



Elatostema rigidiusculum (Urticaceae), a new species endemic to Sri Lanka

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Abstract

Elatostema monandrum var. *rigidiusculum*, confined to the Bambarabotuwa Forest Reserve in Sabaragamuwa province of Sri Lanka, is reclassified to the rank of species as *E. rigidiusculum*. We compare it to the morphologically most similar, *E. monandrum*. The main diagnostic features of *E. rigidiusculum* are obovate leaves 0.3–1.5 cm long whose laminae are apically crenate, and the presence of sessile receptaculate involucre inflorescences in both sexes. The proposed IUCN conservation status of *E. rigidiusculum* is Critically Endangered (CR).

Keywords: Plant diversity, plant taxonomy, endemism, Flora of tropical Asia

Introduction

The genus *Elatostema* J.R. Forster & G. Forster. (1775: 53, Urticaceae) consists of 500 species distributed throughout the tropical and subtropical Africa, Asia and Oceania (Lin *et al.* 2011, Wang 2012). The generic delimitation of *Elatostema* with respect to *Elatostematoides* C.B. Robinson (Urticaceae, 1911: 497), *Pellionia* Gaudichaud (1830: 494) and *Procris* Commerson ex Jussieu (1789: 403) has been controversial but recent phylogenetic analyses demonstrate that *Elatostema* is a monophyletic group, distinct from *Elatostematoides* and *Procris*, which includes most species of *Pellionia* (Tseng *et al.* 2019). In Sri Lanka the genus includes four species and five to eight varieties (Hooker 1890, Murti 1996, Wadhwa 1999). All taxa inhabit the island moist evergreen forests at low and middle elevations.

Elatostema monandrum (Buchanan.-Hamilton ex D. Don) H. Hara (1975: 21) (= *Elatostema surculosum* Wight (1853:4)) is the most common species associated with stream networks in humid forests in Sri Lanka. It is also widely distributed in India, Nepal, Bhutan, Myanmar, Indochina Peninsula and western China (Murti 1996). This species is variable (Murti 1996, Wadhwa 1999) but remains inadequately studied.

Hooker (1890) described nine varieties under *E. surculosum* from Sri Lanka, India, Nepal and Bhutan including three endemic varieties from Sri Lanka. Later, Murti (1996) made eight new combinations for *E. surculosum* varieties including three Sri Lankan taxa, *E. monandrum* var. *rigidiusculum* (Hooker 1888:573) Murti (1996: 195) *E. monandrum* var. *serpens* (Hooker 1888:573) Murti (1996: 195) and *E. monandrum* var. *zeylanica* (Hooker 1888:573) Murti (1996: 195). Among them Wadhwa (1999) has accepted only var. *rigidiusculum* under *E. surculosum* in his enumeration of the family for Sri Lanka (Wadhwa, 1999). However, Lin (Lin *et al.* 2011) has determined Thwaites's specimen of *E. surculosum* var. *rigidiusculum*, housed at K (CP. 2182—K000741030), as a synonym of *E. monandrum*. Whilst Hooker (1890), Murti (1996) and Wadhwa (1999) all used a single specimen to designate the variety *rigidiusculum*, there are five of Thwaites's specimens collected in 1866 and which share the same collection number. Two of these are at K (K000741030 and K000741033), the others are at BR (BR00000542172), BM (BM001209773) and PDA. After ca 150 years a substantial number of mature individuals of *E. surculosum* var. *rigidiusculum* have been collected from the Bambarabotuwa Forest Reserve in Sri Lanka. After a comprehensive assessment of its macro and micro morphological characteristics we propose to reclassify this taxon to species level. Comparison of the diagnostic features of *E. rigidiusculum* and *E. monandrum* are given in Table 1.

TABLE 1. Comparison of diagnostic morphological features of *E. monandrum* and *E. rigidiusculum*.

