

Red List assessment of *Carissa andamanensis* L.J. Singh and Murugan (Apocynaceae): an endemic flowering plant of Andaman and Nicobar Islands, India

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Abstract

Threat assessment of *Carissa andamanensis* L.J. Singh & Murugan [APOCYNACEAE] has been conducted by following the IUCN Red Listing guidelines. Based on the field observation, herbarium study and distribution record, the species has been assessed as Critically Endangered [CRC2a(i); D]. Habitat conservation and research have been recommended for its conservation.

Key words: Conservation; Endemic; IUCN; Red List Assessment; Red List Index; Threat.

Introduction

Carissa L. [APOCYNACEAE-RAUVOLFIOIDEAE-CARISSEAE] is a cosmopolitan genus with 15 species distributed mainly in Africa to Indo-China and extending up to Australia to New Caledonia (POWO, 2025). The genus is well known for its medicinal and culinary use in traditional practices. In India, the genus is represented by four species viz. *Carissa andamanensis* L.J. Singh & Murugan, *Carissa carandas* L., *Carissa kopilii* Barbhuiya, J. Sarma & S. Dey, and *Carissa spinarum* L. (Singh and Murugan 2012; Dutta *et al.*, 2025). Of these, *Carissa andamanensis* is endemic to Andaman and Nicobar Islands (ANI) (Singh and Murugan 2012; Singh *et al.*, 2014, 2021; POWO, 2025). The present study is a part of species documentation under the Flora of India project of Botanical Survey of India. The threat assessment of the endemic species *Carissa andamanensis* has been carried out by applying the IUCN Red Listing Criteria (IUCN, 2012, 2024). The species was discovered in 2012 (Singh and Murugan, 2012) and presently known from the forest range areas of Chidiyatapu (Chidiyatapu, Munda Pahad, Pongi Balu) and Rutland Island, all in the South Andaman group of Islands. The species is also brought under cultivation at Dhanikhari Experimental Garden-

cum-Arboretum (DEGCA) of Botanical Survey of India which offers excellent facilities for plant introduction and ex-situ conservation. Despite been discovered in 2012, the species is known so far from its original place of discovery with a very small population size and restricted distribution. Therefore, the threat assessment of this endemic species was carried out by applying the IUCN guidelines. This will help to understand the threats and to facilitate conservation of this important germplasm in its natural habitat. A brief description, diagnostic features and photographs are provided for easy identification. Some additional morphological features were also observed that are not included in the original description of this species.

Materials and Methods

Data on the distribution and occurrence was compiled from the protologue, herbarium specimens at CAL and PBL and field survey conducted during 2012 to 2024. The occurrence points were geo-referenced with Google Earth Pro and GPS recording; distribution map was prepared using ArcGIS 10.2.2 software and geoCAT mapping domain. Herbarium specimens were prepared by following the standard procedure and following International Code of Nomenclature (Turland *et al.*,

2018). The species assessment was carried out with the help of IUCN tools viz. Guidelines for Using the IUCN Red List Categories and Criteria “(Version 16, 2024)” and the “IUCN Red List Categories and Criteria (Version 3.1, Second Edition, 2012)”. The Area of Occupancy (AOO) and Extent of Occurrence (EOO) were calculated using GeoCAT (Geospatial Conservation Assessment Tool).

Taxon data sheet with justification of Red List Assessment

Name of the Taxon: *Carissa andamanensis* L.J. Singh and Murugan, Indian J. Forest. 35(4): 493 (2012).

Taxonomic status: Species.

Description: Large, thorny, evergreen, climbing shrub; latex milky white; thorns simple or dichotomously branched, cruciform at leaf axis, up to 11 cm long; Mature stem brown, with cracked bark and aster-shaped spines having four arms. Leaves opposite, elliptic-ovate, 3- 11.5 × 1.8-6 cm, obtuse at base, entire, acute, membranous, green and glossy above, yellowish green below; lateral veins 3-5 pairs, obscure above, rather visible beneath; petioles red, 0.5 - 0.8 cm long. Inflorescence terminal, corymbose cymes; peduncles 1-2 cm long, terete. Flowers clustered, 6-23, bisexual, actinomorphic, ca 1.5 cm diam., sweet-scented, white; pedicels 0.4-1.0 cm long; bracts linear, 0.3-1.5 mm long, pubescent. Calyx lobes 5, imbricate, lanceolate, ca 2.5 × 1.5 mm, connate at base, entire, acuminate, pubescent. Corolla tube 2-3 cm long, broad towards apex; lobes 5, imbricate towards right, lanceolate, 0.7-1.6 cm long, acute. Stamens 5, adnate above the middle of corolla tube; filaments 1-3 mm long; anthers linear, ca 2.5 × 0.6 mm, basifixed, rounded at base, apiculate, 2-celled. Ovary ellipsoid, 2-celled; ovule 1 in each, ca 1.7 × 1.2 mm, on axile placenta; style slender, 6-8 mm long; stigma forked, erect, ca 1.7 mm long. Fruit ellipsoid, 1.0-2.5 × 0.6 -1.2 cm, greenish when young, red

to brown-red at maturity with persistent calyx; stalk 0.6-1.5 cm long; seeds 2, concave, hairy.

