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A new rheophytic species of *Syzygium* Gaertn. (Myrtaceae) from Assam, North East India

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**ABSTRACT**
A new species of *Syzygium* Gaertn. (Myrtaceae) is described from North East India: *Syzygium nivae* Barbhuiya, J.Sarma & S.Dey, sp. nov. The new species is a rheophyte, which is restricted to the Kopili riverbed of West Karbi Anglong district of Assam. The present species shows little affinity with *Syzygium khasianum* (Duthie) N.P.Balakr. in having lanceolate leaves, paniculate inflorescence and calyptrate petals, but differs in various aspects, such as shrubby rheophytic plant habit, narrower leaves, non-caudate leaf apex, shorter peduncles, larger flowers etc.

**RÉSUMÉ**
Une nouvelle espèce rhéophytique de *Syzygium* Gaertn. (Myrtaceae) d’Assam, nord-est de l’Inde.
Une espèce nouvelle de *Syzygium* Gaertn. (Myrtaceae) est décrite du nord-est de l’Inde: *Syzygium nivae* Barbhuiya, J.Sarma & S.Dey, sp. nov. Cette espèce est une rhéophyte, circonscrite aux rives de la rivière Kopili, dans le district Karbi Anglong Ouest (Assam). Elle montre une faible affinité avec *S. khasianum* (Duthie) N.P. Balakr. par ses feuilles lancéolées, son inflorescence paniculée et ses pétales calyptrés, mais en diffère par divers caractères, tels que son port arbustif rhéophytique, ses feuilles plus étroites à apex non caudés, ses pédicules plus courts, ses fleurs plus grandes, etc.
INTRODUCTION

Syzygium Gaertn. is the largest genus in Myrtaceae (clove family), which comprises c. 1200 species (Soh & Parnell 2015). It is a paleotropical genus with a wide range of occurrence mainly in southern and southeastern Asia, Australia, Malesia, and New Caledonia. Some species occur in east Africa, Madagascar, the Mascarenes, southwestern Pacific Islands, Taiwan, and southern Japan (Chen & Craven 2007; Soh 2017). Duthie (1878-1879), in Hooker’s Flora of British India, treated the genus under Eugenia L. sensu lato, with 131 species which has been split into genera Eugenia and Syzygium with the majority of Indian species now placed in the latter genus (Byng et al. 2015). The genus shows high diversity in North Eastern India and Western Ghats. Kanjilal et al. (1938) enumerated c. 35 species from North East India under Eugenia sensu lato and Sujanapal & Kunhi-kannan (2017) reported c. 48 species of Syzygium from the Western Ghats. In India, the genus has received very little attention as till date there is no comprehensive revisionary work available for the area, except the discovery of few new species in recent years (Viswanathan & Manikandan 2008; Shareef et al. 2012, 2013, 2014; Ratheesh et al. 2014; Sujanapal et al. 2014; Venkat Ramana et al. 2014) and it is hoped that many more novel species awaits their formal scientific discovery.

During field explorations (2016-2018) at Koka, Panimur, Amreng and Zirkindeng regions of West Karbi Anglong District of Assam the senior author found this rheophytic shrub growing on rock crevices at the edges of Kopili riverbed near Koka. Observations in the field and critical examination of the voucher specimen have revealed number of morphological differences from all other hitherto known species of genus Syzygium, which warrants the description of a new species.

SYSTEMATICS

Syzygium nivae Barbhuiya, J.Sarma & S.Dey, sp. nov.
(Figs 1; 2)

The new species differs from S. khasianum (Duthie) N.P.Balakr. for its shrubby rheophytic plant habit, narrower leaves, non-caudate leaf apex, shorter peduncles, larger flowers and oblong to subglobose fruits.

TYPUS. — India. Assam. West Karbi Anglong District, Panimur, Koka, on the edges of Kopili riverbed, 25°43’-56.6’N, 92°49’-19.31’E, c. 90 m, 17.VIII.2016, fl., J. Sarma s.n. (holo-, HBARC[HBARC00006399]).

ETYMOLOGY. — The species is named after Mrs Niva Deka, the wife of first author of the paper, who constantly encouraged her husband to continue his botanical explorations in remote area of the state of Assam. By profession, Mrs Deka is an Engineer and presently working under the government of Assam.

