

A NEW SPECIES OF *NOTOTHYLAS* SULL., *N. PANDEI* UDAR ET CHANDRA FROM INDIA*

RAM UDAR AND VINOD CHANDRA**

Department of Botany, University of Lucknow, Lucknow

ABSTRACT

A new species of *Notothylas*, *N. pandei* sp. nov., has been described from the vicinity of Jog Falls, Shimoga, in West Coast region of South India. The most impressive feature of this species is the presence of tubers which have not been observed among any known species of the genus. Other supplementing diagnostic characteristics are provided by the thallus, involucre mouth, less exposed sporogonium, number of sutures, columella, spores, and elaters. In its overall features the plant has a cumulative impact of forming a distinct link between *Phaeoceros-Notothylas* assemblage.

INTRODUCTION

The genus *Notothylas* Sull. is represented in tropical and temperate regions of the world by 13 species, viz. *N. amazonica* Spruce, *N. breutelii* (Gott.) St., *N. cubana* St., *N. dissecta* St., *N. angolensis* St., *N. decurva* Mitt., *N. flabellata* St., *N. levieri* (Schiffn. Ms.) St., *N. orbicularis* (Schwein) Sull., *N. javanica* (Gott. Ms.) St., *N. japonica* Horik., *N. indica* Kash. and a doubtful taxon *N. chaudhurii* Nirula. Four other species on record, viz. *N. valvata* Sull., *N. melanospora* Sull., *N. fertilis* Milde are synonyms of *N. orbicularis*. *N. minuta* (Mitt.) St. is now recognized as *Phaeoceros minutus* (Mitt.) S. Arnell. From India *N. levieri* (STEPHANI, 1912-1917), *N. indica* (KASHYAP & DUTT, 1925), *N. chaudhurii* (NIRULA, 1945), *N. decurva* (GUPTE, 1945), *N. orbicularis* and *N. javanica* (KAGHROO, 1954) have been recorded (see also UDAR, 1976). *Notothylas pandei* described here as new species raises the number of species recorded from India to seven.

TAXONOMIC DESCRIPTION

***Notothylas pandei* sp. nov.**⁺

(Text-figs. 1-11 ; Pl. 1, Figs. 1-5)

