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Studies on *Cephalozia pandei* Udar *et* Kumar from Meghalaya : India

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Abstract – Observation on female plants and sporophytes of *Cephalozia pandei* Udar *&* Kumar has been made for the first time from Mawphlong forest (alt. *ca* 5600 ft.) Shillong, Meghalaya. Earlier this species was described vegetatively only from Darjeeling (alt. *ca* 7000 ft.). Details of the fertile plants are provided.

***Cephalozia pandei* / Hepaticae / fertile specimen / perianth / capsule / elater / Meghalaya**

INTRODUCTION

The genus *Cephalozia* Dumort. is represented in India by seven species, viz. *Cephalozia gollanii* Steph., *C. darjeelingensis* Udar & Kumar, *C. pandei* Udar & Kumar, *C. indica* Udar & Kumar, *C. kashyapii* Udar, *C. siamensis* Kitag., and *C. udarii* Kumar according to the present knowledge (Udar and Nath, 1973; Udar and Kumar, 1976; Udar, 1978; Kumar, 1987). Out of these, five species occur in eastern Himalaya and the other two in South India and Western Himalaya, respectively. *Cephalozia gollanii* has wide distribution in Eastern Himalaya as well as in Western Himalaya. Long and Grolle (1990) reported three species, *C. gollanii*, *C. darjeelingensis* and *C. siamensis* from Eastern Himalaya, India. Fertile plants were found only in *C. darjeelingensis, C. udarii* and *C. siamensis*. During a critical investigation of recent bryophyte collection from Khasi and Jaintia hills (Meghalaya) fertile specimens of *C. pandei* were encountered for the first time and details of this species are being provided.

MATERIALS AND METHODS

The material was collected in November 1998 in Mawphlong forest, 24 km from Shillong, Meghalaya, alt *ca* 5600 ft., growing on soil adjacent to stream. The specimens are deposited in the Bryophyte Herbarium NBRI (LWG).

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OBSERVATION

***Cephalozia pandei* Udar & Kumar,** *Geophytology* **6** (1): 35-45 (1976). Figs 1-23

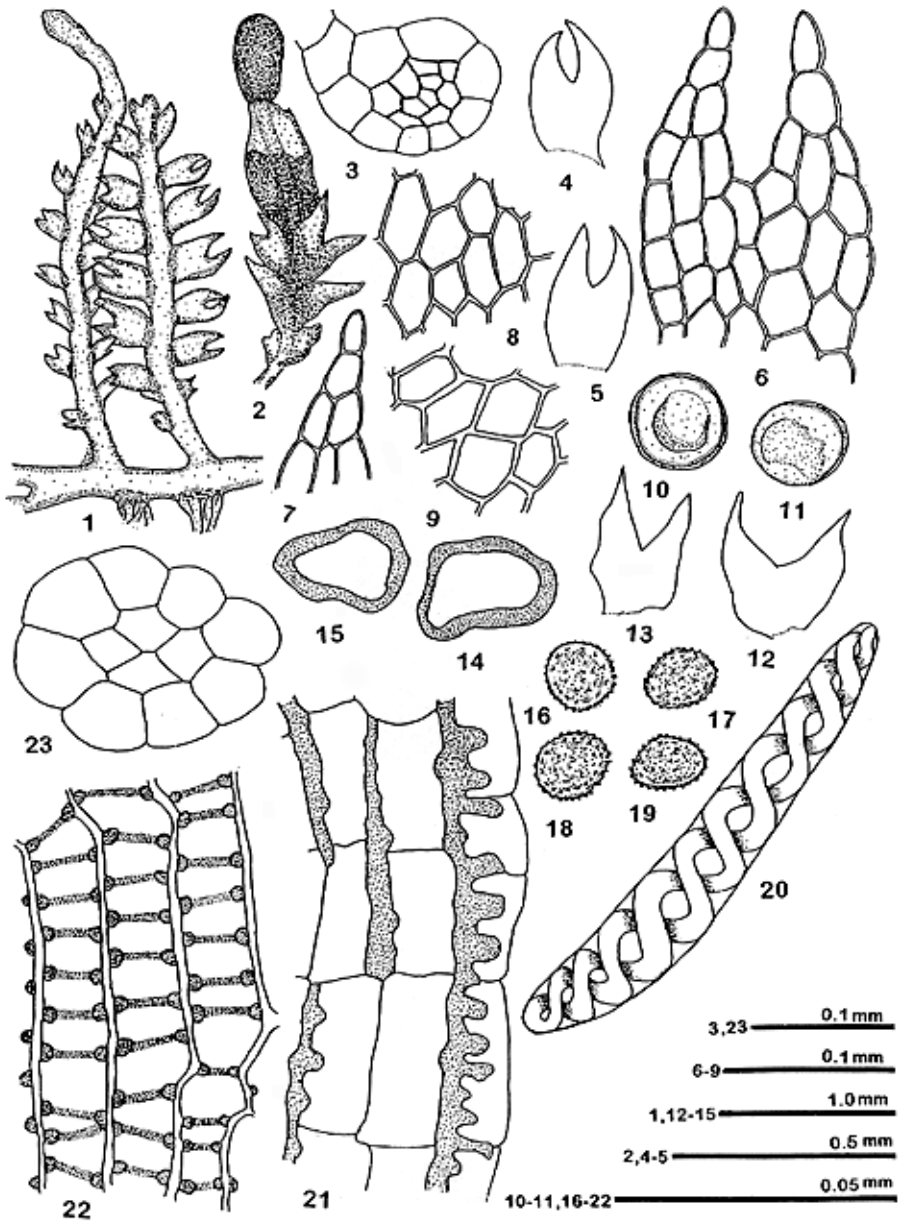
– **Holotype** (sterile plants): in the vicinity of Senchal lake, Darjeeling (alt. *ca* 7000 ft.), Eastern Himalaya, India, on moist soil, 2.01.1970, *R. Udar & Dinesh Kumar 40-D*, Lucknow University Hepatic Herbarium (LWU!).