Character	<i>E. monandrum</i>	<i>E. rigidiusculum</i>
Plant habit	Prostrate or ascending	Pendulous
Stem	Somewhat fleshy	Very fleshy
Branching	Few branching	Many branching
Stem length	5–35 cm	10–25 cm
Number of leaves	Few	Numerous
Length of normal leaf	1.5–7.5 cm	0.3–1.5 cm
Width of normal leaf	4–12 mm	0.2–0.7 cm
Shape of normal leaf	Lanceolate or oblong	Obovate
Male receptacles	Shortly pedunculate	Sessile
Length of nanophylls	2–4 mm	3–5 mm
Diameter of male inflorescences	1.5–2 mm	2–3 mm
Diameter of female inflorescences	2–5 mm	2–3 mm
Involucral bract shape	Rounded	Acute

Materials & Methods

A number of field surveys were undertaken in Rassagala-Horahena forest in Bambarabotuwa Forest Reserve, Rathnapura district, Sabaragamuwa province of Sri Lanka (06.4049°N 80.3765°E) from October 2015 to June 2017. Samples were collected from two populations and deposited at the PDA. Morphological investigations were carried out on living specimens sampled in two localities. Flower and leaf characters were critically examined. In addition, high resolution digital images from BM, BR, K and PDA were also examined. The material was examined under a Zeiss Stemi SV 11 Apo stereomicroscope at 4–100X magnification. Murti (1996) and Wadhwa (1999) were also used as key information sources for the confirmation of taxonomic status of species. Individuals of each population were counted to calculate the population density. The peripheral community was interviewed to understand the possible threats for the existing populations. The IUCN criteria B1ab (i, iii) (IUCN, 2014) was used to determine the conservation status.

Taxonomy

Elatostema rigidiusculum (Thwaites ex Hooker) Ranil & Nadeeka, *comb. & stat. nov.* (Figs. 2–4)

≡ *E. surculosum* Wight var. *rigidiusculum* Thwaites ex Hooker (1888: 573, id. 1888: 112).

Type:—SRI LANKA. Adam's Peak, May 1866, *Thwaites* C.P. 2182 (holotype PDA, isotypes K000741030, K000741033, BR00000542172).

≡ *E. monandrum* var. *rigidiusculum* (Thwaites ex Hooker) Murti (1997: 195).

Description:—Herbs, mostly dioecious, rarely monoecious, stem slender, 1–25 cm long, pendulous, succulent, 3–5 mm in diameter, glabrous, light green, alternatively branched, usually with 5–9 branches at the fully maturity stage, stoloniferous. Leaves numerous, sessile or with petioles to 1.2 mm long, alternate, usually glabrous, dark green, succulent, 3–15 × 2–7 mm, densely arranged, slightly increasing in size towards the middle of the plant at flowering stage, then decreasing in size apically, obovate in outline and apically crenate, symmetrical for the basal 1/3 of the main stem, then asymmetrical, margin ciliate, apex obtuse, 3-veined. Nanophylls 3–5 × 2–3 mm, symmetrical, dark green, succulent, sessile, lanceolate, margin entire, ciliate, obtuse at base and apex. Male inflorescences solitary, unbranched, sessile, 2–3 mm in diameter, receptaculate involucre, bracts with margins ciliate, acute and connate, 2 bracts per flower, equal in size, broadly ovate to lanceolate, tepals four, white, translucent, stamens four. Female inflorescences receptaculate involucre, solitary, 2–3 mm in diameter, sessile, flowers subtended by two bracts, equal in size, 2–3 × 3–5 mm with ciliate margins, white, translucent, tepals 3.

Phenology:—Flowering was observed in May to November.

Distribution:—The species is currently known from only two colonies in Rassagala-Horahena forest in Bambarabotuwa Forest Reserve, Rathnapura district, Sabaragamuwa province of Sri Lanka. (Fig. 1).

