Phaeoceros kashyapii Asthana *et* Sriv. new to eastern Himalayas

Genus *Phaeoceros* Prosk. was established by Proskauer[1] and is represented in India by five taxa, viz. *P. laevis* (L.) Prosk. s.sp. *laevis* Prosk., *P. laevis* (L.) Prosk. s.sp. *carolinianus* (Michx.) Prosk., *P. himalayensis* (Kash.) Prosk., *P. kashyapii* Asthana *et* Sriv. and *P. udarii* Asthana *et* Nath. Subsequently, some studies on the genus *Phaeoceros* have also been made[2,3]. During a recent investigation on the bryophytes of Darjeeling, plants of *P. kashyapii* were encountered from Lebong Road and HMI Road. Earlier, this species was established from Deoban[4], western Himalayas and it was later collected from Patalkot valley, district Chhindwara, Madhya Pradesh, Central India. However, the discovery of this taxon from Darjeeling has extended its range of distribution from western Himalayas to Central India and also in eastern Himalayas, which is a new addition to the bryoflora of this region. It is remarkable that some thalli bearing male sex organs (antheridia) were found. Details of male sex organs in this species are provided here.

Phaeoceros kashyapii Asthana *et* Sriv. *Bryophyt. Biblioth.* Band 42: 129 (1991). (Figure 1)

Plants monoecious, thallus 8–10 mm long and ± 5 mm wide, fanning above and narrow at base, compact; chloroplast single per cell, irregular in shape. Antheridia 2–5 per androecial chamber, antheridial body globose–sub-globose, 140–150 μm × 120 μm without tiered arrangement, stalk biseriate, short. Involucre compact, cylindrical with wider, smooth–crenulate mouth, 2–4 mm long and 0.5 mm wide. Epidermal layer of capsule wall stomatiferous, stomata with two reniform guard cells, 62.5 μm × 40 μm, surrounded by 5–6 more longer than broad epidermal cells with thickened radial and end walls. Spores yellowish-green, 35–37.5 μm in diameter with a prominent equatorial crossitudo, sporoderm with lamellate and few scattered papillose projections, proximal face with a thin and prominent tri-radiate mark reaching to the inner border of equatorial crossitudo. Pseudoelaters light brown, thin-walled, 70–137.5 μm long and 10 μm wide.

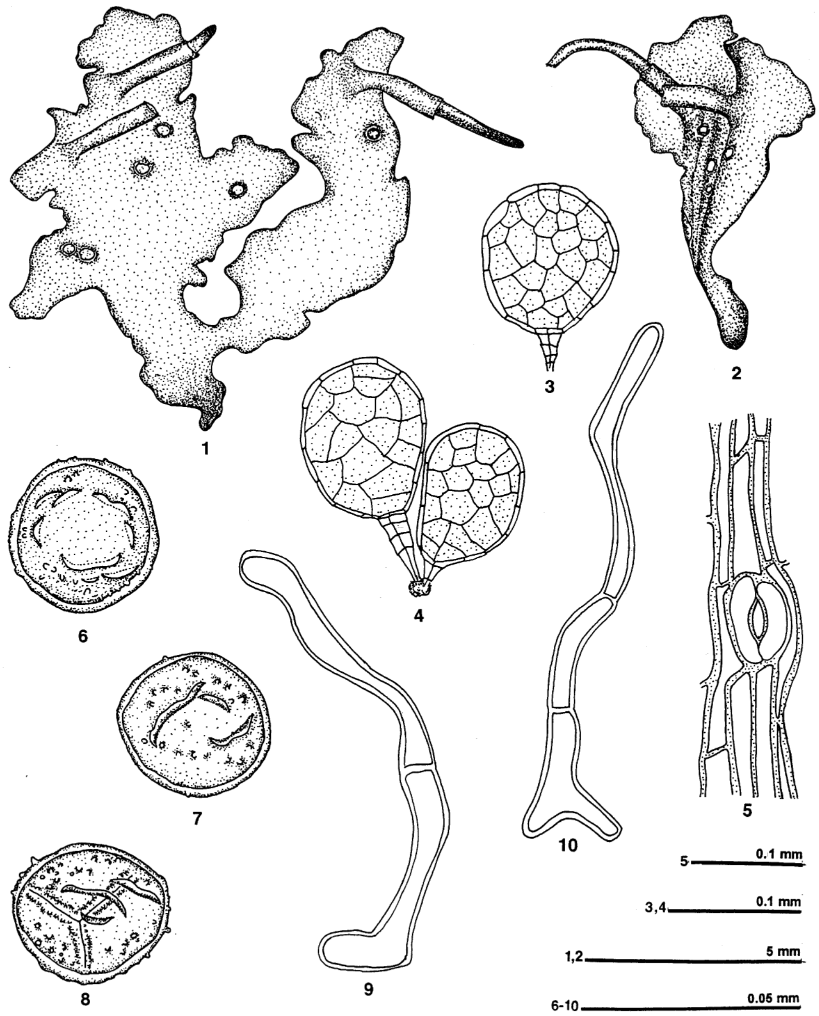

Figure 1. *Phaeoceros kashyapii* Asthana *et* Sriv. 1, 2, Thalli bearing androecial chambers and sporophyte; 3, 4, Antheridia; 5, Epidermal layer of capsule wall; 6, 7, Spores (distal face); 8, Spore (proximal face); 9, 10, Pseudoelaters.

