hopefully will find the political will to forestall the evolving GMO-driven ecological, economic and social disasters in cotton and in other food crops.

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Arenaria thangoensis W.W.Sm. (Caryophyllaceae), a threatened species hitherto considered endemic to Sikkim rediscovered from the Western Himalaya, India

The genus *Arenaria s.l.* is represented by about 210 species of annual or perennial herbs distributed in the temperate and arctic areas of Asia, Europe, northern Africa, North America and South America[1]. In India, it is represented by 24 species[2] mainly confined to the Himalaya of which *Arenaria curvifolia* Majumdar, *Arenaria ferruginea* Duthie ex F. Williams and *Arenaria thangoensis* W.W.Sm. are listed as Indian endemics and 'endangered'/'vulnerable' species in the 1997 IUCN Red List of Threatened Plants[3] and Red Data Book of Indian Plants[4]. *A. curvifolia* was rediscovered after 121 years in its type locality, i.e. Kuari Pass, Uttarakhand nearly a decade ago[5], but *A. ferruginea* and *A. thangoensis* still elude the taxonomists.

A. thangoensis W.W.Sm. was described[6] in 1911 based on the collection of plant specimens by Smith & Cave (2572 CAL!) in 1909 from Thangu ('Tangu') area of Sikkim in the Eastern Himalaya. This species was also collected from Chugya (Eastern Himalaya) by Rohmoo Lepcha (285 CAL image!), but never recollected either from the type locality or anywhere in the Himalaya or Tibet. It has also been mentioned as known by the type collection only[7].

During a floristic exploration in the Kuari Pass alpine zone (Chamoli district,

Uttarakhand, Figure 1 *a*), which happens to be the type locality of 'Endangered' *A. curvifolia.* Majumdar[5] collected a small *Arenaria* species from a moss-covered steep rock face. This species was identified as *A. thangoensis* W.W.Sm. after consulting the relevant literature[2,4], original description[6] of the species and comparison with type specimens housed in the Central National Herbarium, Howrah (CAL) and herbarium of Forest Research Institute, Dehradun (DD). This collection is a rediscovery of this threatened species after more than a century. Critical observations of our specimens and the type specimens in CAL and DD proved worthy as some minor variations were recorded in plant size, merosity and number of stamens and styles. Since the species was earlier known only by the original description based on a few dried plant specimens some minor characters were overlooked. Consequently, the images and detailed descriptions of this species, including observed variations are provided here for correctly describing it to further authenticate that it is indeed a threatened species and to facilitate its correct identification.

Arenaria thangoensis W.W.Sm. *Rec. Bot. Surv. India*, **4**, 180, 1911; Majumdar in B.D. Sharma & N.P. Balakr., Fl. India **2**: 517.1993.

Herb, perennial. Taproot fusiform, tuberous, 5–15 × 1–1.5 mm. Stem short (0.5–4 cm long), reddish, cylindrical, branched from base, further dichotomously branched 2–3 times, hairy with one line of eglandular white hairs. Leaves succulent, bi-convex, obovate–oblanceolate, 1.5–4 × 0.5–1.25 mm, hairy on both surfaces and margins, long hairy at base, lamina narrowing down to broad petiole, leaf base marginally broader than petiole and united in pairs, apex acute. Pedicel erect or curved, 2–4 mm, longer than sepals, pubescent throughout. Flowers in cymes, usually pentamerous, rarely tetramerous, apetalous, 2–3 mm across when open. Sepals 5(4), succulent, linear–lanceolate, 1.5–3 × 0.5–0.75 mm, saccate at base, obtuse or acute at apex, margin and abaxial surface hairy. Petals absent. Stamens 2(3)–5, antisepalous, 1–1.5 mm long, basal gland absent, anther brownish–black, ca. 0.5 mm long. Ovary ovoid, 1–1.5 × 0.5–1 mm, styles 2 (–3), ca. 1 mm long. Capsule ovoid, 1.5–3 × 1–2 mm, dehiscing by four valves to base. Seeds 3–5 (–8) per fruit, oblong–subglobose, brown, 0.5–0.8 × 0.5 mm, smooth or faintly wrinkled (Figure 1 *b*).

Flowering: August–September; fruiting: September.

Distribution: India (Sikkim, Uttarakhand), China (Tibet).

Specimens examined: India – Sikkim: Thangu, 27°58′14.7″N 88°34′42.5″E, 4500 m, 15 August 1909, Smith & Cave 2572 (CAL!; DD!); Uttarakhand: Chamoli district, Kuari Pass, 3300–3600 m, 10 September 1885, J.F. Duthie 3869 (DD!); Uttarakhand: Chamoli district, Kuari Pass, 3600–3700 m, 30°26′52.2″N 79°33′58.1″E, 22 August 2015, Satish Chandra *s.n.* (Acc. no. 826 G.B. Pant University Herbarium Pantnagar, Uttarakhand, India!). China – Tibet: Eastern Himalaya, Chugya, 27°46′28.4″N 89°08′43.7″E, 15000 ft, 18 September 1912, Rohmoo Lepcha 285 (CAL, image!).

This species was found growing with mosses, *Saxifraga* sp., *Koenigia islanddica*, etc. on a shady, moist vertical rock face at one locality only. Up to 50 individuals were seen in a small area of 4–5 m^2. However, presence of this species in a few similar habitats in inaccessible adjacent rock slopes cannot be ruled out.

It is interesting to mention that this species was collected earlier from Kuari Pass area in 1885 (J.F. Duthie 3869 DD!), 26 years prior to its discovery[6] from Sikkim in 1911. However, the specimens of Duthie housed in DD remained unnoticed during the compilation of Caryophyllaceae flora of India[2] and Uttarakhand[8].