DISTRIBUTION. — Endemic to the type locality, Koka, Panimur, West Karbi Anglong District, Assam, India (Fig. 3).

PHENOLOGY. — The plant flowers during the months of August to October and its fruit matures in October and November.

CONSERVATION STATUS. — Syzygium nivae Barbhuiya, J.Sarma & S.Dey, sp. nov. is provisionally categorized as 'Data Deficient' (DD), as only 50 mature individuals were located during the survey at Koka locality. To ascertain its actual status, the entire course of Kopili River is required to be surveyed.

HABITAT AND ECOLOGY. — Syzygium nivae Barbhuiya, J.Sarma & S.Dey, sp. nov. grows in rock crevices along the Kopili riverbed, at altitudes 86-102 m above MSL. The riverbed is characterized by the alternating bands of shale and sandstones. The sandstone are mainly composed of quartz, lithic fragments with meager amount of feldspar and cemented by calcareous and ferruginous cements (Bhuyan 2016). The rate of water flow of the river is very high during June-July and gradually slowed down from August, when the plant starts flowering. The other associated rheophytes occurring in the type locality were Syzygium cyanophyllum, S. polypetalum, Ixora yunnanensis, Pavetta puffii, Carissa sp., Tarenna pumila, Eriobotrya angustissima, Millettia sp., Melastoma malabathricum etc.

### Table 1. — Morphological differences between Syzygium nivae Barbhuiya, J.Sarma & S.Dey, sp. nov. and S. khasianum (Duthie) N.P.Balakr.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Habit</td>
<td>A shrub, to 2.5 m high</td>
<td>A middle-size spreading tree</td>
</tr>
<tr>
<td>Leaf blade</td>
<td>narrowly lanceolate, 3.1-6.6 × 0.8-1.1 cm</td>
<td>ovate lanceolate, 5.0-7.5 × 1.1-2.7 cm</td>
</tr>
<tr>
<td>Leaf apex</td>
<td>acuminate, not caudate</td>
<td>abruptly acuminate, shortly caudate</td>
</tr>
<tr>
<td>Leaf base</td>
<td>attenuate</td>
<td>cuneate or attenuate</td>
</tr>
<tr>
<td>Lateral nerves</td>
<td>numerous, 0.5-1.6 mm apart</td>
<td>numerous, 0.4-1.4 mm apart</td>
</tr>
<tr>
<td>Peduncle</td>
<td>3.1-4.9 mm long</td>
<td>8.0-17 mm long</td>
</tr>
<tr>
<td>Inflorescence</td>
<td>paniculate-cyme, terminal and axillary, to 12 cm long and 6.8 cm in diam.</td>
<td>paniculate-cyme, terminal and axillary, 10-14 cm long and 6-10 cm in diam.</td>
</tr>
<tr>
<td>Pedicel</td>
<td>absent or to 0.6 mm long</td>
<td>5.0-7.5 cm long</td>
</tr>
<tr>
<td>Flower bud</td>
<td>pyriform, 5-6 mm long</td>
<td>absent or to 1 mm long</td>
</tr>
<tr>
<td>Flowers</td>
<td>10-12 mm in across</td>
<td>pyriform, c. 5.8 mm long</td>
</tr>
<tr>
<td>Hypanthium</td>
<td>obconic, 4.9-7.4 mm long and 4.2-5.2 mm wide at mouth</td>
<td>obconic, 3.2-4.7 mm long and 2.5-3.5 mm wide at mouth</td>
</tr>
<tr>
<td>Petals</td>
<td>4, calyptrate, sub-orbicular, bowl-shaped, 2.4-3.0 mm in diam.</td>
<td>4, calyptrate, rarely free, bowl-shaped, 1.5-2.0 mm in diam.</td>
</tr>
<tr>
<td>Style</td>
<td>thickenined at base slightly narrowed upwards, c. 8.3 mm long</td>
<td>uniform, c. 6.5 mm long</td>
</tr>
<tr>
<td>Fruit</td>
<td>slightly obovate or subglobose, 10-16 mm long</td>
<td>cylindric c. 6.3 mm long</td>
</tr>
<tr>
<td>Distribution</td>
<td>India (Assam: West Karbi Anglong District) (Fig. 3)</td>
<td>India (Meghalaya: Garo &amp; Khasi Hills) (Fig. 3)</td>
</tr>
</tbody>
</table>
A new Syzygium Gaertn. (Myrtaceae) from India