Plants small, 6.5-9 mm long, delicate, light green to yellowish brown, sparsely ventrally branched. **Stem** 90-125 µm wide, flattened, cortical cells in 8 longitudinal rows, thin-walled, ± pigmented, longer than wide, dome shaped, 30-52 µm long and 15-40 µm wide. Medullary cells smaller, pale in colour, thick-walled, tetra to hexagonal, but mainly pentagonal, 20-38 µm long and 17-25 µm wide. **Leaves** ± distant, latero-obliquely arranged; lower leaves smaller, less distant, upper ones somewhat larger and more distant, alternate, simple, half of their length or less bilobed, not decurrent, broadly quadrate to oval, convex, slightly narrowed at apex, 230-320 µm long and 150-180 µm wide. Apical cells somewhat triangular, longer than wide, 22-25 µm long and 15-18 µm wide. Sinus large, extending to half of the leaf, base two-celled, obtuse to subobtuse, rounded, lobes rarely connivent, slightly bent inward, usually with single row of two or three cells. Leaf cells large, pentagonal, thin-walled, without trigones. Marginal cells 35-45 µm long and 15-20 µm wide, median cells 37-45 µm long and 20-28 µm wide, basal cells 50-52.5 µm long and 35-40 µm wide. **Underleaves** absent, rhizoids simple, scattered on ventral surface of axis. **Gemmae** at shoot apices, spherical, unicelled, 20-23 µm. **Dioecious**. Male plant not seen. **Gynoecia** terminal on main axis, covered with large bracts. **Bracts** bilobed, 1 mm long and 0.85 mm wide, erect, cells thin-walled, large, similar to those of leaves, sinus descending to 2/3 of the bract length. **Perianth** long, yellowish brown, margins ± undulate, almost smooth. **Capsule** dark brown to blackish red, oblong, 0.55 mm long and 0.30 mm wide. Capsule wall double-layered, outer layer with nodulated thickening bands, parallel to cell length, cells 37-40 µm long and 30 µm wide, inner layer with dark semi-annular, dense transverse thickening bands. **Seta** cylindrical with eight outer and four inner rows of longitudinal cells. Outer cells 60-70 µm long and 50-60 µm wide, inner cells 40-50 µm long and 30-40 µm wide. **Spores** spherical, oval, sporoderm papillose, 12-15 µm. **Elaters** long, cylindrical, smooth, brownish black with narrowed ends, with two spirals, 107-125 µm long and 15 µm wide.

Specimen examined: *Cephalozia pandei* (female plants) – Meghalaya, Mawphlong forest (alt. *ca* 5600 ft. Shillong), on moist soil, 5.11.1998, *V. Nath, A. K. Asthana & A. P. Singh 205940-A* (LWG!). – Holotype of *Cephalozia darjeelingensis*, (female plants) Lebong road, Darjeeling (alt *ca* 6000 ft.), Eastern Himalaya, India, on moist soil over rocks, 31.12.1969, *R. Udar & Dinesh Kumar 255-A*, Lucknow University Hepatic Herbarium (LWU!).

DISCUSSION

A world wide monographic study on *Cephalozia* was carried out by Váňa (1988) who mentioned the probable conspecificity of *C. pandei* to *C. darjeelingensis*. However, our study of the type specimens of *C. pandei* and *C. darjeelingensis*



Figs 1-23. *Cephalozia pandei* Udar & Kumar. **1**. Vegetative plant. -**2**. Perianth and capsule bearing shoot. -**3**. Cross-section of stem. -**4-5**. Leaf lobe. -**6**. Enlarged view of the leaf lobe. -**7**. Apical and marginal cells of the leaf lobe. -**8**. Median cells of the leaf lobe. -**9.** Basal cells of the leaf lobe. -**10-11**. Gemmae. -**12-13**. Female bracts. -**14-15**. Cross-section of perianth. -**16-19**. Spores. -**20**. Elater. -**21**. Outer layer of the capsule wall. -**22**. Inner layer of the capsule wall. -**23**. Cross-section of the seta.

Table 1. Morphological comparison of the seven species of *Cephalozia* Dumort. represented in India.

