

THE FLORA OF EASTERN HIMALAYA

Results of the Botanical Expedition to Eastern Himalaya
Organized by the University of Tokyo 1960 and 1963

Compiled by
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LICHENES

by Yasuhiko Asahina

The Lichen specimens were mainly collected by Makoto Togashi.

Cladonia Vain. Subgenus *Cladina* (Nyl.) Vain.

Cladonia rangiferina (L.) Web.

Sikkim: Jongri (22. V. 1960).

Subgenus *Clathrina* (Müll. Arg.) Zahlbr.

Cladonia aggregata (Sw.) Ach.

Darjeeling: Takdah (16. IV. 1960); Senchal (16. IV. 1960); Sandakphu (6. VI. 1960). Sikkim: Migothang-Nayathang (1. VI. 1960).

All specimens contain barbatic acid (P-).

Subgenus *Cenomyce* (Ach.) Th. Fr.

Sect. *Cocciferae* Del. Subsection *Stramineo-flavidae* Vain.

Cladonia pleurota (Flk.) Schaer.

Darjeeling: Senchal, 2400 m (16. IV. 1960); Ramam (8-11. V. 1960); Phalut-Sandakphu (6. VI. 1960); Sandakphu-Tonglu (7. VI. 1960). Sikkim: Jongri (20-23. V. 1960); Olohang-Jongri (23. V. 1960); Migothang (1. VI. 1960). East Nepal: Batasay, etc. (2-11. XI. 1963); Batasay-Halhale (1. XII. 1963).

All specimens contain usnic acid and zeorin.

Cladonia yunnana (Vain.) des Abb. in *Candollea* **16**: 202 (1958).

Sikkim: Jongri, 4000 m (20. V. 1960); Olohang-Jongri (23. V. 1960); Migothang-Nayathang (1. VI. 1960).

This species distinguishes itself from resembling *Cladonia digitata* Schaer. by the medullary reaction K—or by the conspicuous fluorescence caused by the irradiation with U.V. ray (squamatic acid).

Subsect. *Subglaucescentes* Vain.

Cladonia Floerkeana (Fr.) Sommf. var. **intermedia** Hepp

Darjeeling: Phalut, 3500 m (10. V. 1960).

This specimen contains besides usnic acid and barbatic acid a trace of didymic acid.

Cladonia bacillaris Nyl. f. **tenuistipitata** Sandst.

Darjeeling: Rimbick (6. V. 1960).

This specimen contains, besides usnic acid and barbatic acid, didymic acid and its ether extract is colored by C (moistened with alcohol) green.

f. **clavata** (Ach.) Vain.

Darjeeling: Senchal (16. IV. 1960). Sikkim: Olohang-Jongri (23. V. 1960); Jongri-Gamothang (26. V. 1960.)

These specimens contain barbatic and didymic acids together with usnic acid.

Cladonia vulcanica Zollinger: Vain., *Monogr. Clad. Univ.* **1**: 145 (1887).

f. **vulcanica**

Darjeeling (2. IV. 1960); Senchal (6. IV. 1960); Kurseong (12. IV. 1960); Takdah (18. IV. 1960).

These specimens contain, besides usnic acid, thamnolic acid and didymic acid but not barbatic acid.

f. **melanodes** des Abb. in Kew Bull. 1956(2): 259–261 (1956).

Darjeeling: Rimbick (6. V. 1960); Ramam (8. V. 1960); Phalut (2. VI. 1960).

Cladonia macilenta (Hoffm.) Nyl. f. **tomentosula** Flk.

E. Nepal: Yamphodin–Ghatte. (18. XI. 1963).

External appearance of this specimen resembles closely *Cladonia bacillaris* Nyl. f. *clavata* (Ach.) Vain. It contains besides usnic acid, barbatic, thamnolic and didymic acids.

Sect. Ochrophaeae Vain. Subsect. Unciales (Del.) Vain.

Cladonia amaurocraea (Flk.) Schaer. f. **oxyceras** (Ach.) Oliv.

Sikkim: locus accuratus ignotus.

Cladonia Delavayi des Abb. in Candollea 16: 203 (1958).

Sikkim: Yoksam (21–22. V. 1960); Jongri, 4000 m (23. V. 1960); Olothang–Jongri (29. V. 1960); Gamothang, 3900 m (29. V. 1960).

H. des Abbayes found the thalline reaction of this species as K–, C–, KC+ yellow and confirmed the presence of usnic acid only.

If we extract the thalline fragments of *Cladonia Delavayi* with cold ether and evaporate the solution to dryness, there remains an almost colorless crystalline powder (A), which yields on recrystallization from G.E. solution usnic acid crystals alone. But it (A) exhibits temporarily brownish red KC reaction changing gradually in deep yellow. This contaminate substance was distinctly demonstrated by thin layer chromatogram. Developing solution of ether extract . . . benzene: ethylacetate: formic acid=5:2:0.2. Silicagel was mixed with oxalic acid solution and sprayed upon the glass plate. a, b . . . starting points of ether extract and of pure usnic acid respectively. Rf. . . 0.78. . . corresponds with usnic acid. Rf. . . 0.60. . . a substance contaminated with the usnic acid. (Fig. 44)

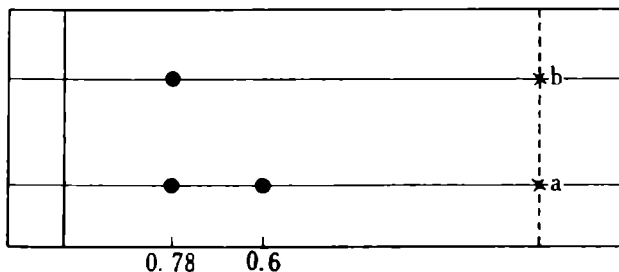


Fig. 44.

Formerly the author has misidentified this species with *Cladonia sylvatica* (L.) Hoffm. (cf. Fauna and Flora of Nepal Himalaya. Scientific Results of the Japanese Expedition to Nepal Himalaya 1952–1953. 1: 47, 1955). H. des Abbayes pointed out the presence of cortex on the podetia and arranged this species in Subsect. Unciales.

Subsect. Chasmariae (Ach.) Vain. Ser. Microphyllae Vain.

Cladonia furcata (Huds.) Schrad.

var. **racemosa** (Hoffm.) Flk. f. **squamulifera** Sandst.

Darjeeling: Rimbick (8. V. 1960); Phalut (11. V. 1960). Sikkim: Jongri, 4000 m (22. V. 1960).

var. **pinnata** Flk. f. **foliolosa** Del.