Fig. 1. — Syzygium nivae Barbhuiya, J.Sarma & S.Dey, sp. nov.: A, type locality showing plant habit and habitat; B, inflorescence; C, flowers; D, fruits (photos by J. Sarma).
Fig. 2. — Syzygium nivae Barbhuiya, J.Sarma & S.Dey, sp. nov.: A, apex of a branch showing inflorescence and leaves; B, a portion of the stem showing arrangement of leaves; C, leaves; D, leaf base showing petiole; E, middle portion of a leaf showing reticulate venation; F, leaf apex; G, a portion of the inflorescence showing flower buds; H, a portion of the inflorescence showing flowers; I, an opened flower bud; J, calyptra; K, L.S. of the flower; L, L.S. of hypanthium and gynoecium; M, petals; N, stamens; O, T.S. of calyx tube and style; P, T.S. of ovary (photos by H. A. Barbhuiya, based on holotype). Scale bars: A, C, 2 cm; B, G, H, 5 mm; D-F, 1 cm; I-N, 3 mm; O, 2 mm; P, 1 mm.
A new Syzygium Gaertn. (Myrtaceae) from India

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DESCRIPTION
A rheophytic shrub, to 2.5 m high; branchlets terete. Leaves opposite decussate, coriaceous; blade narrowly lanceolate, 3.1-6.6 × 0.8-1.1 cm, margins revolute, finely reticulate, both surfaces glabrous, deep green above, pale-green beneath, apex acuminate or obtuse, rarely retuse, base attenuate; midvein subcanaliculate above, raised beneath; lateral veins numerous, obscure,brochidodromous, 0.5-1.6 mm apart; intramarginal vein looped, 0.5-0.8 mm away from the leaf margin; petiole yellowish, 8.3-11 mm long, glabrous. Inflorescence a paniculate-cyme, terminal and axillary at upper leaf axils, to 12 cm long and 6.8 cm in diam.; branches quadrangular, green, opposite spreading, 1.4-2.5 mm in diam.; peduncle subquadrangular, 1.8-2.5 cm long. Flowers sessile or shortly pedicellate; pedicel, to 0.6 mm long. Flower bud pyriform, 5-6 mm long, flowers 10-12 mm in across during anthesis; hypanthium obconic, 4.9-7.4 mm long and 4.2-5.2 mm wide at apex. Calyx tube c. 3.1 mm long and up to 5.2 mm in diam.; lobes inconspicuous. Petals 4, falling as a calyptra, suborbicular, bowl-shaped 2.4-3.0 mm in diam. Stamens many, of different lengths; filaments cylindric, narrowed at apex, 4.0-8.6 mm long and 0.1-0.3 mm in diam.; anthers minute, versatile, 0.4-0.6 × 0.2-0.4 mm. Ovary fleshy c. 3.1 × 1.7 mm, 2-locular, glabrous; style c. 8.3 mm long, 0.2-0.5 mm in diam., cylindric, thickened at base, narrowed upwards; stigma inconspicuous. Fruits slightly oblong or subglobe, 1.0-1.6 × 0.8-1.3 cm, apex with cup-shaped limb, reddish when young, blackish on ripening and slightly sweeter in taste.

REMARKS
Syzygium nivae Barbhuiya, J. Sarma & S. Dey, sp. nov. shows superficial similarity with S. khasianum (Duthie) N.P. Balakr. But the latter is quite distinct from the former by its arboreal habit, abruptly acuminate and caudate leaf apex, longer peduncles, much smaller flowers, etc. The detailed comparison between the two species is summarized in the Table 1. The other closely related species occurring in the same locality was S. cyanophyllum (P.C. Kanjilal & Das) Raizada, which can be easily distinguished from the newly described species by its smaller leaves, shortly corymbose inflorescence bearing flowers with long hypanthium.

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We are thankful to the Assam Forest Department for allowing us to use their resources in extensive field exploration works especially in remote areas. We extend our sincere thanks to Karbi Anglong Autonomous Council Authority and Hamren Territorial Division for providing logistic support during field tours. We acknowledge our heartiest thanks to officers and staffs of Southern Range Kheroni, Hamren Territorial Division for their continuous assistance in frequent field explorations. Finally yet importantly, we are indebted to Mr. Rowelson Engti, Forester I, Southern Range Kheroni, for his valuable help.

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