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Rediscovery of *Elatostema ellipticum* (Urticaceae) after 150 years in Arunachal Pradesh, India

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Keywords: critically endangered (CR), Eastern Himalaya, endemic species, holotype, Mishmi Hills, riparian habitat.

Summary. The rare, monoecious, sub-ascending herb *Elatostema ellipticum* (Urticaceae), originally described by Weddell in 1869, has been re-collected from the Mishmi Hills, Arunachal Pradesh, India, in 2018 after an interval of over 150 years. This rediscovery confirms the species' existence and its endemic status in the region. This information rectifies a historical error regarding the species' type locality, confirming the correct origin and contradicting previous, erroneous attributions to Bangladesh, even though the holotype (K000741065) is housed at Kew. Morphological examination of the plant shows a strong match to the protologue and type material, highlighting diagnostic features like its succulent stems, narrowly elliptic leaves with finely serrulate margins, and distinctive linear-lanceolate, caducous stipules. Ecologically, *E. ellipticum* is restricted to the humid, shaded understory of subtropical riparian forests between 1200–1400 m a. s. l., requiring persistently moist, rocky substrates along streams in the Eastern Himalayas. Its known distribution is highly restricted to a single locality in the Upper Dibang Valley, where only 42 mature individuals were recently recorded. Given its extreme rarity, localized existence, and specific microhabitat requirements, the species likely qualifies as critically endangered (CR) under IUCN criteria, warranting urgent conservation attention, long-term in situ monitoring, and protective measures for its specialized riparian habitat.

Повторное открытие *Elatostema ellipticum* (Urticaceae) спустя 150 лет в Аруначал-Прадеше, Индия

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Ключевые слова: Восточные Гималаи, голотип, находящийся под критической угрозой исчезновения (CR), прибрежная зона обитания, холмы Мишми, эндемичный вид.

Аннотация. Однодомное полувосходящее травянистое растение *Elatostema ellipticum* (Urticaceae), первоначально описанное Уэдделлом в 1869 г., было вновь обнаружено в горах Мишми, Аруначал-Прадеш, Индия, в 2018 г. после более чем 150-летнего перерыва. Повторное открытие подтверждает существование вида и его эндемичный статус в регионе, а также исправляет историческую ошибку относительно типового местонахождения вида, уточняя происхождение и опровергая предыдущие неверные отнесения к Бангладеш, несмотря на то, что голотип (K000741065) находится в Кью. Морфологическое исследование растения показывает соответствие протологу и типовому материалу, подчёркивая такие диагностические признаки, как его сочные стебли, узкоэллиптические листья с мелкозубчатыми краями и отличительные линейно-ланцетные, рано опадающие

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прилистники. *Elatostema ellipticum* обитает во влажном, затенённом подлеске субтропических прибрежных лесов на высоте 1200–1400 м над ур. м., требуя постоянно влажных каменистых субстратов вдоль ручьёв в Восточных Гималаях. Известное распространение вида ограничено одним участком в верхней долине реки Дибанг, где недавно были зарегистрированы всего 42 зрелые особи. Учитывая его крайнюю редкость, локальное распространение и особые требования к микросреде обитания, этот вид, вероятно, относится к категории «находящихся под критической угрозой исчезновения» (CR) по критериям МСОП, что требует неотложных мер по охране, долгосрочного мониторинга *in situ* и мер защиты его специализированной прибрежной среды обитания.

Introduction

The family Urticaceae, commonly referred to as the nettle family, comprises approximately 54 genera and over 2500 species, with a predominantly tropical and subtropical distribution (Friis, 1993; Wu et al., 2013). Members of this family are typically herbs or small shrubs, often characterised by stinging hairs, unisexual flowers, and wind-pollinated inflorescences. The greatest diversity occurs in Southeast Asia and the Pacific Islands, although the family is represented globally (Friis, 1993; Wu et al., 2013).