Darjeeling: Ramam (8. V. 1960). Sikkim: Jongri (21. V. 1960); Migothang-Nayathang (1. VI. 1960).

f. **truncata** Flk.

Sikkim: Olothang-Jongri (23. V. 1960). Darjeeling: Phalut, 3500 m (2. VI. 1960); Sandakphu (6. VI. 1960).

f. **regalis** Flk.

Sikkim: Migothang-Nayathang (1-2. VI. 1960). Darjeeling (6. VI. 1960).

Some specimens of f. *regalis* resemble closely *Cladonia macroptera* Räs. However, the latter belongs to the group of *Cladonia scabriuscula* (Del.) Coem. and must be kept distinct.

In Journ. Jap. Bot. **16**: 403 (1940), the author acknowledged the autonomy of *Cladonia macroptera* Räs. and established two formae. But in the same journal **19**: 196 (1943), he abandoned the above opinion and identified *Cladonia macroptera* with *Cladonia scabriuscula* (Del.) Coem. f. *elegans* Robbins (cf. Sandstede Cl. Exsicc. no. 1570) while the two formae "f. *ramosa*" and "f. *subnuda*" were transformed to *Cladonia furcata* (Huds.) Schrad. v. *pinnata* (Flk.) Vain. Though the podetia of *Cladonia furcata* v. *pinnata* are sometimes dispersed areolate, they are never sorediose nor isidiose decorticate and their squamae are only shallowly lobed. On the contrary the podetia of *Cladonia macroptera* are always sorediose and their squamae are deeply lacinate and are always sorediose on the underside.

Cladonia scabriuscula (Del.) Coem. f. **adpersa** Flk.

Darjeeling (2. IV. 1960); Senchal (16. IV. 1960); Takdah (18. IV. 1960); Ramam (8. V. 1960); Phalut (10. V. 1960); Phalut-Sandakphu (6. VI. 1960).

f. **sublaevis** Sandst.

Darjeeling: Batasi (4. V. 1960).

f. **farinacea** Vain.

Sikkim: Jongri (22. V. 1960); Olothang-Jongri (23. V. 1960).

f. **cancerata** Müll. Arg.

E. Nepal: Batasay, etc. (1. XII. 1963).

Cladonia rangiformis Hoffm.

var. **pungens** (Ach.) Vain. f. **foliosa** Flk.

Darjeeling: Senchal (6. IV. 1960); Takdah (18. IV. 1960); Ramam (7-8. V. 1960); Sandakphu, 3400 m (6-7. VI. 1960); Jongri (20. V. 1960). E. Nepal: Sinduwa-Bilbatay Bhanjang (25. X. 1963); Dumhan-Taplejung (2. XI. 1963); Baroya Khimty-Thakma Kholā (16. XI. 1963); Batasay-Halhale Bhanjang (2. XII. 1963); Bhuspate Danra-Bhandukay, etc. (3. XII. 1963).

Formerly the author misidentified this form with *Cladonia ceratophyllina* (Nyl.) Vain. (cf. Fauna and Flora of Nepal Himalaya **1**: 47, Fig. 9 on p. 48, 1955).

f. **versicolor** Elenk.: Savicz in Fedde, Rep. **19**: 352 (1924).

E. Nepal: Bilbatay Bhanjang, etc. (27. X. 1963); Hati Sar, etc. (28. X. 1963); Walunchung, etc. (11. XI. 1963); Helok-Baroya Khimty (15. XI. 1963); Batasay, etc. (1. XII. 1963); Mai Majuwa, etc. (4. XII. 1963).

var. **muricata** (Ach.) Arn.

Sikkim: Yoksam (18. V. 1960); Jongri (20. V. 1960).

var. **pseudofissa** Asahina, var. nov.

Statura thalli ut in *Cladonia furcata* (Huds.) Schrad. f. *fissa* Flk. sed differt strato chondroideo tenuiore et atranorinum continente.

Primary thallus disappearing, podetia up to 12 cm high, 2 cm thick brownish gray, repeatedly dichotomously branched, apices sharply pointed, longitudinally fissured.

Sikkim: Jongri, 4000 m (22. V. 1960—typus in TNS, TI); Migothang-Nayathang (1. VI. 1960). Darjeeling: Sandakphu, 3400 m (6. VI. 1960).

Cladonia squamosa (Scop.) Hoffm.

var. **levicorticata** Sandst. f. **turfacea** Rehm

Darjeeling: Kurseong, 1500 m (13. IV. 1960); Phalut (10. V. & 2. VI. 1960) Phalut-Sandakphu (6. VI. 1960). Sikkim: Jongri (20–23. V. 1960); Olothang-Jongri (23. V. 1960); Jongri Base Camp (25. V. 1960); Migothang (31. V. 1960). East Nepal: Hati Sar, etc. (28. X. 1963); Selap, etc. (10. XI. 1963).

Almost all specimens of *Cladonia squamosa* are inhabitants of moor land and dark colored, though some of them are only slightly darkened or even greenish white.

Subsect. Clausae Vain. Ser. Thallostelides Vain.

Cladonia gracilis (L.) Willd.

var. **elongata** (Jacq.) Vain. f. **laontera** (Del.) Arn.

Sikkim: Jongri (20–23. V. 1960); Jongri-Olothang (23. V. 1960); Migothang-Nayathang (1. VI. 1960). East Nepal: Walunchung Gola, etc. (11. X. 1963).

f. **Hugeninii** Kovar.

Sikkim: Migothang-Nayathang (1. VI. 1960).

f. **ceratosterioides** Kovar.

Darjeeling: Phalut (10. V. 1960); Phalut (2. VI. 1960); Sandakphu, 3400 m (6. VI. 1960). East Nepal: Baroya Khimty, etc. (16. XI. 1963).

Cladonia cornuta (L.) Schaer. f. **scyphosa** Schaer.

Sikkim: Jongri (22. V. 1960); Olothang-Jongri (23. V. 1960); Jongri-Gamothang (26. V. 1960).

Cladonia lepidota Nyl. f. **cerasphora** (Lynge) Sandst.

Darjeeling: Phalut-Sandakphu (6. VI. 1960).

Cladonia verticillata Hoffm. var. **evoluta** Th. Fr.

Sikkim: Yoksam, 1800 m (18. V. 1960); Jongri (22. V. 1960); Olothang-Jongri (23. V. 1960).

var. **cervicornis** (Ach.) Flk.

Sikkim: Jongri (22. V. 1960).

Cladonia calycantha Nyl.

