

# ON A COLLECTION OF MACROLICHENS BY THE INDIAN EXPEDITION TO CHO-OYU, EAST NEPAL

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THE Indian mountaineering expedition undertaken in 1958, to the world's sixth highest peak—Cho-Oyu, in East Nepal, provided excellent opportunities to simultaneously explore scientific facts particularly on Natural Sciences from the regions visited. To get all possible data of botanical interest and collect plants, the Government of India deputed a senior member of Botanical Survey of India to accompany the expedition. Due care seems to have been taken to the collection of all groups of plants with the result that lichens are also well represented in the collection. The macrolichens (foliose and fruticose types) alone, which have been sent to me for determination, for the present, constituted 45 packets. Except in few cases (when it becomes almost unavoidable in bulk collection), there was no mixture of different lichens in the packets. The specimens have been collected from the altitudes of about 1880 m. (= 6,200 ft.) to 5455 m. (= 17,000 ft.), which corresponds to the temperate and alpine zones of the Himalayas, where lichens abound in variety and abundance constituting an important component of the vegetation. The variety is well reflected in the occurrence of 38 species in a collection of 45 packets.

All these specimens were collected by Mr. Rolla Seshagiri Rao, the Regional Botanist, Botanical Survey of India, who accompanied the expedition, and the numbers of the specimens pertain to his field numbers. I am thankful to him for placing at my disposal this excellent collection of lichens for determination and also for allowing me to retain parts from all the specimens, with the field notes on the labels, for my herbarium. The other set is preserved at the Shillong Herbarium of the Botanical Survey of India.

I also take the opportunity of expressing my thanks to Professor S. N. Das-Gupta for constant encouragement and helpful suggestions and to Mr. M. B. Raizada for the loan of the part of the Isotype of *Cetraria ambigua* from Dehra Dun Herbarium.

The species as determined from the collection are arranged below according to Zahlbruckner's system.

### STICTACEÆ

#### *Lobaria isidiosa* (Müll. Arg.) Vain.

Common on bark of *Rhododendron campanulata*, near Debuche, alt. 3657-3962 m., April 28, 1958 (No. 13834).

Thallus foliose, characteristic, widely lobate laciniate, darkish-brown, isidiose along the margins and on the ridges of the scrobiculate surface. Medulla K-, Cl-, Pd-. Sterile.

Common in temperate Himalayas, in shade.

#### *Sticta henryana* Müll. Arg.

On bark of *Rhododendron campanulata*, near Debuche, alt. 3657-3962 m., April 28, 1958 (No. 13833/A).

Thallus foliose, sinuate lobate, lobes up to 1 cm. broad, smooth, ashy-grey to pale-greyish; underside pale with round cyphellæ, dark-brown rhizinæ and long-branched rhizinose fibrils. Medulla K-, Cl-, K (Cl)-, Pd-. Sterile.

The species is a new report for this area as it has so far been known only from China.

#### *Sticta platyphylloides* Nyl.

Mixed with the last one (*S. henryana*) in the same packet, separated out and numbered as 13833/B.

Thallus foliose, sinuate lobate, glaucous pale-grey to brownish, subpruinose under lens on the upper surface; underside with cyphellæ and pale grey tomentum of rhizinæ. Medulla K-, Cl-, K (Cl)-, Pd-. Apothecia profuse; subpodicellate, up to 6 mm. in diameter; disc plane to convex, red-brown; margin minutely crenate; spores elongate, fusiform, 40-50 × 6 μ in size.

It is a new report for this region, being known so far, like the previous species from China only.

### CLADONIACEÆ

#### *Cladonia mitis* Sandst.

Along rocky crevices, Chule to Lhenjo, alt. 4724 m., May 11, 1958 (No. 13899). Common on soil, *Rhododendron* and grass-covered soil, along Relmo Lak area, alt. 4998 m., May 12, 1958 (No. 13916).

Thallus densely bushy, podetia pale-white to pale-greyish, subarachnoid tomentose and semipellucid, usually terminating in 2-3 branchlets at the apex. Podetia K-, Pd-. Sterile.

