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## NOTES ON RECOLLECTION AND EXTENDED DISTRIBUTION OF *RHYNCHOTECHUM ALTERNIFOLIUM* C.B.CLARKE (GESNERIACEAE) IN EASTERN HIMALAYA, BHUTAN

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### Abstract

*Rhynchotechum alternifolium* C.B.Clarke, a Gesneriaceae plant taxon earlier known from India and Myanmar, is reported here as an extended distribution to Bhutan. In India, earlier it was reported from Arunachal Pradesh, Assam, Manipur and Nagaland. The last observation of this taxon was in 1962 from Myanmar. During recent field exploration (2015), it is once again reported from Nagaland. Based on herbaria records, it is also recorded from Sikkim Himalaya. Brief taxonomic description along with photographic illustration and distribution map of the taxon is provided. Further investigation is required in the eastern Himalaya and North-eastern region of India to ascertain its present population status as well as IUCN status for conservation point of view.

Keywords: *Rhynchotechum alternifolium*, Extended distribution, Bhutan.

## Introduction

The genus *Rhynchoatechum* belonging to dicotyledonous family Gesneriaceae was erected by Blume (1826) and has recently been revised by Anderson and Middleton (2013) who recognised 16 species of the same taxon. Geographically, its members are distributed from India to China, north to the Ryukyus in Japan, south through the Philippines and the Malay Peninsula to Sumatra and east to Papua New Guinea. The genus has 9 species in India viz. *R. alternifolium* C.B.Clarke, *R. calycinum* C.B.Clarke, *R. ellipticum* (Wall. ex D.Dietr.) A.DC., *R. gracile* B.M.Anderson, *R. hookeri* (C.B.Clarke) B.M.Anderson, *R. obovatum* (Griff.) B.L.Burt, *R. parviflorum* Blume, *R. permolle* (Nees) B.L.Burt and *R. vestitum* (Griff.) Wall. ex C.B.Clarke, and 3 species in Bhutan (including species recorded here presently) namely *R. alternifolium*, *R. ellipticum* and *R. vestitum*. Of these, *R. calycinum* (Arunachal Pradesh), and *R. gracile* (Assam) are endemic to Eastern Himalaya (Anderson and Middleton, 2013).

During field exploration in May 2015, in Tuensang district of Nagaland state, North East India, one Gesneriaceae plant was collected between Noklak and Pangsha village and introduced in the garden of Botanical Survey of India, Shillong. The plant is surviving well and has flowered in the month of July, 2016. The significant morphological characters of the mature plant viz. relatively small and sub-regular flowers in cymose inflorescences, short corolla tubes, four fertile stamens with unilocular anthers, revealed that the plant is a member of the genus *Rhynchoatechum*. The flowers were dissected to study its morphological features. Later on consultation of the literature (Clarke, 1884; Kanjilal, 1939; Hara, 1966; Hilliard, 2001; Anderson and Middleton, 2013) and comparison with herbarium specimens housed in K, E, CAL and ASSAM, the plant is identified as *Rhynchoatechum alternifolium*, a species recollected after a lapse of more than 50 years. The last collection of the species is being in 1962 from Myanmar (Anderson and Middleton, 2013). While identifying this plant, the authors came across some interesting collections of A. S. Rao from Bhutan (34204, 30 Aug. 1962; Figure 1A) and of N. L. Bor made from Sikkim (19888, July 1934; Figure 1B) housed in ASSAM. These specimens were wrongly identified as *Rhynchoatechum ellipticum* instead of *Rhynchoatechum alternifolium*, a hitherto unknown species in Bhutan and Sikkim Himalayas (Clarke, 1884; Kanjilal, 1939; Hara, 1966; Singh and Chauhan, 1999; Hilliard, 2001; Anderson and Middleton, 2013).

In this paper, *Rhynchoatechum alternifolium* is reported as an addition to the Flora of Bhutan as well as a new distributional record for Sikkim Himalaya. A detailed description, along with photographic illustration and distribution map (Figure 1C) has been provided.