At present *A. thangoensis* is known from three localities (Thangu, Sikkim; Kuari Pass, Uttarakhand, and Chugya, Tibet; Figure 1 *c*) in the world and not endemic to India as Chugya lies in the uppermost part of Chumbi valley, just 5.5 km north of Phari Plains along S204 Provincial Road which starts from Nathula Pass and goes to Gyantse and Shigatse in Tibet (China). Despite similar habitats, the species is not known from well-explored Bhutan[9], Nepal[10], Himachal Pradesh[11], Jammu and Kashmir[12], Arunachal Pradesh[13] in the Himalaya, and adjacent China[14]. In the *Flora of Sikkim*, Srivastava[15] (type locality of the species) reported it based on the type collection made in 1909. Previous floristic studies[8,16,17] have not mentioned this species, indicating its extreme rarity. It is

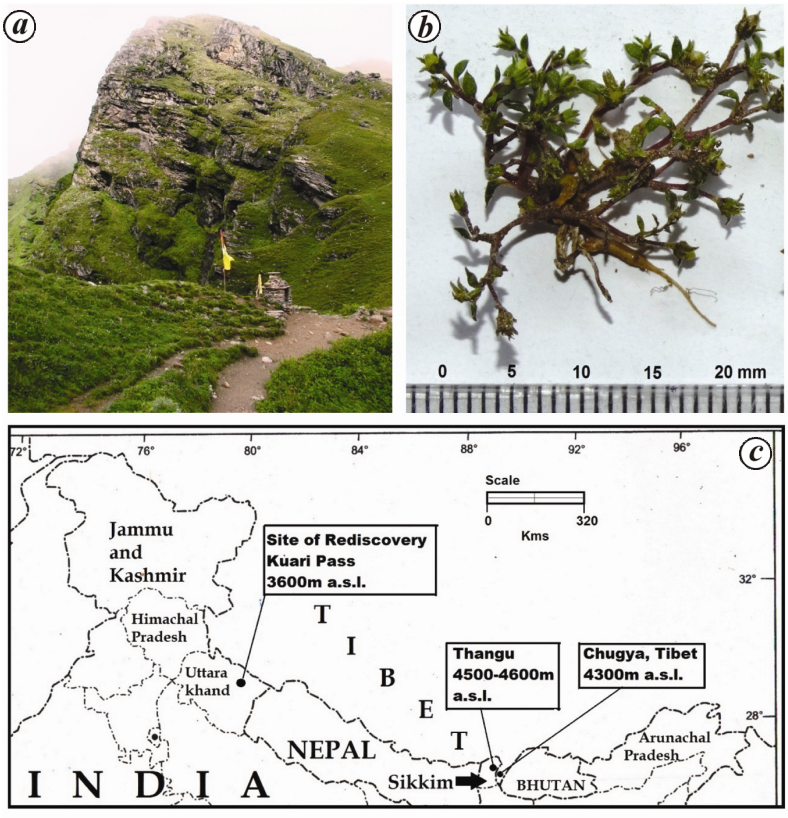

Figure 1. ***a***, Kuari Pass, Uttarakhand, India. ***b***, *Arenaria thangoensis* with scale. ***c***, Map showing known locations of species and location of rediscovery.

possible that the populations of this species in Thangu and Chugya areas were not visited by subsequent collectors leading to the unavailability of specimens from these areas. The collection reported here indicates that it continues to survive in Kuari Pass area since the last 130 years (1885–2015). The species is not endemic to India and fulfils the criteria B2a, B2biv and D1 of section B and D of the 'Vulnerable' category at regional level according to IUCN[18].

A. thangoensis W.W.Sm. has been rediscovered from Kuari Pass area district Chamoli, Uttarakhand. A new distributional record is made here from Western Himalaya based on Duthie's collection after a lapse of 130 years and our own collection in 2015 after 106 years of type collection from Sikkim. Interestingly, the specimen collected from Chugya (Tibet, China) by Rohmoo Lepcha (285, CAL) as mentioned in Singh and Diwakar[19], also makes it a new record to the flora of China. It is a threatened species assessed as 'Vulnerable'[3,4] and based on our field observations, its 'Vulnerable' status is tentatively supported. However, the continued existence (1885–2015) of this species in Kuari Pass area proves that it survives on inaccessible rocky slopes despite anthropogenic pressures and calls for a survey of all known localities and similar habitats, both in India and China for correct assessment of its global threat status.

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Species richness estimate of freshwater rotifers (Animalia: Rotifera) of western Maharashtra, India with comments on their distribution

Of the 2031 Rotifera species described so far, the Oriental region harbours 78 monogonont genera with 486 species and 9 bdelloid genera with 58 species[1]. Only a small fraction (~19%) of that total rotifer diversity is known from the Indian region when compared with the Southeast Asian countries[2]. Given the complex geography and geology of the Indian subcontinent, with estimates ranging from 360 to 492, it is difficult to predict the actual number of valid rotifer species present in India[3–7]. Comprehensive work has been carried out in the North East (NE) Indian states with valid reports of 238 species[6], while only some reliable faunistic information is available from other regions of the country[8,9]. The same state exists for the rotifer fauna of Maharashtra as well[10–13]. The literature though abounds with faunistic inventories from single localities having numerous nomenclatural errors. In this regard, we present a species richness estimate and a comprehensive faunistic report of freshwater monogonont rotifers from part of western Maharashtra. We also present faunal comparison between our study area and NE India (henceforth referred to as NEI) with special attention to families Brachionidae and Lecanidae.

The region selected for the study was between 18°–19°N and 73°–75°E. The region broadly consists of the Western Ghats on the western side and Deccan plateau on the eastern side (henceforth