***Cladonia sylvatica* (L.) Harm.**

On soil, slopes below Minjbo, alt. 4480 m., April 20, 1958 (No. 13759).

Thallus bushy, subsimilar to the last species (*Cl. mitis*) but distinguished by the stouter podetia which are characteristically multiple branched, conidia colourless. Podetia K-, Pd + orange-red to red. Sterile.

***Cladonia aggregata* (Sw.) Ach.**

Common on tree branches, Cho-Oyu, near Nigala, alt. 2133 m., March 29, 1958 (No. 13558). Thallus bushy, up to 4 cm. tall. Podetia densely congested and characteristically elliptically perforated at intervals, light-pale to light-chestnut coloured.

***Cladonia pleurota* (Flk.) Schaer.**

On soil, Lobuje to Pangboche, alt. 4267 m., April 26, 1958 (No. 13820). Near Debuche, alt. 3657 m., April 28, 1958 (No. 13836).

Primary thallus squamulose, podetia smooth elongated and gradually widened to a short scyphus, Pd-. The first specimen (No. 13820) is fertile and latter (No. 13836) sterile.

***Cladonia pyxidata* (L.) Fr.**

On soil-covered rock, Dole, alt. 4267 m., May 15, 1958 (No. 13937).

Primary thallus squamulose, podetia short with wide funnel-shaped scyphus, surface scurvy squamulose, Pd + orange-red. Sterile.

***Cladonia* cf. *ceratophyllina* (Nyl.) Vain.**

On soil, near Debuche, alt. 3657 m., April 28, 1958 (No. 13838).

Specimen with few podetia which are tapering and unilaterally squamulose, Pd + orange-red.

***Cladonia* cf. *verticillata* Hoffm.**

On soil, near Debuche, alt. 3657 m., April 28, 1958 (No. 13837).

Podetia linear elongated with scyphus at the top, grey-brown to brownish, Pd + orange-red. Fertile.

***Stereocaulon myriocarpum* Th. Fr. var. *orizabæ* Th. Fr.**

On rocks, near Gora shop, alt. 5303 m., April 26, 1958 (No. 13804).

Thallus erect bushy and congested, up to 4.5 cm. tall. Pseudopodetia branched from the base, much entangled, densely covered by the characteristic ashy grey phylloclades. Apothecia copious, terminal or lateral, small, rounded and brown; spores  $30-40 \times 4-9 \mu$  in size. Specimen No. 13804 fertile and No. 13938 sterile.

***Stereocaulon piluliferum* Th. Fr.**

On dry rocks, Ghat to Namchebazar, alt. 2743 m., April 11, 1958 (No. 13727).

Pseudopodetia erect, up to 3 cm. tall, scarcely branched or branches few, phylloclades well developed, linear, tapering, cephalodia sacculate type. Apothecia terminal, convex, dark-brown; spores elongate, fusiform, multicelled,  $100-140 \times 3-5 \mu$  in size.

Endemic in the temperate Himalayas. Usually growing gregariously on moist exposed rocks.

**PARMELIACEÆ*****Parmelia vittata* (Ach.) Röhl.**

On Rosa shrubs, Thengbock to Pangbock, alt. 3992 m., April 19, 1958 (No. 13740/C).

Only few fragments; the laciniae with the characteristic, apically leprose soredia. As mixture with *Parmelia cirrhata*, etc.

***Parmelia cirrhata* Fr.**

On shrubs near Mahabir village, alt. 2438-2682 m., April 4, 1958 (No. 13638). On Rosa shrubs, Thengbock to Panbock, alt. 3992 m. April 19, 1958 (No. 13740/A)—Specimens in both somewhat typical though in the latter the marginal rhizinæ are much longer.

On trees and shrubs near Nigala village, alt. 2133 m., March 29, 1958 (No. 13561)—laciniae narrow, apothecia almost subterminal, large and lobulate.