Among the largest and most taxonomically complex genera within Urticaceae is *Elatostema* J. R. Forst. et G. Forst., which includes primarily herbaceous, shade-adapted species occupying moist, rocky, forested understorey habitats. The genus includes over 650 described species, although this number varies depending on taxonomic interpretation and whether traditionally segregated genera such as *Pellionia* Gaudich. are included (Tseng et al., 2019, 2025). Recent molecular phylogenetic studies have redefined *Elatostema* s. l., supporting its division into distinct clades such as *Elatostema* s. str., *Weddellia*, and *Pellionia*, all nested within the broader *Elatostema* complex (Tseng et al., 2019, 2025). These lineages are believed to have diverged during the Eocene (approx. 38–42 Mya), followed by significant diversification in subtropical Asia.

In India, species of *Elatostema* are primarily restricted to the Eastern Himalaya and the northeastern states notably Arunachal Pradesh, Assam, Sikkim, Meghalaya, Mizoram, and Tripura (Murti, Pusalkar, 2020, 2022). These species are typically habitat specialists, growing along shaded streams, rocky crevices, or mossy gorges. Due to their diminutive size, ecological specificity, and difficulty in accessing habitats, several species are underrepresented in herbaria, with many remaining poorly known or data deficient.

Notable Indian taxa include *Elatostema monandrum*, which ranges from the Eastern Himalaya to Sri Lanka and Southeast Asia (*Elatostema*, 2025); *E. papillosum*, widespread in Northeast India and Bangladesh; *E. dissectum* from Sikkim and Bhutan; *E. lineolatum*, recorded in Tripura and Meghalaya; and *E. cuneatum*, known from southern India (Murti, Pusalkar, 2020, 2022).

Elatostema ellipticum Wedd., a rare and historically obscure species, was originally described from the Mishmi Hills of Arunachal Pradesh by Weddell (1869) based on a specimen collected during the East India Company's botanical expeditions. The holotype (K000741065) is housed at the Royal Botanic Gardens, Kew. Interestingly, databases such as "Global Biodiversity Information Facility" (GBIF. URL: https://www.gbif.org/) and Kew's specimen portal have historically misattributed the type location to Bangladesh (GBIF record; Kew record). However, Murti and Pusalkar (2022) and herbarium records confirm that the type locality is correctly the Mishmi Hills of Arunachal Pradesh, India.

Materials and Methods

Field surveys were conducted in May 2018 in the Mishmi Hills, Arunachal Pradesh, India (N27.4890°, E95.8350°), focusing on shaded, moist riparian habitats between 1200–1600 m a. s. l. Specimens were collected, pressed, and deposited at Central National Herbarium, Botanical Survey of India, Howrah (CAL). Digital photographs were taken *in situ*. Morphological measurements were taken from both live and dried specimens. Diagnostic characters were compared against the original description by Weddell (1868) and the holotype at Kew Herbarium (K000741065). Key identification features included leaf shape, stipules, and inflorescence morphology.

Results

Elatostema ellipticum Wedd. 1869, in A. P. de Candolle, Prodr. 16(1): 186 (Fig. 1).

Herb sub-ascending, monoecious, 15–35 cm tall. Stems succulent, terete, green to reddish,

glabrous to sparsely pubescent, usually simple or sparsely branched apically; internodes elongate, exuding clear latex when injured. Leaves alternate, spirally arranged; lamina elliptic to narrowly elliptic, 4–8 × 1.5–3 cm, base cuneate to attenuate, apex acute to shortly acuminate, margins serrulate; both surfaces glabrous or sparsely puberulous; venation pinnate with 3–5 pairs of secondary veins, prominently raised beneath. Petiole 0.5–1.2 cm long, striate; stipules linear-lanceolate, 5–8 mm long, membranous, translucent, caducous. Inflorescences axillary, solitary. Staminate inflorescences capitate or shortly pedunculate, ca. 5 mm in diameter, subtended by involucral bracts; flowers with 3–4 free or slightly connate tepals, 3–4 stamens, filaments free, anthers dorsifixed. Pistillate inflorescences not seen.

Fig. 1. *Elatostema ellipticum* Wedd.: A – habit showing stems in shaded riparian habitat; B – close-up of staminate inflorescence showing involucral bracts and flowers; C – staminate capitula borne in axillary clusters. Scale bars: A = 3 cm; B = 1 cm.