Phenology: Flowering-January to June, Fruiting- March-August

Ecology and Habitat: *Carissa andamanensis* grows on hill slopes in evergreen forests on sandy loam soil with rocky surfaces near water stream, at about 158 m altitude and associated with plants such as *Lannea coromandelica* (Houtt.) Merr. (Andacardiaceae), *Trigonostemon viridissimus* (Kurz) Airy Shaw (Euphorbiaceae), *Memecylon ovatum* Sm., *Zingiber zerumbet* (L.) Roscoe ex Sm. (Zingiberaceae), *Geodorum densiflorum* (Lam.) Schltr. (Orchidaceae), *Scleria lithosperma* (L.) Sw. (Cyperaceae) and *Vitex diversifolia* Kurz ex C.B. Clarke (Lamiaceae). The distribution of the species is known only in the forest range areas of Chidiyatapu (Chidiyatapu, Munda Pahad, Pongi Balu) and Rutland Island of South Andamans.

Global distribution: Endemic to Andaman group of Islands, India.

Distribution in India: Andaman and Nicobar Islands, South Andaman, Chidiyatapu, Munda Pahad, Pongi Balu and Rutland Island.

Specimens examined: Andaman and Nicobar Islands, South Andaman, Chidiyatapu, Munda Pahad, 15.03.2012, *Lal Ji Singh* 29526 (CAL-Holotype, PBL-Isotype); 29.08.2023, *Sagarika Kumari* 33312 (PBL); Munda Pahad, 30.03.2012, *Lal Ji Singh* 29527 (PBL); Chidiyatapu, 02.04.2016, *Lal Ji Singh* 32362 (PBL); Pongi Balu, 03.04.2016, *Lal Ji Singh* 32363 (PBL); 24.09.2024, *Sagarika Kumari & Lal Ji Singh* 34901 (PBL); Chidiyatapu, 29.05.1974, *K. Thothathri and N.G. Nair* 1084 (PBL); Chidiyatapu, 10.06.1977, *N.G. Nair* 4291 (PBL); Rutland Island, Ukuldera, 08.05.2003, *K. Karthigeyan* 19522 (PBL).