On twigs near Debuhe, alt. 3657-3962 m., April 28, 1958 (No. 13835)—mixture of typical *cirrhata* and another with *cirrhata* like thallus with the difference that the laciniae are about 3 mm. broad at base and gradually taper to 0.5 mm. apically. Underside black with stiff rhizinæ.

*P. cirrhata* is the most abundant and widely distributed species in the temperate Himalayas from East to West. Distributed in many other temperate parts of the world.

***Parmelia stenophylla* (Ach.) DR.**

On rocks, Lobuje to Pangboche, alt. 4572 m., April 26, 1958 (No. 13822). At Kisan Yak grazing village, alt. 4480 m., May 5, 1958 (No. 13868).

Thallus foliose pale-yellow, laciniae much imbricated, usually 0.5-1 mm. broad, rarely narrower. Underside with pale-grey rhizinæ. Occasionally laciniae with characteristically broadened lobes. Medulla K + red, Cl-, Pd + deep-yellow to orange. Chiefly a European species, extending to the Himalayas. The laciniae of the European specimens are broader; even the laciniae in specimens from Kashmir (preserved in my herbarium) are broader than in these Nepal specimens.

***Parmelia reticulata* Tayl.**

On twigs of *Berberis*, near Nigala village, alt. 2133 m., March 29, 1958 (No. 13557).

A small piece but easily distinguished by the minute, white reticulations on the upper surface (distinct under lens) and the globose marginal soralia which are often confluent. Medulla K + yellow changing to deep blood-red.

***Parmelia nimandairana* Zahlbr.**

On branches of *Rhododendron arboreum*, near Nigala village, alt. 1889 m., March 29, 1958 (No. 13563).

Thallus foliose, sinuate lobate, yellowish-grey to grey, densely isidiose towards the central part, underside with black rhizinæ up to the margin. Medulla K + red, Pd + deep yellow to orange.

***Parmelia caperata* (L.) Ach. var. *cylisphora* Ach.**

On rock, Thyangbock from Namchebazar, alt. 2743 m., April 16, 1958 (No. 13726).

Thallus adpressed, foliose, pale to pale-grey, centrally ashy-grey, lobes imbricated and convoluted, soredia superficial on the raised submarginal areas and granular. Medulla K-, CL, Pd + red.

***Parmelia* cf. *cetrarioides* Del.**

On *Rhododendron*, near Debucho, alt. 3657, April 28, 1958 (No. 13833/C) mixed with the *Sticta* species described.

Thallus foliose imbricated, lobes marginally sorediate and undulate. Upper side pale glaucous grey, smooth with dispersed minute pseudocyphellæ, which are also present on the chestnut-brown to black underside;—scattered rhizinæ in the central part only. Medulla. K<sub>-</sub>, Cl<sub>-</sub>, Pd<sub>-</sub>.

***Parmelia tinctorum* Despr.**

Abundant on rocks, Dolaghat to Bhumlutar, alt. 1981 m., March 29, 1958 (No. 13537).

Thallus glaucous grey to ashy-grey, adpressed, densely isidiate in the central part and smooth in the peripheral parts of the lobes. Medulla K<sub>-</sub>, Cl + red, Pd<sub>-</sub>. Easily distinguished by the colour of thallus, isidiate nature combined by the positive Cl<sub>-</sub> reaction.

A widely distributed species.

***Parmelia nilgherrensis* Nyl.**

Fairly abundant on twigs, near Mahabir village, alt. 2438 m., April 4, 1958 (No. 13637).

Thallus foliose, thick, coriaceous, glaucous pale-grey; lacinate lobate and much imbricated, margin black ciliate. No. soredia and isidia. Medulla K<sub>-</sub>, Cl<sub>-</sub>. Apothecia large subpodicellate, spores 20-22 × 12-13 μ in size.

***Cetraria everniella* (Nyl.) Krmphbr.**

(Habitat not given), slopes below Minjbo, alt. 4450 m., April 20, 1958 (No. 13760). Lobuje to Pangboche, alt. 4572 m., April 26, 1958 (No. 13824).