Habitat and Ecology. *Elatostema ellipticum* is confined to the humid, shaded understory of subtropical riparian forests at elevations of 1200–1400 m in Arunachal Pradesh, India. It grows on perpetually moist, rocky substrates or along forest streams, where it benefits from high humidity, low light intensity, and stable microclimatic conditions. This microhabitat supports a rich assemblage of shade-tolerant and hygrophilous plant species. Common associates include ferns such as *Diplazium esculentum* and *Pteris wallichiana*, mosses and liverworts, and other understory herbs like *Impatiens* spp., *Begonia palmata*, and *Laportea terminalis*. These plant communities often indicate undisturbed forest conditions and high moisture availability.

Distribution. *Elatostema ellipticum* is endemic to Arunachal Pradesh, India. Originally known from the Mishmi Hills, which serves as the type locality, the species has a very limited range. It is now known from a single locality in the Upper Dibang Valley. Despite the discovery of 42 mature individuals recently recollected from the same region after 150 years, its distribution remains extremely restricted. Given its highly restricted distribution, currently limited to a single known locality in the Upper Dibang Valley, and its re-collection after more than a century, *E. ellipticum* should be prioritized for long-term *in situ* monitoring and habitat-specific conservation measures focused on preserving riparian forest integrity in the Eastern Himalayas.

Diagnostic Features. Distinguished from allied species by its narrowly elliptic leaves with cuneate bases and finely serrulate margins, as well as the glabrous or minutely pubescent stems and the characteristic stipules. It resembles *Elatostema lineolatum* but differs in having larger leaves and less branched stems.

Specimens Examined: "India, Arunachal Pradesh, Mishmi Hills. 1863. Griffith" (holo – K000741065); "India, Arunachal Pradesh, Upper Dibang Valley, near Punli, 28°40′04.2″N, 95°51′21.4″E; 1217 m a. s. l. 7 III 2018. U. L. Tiwari 40312" (CAL0000309291) (Fig. 2).