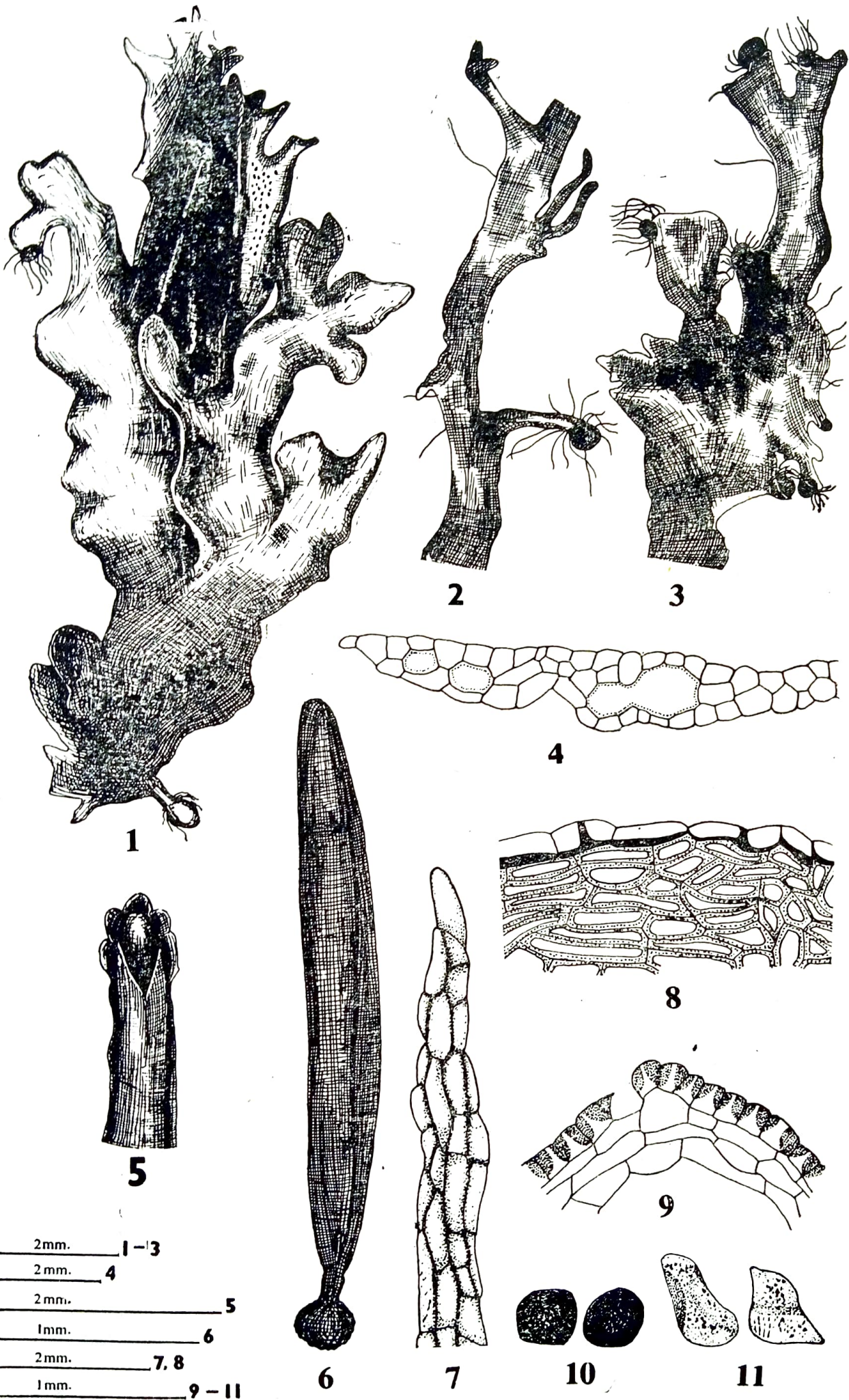
Diagnosis—Herba monoica, fusce viridis, superpositae, lobum longa, apicem lobatum tuberiformis; cellulae epidermales nonelevati; lacunae 1-2 stratae; involucre marginibus, ultra apicem thalli procurrens, apicem dorso lobatum papillosum, facies ventralis v forma; capsulum infra apicem, decurrens, columella eminentis; sporae fuscae, subangulosa

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**Present address : Department of Botany, Shivaji College, New Delhi, 110015, India.

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Text-figs. 1-11—*Notothylas pandei* sp. nov. 1, Thallus with sporogonia and tubers (Dorsal view); 2, Portion of thallus showing apparently stalked tuber on long lobe; 3, Tubers borne on apices of broad lobes; 4, Cross section of thallus; 5, Portion of involucre showing shape of the mouth and position of capsule; 6, Sporogonium; 7, Columella; 8, Portion of capsule wall showing special marginal cells of the valve; 9, Transverse section of capsule wall; 10, Spores; 11, Pseudoelaters.



vel sphaericis, facies plana, 33.6—38.4 μm in diametro maximo ; pseudoelateres inconspicue spiralibus, 38.4—57.6 μm longi.

Holotypus positus in herbario hepatico, sectionis botanices, Universitatis Lucknowensis, subnumero N. S. 528, *Notothylas pandei* Udar et Chandra sp. nov., Loc. Jog Falls, Shimoga, South India. Leg et Det. Udar, R. and Chandra, V. mense, October, 1962.

Description—Plants monoecious, dark green ; thalli caespitose, ca 10.5 mm long, 3 mm broad, deeply lacinate, lobes bearing apical tubers. Nostoc auricles irregularly distributed. Cells of the dorsal epidermis not protuberant, oblong-hexagonal, ca 96 μm \times 38.4—48 μm ; internal tissue with several lacunae in 1-2 layers ; thallus in cross section ca 3-4 cells thick in the middle region. Involucre commonly on the marginal sinuses, not concealed by thallus lobes, cylindrical, horizontal, deflexed, dorsal lobe at the mouth apex broadly papillose, ventral face V-shaped. Capsule cylindrical, apex obtuse, not projecting beyond the involucre, ca 4 mm long, foot bulbous, seta inconspicuous ; capsule wall nonstomatiferous, 4 cell-layers thick, cells of the outer layer with thickenings on vertical walls and peripheral regions of dorsal wall, inner wall without thickenings ; capsule dehiscing longitudinally along two sutures into two valves ; special cells bordering each valve in one row, thickened along the inner walls and the walls between adjoining special cells ; columella prominent, persistent, consisting of cells arranged in 16 vertical rows for about 2/3 of its length, apex acuminate, terminated by single large conical cell. Spores black, subangular or spherical, surface smooth, 33.6—38.4 μm across diameter ; pseudoelaters subcubical to variously shaped, light brown, having faint spiral thickening bands, 38.4—57.6 μm long.