Thallus fruticose, erect bushy; laciniaë dorsiventral, narrow, dichotomously branched and congested; smooth, glaucous pale above and lacunose pale on underside. The laciniaë in No. 13760 are narrower to sometimes subterete, underside more prominently lacunose. Medulla croceus (sometimes it is colourless in young parts).

Thallus superficially Pd + red to red-brown after a long interval (10-12 hours) on drying. Medulla K<sub>-</sub>, Cl<sub>-</sub>, Pd<sub>-</sub>. Stérile.

***Cetraria cf. everniella***

On rock and soil, Chukpula to Lobuje, alt. 4998 m., April 22, 1958 (No. 13786).

Thallus erect to 4 cm. tall, bushy, fronds subdichotomously divided and congested, subcylindrical to cylindrical, 1-2 mm. wide, irregularly lightly

lacunose; minute white tubercles on ridges of lacinæ, singly or in groups, often associated with or in the neighbourhood of black pycnidial fibrils, fronds spongy to touch or pressure (not so in *everniella*). Algal zone on all sides or in the greater part of the circumference in the subcortical region. Medulla croceus, K<sub>-</sub>, Cl<sub>-</sub>, Pd<sub>-</sub>. Thallus surface externally Pd + red to red-brown after a long interval as stated above in *everniella*. Sterile.

It compares favourably to *C. everniella* in general characters but differs in the subcylindrical to cylindrical nature of fronds which are spongy to pressure, presence of algal zone in a greater part on all sides and in the absence of differentiation into dorsiventral nature except sometimes in the apical parts. Thus it may be considered either a variety or only an ecological variation.

*Cetraria cf. ambigua* Bab.

On rock, soil and Rhododendron, Pambochi to Mingbo, alt. 4480 m., April 20, 1958 (No. 13758).

Thallus suberect to erect, narrowly lobate laciniate, lacinia linear, 2-4 mm. broad, divaricately divided and imbricated, margin undulated and often recurved on the upper side thereby making them (lacinia) semicanaliculate. Upper side smooth straw pale, lower side minutely lacunose (lacunæ more prominent in older parts) and pale. Margin beset with minute cylindrical brown fibrils bearing apical black pycnidia. Medulla white. Thallus externally (surface) Pd + red to brownish-red after long interval (comparable to *everniella*). Medulla K<sub>-</sub>, Cl<sub>-</sub>, Pd<sub>-</sub>.

Apothecia marginally terminal, rounded, up to 3 mm. in diameter, reticulately lacunose on underside, disc concave, brown, smooth, margin entire to minutely crenate. Asci immature.

The specimen compares favourably with the description of *Platysma ambiguum* (syn. of *Cetraria ambigua* Bab.) by Nylander (1860, p. 344). However, it differs from the Isotype of the species, preserved in the Dehra Dun Herbarium, in being somewhat thinner in texture, in the straw pale to pale in colour and the non-palmate branching of the lacinia. The Isotype piece is palmately branched; smooth, brown on upper side and prominently lacunose up to the apex, and brown on lower side (the age of specimen may partly be responsible for the browning as I have noticed the specimens of *C. everniella* turned light-brownish collected just 9 years ago).

## USNEACEÆ

*Letharia vulpina* (L.) Hue.

On trees and shrubs, Lobuje to Pangboche, alt. 4572 m., April 26, 1958 (No. 13823). On Juniperus, Porcha to Namchebazar, alt. 3962 m., April 30, 1958 (No. 13848).

Thallus fruticose, light greyish-pale to pale, laciniae not dorsiventral, subcylindrical, dichotomously branched and attenuating apically, tip with a brownish point, surface angularly lacunose, densely isidiose and furfuraceous. Medulla white of loose hyphæ, K<sub>-</sub>, Pd<sub>-</sub>. Sterile.

Though well distributed in the mountains of the Northern Hemisphere, a review of the literature reveals that it has not been reported so far from the Himalayas and thereby forms a new report for this area.

*Alectoria sulcata* (Lév.) Nyl.

On Quercus trees, Shete to Jambosi, alt. 2971 m., April 6, 1958 (No. 13679).