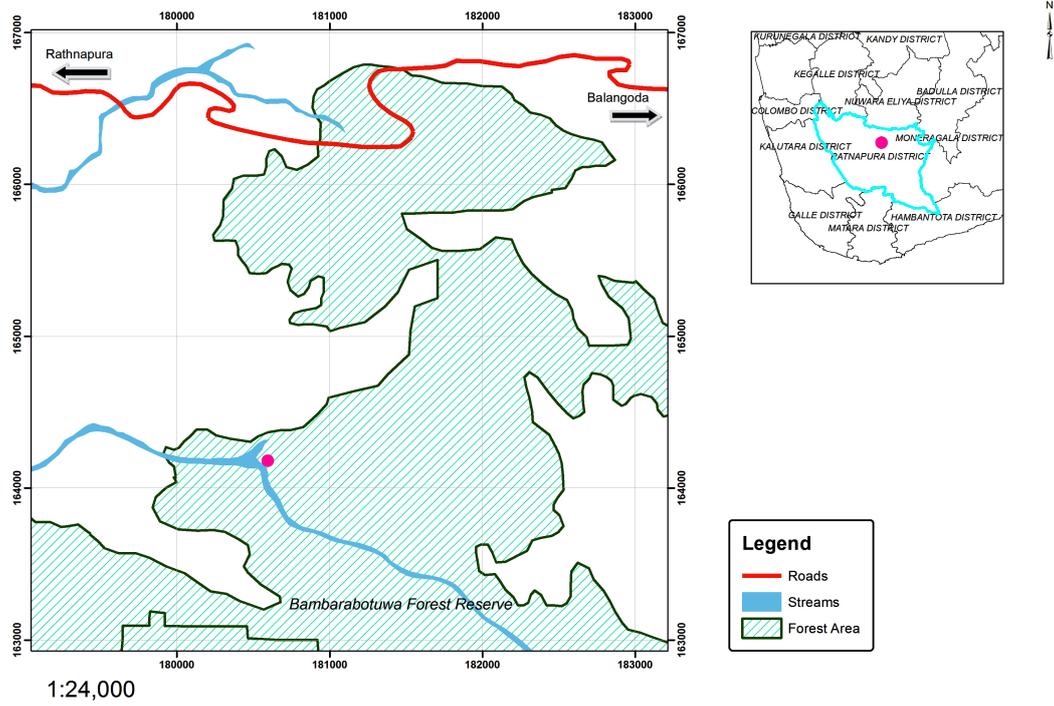


FIGURE 1. Current locality of *E. rigidiusculum* in the Bambarabotuwa Forest Reserve.