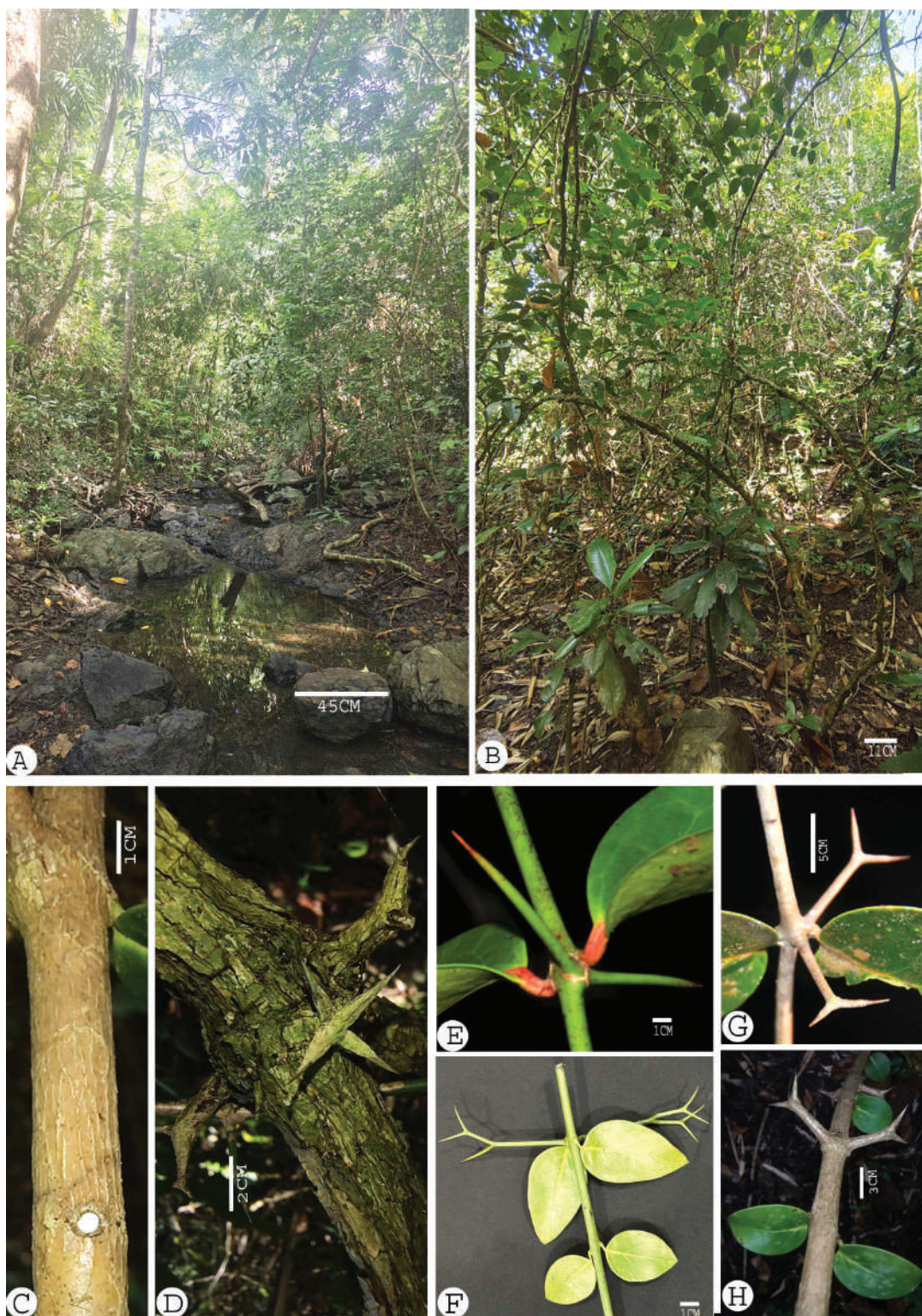


Fig. 1: *Carissa andamanensis* L. J. Singh and Murugan (Apocynaceae) : **A.** Habitat **B.** Habit **C.** Stem with milky white latex and brown cracked bark **D.** Stem with aster shaped spines and cracked bark **E.** Cruciform spines and red petiole **F-H.** Dichotomous Spines