Thallus fruticose, laciniae filamentous, subcylindrical, divaricately branched and attenuated apically, smooth,  $\pm$  furrowed on one side, setaceous pale-grey to olive in colour. Apothecia terminal, up to about 6 mm. in diameter, disc brownish, pruinose; margin thin, spores colourless, oval ellipsoid, single-celled,  $36-44 \times 12-16 \mu$  in size.

*Alectoria* spp.

On branches of bushy Rhododendron, Thaparma to Pheriche, alt. 4511 m., April 21, 1958 (No. 13768).

Thallus fruticose filamentous, densely branched and branches attenuated and entangled, dark-brown to almost black, light brownish toward apex. In the packet there are two types well entangled, subsimilar in thallus characters except that one is with white maculate soralia and other esorediate.

*Ramalina sinensis* Jatta.

On small twigs, Lobuje to Pangboche, alt. 4267 m., April 26, 1958 (No. 13819).

Thallus fruticose, small, broad, deeply laciniate, longitudinally venose, light glaucous pale to brownish. No soredia. Apothecia copious, terminal, up to 5 mm. in diameter, spores  $12-15 \times 6-7 \mu$  in size, straight or curved. Thallus and medulla K<sub>-</sub>, Pd<sub>-</sub>.



***Ramalina subcomplanata* Nyl.**

On moss covered soil, near Nigala village, alt. 2133 m., March 29, 1958 (No. 13560/A).

Thallus fruticose divaricately branched; laciniae narrow, flattened or  $\pm$  strap-shaped, brownish in basal parts and pale glaucous grey upwards. Surface lacunose nervose with white pseudocyphellae. Medulla white, K, Pd. Apothecia copious, spores  $11-16 \times 5-7 \mu$  in size.

Though endemic yet well distributed and abundant in the temperate Himalayas.

***Ramalina conduplicans* Vain.**

Associated as a mixture with the former (*R. subcomplanata*) and separated as No. 13560/B.

Thallus subsimilar to *subcomplanata* but medulla in *conduplicans* K + red, Pd + red or reddish.

A species originally reported from Siam forms a new report for the Himalayas.

***Usnea Hookeri* Mot.**

On dry soil, slopes above Gora Shop, alt. 5425 m., April 25, 1958 (No. 13792). Chule to Lhengo, alt. 4724 m., May 11, 1958 (No. 13900).

Thallus consisting of an irregularly flattened base from which arise the suberect to erect fronds branching divaricately; branches divergent, flexuose, intricately and attenuated apically. Basally fronds whitish to dark-brown or black and the upper half deep-orange or saffron-yellow, surface longitudinally finely reticularly rugulose. Orange part of thallus K + deep purple violet.

The species is endemic in the Himalayas and Tibet. It is reported to be used for dyeing wool in Tibet, thereby giving indication of its abundance in that country, though in the Himalayas it is of rare occurrence.

***Usnea flexilis* Strtn.**

Near Mahabir village, alt. 2438-2682 m., April 4, 1958 (No. 13634).

Thallus pendulous, filamentous, dichotomously branched, articulated and constricted at joints, flaccid in between the joints, and gradually attenuated apically. Surface straw pale, smooth with minute white pseudocyphellae. Medulla white, K + red. Sterile.

***Usnea pectinata* Tayl.**

Abundant on branches of *Betula* and *Rhododendron*, Thengboche, alt. 3962 m., April 29, 1958 (No. 13844).

Thallus pendulous of long filaments, which are uniformly thin (0.2-0.3 mm.), lateral branches at right angles to the main axes, pale glaucous grey in colour. Central chondroid axis of filaments L. Apothecia few, on short lateral branches, up to 1.5 mm. in diameter, disc convex, carneous pale to pale, subpruinose, with a thin whitish margin and few to many marginal cilia. Spores oval, single-celled, colourless,  $9-10 \times 5-6 \mu$  in size. Subsimilar to *U. longissima* but distinguished by the negative I-reaction in central axis (in *U. longissima* axis I + blue).