## Material and Methods

The collection, pressing and preparation of herbarium specimens of this taxon have been done according to the conventional herbarium techniques (Jain and Rao, 1976). Flowers were preserved in FAA (Formalin–Acetic Acid–Alcohol: 50% Ethanol 90 ml + Glacial Acetic Acid 5 ml + Formaldehyde (38%) 5 ml) solution. Taxonomic measurements and descriptions of each plant part are based on living material. Microscopic details were observed using Olympus stereo-zoom microscope SZ-2-ILST and photographed with Nikon COOLPIX520. The voucher specimens have been deposited in the Herbarium of Botanical Survey of India, Eastern Regional Centre, Shillong (ASSAM).

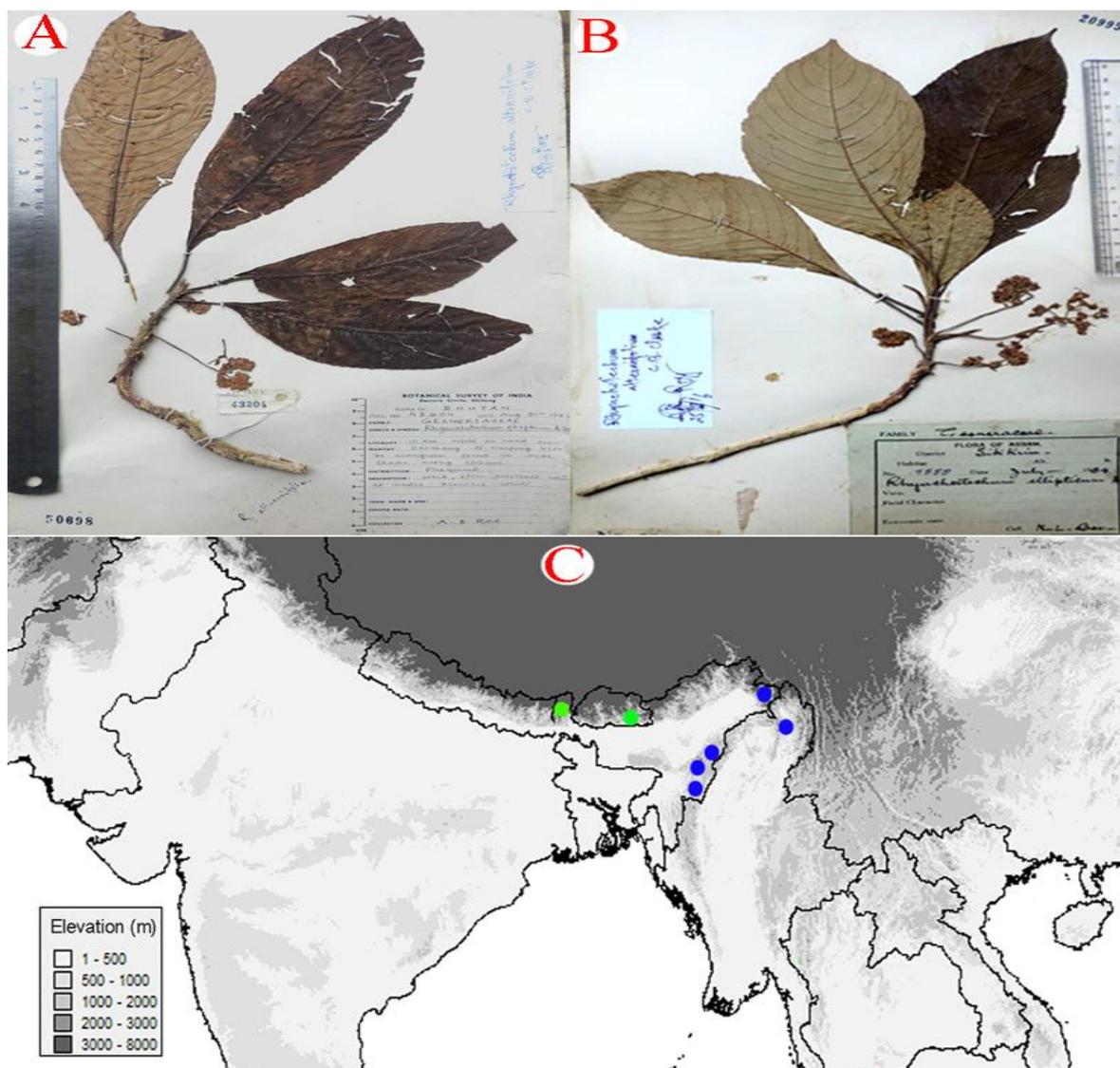


Figure 1: A. *Rhyncholechum alternifolium* C.B. Clarke (A.S. Rao 43204, Bhutan). B. *Rhyncholechum alternifolium* C.B. Clarke (N.L. Bor 19888, Sikkim). C. Distribution map of *Rhyncholechum alternifolium* C.B. Clarke (Green marked areas are the extended distribution).

### Taxonomic features

*Rhyncholechum alternifolium* C.B. Clarke in A. DC. & C. DC., Monogr. Phan. 5(1): 198. 1883; C.B. Clarke in Hook. f., Fl. Brit. India 4: 374. 1884; Anderson & Middleton in Edinburgh J. Bot. 70 (1): 131. 2013. (Figure 2 & 3).

Type: INDIA. Upper Assam, by lake Brahmakoondo [Brahmakund], Griffith 3850 (Lectotype: K).

Perennial herb to subshrub; stem erect, to 70 cm high, 0.8–1.0 cm in diam., hard, woody, smooth, the upper parts covered with brown hairs, the remaining of old petioles in the lower parts; woody root stock stout. Leaves many, alternate, in a distance of 2–4 cm apart throughout the stem; petiole 3.0–4.5 cm long, 3–4 mm in diam., densely arachnoid hairy; blade oblong, elliptic to oblanceolate, 12–24 × 3.5–6.0 cm, apex acuminate, base attenuate, margin dentate, secondary veins 8–16 on