E. Nepal: Hati Sar, etc. (28. X. 1963); Batasay, etc. (2. XII. 1963).

Cladonia cf. **gymnopoda** Vain.

E. Nepal: Batasay, etc. (1. XII. 1963).

A doubtful specimen of slender podetia.

Cladonia pyxidata (L.) Fr. var. **neglecta** Flk.

Sikkim: Jongri, 4000 m (21. V. 1960); Migothang (31. V. 1960).

Cladonia Rappii A. Evans in Trans. Connecticut Acad. Arts and Sci. **38**: 297 (1952).

f. **sikkimensis** Asahina, form. nov.

Thallus ut in *Cladonia verticillata* var. *cervicornis*, scyphis vulgo simplicibus vel raro e centro vel e margine scyphorum proliferis, 1–2(3) tabulatis, areolato corticatus, medulla P+ flavens, acidum psoromicum continens.

Sikkim: Jongri (20. V. 1960—typus TNS, TI).

Externally resembles closely *Cladonia verticillata* var. *cervicornis*, but differs by the thalline reaction P+ bright yellow.

Cladonia chlorophaea (Flk.) Spreng.

Darjeeling: Phalut (10. V. 1960). Sikkim: Jongri (20. V. 1960). E. Nepal: Baroya Khimty (16. XI. 1963).

Cladonia ochrochlora Flk.

Sikkim: Jongri (20. V. 1960); Gamothang (21. V. 1960). East Nepal: Batasay-Halhale, etc. (2. XII. 1963).

Cladonia coniocraea (Flk.) Sandst.

Darjeeling: Senchal, 2400 m (6. IV. 1960).

Cladonia cornutoradiata (Coem.) Zopf f. **subulata** (L.) Vain.

Darjeeling (6. IV. 1960). Sikkim: Preig Chu, 2100 m (19. V. 1960); Jongri-Gamothang (26. V. 1960). E. Nepal: Bilbatay Bhanjang, etc. (27. X. 1963).

f. **radiata** (Schr.) Coem.

E. Nepal: Baroya Khimty, etc. (16. XI. 1963).

Cladonia cf. **Balfourii** Cromb.

Darjeeling: Takdah (18. IV. 1960).

Cladonia pityrea (Flk.) Fr. f. **crassiuscula** (Coem.) Vain.

Sikkim: Jongri, 4000 m (20–21–22. V. 1960); Olothang–Jongri (23. V. 1960); Jongri–Olothang (26. V. 1960). Darjeeling: Phalut–Sandakphu (6. VI. 1960).

f. **squamulifera** Vain.

Darjeeling (2. IV. 1960; 12. IV. 1960); Rimbick (6. V. 1960); Sandakphu (6. VI. 1960). Sikkim: Jongri (21. V. 1960); Jongri–Gamothang (26. V. 1960); Migothang–Nayathang (1. VI. 1960). East Nepal: Dumhan–Taplejung (1. XI. 1963); Selap-Zongi (10. XI. 1963).

f. **subuliformis** Vain.

Sikkim: Yoksam, 1800 m (17. V. 1960). Darjeeling: Senchal, 2400 m (16. IV. 1960).

f. **phyllophora** (Mudd) Vain.

Sikkim: Gangtok (13. VI. 1960). E. Nepal: Batasay etc. (2. XII. 1963).

f. **cladomorpha** Vain.

East Nepal: Birwa–Yektin (28. XI. 1963).

f. **subacuta** Vain.

Darjeeling: Kurseong, 1500 m (12. IV. 1960); Takdah (18. V. 1960). Sikkim: Jongri Base Camp, 4000 m (25. V. 1960).

f. **hololepis** Vain.

Darjeeling: Ramam (8. V. 1960). Sikkim: Yoksam (17. V. 1960).

Cladonia formosana Asahina f. **formosana**

Darjeeling: Senchal (6. IV. 1960); Kurseong (12. IV. 1960); Lopchu (28. IV. 1960). Sikkim: Yoksam (17. V. 1960). E. Nepal: Taplejung, etc. (3. XI. 1963).

f. **sublaevigata** Asahina

Darjeeling: Observatory Hill (2. IV. 1960); Rimbick (6–8. V. 1960).

f. **aberrans** Asahina

Darjeeling: Ramam (8. V. 1960); Takdah (18. IV. 1960).

Cladonia submultiformis Asahina f. **foliolosa** Asahina

Darjeeling, 2000 m (2. IV. 1960); Ramam (7. V. 1960); Phalut, 3500 m (10. V. 1960); Kurseong (12. IV. 1960); Senchal (6. IV. 1960); Takdah (18. IV. 1960).
Sikkim: Yoksam (17. V. 1960).

f. **humilis** Asahina, form. nov.

Thallus primarius persistens, ca 3 mm longus, 1–5 mm latus crenulato-lobatus. Podetia simplicia, subulata usque ad 15 mm longa, 1 mm crassa, decorticata, semipellucida, granulis minutis gonidiis continentibus dispersa. Pycnidia bene evoluta, ovoidea, 0.5 mm lata, nigra. Pycnoconidia curvata 6–7 μ longa, materiam coccineam non continentia.

Darjeeling: Kurseong, 1500 m (12. IV. 1960—typus TNS, TI).

Ser. Foliosae (Bagl. et Carest.) Vain.

Cladonia foliacea (Huds.) Schaer.

var. **meiophora** Asahina, var. nov.

Acidum usnicum tantum continens (P–)

Darjeeling: Phalut (10. V. 1960—typus TNS, TI).

Ser. Ochroleucae Fr.

Cladonia cyanipes Sommerf. f. **connectans** Vain.

Sikkim: Jongri (22. V. 1960).

Stereocaulon Schreb.¹⁾

Stereocaulon arbuscula Nyl. emend. Asahina in Journ. Jap. Bot. **19**: 282 (1943).

Sikkim: Jongri–Gamothang (26. V. 1960). E. Nepal: Preig Chu (10. XI. 1963).

Acidum fumarprotocetraricum continens.

Stereocaulon pseudarbuscula Asahina in Journ. Jap. Bot. **19**: 282 (1943).

Sikkim: Preig Chu–Bakkim, 2200 m (19. V. 1960).

Acidum thamnolicum continens.

Stereocaulon coniophyllum M. Lamb in Botan. Notiser **114** (3): 266 (1961).

Darjeeling: Sandakphu–Tonglu (7. VI. 1960). Sikkim: Olothang–Jongri (23. V. 1960).

Atranorinum et acidum lobaricum continens.