***Usnea Hossei* Vain.**

On *Quercus* trees, Shete to Jambosi, alt. 2971 m., April 6, 1958 (No. 13676/A).

Thallus pendulous, filamentous, main branches irregularly thickish (0.5-1 mm.), dark-brown or glaucous grey-brown, lateral branches divergent pale towards the apex. Cortex persistent in the main filaments, central chondroid axis light yellowish L. Medulla K.

A Malayan species showing the extension of its distribution to the Himalayas. It has been collected from East Nepal by me earlier (in 1953) as well. The report is being made for the first time now from this area for the species.

***Usnea thomsonii* Strtn. subsp. *arborea* (Strtn.) Mot.**

Mixed with the last species (*U. hossei*) and separated as No. 13676/B.

Thallus fruticose, sympodially branched, somewhat inflated in the middle parts, pale greenish grey. Surface waxy, distinctly papillate and with dispersed white maculae (= soralia) of irregular shape. Medulla arachnoid, K + gradually red. Apothecia copiously present, margin ciliate.

Endemic in the Himalayas.

A sterile specimen (No. 13739) from Thengboche, alt. 3992, April 16, 1958 is also comparable to this species.

***Thamnolia vermicularis* (Sw.) Ach.**

On soil, in slopes above Gora Shop, alt. 5455 m., April 25, 1958 (No. 13793).

Thallus erect of simple or sparingly branched apically tapering, smooth fronds of bone-white colour. Thallus Pd + yellow then later persistently orange-red. Easily recognised by its form which resembles to small white worms.

It is reported "used as offering while praying in the monasteries" (R. S. Rao).

### PHYSICIACEÆ

#### *Anaptychia esorediata* (Vain.) DR. et Lynge.

On Quercus trunk, Shete to Jambosi, alt. 2971 m., April 6, 1958 (No. 13680).

#### *Anaptychia leucomelana* var. *angustifolia* (Mey. et Flot.) Müll. Arg.

On soil growing along with mosses, also mixed with other lichens, near Nigala village, alt. 2133 m., March 29, 1958 (No. 13559). Thangboche to Pangboche along with *Parmelia cirrhata* No. (13740/D).

Thallus pendulous, laciniae linear, narrow. Sterile.

#### *Anaptychia leucomelana* var. *sorediosa* Jatta

Over stones, Dole to Namchebazar, alt. 4084 m., May 16, 1958 (No. 13959).

Thallus pendulous, laciniae linear, copiously sorediate on the upper side and along the margins. Sterile.

#### *Anaptychia pellucida* Awasthi

On Rosa twig, Thengboche to Pangbock, alt. 3992 m., April 19, 1958 (No. 13740 E).—Mixed with *Parmelia cirrhata*, etc.

Thallus pendulous, fruticose ashy grey. Apothecia epruinose with thin margin, spores distinctively large (60–70  $\mu$  long), 2-celled, brown and pellucid.

The specimens are somewhat smaller than the type (Awasthi, 1957) but it is easily distinguished from its nearest ally *A. podocarpa* by the epruinose apothecia, larger and pellucid spores.

Only a few years back, Asahina (1955) described 62 species under 19 genera of lichens from the collection made by the Japanese Expeditionists to the Nepal Himalayas. The present collection though smaller in the number

of species (38 spp. under 12 genera) yet includes the 14 species as new additions to that list of Nepal lichens, which are *Sticta henryana*, *St. platyphylloides*, *Cladonia mitis*, *Parmelia stenophylla*, *P. reticulata*, *Letharia vulpina*, *Alectoria sulcata*, *Ramalina subcomplanata*, *R. conduplicans*, *Usnea Hookeri*, *U. pectinata*, *U. Hossei* and *Anaptychia pellucida*.

#### SUMMARY

The paper deals with 38 species under 12 genera of lichens that had been collected by Mr. R. S. Rao, Botanist Member of the Indian Expedition to Cho-Oyu in East Nepal. Five species as new reports for the Himalayas are described.

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