Specimens examined: India. Eastern Himalayas. Darjeeling. HMI Road (alt. ca. 6800 ft). 23.09.2002. Leg. A.K. Asthana & Vinay Sahu. 224008-A (LWG); Lebong Road (alt. ca. 6000 ft), 24.09.2002. Leg. A.K. Asthana & Vinay Sahu. 224031-A (LWG). Det. A.K. Asthana, V. Nath & Vinay Sahu. Western Himalayas. Deoban (alt. ca. 10,890 ft). 29.09.1976. Leg. D. K. Singh & J.C. Joshi. 2170/76 (LWU). Det. A.K. Asthana & S.C. Srivastava. Central India. Chhindwara. Patalkot (alt. ca. 1320 ft) 06.10.1992. Leg. V. Nath & A.K. Asthana. 205475 (LWG). Det. A.K. Asthana & V. Nath.

A comparative study on the morphological variations in plants from Deoban (western Himalayas), Patalkot valley (Central India) and Darjeeling (eastern Himalayas) has revealed that plant thalli of Darjeeling are comparatively larger than the plants from Patalkot valley (6 mm × 2–4 mm) and smaller than those from Deoban (12 mm × 6 mm). As far as the length of involucre is concerned, it is more or less same in all the plants. The size of stomata on the capsule wall is largest in the specimens of Deoban (62–80 μm × 50 μm), whereas it is consecutively smaller in Darjeeling specimens (62.5 μm × 40 μm) and Patalkot valley specimens (60 μm × 32 μm). Spores are smallest in the plants from Darjeeling (35–37.5 μm) compared to those from Deoban (36–42 μm) and Patalkot valley (37–40 μm). Length of pseudoelaters is smallest (72–100 μm) in the plants of Patalkot valley in comparison to those from Deoban and Darjeeling. *P. kashyapii* Asthana *et* Sriv. is distinctly different from *P. laevis* s.sp. *laevis* and s.sp. *corolinianus* in having lamellate sporoderm, while the latter two

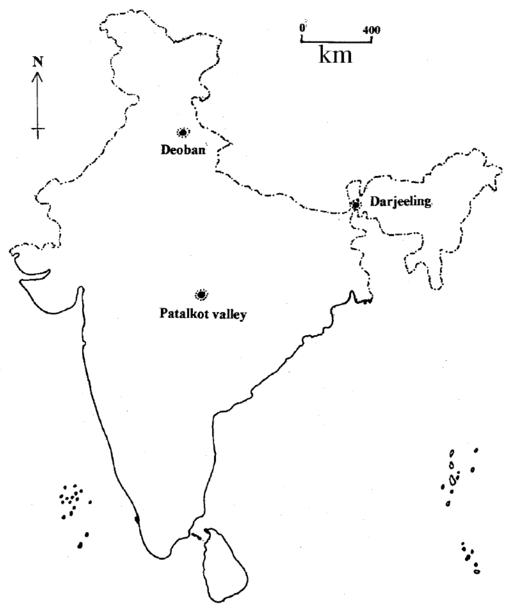

Figure 2. Map showing distribution of *P. kashyapii* Asthana *et* Sriv. in India.

possess minutely papillate sporoderm. *P. udarii* can be easily differentiated from *P. kashyapii* by possessing minutely papillate projections over the elateroderm, whereas *P. himalayensis* is quite seperable by hump-like marks on the sporoderm.

Occurrence of *P. kashyapii* (see Figure 2) in the three major bryogeographical regions of India, between an altitudinal range of 1320 ft in Central India and 10,890 ft in western Himalayas, suggests the widespreading nature of this taxon and its adaptability to grow in varied ecological conditions.

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A. K. ASTHANA
VIRENDRA NATH*
VINAY SAHU

Bryology Laboratory,
National Botanical Research Institute,
Lucknow 226 001, India
**For correspondence.*
e-mail: drvirendranath2001@rediffmail.com

Plant proteins in fish feed

Profitable fish culture requires unfailing supply of formulated fish feed in which proteins serve as both growth nutrient and energy currency. Thus, formulation of low-cost feeds using the cheapest sources of proteins is essential to hasten fish production and to reduce feed cost[1]. With the objective, studies on plant protein sources (PPSs) are continuing at present. But a recent analysis of data from 87 papers revealed a low positive correlation ($r = 0.177$; $n = 377$) between dietary crude protein (DCP in %) of PPS-based feeds and specific growth rate (SGR), and high negative correlation ($r = -0.990$; $n = 332$) between DCP and protein efficiency ratio (PER) of farmed fishes[2]. Evidently, use of PPS-based feeds in profitable fish culture is still a matter of extensive research.

SGR and PER are conversion (growth)-based estimates. In bioenergetics, absorption (A) precedes conversion. A is quantified as absorption efficiency (Ae). It is an index of the proportion of ingested food (C) that is transferred from the gut lumen into the body of a fish ($\mathrm{Ae} = A/C \times 100$)[3]. Ae is primarily influenced by both quantity and origin of proteins in feeds. Fishes digest high proteinaceous diets more efficiently[4]. Plant diets with low natural proteins reduce the Ae of fishes[5,6]. Pandian[3] also summarized mean Ae values as 89 and 44% for fishes on animal and plant diets respectively. This report is first aimed to estimate the DCP–Ae relationship in an earlier dataset[2] on PPS-based feeds. In this context, food nitrogen (N in %) is positively ($r = 0.959$; 50 species) and significantly correlated with Ae of fishes. Ae is also predictable from N using the regression model: $\log\mathrm{Ae} = 1.3706 + 0.5807\log\mathrm{N}$. The second aim is to get a new outlook to the Ne–Ae relationship using an earlier dataset[2] on PPS-based feeds.

Among the 100 values regressed in the previous analysis[7], 52 pertain to 32 species fed on high N-containing (5.7–13.7; mean: 9.855%) animal diets and 22 pertain to