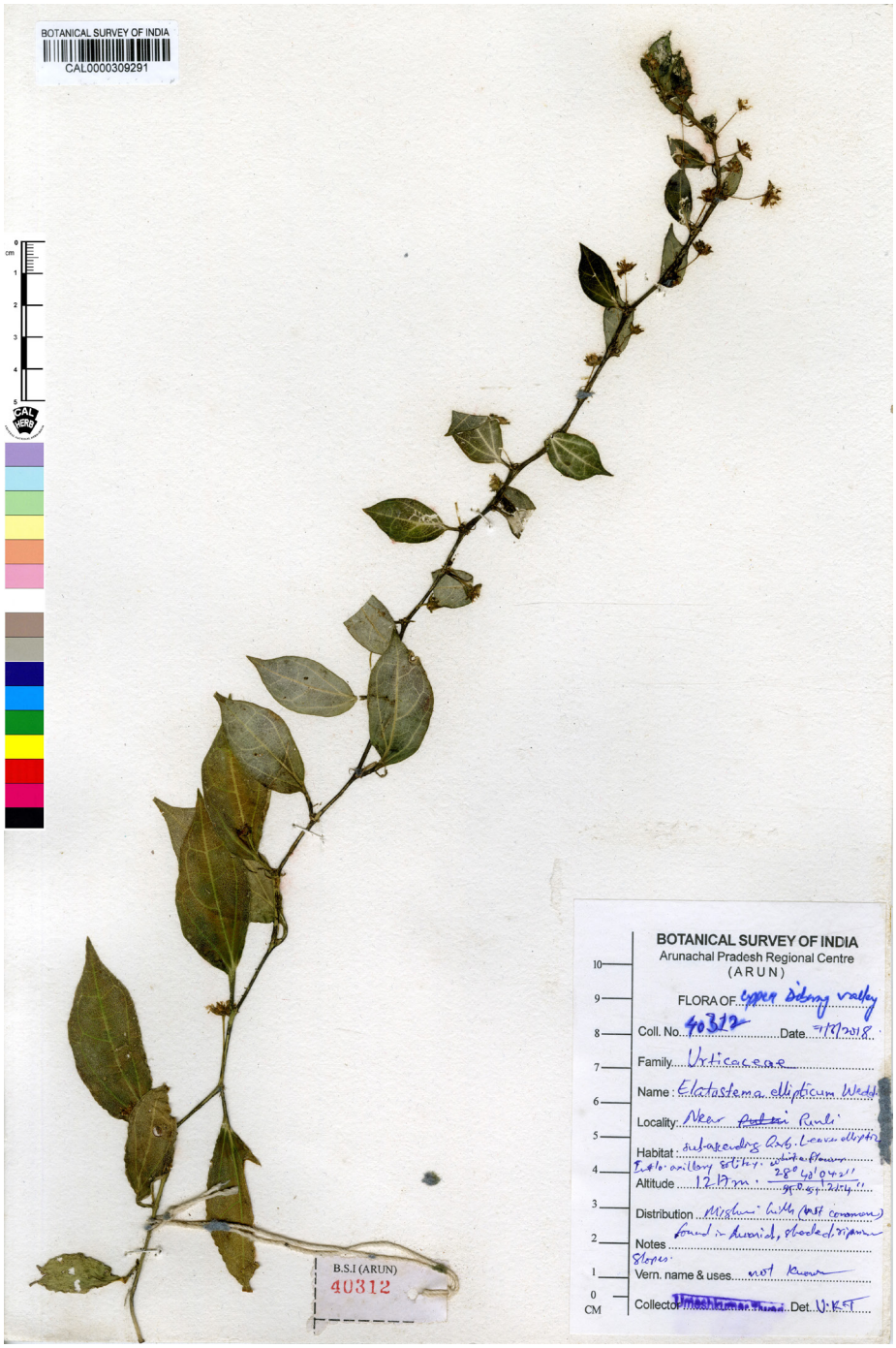

Fig. 2. Herbarium specimen of *Elatostema ellipticum* Wedd. (CAL0000309291).

Taxonomic key to closely allied species of *Elatostema* found in the region

1. Plants subshrubs or over 50 cm tall (to 200 cm) 2

+ Plants herbs, less than 50 cm tall 4

2. Plants 60–200 cm tall; stems glabrous or strigillose; leaves with entire to slightly crenate margin ..... ***E. integrifolium***

+ Plants 50–200 cm tall; stems densely strigose; leaves with dentate margins 3

3. Leaves oblong or obovate-oblong, both surfaces strigillose; cystoliths conspicuous or obscure .... ***E. lineolatum***

+ Leaves elliptic to oblanceolate, surfaces glabrous or sparsely strigillose; cystoliths dense ... ***E. parvum***

4. Plants very small, up to 5 cm tall; leaves rhombic-obovate; stem pubescent ..... ***E. cuneatum***

+ Plants usually > 5 cm tall; leaves not rhombic; stems glabrous or sparsely hairy 5

5. Leaves spirally arranged; stems succulent .... ***E. ellipticum***

+ Leaves spirally arranged; stems not succulent 6

6. Leaves usually opposite, leaf margin dentate or pinnatifid; stems pilose or furfuraceous ..... ***E. monandrum***

+ Leaves alternate, margin denticulate; stems glabrous; leaves falcate ..... ***E. hookerianum***

Discussion

The rediscovery of *E. ellipticum* confirms its continued existence in its historical range. Its persistence in moist, shaded habitats of the subtropical Eastern Himalaya highlights the ecological stability of such microrefugia. The absence of records for over a century may be attributed to limited botanical exploration in the region, the plant's cryptic nature, or its localized distribution.

Given its rarity and restricted range, *E. ellipticum* qualifies for re-evaluation under the IUCN Red List framework. Based on the current data it is classified as critically endangered under criterion B2ab(iii)(iv)(v), due to its extremely restricted area of occupancy (AOO), estimated to be less than 10 km^2. The species is known from only a single location and is subject to ongoing threats from habitat degradation and forest loss. It occurs in isolated patches of moist forest, which are continuing to decline in both extent and quality as a result of deforestation, agricultural expansion, and infrastructure development. These threats are ongoing and likely to intensify, placing the species at significant risk of extinction. Additionally, it qualifies under criterion D, as the total population is estimated to consist of fewer than 50 mature individuals.

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