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

Sikkim: Bakkim–Jongri, 4000 m (20. V. 1960); Jongri (21. V. 1960); Olothang–Jongri (23. V. 1960); Gamothang (29. V. 1960); Migothang (31. V. 1960). Darjeeling: Phalut–Sandakphu (6. VI. 1960).

var. **orizabae** Th. Fr.

Sikkim: Jongri (21–22. V. 1960); Jongri Base Camp (25. V. 1960).

Stereocaulon Massartianum Hue, Lichenes Extra-Europaei no. 61.–*St. nesaeum* auctor. cf. M. Lamb in Journ. Jap. Bot. **40**: 271 (1965).

Sikkim: Preig Chu, 2100 m (19. V. 1960). Darjeeling: Takdah (18. IV. 1960).

Stereocaulon Montagneanum M. Lamb in Journ. Jap. Bot. **40**: 272 (1965).

¹⁾ This treatment of *Stereocaulon* is based on the determination of Dr. I. M. Lamb, who was kind enough to review the writers sendings.

E. Nepal: Baroya Khimty (16. XI. 1963).

Stereocaulon claviceps Th. Fr. var. **claviceps**

Medulla cephalodiorum densa, cellulis alborum chroococcoideis.

Darjeeling: Phalut (11. V. 1960). Sikkim: Bakkim, etc. 2100 m (19. V. 1960); Jongri, 4100 m (22. V. 1960); Olothang–Jongri (23. V. 1960); Jongri Base Camp, 4500 m (25. V. 1960); Gamothang, 3900 m (29. V. 1960).

var. **pomiferum** (Duv.) M. Lamb

Darjeeling: Phalut (10. V. 1960); Sandakphu–Tonglu (20–22. V. 1960). Sikkim: Jongri (20–22. V. 1960); Jongri–Olothang (23. V. 1960); Jongri Base Camp, 4500 m (25. V. 1960); Gamothang (29. V. 1960); Migothang, 4000 m (31. V. 1960).

Stereocaulon piluliferum Th. Fr.

Darjeeling: Senchal (16. IV. 1960).

Statura thalli ut in *St. claviceps* Th. Fr., sed differt medulla cephalodiorum laxa, cellulis gonidiorum vulgo scytonemoideis.

Stereocaulon foliolosum Nyl. var. **foliolosum**

Darjeeling: Phalut (10–11. V. 1960 & 5. VI. 1960); Phalut–Dentam (11. V. 1960); Phalut–Sandakphu (6. VI. 1960). Sikkim: Preig Chu, 2100 m (19. V. 1960); Olothang–Jongri (23. V. 1960).

Phyllocladia squamulosa, marginibus crenulatis laciniatisque.

var. **strictum** (Bab.) M. Lamb

Sikkim: Jongri (22–25. V. 1960); Migothang (31. V. 1960). Darjeeling (6. IV. 1960); Phalut (10. V. 1960).

Podetia inferne phyllocladii cylindrico-coralloideis, superne globoso-granulatis.

Stereocaulon botryophorum Müll. Arg.

Sikkim: Jongri (21. V. 1960); Olothang–Jongri (23. V. 1960); Jongri Base Camp, 4500 m (25. V. 1960); Gamothang (29. V. 1960); Migothang (30. V. 1960).

Usnea Wigg. Subgenus *Eumitria* (Stirt.) Mot.

Usnea Bayleyi (Stirt.) Zahlbr., Cat. Lich. **6**: 542 (1930).

Eumitria Bayleyi Stirt. in Scot. Natur. **6**: 100 (1881).

Eumitria implicita Stirt. in Scot. Natur. **6**: 100 (1881).

Eumitria endorhodina Vain. in Philip. Journ. Sci. **4**: 651 (1909).

Usnea implicita (Stirt.) Zahlbr., Cat. Lich. **6**: 582 (1930).

subsp. **septentrionalis** Asahina, subsp. nov.

Thallus usque ad 25 cm longus, obscure sordide fusco-viridis rami, supra basin usque ad 2 mm crassi, increbre divaricato ramoso verruculosi, verruculis saepe dense solediosis, medulla rubra.

Sikkim: Pamianchi, 2000 m (13. V. 1960, M. Togashi—typus in TNS, TI). Darjeeling (2. IV. 1960); Senchal (6. IV. 1960); Takdah (20. IV. 1960); Lopchu (28. IV. 1960); Rimbick (6. V. 1960); Kurseong, 1500 m (12. V. 1960). Sikkim: Yoksam, 1800 m (17. V. 1960); Gangtok, 1900 m (14. VI. 1960). East Nepal: Sinduwa, 2100 m (23. X. 1963); Bilbatay, etc., 2200 m (25. X. 1963); Hati Sar, etc. (28. X. 1963); Minchin Dhap, etc. (29. X. 1963); Birwa–Yektin (28. XI. 1963).

f. **creberrima** (Asahina) Asahina, comb. nov.

Usnea creberrima Vain. in Bot. Mag. Tokyo **35**: 46 (1921); in Journ. Jap. Bot. **40**: 33 (1965).

Usnea implicita (Stirt.) Zahlbr. f. *creberrima* Asahina in Journ. Jap. Bot. **41**: 161 (1966).

Darjeeling (2. IV. 1960); Victoria Fall-St. Paul School (8. IV. 1960). East Nepal: Sinduwa, 2000 m (21. X. 1963).

f. **subcreberrima** (Asahina) Asahina, comb. nov.

Usnea implicita (Stirt.) Zahlbr. f. *subcreberrima* Asahina in Journ. Jap. Bot., **41**: 162 (1966).

Loci ut in f. *creberrima* (Asahina) Asahina.

Subgenus *Euusnea* Jatta

The *Usnea Thomsonii* group.

Usnea Thomsonii Stirt.: Motyka, Monograph. 615 (1938).

Darjeeling: Senchal (16. IV. 1960); Phalut, 3000 m (9. V. 1960); Phalut (11. V. 1960); Phalut, 3500 m (2-5. VI. 1960); Phalut-Sandakphu (6. VI. 1960). Sikkim: Jongri (20. V. 1960); Migothang, 3900 m (30-31. V. 1960); Gamothang, 3750 m (30. V. 1960); Migothang-Nayathang (1. VI. 1960). E. Nepal: Tharpu near Chyangthaphu (27. X. 1963); Dumhan-Taplejung (1. XI. 1963); Walunchung Gola-Zongri (11. XI. 1963); below Siling Tzokupa (21 XI. 1963); Birwa-Yektin (28. XI. 1963).