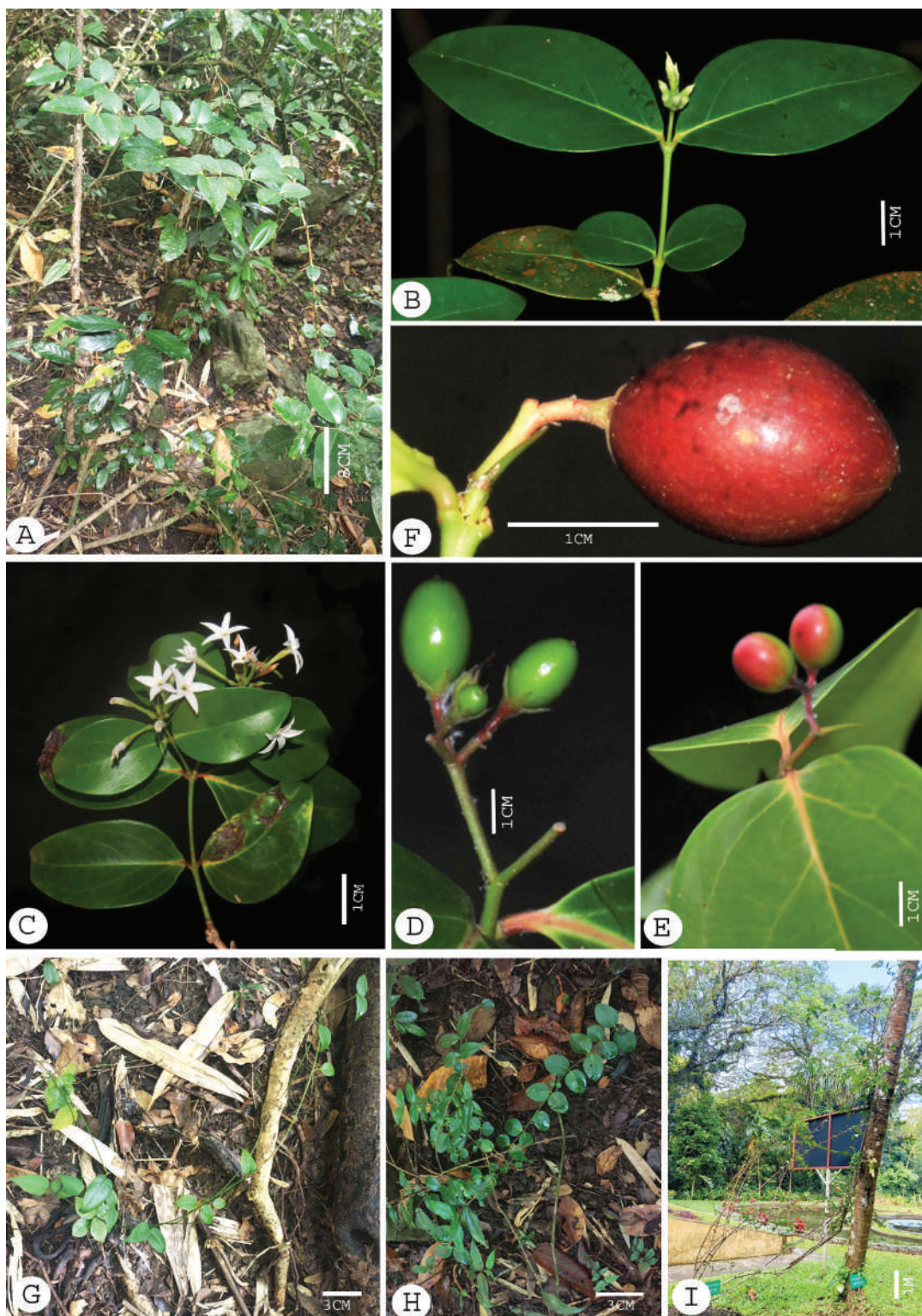


Fig. 2: *Carissa andamanensis* L. J. Singh and Murugan (Apocynaceae) : **A.** Magnified view of a portion of twig, **B.** Inflorescence with buds **C.** Inflorescence with buds and open flowers **D-F.** Fruits **G-H.** Seedlings **I.** Mature individuals under ex-situ conservation at DEGCA.

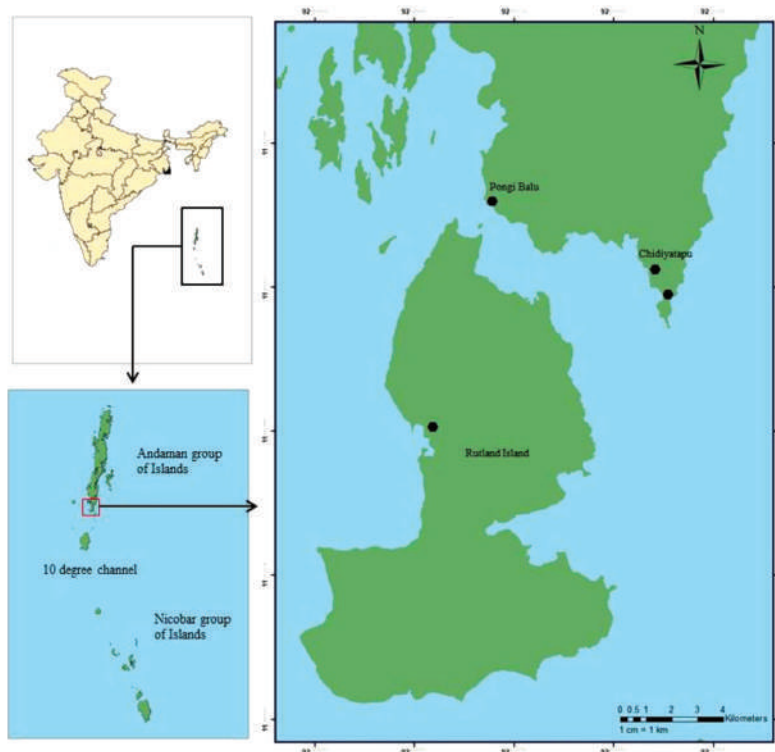


Fig. 3: Arc-GIS map showing distribution of *Carissa andamanensis* L. J. Singh and Murugan (Apocynaceae) in ANI.