each side of midrib, densely covered with short arachnoid hairs when young but gradually disappearing in maturity more on the upper surface than lower surface of blade. Inflorescences 1–2 per stem, axillary in the mid of stems, compound dichasia cyme, smaller than leaves, 10–12 cm long, loosely congested 4 branches at each node (just below each primary branch there is a subordinate primary branch), single cyme from a single axil, 1–2 flower(s) between the two primary branches, subordinate branches also develop within the secondary branches; peduncle 4–9 cm long, densely covered with short arachnoid hairs; peduncle bracts lanceolate, up to 1.2 cm long, 4 mm wide, densely covered with short arachnoid hairs on both surfaces, apex acuminate. Flowers are white, slightly odorous, 4–5 mm across. Pedicel up to 1.7 cm × 1.5 mm, covered with white woolly hairs; pedicel bracts lanceolate, 5 × 1.5 mm, green, glabrous inside, hairy outside, apex acute. Calyx 5–7 mm long, white, 5-lobed to the base, lobes lanceolate, 1.0–1.5 mm wide, glabrous inside, sparsely arachnoid hairy outside along midvein. Corolla white with dark purple mark in upper lip inside and purplish-green outside, glabrous, c.5 mm long, 8 mm across; tube 1.5–2.0 mm long, limb 2-lipped; upper lip with 2 lobes, lobes ovate, 2.5–3.0 × 2.5–3.4 mm, apex rounded; lower lip with 3 lobes, lobes ovate, 2.5–3.5 × 2.0–2.5 mm, apex rounded. Stamens 4, inserted near base of corolla tube; filament white, c. 1.5 mm long; anthers yellow, c. 1.8 × c. 1.5 mm; staminodes strongly reduced. Ovary ovate, cylindrical, 1.5 × 1.8 mm, densely pubescent; style white, 7–8 mm long, glabrous; stigma capitate, creamy white.

*Flowering and Fruiting:* July – August.

*Distribution:* INDIA (Arunachal Pradesh, Assam, Manipur, Nagaland and Sikkim), BHUTAN and MYANMAR.