According to Motyka the medullary reaction of *U. Thomsonii* is K-. The present writer has found that the medullary reaction of P is sometimes + yellow, which is the case more frequently on the medulla of receptacles. This is due to the presence of psoromic acid. Also the writer has found barbatic acid in specimens K-, P-.

subsp. ***arborea*** (Stirt.) Motyka, Monograph. 617 (1938).

Darjeeling, 2000 m (2. IV. 1960); Senchal (6. IV. 1960); Senchal, 2400 m (16-23. IV. 1960); Phalut (5-10. V. 1960). Sikkim: Bakkim-Preig Chu (19. V. 1960); Jongri (21. V. 1960); Tendong Peak, 2700 m (26. III. 1963). E. Nepal: Sinduwa-Bilbatay (23. X. 1963); Bilbatay Bhanjang, etc. (27. X. 1963); Tharpu near Chyangthaphu (27. X. 1963); Hati Sar-Mangalbare, etc. (28. X. 1963); Batasay-Halhale Bhanjang (1-2. XII. 1963); Bhuspate Dhanra, etc. (2. XII. 1963).

Motyka segregated this subspecies from the type above all by the medullary reaction "K+ distincte rubescens". The present writer could select such specimens and identified that substance (K+) with salacinic acid.

Usnea dendritica Stirt.: Motyka, Monograph. 617 (1938).

Darjeeling: Phalut (5. VI. 1960). Sikkim: Jongri (20-22. V. 1960); Gamothang (30. V. 1960); Migothang (31. V. 1960); Migothang-Nayathang (1. V. 1960).

A robust plant difficult to distinguish from *Usnea Thomsonii* Stirt. According to Motyka the medullary reaction of this species is "K sensim et indistincte rubescens". He adds the following points to the differentiation of *Usnea dendritica*: deep chestnut-brown thallus, absence or very few occurrence of white pseudocyphellae, narrow medulla and thick axis.

Usnea sordida Motyka, Monograph. 619 (1938).

Darjeeling, 200 m (2. IV. 1960); Senchal (6-16. IV. 1960).

The writer hesitates to adopt the Motyka's expression "tomentellus" of the thalline surface of the specimens determined by Motyka.

Usnea* cf. *cineraria Motyka, Monograph. 618 (1938).

Darjeeling: Takdah (18. IV. 1960).

Thallus cinereofuscens, pseudocyphellis nullis; medulla K+ rubescens, P+ lutescens. Acidum usnicum et acidum salacinicum continens.

***Usnea subsordida* Stirt.**

Darjeeling, 2000 m (2 & 8. IV. 1960); Senchal (6. I. 1960); Takdah (18. IV. 1960); Rimbick (6. V. 1960); Phalut (10. V. 1960). Sikkim: Jongri (20. V. 1960); Migothang-Nayathang (1. VI. 1960). E. Nepal: Bilbatay Bhanjang, etc. (27. X. 1963); Minchin Dhap (29. X. 1963); Walunchung Gola (10. XI. 1963); below Siling Tzokupa (21–22. XI. 1963); Birwa-Yektin (28. XI. 1963); Batasay-Halhale Bhanjang, etc. (1. XII. 1963); Bhuspate Dhanra, etc. (3. XII. 1963).

Motyka mentions *Usnea subsordida* is rather a small plant ("thallus ca 4 cm longus"). But its photograph in natural size taken by Motyka reveals more larger habit. Though Motyka arranged it in Sect. *Glabratae*, subsect. *Scabridae*, its belonging to sect. *Albomaculatae* of the Sect. *Dendriticae* will be justified by the presence of pseudocyphellae.

***Usnea pseudosinensis* Asahina, sp. nov.**

Thallus ca 10 cm longus; cinereoviridis, in herbario cinereo vel stramineo fuscescens, opacus, ad ramulos pallidior, basi attenuata obscurata, mox supra basin subsympodialiter ramosus, ramis secundariis varidioribus, axillis rectis. Rami leviter curvati, ad basin attenuati, ceterum inflatulo-incrassati, ad apices sensim subulato attenuati, rare fracti vel articulati, medio usque ad 3 mm crassi, teretes, papillati, papillis obtusiusculis, fere concoloribus et maculis albidis farinosis, ecorticatis, leviter elevatis, pseudocyphelliformibus oblongis vel irregularibus sat crebre vel sat rare sparsi. Ramuli crebri, 2–10 mm longi, verruculosi. Apothecia crebra, terminaria, 4–10 mm lata, concava; excipulum laeve et laeviter lacunosum. Cilia sat crebra, ad basin non constricta. Discus carneus, vulgo albo pruinosus. Sporae ellipsoideae $13 \times 8 \mu$.

Darjeeling: Senchal, 2400 m (6. IV. 1960—typus TNS, TI). Sikkim: Gamothang (29. V. 1960). E. Nepal: Hati Sar, etc. (28. X. 1963); Walunchung Gola-Zongi (11. XI. 1963); Siling Tzokupa (21. XI. 1963); Batasay-Halhale Bhanjang (1. XII. 1963).

RS- and AQ-values:

- 1) thickness of branch 1.9 mm. c:m:a = 100:700:300 (μ) AQ = 16%
- 2) " " " 1.5 mm. c:m:a = 70:600:200 (μ) AQ = 13%

Reaction.: medulla K–, P–vel flava. Acidum usnicum, acidum barbaticum et acidum psoromicum continens. The contents of psoromic acid is sometimes so small, that it is hardly demonstrable by the microcrystallization. External appearance closely resembles *Usnea subsordida* Stirt., but it is distinguished from the latter by the difference of chemical contents. This new species resembles also Ethiopian *Usnea albomaculata* Mot., which differs by the different combination of chemical ingredients: usnic acid and norstictic acid.

The *Usnea orientalis* group

Usnea orientalis Motyka, Monograph. 547 (1938).

cf. Asahina, Lich. Japan 3: 100 (1956).

Darjeeling: Senchal (6. IV. 1960). Sikkim: Gangtok (13. VI. 1960); Preig Chu (19. V. 1960).

Medulla laxissima, hyphis arachnoideis, K mox rubens, P lutescens. Acidum usnicum et acidum salacinicum continens.

Motyka's description in Monograph., p. 548 "—soredia farinosa—" is unne-

essary and to be omitted.

Usnea sinensis Motyka, Monograph 248 (1936).

Sikkim: Jongri, 4000 m (22. V. 1960); Gamothang, 3900 m (29. V. 1960).

Medulla sat laxa et hyphis arachnoideis, K-, P-.

The *Usnea ceratina* group

Usnea nipparensis Asahina, Lich. Japan 3: 91 (1956).

