



## Taxonomic notes on *Phaeoceros himalayensis*, with lectotypification of *Anthoceros himalayensis*

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The hornworts are the smallest group of bryophytes, comprising 10 to 12 genera (Li *et al.* 2011; Villarreal & Renner 2012; Chantanaorrapint 2014) with approximately 220 species worldwide (Villarreal *et al.* 2010; Söderström *et al.* 2015). The status of some species is still unclear and several taxa are yet to be typified (Villarreal *et al.* 2015). *Anthoceros himalayensis* Kashyap (1915: 8) was first described by Kashyap from India without designating any type specimen, but was probably based on material collected by himself during a field trip in Mussoorie, Western Himalayas. Furthermore, the figure that accompanies the protologue appears, judging by the shapes of the thalli and the position of the tubers, to include line drawings of two species, namely *A. himalayensis* and perhaps a *Phymatoceros* sp. *Anthoceros himalayensis* was later transferred to the genus *Phaeoceros* Proskauer (1951: 346) by Proskauer (Bapna & Vyas 1962), however, he had not examined Kashyap's collection. Attempts to locate Kashyap's specimens have been problematic. Asthana and Srivastava (1991) also failed to locate the specimen during the study of Indian hornworts. It became necessary to designate a lectotype. Therefore, we here designate Kashyap's illustration, the Figure 4.4, in the original publication (Kashyap 1915: 8) as the lectotype of *Phaeoceros himalayensis* (Kashyap) Proskauer (1967: 61) ex Bapna & Vyas (1962: 88) ( $\equiv$  *Anthoceros himalayensis* Kashyap). A detailed description, line drawings, and SEM photographs are provided, based on Chopra's collection from type locality and the recent collections from Thailand.

*Phaeoceros himalayensis* (Kashyap) Prosk. ex Bapna & G.G.Vyas, J. Hattori Bot. Lab. 25: 88. 1962. (Figs. 1 & 2)

Basionym: *Anthoceros himalayensis* Kashyap, New Phytol. 14: 8. 1915.

Type:—INDIA. Western Himalayas, Mussoorie, Kashyap's illustration (Lectotype: New Phytologist 14: 8. fig 4.4. 1915, **designated here**).

Thallus yellowish-green to bright green in fresh material, dull green to blackish brown in dry material, prostrate or moderately adhering to the substratum, solid, ecostate, obcordate to fan-shaped, 8–16 mm long, 4–10 mm wide at apex, irregularly branched, with a smooth dorsal surface; apex lobulate to dissected, often attenuate with apical and marginal tubers; dorsal epidermal cells subquadrate, rectangular, or irregularly hexagonal, 60–110 × 30–50  $\mu$ m, with a solitary chloroplast; pyrenoid present. Rhizoids scattered along the median part of the ventral surface, hyaline to pale brown. *Nostoc* colonies irregularly scattered on the ventral side of thallus, appearing as dark dots.

Dioicous or monoicous. Androecia scattered, antheridia not seen. Involucre solitary, oblique to erect, cylindrical, up to 3 mm high, smooth or slightly plicate. Capsules up to 12 mm long, 0.4–0.6 mm in diameter, opening longitudinally along 2 suture lines, sutures bordered by 2 rows of thick-walled and dark brown cells, bivalves becoming twisted with drying; epidermal cells of capsule elongate-rectangular, 80–190 × 15–20  $\mu$ m, walls becoming thickened with maturity, stomata present; assimilative layer 4–5 cell layers in transverse section; the innermost capsule wall cells dark brown, subquadrate to rectangular 25–75 × 25–40  $\mu$ m; columella well-developed, consisting of 5–10 cells in transverse section. Spores yellowish-brown, rounded-tetrahedral equatorial diameter 30–37.5  $\mu$ m; proximal face with a distinct trilete mark, each facet concave, the surface finely vermiculate, with a central hollow sparsely surrounded by verrucose projections (Figs. 2A & C); distal face with irregular verrucose projections, sometimes with aggregation in centre (Figs. 2B & D). Pseudoelaters yellowish-brown at maturity, thin-walled, linear or branched, 45–85  $\mu$ m long, 10–14  $\mu$ m wide, without helicoidal band.