Holotype deposited in Hepatic Herbarium, Department of Botany, University of Lucknow, No. N. S. 528, *Notothylas pandei* Udar et Chandra sp. nov. Loc., Jog Falls, Shimoga, South India. Coll. and Det. Udar, R. and Chandra, V., October 1962.

DISCUSSION

N. pandei was found growing along with *Cyathodium aureonitens* on thin loamy soil in very moist and shady habitats in the vicinity of Jog Falls, Shimoga, in West Coast region of South India. In India, species of *Notothylas* are mostly found growing with different species of *Cyathodium*, for example *N. indica* with *C. cavernarum* and *N. levieri* with *C. tuberosum*. It indicates that both of these tender genera prefer nearly the similar habitat. In its type locality, *N. pandei* would have escaped the attention of the authors but caespitose habit of thalli and long ribbon shaped narrow lobes bearing tubers were enough to invoke curiosity. A careful laboratory examination of the species revealed that this is a new taxon.

The most impressive feature of this species is the presence of tubers which have been not observed among any of the known species of *Notothylas*. Although tubers have been noted earlier in *N. minuta* but actually this taxon does not belong to *Notothylas* but to the genus *Phaeoceros* Prosk. whose most of the species generally produce tubers. Through tubers in *N. pandei*, the genus *Notothylas* shares this one character with *Phaeoceros* Prosk. Tubers appear to be a normal feature of this species as 1-8 tubers were found on most of the plants. These tubers are spherical or ovoid in shape and morphologically are tuberoid modifications of the apices of thallus lobes. They remain covered with smooth walled rhizoids. All the tubers in this species are basically sessile and apical. However, they give the impression of two types viz. sessile and stalked tubers. In Plate 1, Figures 1-2, tubers (t) are situated in terminal position on narrow lobes of the thallus. These narrow lobes do not appear to be the stalks of the tubers. In certain cases these terminal tubers are shifted towards the ventral side of the thallus lobes and appear to be ventral adventi-

Table 1

Characters	<i>N. decurva</i>	<i>N. indica</i>	<i>N. javanica</i>	<i>N. orbicularis</i>	<i>N. pandei</i>
Habit	Thalli profoundly lobed	Thalli commonly forming rosettes	Thalli forming flat rosettes	Thalli forming flat, often confluent rosettes, thallus surface ridged	Thalli commonly caespitose
Thallus thickness	Not described	ca 6 cells thick in middle region.	Not described	Not described	ca 3-4 cells thick in the middle region.
Involucre	Cylindrical, plicate	Short, inconspicuously projecting beyond the thallus lobes; mouth simple	Cylindrical, plicate	Corniform; mouth simple	Long, prominently projecting beyond the thallus lobes, dorsal lobe of the mouth broadly papillose, ventral face V-shaped
Capsule	Short; columella persistent	Short, projecting beyond the involucre, ovoid oblong, apex subconical, lines of dehiscence 1-4, special cells along the margins of valves thickened along the inner, outer and vertical walls between adjacent cells; columella persistent	Long; columella non-persistent, poorly developed	Ovate or oblong or oblong cylindrical; columella persistent, often appendiculate	Long, not projecting beyond the involucre oblong, cylindrical, apex obtuse, lines of dehiscence 2, special cells lining the margins of valves thickened along the inner and vertical walls between adjacent cells, outer walls thin, columella persistent
Spore	Yellow, 36 μ m across diameter	Dark brown, surface finely granulose, 36.1 μ m across diameter	Yellow, surface minutely asperate, 45 μ m across diameter	Spores brown, papillate or tuberculate or muriculate, 45 μ m across diameter.	Black, smooth, 33.6-38.4 μ m across diameter
Pseudoelaters	Not described	40 μ m long, spiraling bands conspicuous	45 μ m long	45 μ m long	38.4-57.6 μ m long, spiraling thickening bands inconspicuous

tious tubers (Pl. 1, Fig. 3). However, their terminal position on each lobe evidently indicates that these are not adventitious tubers.