Darjeeling: Rimbick (8. V. 1960); Phalut (9. V. 1960); Phalut-Sandakphu (6. VI. 1960). Sikkim: Pamianchi (13. V. 1960); Migothang-Nayathang (1. VI. 1960). E. Nepal: Walunchung Gola-Zongi (11. XI. 1963); Bhuspate Danra-Bhandukay (2. XII. 1963).

On the basis of Japanese specimens this species was established as a distinct member of the *Usnea ceratina* group. Afterwards its occurrence was confirmed in Formosa, Corea and also in Nepal Himalaya.

Usnea fragilis Stirt.: Motyka, Monograph. 355 (1938).

Darjeeling (8. IV. 1960); Lopchu (28. IV. 1960); Rimbick (6. V. 1960). Sikkim: Pamianchi (13. V. 1960).

Thallus omnino dichotome ramosus.

Usnea roseola Vain. in Bot. Mag. Tokyo 30: 46 (1921)-Asahina, Lich. Japan, 3: 103 (1956).

Darjeeling: Senchal, 2400 m (6. IV. 1960). Sikkim: Gangtok (13-15. VI. 1960). E. Nepal: Bilbatay Bhanjang-Tutay (27. X. 1963).

Thallus vulgo sympodialiter ramosus.

The *Usnea articulata* group.

Usnea flexilis Stirt.

Darjeeling: Ramam (8. V. 1960); Phalut, 3000 m (9-11. V. 1960). Sikkim; Migothang-Nayathang (1. VI. 1960). E. Nepal: Chyangthaphu-Birwa (27. X. 1963); Hati Sar-Mangalbare (28. X. 1963); below Siling Tzokupa (21. XI. 1963); Khebang, 1400 m (23. XI. 1963); Batasay-Halhale Bhanjang (1. XII. 1963).

The main branches of our specimens are much thicker than those of Motyka's report (1.0-1.4 mm). According to the latter author, the medullary reaction of this species is "K leviter flavescens". On the contrary Stirton mentions "fibrillae medullares K fl. dein rufo ferruginea vel rubentes". The present author has found the same result as Stirton and confirmed the presence of salacinic acid.

Usnea Stirtoniana Zahlbr.

Darjeeling (8. IV. 1960); Rimbick (8. V. 1960); Phalut (9. V. 1960); Phalut (5. VI. 1960); Phalut-Sandakphu (6. VI. 1960). E. Nepal: Bilbatay Bhanjang-Tutay (27. X. 1963); Hati Sar-Mangalbare (28. X. 1963); below Siling Tzokupa (21. XI. 1963).

The medullary reaction of typical specimens are K+yellow, P miniate and they contain stictic acid together with usnic acid.

Norstictic acid Strain.

Morphologically identical with *Usnea Stirtoniana* Zahlbr., but contains norstictic acid instead of stictic acid: med. K+yellow soon becoming red and yields fine reddish needles by K (norstictic acid). One specimen from Darjeeling-Phalut contains besides norstictic and usnic acids a fatty substance crystalizing in long colorless needles.

Darjeeling: Phalut (10. V. 1960); Phalut (5. VI. 1960). E. Nepal: Batasay-Halhale Bhanjang (2. XII. 1963).

The *Usnea rubicunda* group.

***Usnea rubicunda* Stirt.**

Darjeeling (2–8. IV. 1960); Senchal (6. IV. 1960); Kurseong (12. IV. 1960); Takdah (18. IV. 1960); Lopchu (28. IV. 1960). Sikkim: Pamianchi (13. V. 1960); Yoksam (17. V. 1960); Gangtok (14. VI. 1960). E. Nepal: Sinduwa, 2000 m (21. X. 1963); Murhay–Bilbatay Bhanjang (25. X. 1963).

A full-grown individual attains up to 20 cm long, and basal branches up to 2 mm thick.

***Usnea rubescens* Stirt.**

East Nepal: Minchin Dhap–Mul Pokhari (29. X. 1963).

***Usnea aciculifera* Vain.** in Bot. Mag. Tokyo **35**: 45 (1921)–Motyka, Monograph. 322 (1938)–Asahina, Lich. Japan **3**: 74 (1956).

Darjeeling (2–8. IV. 1960); Takdah (18. IV. 1960); Lopchu (28. IV. 1960); Rimbick (6. V. 1960). Sikkim: Pamianchi (13. V. 1960); Yoksam (17. V. 1960); Gangtok (13–15. VI. 1960). E. Nepal: Sinduwa (21. X. 1963); Bilbatay Bhanjang, 2200 m (25–27. X. 1963); Minchin Dhap–Mul Pokhari (29. X. 1963); Helok–Baroya Khimty (15. XI. 1963); Birwa–Yektin (28. XI. 1963); Minchin Dhap–Mul Pokhari (29. XI. 1963); Helok–Baroya Khimty (15. XI. 1963).

***Usnea galbinifera* Asahina** in Journ. Jap. Bot. **38**: 257 (1963).

Darjeeling: Rimbick (2. V. 1960); Phalut–Sandakphu (10. V. 1960—typus). Sikkim: Jongri (20. V. 1960).

var. ***subfibrillosa*** Asahina, var. nov.

Thallus crebre fibrillosus, ceterum ut in typo.

E. Nepal: Bilbatay Bhanjang, 2200 m (25. X. 1963—typus TNS, TI); Dumhan–Taplejung (2. XI. 1963).

***Usnea bismolliuscula* Zahlbr.**

Darjeeling: Senchal (6. IV. 1960); Takdah (18. IV. 1960).

The *Usnea longissima* group

***Usnea pectinata* Tayl.** (1847)–Motyka, Monograph. 422 (1938)–Asahina in Journ. Jap. Bot. **40**: 1 (1965).

U. Hossei Vain. (1921)

Darjeeling: Senchal (16. IV. 1960).

***Usnea montis-Fuji* Motyka**, Monograph. 420 (1938).

cf. Asahina, Lich. Japan **3**: 49 (1956).

Darjeeling: Rimbick 2200 m (6. V. 1960); Phalut (9. V. 1960). E. Nepal: Bilbatay Bhanjang–Hati Sar (26. X. 1963); Birwa–Yektin (28. XI. 1963).

***Usnea pseudomontis-Fuji* Asahina**, Lich. Japan **3**: 51 (1956).

Darjeeling: Phalut (9. V. 1960). E. Nepal: below Siling Tzokupa (21. XI. 1963).