*Specimens studied:* **INDIA. Arunachal Pradesh:** Tirap Frontier Division, Waka, 27 Aug 1958, *G. Panigrahi* 14947 (E). **Assam:** 1891, King's Collector *s.n.* (E). **Manipur:** Mayung, 16 Sept 1885, *C.B. Clarke* 42038 (K). **Nagaland:** Naga Hills, 5 Feb 1935, *N.L. Bor* 6285 (K); Tuensang district, Noklak to Pangsha village, (introduced in the Garden of Botanical Survey of India, Shillong, in May 2015 and flowering in July 2016), *N. Odyuo* 132874 (ASSAM). **Sikkim:** July 1934, *N.L. Bor* 19888 (ASSAM). **BHUTAN.** Deothang to Narfong, 4200 ft, 30 Aug 1962, *A.S. Rao* 43204 (ASSAM). **MYANMAR.** Kachin hills, Jan 1898, *Shaik Mokim s.n.* (K [2]); Sumprabum, Hpuginhku Village, Feb 1962, *J. Keenan, U.T. Aung & U. Tha Hla* 3731 (E).



Figure 2: *Rhynchotechum alternifolium* C.B. Clarke: **A.** Habit (Plant introduced in the Garden of Botanical Survey of India, Shillong, Meghalaya), **B.** Inflorescences, **C.** Flowers in close view.



Figure 3: *Rhynchotechum alternifolium* C.B. Clarke: A. Inflorescences. B. Peduncle bract (dorsal view). C. Peduncle bract (ventral view). D. Flower (dorsal view). E. Flower (ventral view). F. Pedicel bract. G. Pedicel with calyx and carpel. H. Corolla (ventral view). I. Corolla (dorsal view). J. Stamens in side corolla tube. K. Stamens. L. Ovary. M. T.S. of ovary.

*Habitat:* *Rhynchotechum alternifolium* was found growing in the forest floor on the bank of streams in association with *Allophylus cobbe* (L.) Raeusch., *Antidesma acidum* Retz., *Begonia palmata* D.Don, *Begonia roxburghii* A.DC., *Goniothalamus simonsii* Hook.f. & Thomson, *Molinaria capitulata* (Lour.) Herb., *Peliosanthes griffithii* Baker, *Pinanga gracilis* Blume, *Rhynchotechum vestitum* (Griff.) Wall. ex C.B.Clarke, *Rohdea wattii* (C.B.Clarke) Yamashita & M.N.Tamura, *Tupistra tupistroides* (Kunth) Dandy. The habitat of the species is represented by subtropical semi-evergreen forest. The forests are dense with short stature, and the height of the tree rarely exceeds 20 m. Major tree species of the area are *Acer laevigatum* Wall., *Calophyllum polyanthum* Choisy, *Camellia cauduca* Cl. ex Brandis, *Castanopsis indica* (Roxb. ex Lindl.) A.DC., *Cephalotaxus mannii* Hook.f., *Lithocarpus pachyphyllus* (Kurz) Rehder, *Phoebe hainesiana* Brandis, *Prunus* sp., *Schima khasiana* Dyer.

*Conservation:* IUCN status not yet evaluated. However, anthropogenic disturbances in the form of timber and non-timber forest product extraction, jhum cultivation and forest fires are the major threats to the species in the present study area.



Figure 4: Natural habitat of *Rhynchotechum alternifolium* C.B.Clarke (Tuensang district, Nagaland).

## Discussion

*Rhynchotechum alternifolium* is so far reported from Bhutan (resent repost), India and Myanmar. In India, it is restricted only in the North Eastern states of Arunachal Pradesh (1958, *G. Panigrahi* 14947, E), Assam (1891, King's Collector *s.n.*, E), Manipur (1885, *C.B. Clarke* 42038, K), Nagaland (1935, *N.L. Bor* 6285, K; 2015, *N. Odyuo* 132874, ASSAM) and Sikkim (1934, *N.L. Bor* 19888 ASSAM -present report). The last collection of the species was in 1962 from Myanmar. The present collection from Nagaland is after a lapse of more than 50 years. From the present study, it is cleared that the occurrence and population status of this species is very rare and low as well as fragmented. As thus the species is under pressure of anthropogenic disturbances. Further investigation is required in the eastern Himalaya and North-eastern region of India to ascertain its present population status as well as IUCN status for conservation point of view. Biotechnological approaches through ex-situ conservation of the species by tissue culture and rehabilitate in Botanic Garden are recommended for effective conservation.

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