N. pandei having prominent and persistent columella is sharply distinguishable with noncolumellate species such as *N. levieri*, *N. japonica*, *N. flabellata* and *N. chaudhurii*. *N. javanica* and *N. breutelii* differ from *N. pandei* in having non-persistent or poorly developed columella, besides minutely asperate spores in the former and muriculate spores in the latter species. It has not been possible to compare *N. pandei* with authentic specimens of *N. amazonica*, *N. cubana*, *N. dissecta*, *N. angolensis* and *N. decurva*. However, descriptions of these species given by STEPHANI (1917) conclusively show that *N. pandei* is distinct from them. The differential characters of these species in relation to *N. pandei* could be summarized as follows: *N. amazonica* has very large orbicular thallus about 30 mm broad with cylindrical attenuate involucre, the capsule about 35 mm long and yellowish spores; *N. cubana* has large profoundly lobed thallus; involucre is longitudinally plicate and the spores are brown, minutely papillate; *N. dissecta* has large thallus with irregularly dissected lobes; involucre inflated and have papillose cells on the surface; capsule is short, spores are yellowish green and elaters are trispirate; *N. angolensis* has a prominent midrib in the thallus lobes and the spores are yellow; and *N. decurva* has medium-sized profoundly lobed thallus, involucre is cylindrical plicate; capsule is short and the spores are yellowish.

The widely distributed species *N. orbicularis* differs with *N. pandei* in having thallus forming flat, often confluent rosettes, thallus surface ridged, pitted and often scarcely lamellate; epidermal cells distinctly protuberant; involucre corniform, mouth simple, capsule ovate or oblong or oblong cylindrical or oblong ovoid; columella often black and appendiculate; spore surface rough often papillate or tuberculate (HOWE, 1898) or muriculate (STEPHANI, 1917), and 45 μ m in diameter.

N. pandei was also compared with *N. indica* which is commonly distributed in the plains and foot hills of India and often reaches higher altitudes. It differs from the latter in having caespitose thalli thinner in the middle region, longer involucre projecting prominently beyond the thallus lobes, larger capsule never projecting beyond the involucre, black smooth spores and pseudoelaters with inconspicuous spiral bands.

The differentiating characters of all the columellate species recorded from India are given in Table 1.

REFERENCES

- GUPTA, K. (1945). Taxonomic observations on a species of *Notothylas* Sull. from Poona. *J. Univ. Bombay* **14**: 52.
- HOWE, M. A. (1898). The Anthocerotaceae of North America. *Bull. Torrey Bot. Club.* **25**: 1-24.
- KACHROO, P. (1954). Studies in Assam Hepaticae. IV. On some species of *Anthoceros* L., *Notothylas* Sull. and *Riccia* L. from Eastern India. *J. Univ. Gauhati (India)* **5**: 124-133.
- KASHYAP, S. R. & DUTT, N. L. (1925). Two Indian species of the genus *Notothylas*. *Proc. Lahore phil. Soc.* **IV**: 54.
- NIRULA, R. L. (1945). *Notothylas chaudhurii*, a new species from Nagpur. *Proc. 32nd Indian Sci. Congress* **III**: 70-71.
- STEPHANI, F. (1912-1917). *Species Hepaticarum*, **V**: Genève.
- UDAR, R. (1976). *Bryology in India*. The Chronica Botanica, New Delhi.

EXPLANATION OF PLATE 1

1—5. *Notothylas pandei* sp. nov. 1, Thallus with sporogonia and tuber (t) \times ca 12 (Ventral view); 2, Tuber covered with smooth walled rhizoids, \times 52; 3, Tuber attached with thallus lobe, \times 52; 4, Thallus showing long narrow lobes, \times 3; 5, Stalk-like narrow thallus lobes(s) with tuberoïd apices, \times 28.