***Usnea longissima* Ach.**: Motyka, Monograph. 423 (1938)–Asahina, Lich. Japan **3**: 46–49 (1956).

var. ***vulgata*** Asahina

Sikkim: Olothang–Jongri (23. V. 1960); Migothang (30–31. V. 1960). Darjeeling: Phalut–Sandakphu, 3500 m (6. IV. 1960). E. Nepal: below Siling Tzokupa–Siling Tzokupa (21. XI. 1963).

Acidum usnicum et acidum barbaticum continens.

subsp. ***jesoensis*** Asahina

Darjeeling: Phalut (9. V. 1960); Rimbick (8. V. 1960). Sikkim: Gamothang,

3900 m (29. V. 1960). E. Nepal: Selap-Walunchung Gola (10. XI. 1963); Walunchung Gola-Zongi (11. XI. 1963).

Acidum usnicum et acidum evernicum continens.

subsp. **ambigua** Asahina

Darjeeling: Phalut (5. V. 1960); Phalut-Sandakphu (6. VI. 1960). Sikkim: Jongri (20. V. 1960). E. Nepal: Selap-Walunchung Gola (10. XI. 1963); Bilbatay Bhanjang-Hati Sar (27. X. 1963).

Acidum usnicum et acidum diffractaicum continens.

subsp. **sensibilis** Asahina

E. Nepal: Birwa-Yektin (28. XI. 1963).

Acidum usnicum et acidum salacinicum continens.

subsp. **dubia** Asahina, subsp. nov.

Acidum usnicum et materiam decolorem peculiarem continens.

Darjeeling: Phalut-Sandakphu (5-6. VI. 1960—typus TNS, TI). Sikkim: Jongri (20 V. 1960); Olohang-Jongri (23. V. 1960). E. Nepal: Mangalbare, etc. (28. X. 1963); Walunchung Gola-Zongi (11. XI. 1963).

By the ordinary microcrystallization usnic acid only was confirmed, neither depside nor depsidone. Generally in ether extract a fatty substance occurs, which crystallizes in broad thin colorless plates and exhibits the same Rf value (T.L.C. by Miss Nuno) with the fatty substance occurring in *Cetraria Togashii* Asahina.

On the basis of Zopf's opinion formerly it became a common sense to accept the barbatic acid as the characteristic ingredient of *Usnea longissima* Ach. But, as the present writer has already shown, the so-called *Usnea longissima* includes a group of morphologically identical and chemically different individuals, which may be distinguished by arranging into different subspecies or by affixing the attribute of different strains in the sense of Lamb. On this subject, the writer is preparing a detailed paper to be published in the near future.

Oropogon formosanus Asahina in Journ. Jap. Bot. 27: 242 (1952).

Sikkim: Jongri (20. V. 1960). E. Nepal: Bilbatay Bhanjang-Tutay (27. X. 1963); Batasay-Halhale Bhanjang, etc. (1. XII. 1963).

Med. K-, P+red, contains protocetraric acid.

Siphula ceratites (Wnbg.) E. Fr. var. **himalayensis** Räs., teste Awasthi.

Sikkim: Migothang, 3900 m (30. V. 1960).

Med. K-, P-, contains usnic acid and zeorin.

Thamnolia vermicularis (Sw.) Ach.

Sikkim: Jongri, 4000 m (21-22. V. 1960); Olohang-Jongri (23. V. 1960).

Evernia mesomorpha Nyl.

Sikkim: Jongri (22. V. 1960). Darjeeling: Phalut-Sandakphu, 3300 m (6. VI. 1960).

f. **esorediosa** Müll. Arg.

Sikkim: Gamothang (29. V. 1960).

Alectoria virens Tayl.

Darjeeling: Phalut, 3000 m (9. V. 1960). E. Nepal: below Siling Tzokupa-Siling Tzokupa (21. XI. 1963); Batasay-Bhuspate Danra (2. XII. 1963); Hati Sar-Minchin Dhap (28. X. 1963).

The specimen collected in Phalut is only faintly colored yellowish. The writer

is of opinion that this specimen is an intermediate form between the type and the following var. *decolorans* Asahina.

var. **decolorans** Asahina, var. nov.

Thallus pendulus, usque ad 30 cm (vel ultra) longus, cinereofuscescens, apicibus obscure fuscescens, ramus principalis applanatus, longitudinaliter sulcatus, sulcis interdum late hiantibus et medulla denudata, crebre subdichotome et sympodialiter ramosus, secundarius tertariusque fere teretes, fuscescentes, ramuli laterales sat crebra, tenues, 1–3 mm longi, denigrati. Apothecia et pycnoconidia ignota. Med. K–, P+aurantiaca.

Darjeeling: Phalut (9. V. 1960—typus TNS, TI). East Nepal: Bilbatay Bhanjang-Tutay, etc. (27. X. 1963).

External appearance of this variety reminds us of the decolorized *Alectoria virens*.

Alectoria sulcata (Lév.) Nyl.

Darjeeling: Rimbick (8. V. 1960); Phalut–Sandakphu (6. VI. 1960). Sikkim: Jongri (20. V. 1960).

f. **ciliata** Hue, Lichenes Extra-Europaei no. 177.

Sikkim: Migothang (30. V. 1960); Singalila–Nayathang (2. VI. 1960). Darjeeling: Phalut–Sandakphu, 3500 m (6. VI. 1960). E. Nepal: Hati Sar–Mangalbare, etc. (28. X. 1963); Selap–Walunchung Gola (10. XI. 1963); below Siling Tzokupa–Siling Tzokupa (21. X. 1963); Birwa–Yektin (2. XI. 1963); Halhale Bhanjang–Mai Majuwa (1. XII. 1963); Bhuspate Danra, 2600 m (2. XII. 1963).

Alectoria asiatica Du Rietz

Sikkim: Jongri (20. V. 1960); Olothang, 3500 m (23. V. 1960); Migothang, 3900 m (30. V. 1960). Darjeeling: Phalut (10. V. 1960). E. Nepal: Bilbatay Bhanjang, 2200 m (26. X. 1963); Walunchung Gola–Zongi (11. XI. 1963); below Siling Tzokupa–Siling Tzokupa (21. XI. 1963); Birwa–Yektin (28. XI. 1963); Bhuspate Danra, 2600 m (2. XII. 1963).

Alectoria acanthodes Hue, Lichenes Extra-Europaei no. 175.

Darjeeling: Phalut (10. V. 1960). Sikkim: Jongri–Gamothang (26. V. 1960). E. Nepal: Hati Sar–Mangalbare, etc. (28. X. 1963); Walunchung Gola–Zongi (11. XI. 1963); below Siling Tzokupa–Siling Tzokupa (21. XI. 1963); Birwa–Yektin (28. XI. 1963); Batasay–Bhuspate Danra (1. XII. 1963).