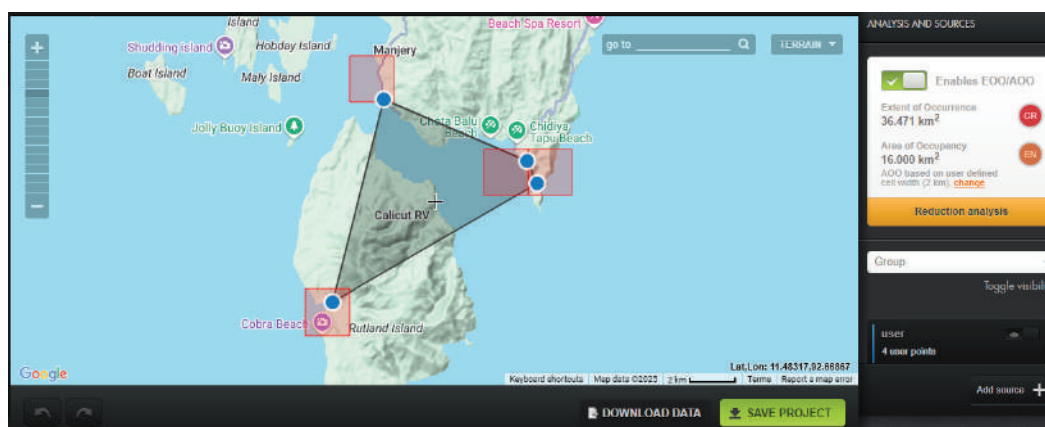


Fig. 4: Google Earth imagery (Geo CAT online software) showing the Conservation status along with AOO and EOO of *Carissa andamanensis* L. J. Singh and Murugan (Apocynaceae)

Population status: Altogether, 25 mature individuals could be located at Chidiyatapu, Munda Pahad and Pongi Balu of South Andamans. Although the species was collected from Rutland Island during 2003, the species could not be located again through recent thorough surveys in the Island. The species is probably disappeared from Rutland due to habitat disturbance for

anthropogenic activities and at present, it is represented by the only herbarium specimen (*Karthigeyan* 19522 PBL). Plants of this species are woody lianas forming large, bushy clumps. Flowering and fruiting happen naturally and large number of seedlings are observed under each canopy during the present study. However, the seedlings do not attain maturity due to selection pressure

and competition with other elements. When the seedlings were transplanted under ex-situ condition at DEGCA, it took 10 years to develop in to full grown individuals with 30 percent survival rate. Although, the number of matured individuals has not declined during past 12 years of observation, the number has not increased either. The habitat quality has declined further due to natural calamities and anthropogenic pressure.

Economic importance/ Potential value/ Trade: The species is not in direct trade. Information on its harvesting from wild is not available.

Threat(s): Natural calamities like cyclones, anthropogenic activities, especially the construction of foot path indicating loss of habitat. Chidiyatapu and Munda Pahad are one of the most visited tourist destinations in these Islands.

Ex-Situ Conservation: 10 seedlings were collected and introduced at DEGCA in 2012 by one of us (LJS) under Ex-Situ Conservation. Of them, only 3 are surviving with one mature individual (during the last 2 years noticed flowering and fruiting).

Red List Assessment as per IUCN Guidelines (IUCN, 2012; 2024): Critically Endangered [CR C2a(i); D].

Justification: *Carissa andamanensis* is endemic to the Andaman Group of Islands and distributed in 3 locations [one each at Chidiyatapu, Pongi Bala and Ukuldera in Rutland Island]. It is presumably disappeared from Rutland Island as observed during the recent surveys. A total of 25 mature individuals could be observed. Habitat quality is declining due to above mentioned threats. Previous data on its population size and decline is not available. The Extent of Occurrence (EOO) and Area of Occupancy (AOO) are calculated as 36.471 Km² and 16 Km² respectively. Based on the above, it qualifies for Endangered under Criterion B2. However, the species meets the threshold for Critically Endangered under Criteria C and D owing to the very small population size and number of matured individuals in each sub-population. Therefore, the final assessment of this species should be Critically Endangered [CR C2a(i); D]. The species is already under ex-situ conservation at DEGCA 10 seedlings were collected and introduced in 2012. Of

them, only 3 are surviving with one mature individual (during the last 2 years noticed flowering and fruiting).

Recommendation: Looking at the number of seedlings observed under each canopy it is evident that there is no problem in seed germination. But due to lack of effective dispersal mechanism, the seedlings are not able to overcome the selection pressure. At present, 25 individuals existing for an endemic species is a very precarious situation. The primary requirement to conserve the species is to translocate the seedlings to suitable places in its natural habitat and monitor their growth and maturity. Further survey and research are also recommended for conservation of this important genetic diversity.

Morphological characters observed additional to the original description

During the present study, some additional characters were observed in the live specimens which were not recorded earlier during the discovery of the species. These are – milky-white latex; brown matured stem with cracked bark and aster-shaped spines having four arms; twigs with cruciform thorns which are unbranched as well as dichotomously branched; fruits with persistent calyx.

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