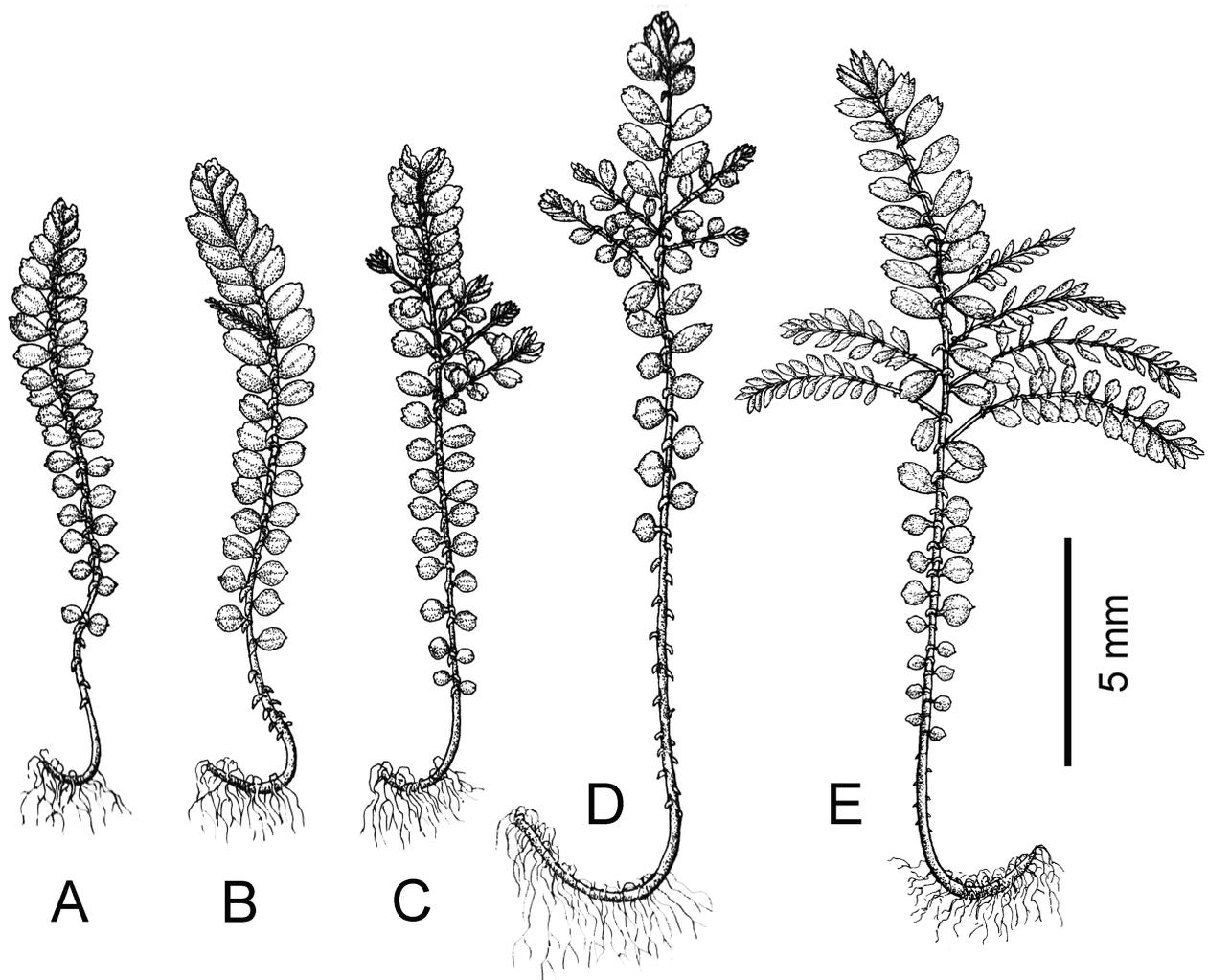


FIGURE 2. Different ontogenesis stages of *E. rigidiusculum* (respectively from A to E).

