–2.9 cm long, inside with tuft of hairs	Red, 2.4–3.4 cm long, inside without tuft of hairs	Scarlet to orange-scarlet, 2.5–3 cm, inside without tuft of hairs	Red, upto 3.2 cm long, inside without tuft of hairs
Corolla mouth	Strongly oblique	Not oblique	Slightly oblique	Not oblique
Stamen	Filament 2.5–2.8 cm long, anther (1.5–3) mm	Filament 1.5–2 cm long, anther (1–1.5) mm	Filament 2.6–3 cm long, (2.5–3) mm	Filament 1.2–1.5 cm long, anther c. 2 mm
Capsule	Upto 10–23 cm long	Upto 20–30 cm long	Upto 27–30 cm long	Upto 4.8–7 cm long
Seed hilar appendages	2–4	2	2	Not available

synonymized *A. andamanensis* Goel, Vasudeva Rao and Mehrotra, *A. deleiensis* C.E.C.Fisch, *A. dolicanthus* W.T.Wang and *A. pachytrichus* W.T.Wang under *A. parasiticus* based on the above character. The new species also has this type of hair inside the corolla tube, but the linear narrow leaves, small triangular bracts, free or slightly fused calyx, corolla lobes without any external marks distinguishes it from *A. parasiticus.* The newly described species is morphologically allied to *Aeschynanthus tengchungensis* W.T.Wang, *A. angustissimus* (W.T. Wang) W.T. Wang and *A. hookeri* C. B. Clarke with their comparison given in Table 1.

Pollen characters like shape, size, pattern of exine sculpturing and apertures in *Aeschynanthus* are important in species delineation (Yan *et al*., 1997). According to Palee *et al*. (2003), pollens in *Aeschynanthus* are spheroidal, tricolpate or tricolporate/tricolporoidate (strongly developed colpus with weak porate) with long apertures. However, in *A. reiekensis*, the P/E ratio ranges between 1.4–1.9 showing prolate shape, tricolporate with long-tapering ectoapertures and exine with microreticulate tectum which is found to be similar with *A. fulgens* Wall. ex R.Br. as reported by Li *et al*. (2020).

The seeds of *A. reiekensis* have straight testa cell orientation and the papillae are formed from the raised ends of two adjacent cells. According to Mendum *et al*. (2001), based on the nature of seeds, it can be placed under the Type B category. Mendum *et al*. (2001) further recognized three sub types based on the nature of hilar appendages, namely, B1 (seeds with single hilar appendage), B2 (seeds with two hilar appendages) and B3 (seeds with a coma of 5–60 hilar appendages). Our species is quite distinct in having 2–4 hilar appendages and does not fit into any of the existing sections of *Aeschynanthus*.

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