	C. pandei	*C. darjeelingensis*	*C. udarii*	*C. gollanii*	*C. kashyapii*	*C. indica*	*C. siamensis*
Plants	6.5-9 mm long, light green to yellowish brown	4-12 mm long, greenish white to greenish yellow	6-12 mm long, light green to green	5-10 mm long, yellowish green to yellowish brown	7-16 mm long, pale green	6-8 (-10) mm long, green to yellowish green	6-12 mm long, light green
Stem t.s.	Flat, 90-125 µm	Nearly round, 113-142.5 µm	Flat 180-235 × 115-155 µm	± Flat, 126-220 µm	Nearly round, 93.6-134 µm	Round, 73.3-93.6 µm	Nearly round, 73.3-101.7 µm
Cortical cells	8 longitudinal rows, thin-walled, 30-52×15-40 µm	12 longitudinal rows, thin-walled, 33.4-57.1 µm	12 longitudinal rows, thin-walled, 31.47×38-52 µm	12 longitudinal rows, 23-70 µm	8 longitudinal rows, 33.3-75 µm	5 longitudinal rows, 15-38 µm	8-9 longitudinal rows
Medullary cells	8-10 longitudinal rows, thick-walled, 20-37.5×17.5-25 µm	Numerous, thin-walled, 24×50 µm	Numerous, slightly thick-walled, 13-26×19-31 µm	Numerous, slightly thick-walled, 20×36 µm	Numerous, thin-walled, 13.3×33.3 µm	1-2 longitudinal rows, thin-walled, 16.6×21.6 µm	9-11 longitudinal rows, thin-walled
Leaves	Distant, alternate, broadly quadrate, 230-320 µm long ×150-180 µm wide, convex	Closely (succubous), subalternate to opposite, ovate broad-ovate, 183-313 µm long ×138-252 µm wide	Closely (succubous), sub alternate to opposite, rectangular to rectangulate - suborbicular, 356-702 µm long×345-650 µm wide	Closely (succubous), suborbicular, 392-450 µm long ×400-500 µm wide	Distant, alternate, ovoid-obovoid, 154-358 µm long x 32-211 µm wide	Distant, alternate, sub alternate, ovoidal, 93-284 µm long ×65-162 µm wide	Distant, imbricate, alternate, oblong to ovate, 345-394 µm long×187-244 µm wide
Sinus	1/2 of the lobe length	1/3-1/2 of the lobe length	1/2-1/3 of the lobe length	1/5-1/4 of the lobe length	1/2-1/3 of the lobe length	1/4 of the lobe length	1/2 or more of the lobe length

Leaf lobes	3 or rarely 4 cells high, marginal cells 35-44.5 µm long ×15-20 µm wide	4 cells high, marginal cells 36-48 µm long ×20-35 µm wide	6-10 cells high, marginal cells 36-91 µm long ×31-73 µm wide	3 cells high, marginal cells 35-90 µm long ×20-65 µm wide	4 cells high, marginal cells 40-61 µm long ×20- 28 µm wide	2-3 cells high, marginal cells 53-57 µm long ×16-20 µm wide	6 cells high, marginal cells 28-67 µm long ×19-28 µm wide
Sexuality	Dioecious, gynoecia on main axis or ventral branches	Dioecious, gynoecia terminal on main axis or ventral branches	Monoecious, gynoecia terminal on main axis or ventral branches	Unknown	Unknown	Unknown	Dioecious, gynoecia terminal on ventral branches
Perianth	0.6 mm long	2-2.2 mm long	2-2.5 mm long	Unknown	Unknown	Unknown	1.3 mm long
Capsule	Oblong, 0.5 mm long × 0.3 mm wide	Oblong, 0.6-0.8 mm long × 0.5 mm wide	Oblong-oval, 0.5-0.9 mm long	Unknown	Unknown	Unknown	Unknown
Seta	With 4 central and 8 peripheral cells	With 4 central and 8 peripheral cells	With 4 central and 8 peripheral cells	Unknown	Unknown	Unknown	Unknown
Spores	12.5-15 µm	12-15 µm	12-14 µm	Unknown	Unknown	Unknown	Unknown
Elaters	Smooth, brownish black, bispiral, 107-125 µm long ×15 µm wide	Smooth, yellow brown, with bi-trispiral, 283 µm long × 17-22 µm wide	Smooth, bispiral, 130-325 µm long ×8-9 µm wide	Unknown	Unknown	Unknown	Unknown
Gemma	Spherical, unicelled	Oblong, unicelled	Unknown	Unknown	Unknown	Unknown	Suboblong, unicelled

revealed that the former is clearly distinctive from the latter (see Tabl. 1). Among the earlier described taxa of *Cephalozia* in India, sporophytic details of only *C. darjeelingensis* (Udar & Kumar, 1976), *C. udarii* (Kumar, 1987) and *C. siamensis* (Udar & Nath, 1973) have been known, of which the latter two are prominently distinctive in having slightly thickened medullary cells; leaf length and width, 6-10 cells high leaf lobes, angular sinus, and monoecious sexuality. A comparative table of distinctive characters of all the 7 Indian species is also provided (Tabl. 1).

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