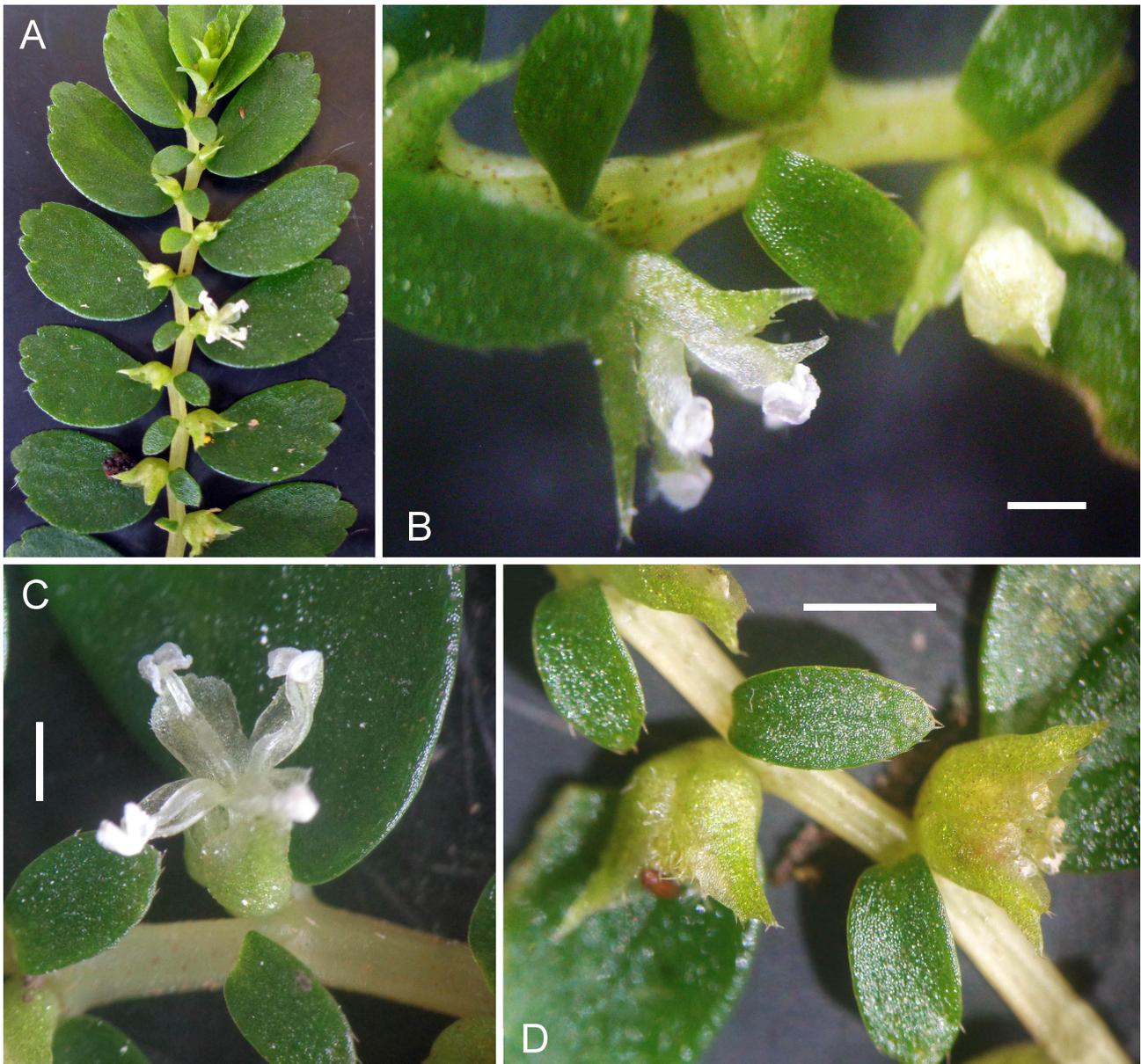


FIGURE 3. Characteristics of *E. rigidiusculum*. **A.** A male plant. **B.** A dioecious plant. **C.** A male flower with nanophylls. **D.** Bracts with ciliate margins.

Note: white colour bars on photographs = 1 mm in length.

Habitat and ecology:—This species grows in rich secondary wet lowland evergreen forest at elevations about 640 m a.s.l. as a lithophytic herb on wet mossy rocks along fast flowing stream. The associated species are *Homaliodendron flabellatum* (Bryophyte) and *Elatostema monandrum*. We found two populations close to each other.

Conservation status:—*Elatostema rigidiusculum* is currently known from only two populations found in the Rassagala-Horahena forest in Bambarabotuwa Forest Reserve of Sri Lanka. Though these two colonies include large number of individuals, the whole population is facing a risk of extinction in the wild. The estimated total known area of its distribution is less than 25 m². Both known populations are about 0.5 km away from the forest boundary and cultivated land including several home gardens. Additionally, this forest ecosystem is seriously threatened due to encroachment for tea plantations (Plate 2F). Based on presently available information, we propose conservation status of *E. rigidiusculum* as Critically Endangered (CR) under IUCN criteria B1ab (i, iii) (IUCN, 2014).

Vernacular names:—We propose two vernacular names here, in Sinhala—*Gal hedaya* and in English—*Rock centipede plant*.

Specimens examined:—SRI LANKA, Sabaragamuwa province, Rathnapura district, Bambarabotuwa Forest Reserve, Rassagala-Horahena forest, on shady mossy rock on fast flowing stream in rich secondary wet evergreen

forest, 640 m, 06.4049°N 80.3765°E, 12 October 2015, *R.H.G. Ranil* 24, 26, 27, 28 (PDA). Bambarabotuwa Forest Reserve, Rassagala-Horahena forest, on shady mossy rock, 640 m, 06.4049°N 80.3765°E, 19 June 2017, *B. Gopallawa*, *N.P.T. Gunawardena*, *R.H.G. Ranil*, BK 2 (PDA). Adam's Peak, May 1866, *Thwaites* C.P. 2182 (BM, BR, K, PDA).

Key to *Elatostema* species in Sri Lanka (sources—Murthi 1996, Wadhwa 1999)

- 1. Major leaves sub-opposite, subtended by small, filiform, linear, lanceolate or oblong, usually deflexed leaf or nanophyll2.
- Major leaves alternate, without (very rarely with) sub-opposite small leaf or nanophyll.....3.
- 2. Male inflorescences pedunculate, female inflorescences sessile; leaves very variable, orbicular, elliptic-oblong to subfalcate to lanceolate, 1.5–7.5 cm long.....*E. monandrum*
- Both male and female inflorescences sessile; leaves oblong or lanceolate, 0.3–1.5 cm long..... *E. rigidiusculum*
- 3. Cystoliths absent or minute4.
- Cystoliths conspicuous *E. lineolatum*
- 4. Stem unbranched, flexuous, tips strigose-pubescent, cystoliths minute*E. walkerae*
- Stem much branched, glabrous, cystoliths absent *E. acuminatum*



FIGURE 4. Habit and habitat of *Elatostema rigidiusculum* (A-D). **A.** A juvenile plants. **B.** A well grown immature plant. **C.** Mature flowering plant with number of branches. **D.** Land use pattern and threats to Rassagala-Horahena forests.

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