Alectoria cf. **bicolor** Nyl. var. **melaneira** Nyl.

Darjeeling: Phalut (10–11. V. 1960). Sikkim: Jongri, 4000–4100 m (21–22. V. 1960); Olothang–Jongri (23. V. 1960); Jongri–Gamothang (26. V. 1960); Gamothang, 3900 m (29. V. 1960); Migothang (30. V. 1960).

Ramalina Ach. Sect. *Euramalina* Vain.

Subsect. *Fistularia* Vain.

Ramalina himalayensis Räs. in Arch. Soc. Zool. Bot. Fenn. “Vanamo” 5: 26 (1950).

Darjeeling: Phalut, 3500 m (10. V. 1960); Phalut (2 & 6. VI. 1960). Sikkim: Migothang (30. V. 1960).

Subsect. *Myelopoea* Vain.

Ramalina sinensis Jatta

Darjeeling: Senchal (6. IV. 1960). E. Nepal: Sinduwa–Bilbatay Bhanjang (23. X. 1963).

Ramalina calicaris (L.) Röhl.f. **papillosa** Hue, Lich. Extra-Europaei no. 159.

Darjeeling: Senchal (6. V. 1960); Phalut (10. V. 1960). Sikkim: Jongri (20. V. 1960); Penlong La, 2100 m (18. III. 1963). E. Nepal: Bilbatay Bhanjang, etc. (27. X. 1963); Hati Sar–Mangalbare, etc. (28. X. 1963); Minchin Dhap–Mul Pokhari (29. X. 1963); Dumhan–Taplejung (1. XI. 1963); Walunchung Gola–Zongi (11. XI. 1963); below Siling Tzokupa (21. XI. 1963); Birwa–Yektin (28. XI. 1963); Batasay–Halhale Bhanjang, etc. (1. XII. 1963).

var. **subfastigiata** Nyl., Lich. Extra-Europaei no. 159.

Darjeeling (2 & 8. IV. 1960); Senchal (6. IV. 1960); Kurseong, 1500 m (12. IV. 1960); Takdah (18. IV. 1960); Lopchu (28. IV. 1960); Rimbick (6. V. 1960); Phalut (9–10. V. 1960). Sikkim: Pamianchi (13. V. 1960); Preig Chu (19. V. 1960); Olothang (23. V. 1960). E. Nepal: Sinduwa–Bilbatay Bhanjang (23. X. 1963); Chyangthaphu–Birwa (27. X. 1963); Bilbatay Bhanjang, etc. (27. X. 1963); Birwa–Yektin (29. X. 1963); Selap–Zongi (10. XI. 1963); Batasay–Halhale Bhanjang, etc. (2. XII. 1963).

Ramalina farinacea Ach.

Darjeeling: Senchal (6. IV. 1960); Lopchu (28. IV. 1960); Rimbick (6. V. 1960); Sandakphu, 3400 m (6. VI. 1960). Sikkim: Jongri (20. V. 1960); Gangtok (13. VI. 1960). East Nepal: Bilbatay Bhanjang, etc. (27. X. 1963); Hati Sar, etc. (28. X. 1963); Selap–Walunchung Gola (10. XI. 1963); Birwa–Yektin (29. XI. 1963).

var. **reagens** Bouly de Lesd. in Bull. Soc. Bot. France **67**: 217 (1920)

Darjeeling: Lopchu (28. IV. 1960).

Medulla K rubescens, acidum salacinicum continens.

var. **multifida** Ach.

Darjeeling: Senchal (6. IV. 1960); Darjeeling (8. IV. 1960); Takdah (18. IV. 1960); Phalut, 3500 m (10. V. 1960). Sikkim: Pamianchi (13. V. 1960); Jongri (20. V. 1960); Phalut–Sandakphu (6. VI. 1960); Phalut (9. VI. 1960). E. Nepal: Murhay–Bilbatay Bhanjang (25. X. 1963); below Siling Tzokupa–Siling Tzokupa (21–22 XI. 1963); Batasay–Halhale Bhanjang, etc. (1. XII. 1963).

ANAPTYCHIAE and PARMELIAE (by Syo Kurokawa)

Anaptychia angustiloba (Müll. Arg.) Kurok. in Nova Hedwig. Beih. **6**: 39 (1962).

Darjeeling (Apr. 2, 1960); Kurseong (Apr. 12, 1960).

Anaptychia Awasthii Kurok., l. c. 88 (1962).

Darjeeling (Apr. 16, 1960). Sikkim: Pamianchi (May 13, 1960).

Anaptychia comosa (Eschw.) Mass.

Sikkim: Pamianchi (May 13, 1960).

Anaptychia dendritica (Pers.) Vain. var. **dendritica**

Darjeeling: Senchal (Apr. 6, 1960).

var. **propagulifera** Vain.

Darjeeling (Apr. 2, 1960); Senchal, Darjeeling (Apr. 6, 1960); Kurseong (Apr. 12, 1960); Takdah (Apr. 18, 1960).

Anaptychia diademata (Tayl.) Kurok., l. c. 28 (1962).

Darjeeling (Apr. 2 & 28, 1960); Kurseong, 1500 m (Apr. 12, 1960); Senchal, Darje-

eling (Apr. 16, 1960); Takdah (Apr. 18, 1960); Phalut, 3500 m (Jun. 5, 1960). Sikkim: Phalut-Dentam (May 11, 1960); Migothang (May 31, 1960); Nayathang (Jun. 1, 1960); Gangtok (Jun. 15, 1960).

Anaptychia dissecta Kurok. (1959); l. c. 38 (1962) var. **dissecta**

Darjeeling (Apr. 2, 1960); Senchal, Darjeeling (Apr. 6, 1960).

var. **koyana** Kurok.

Darjeeling: Takdah (Apr. 18, 1960); Lopchu (Apr. 28, 1960).

Anaptychia firmula (Nyl.) Dodge et Awasthi

Darjeeling: Takdah (Apr. 18, 1960). Sikkim: Gangtok, 1600 m (Jun. 13, 1960).

Anaptychia incana (Stirt.) Zahlbr.

Darjeeling (Apr. 2, 1960); Senchal, Darjeeling (Apr. 6, 1960); Takdah (Apr. 18, 1960). Sikkim: Pamianchi (May 13, 1960); Bakkim-Jongri (May 20, 1960); Nayathang (Jun. 1, 1960).

Anaptychia leucomelaena (L.) Mass.

Darjeeling (Apr. 2, 1960).

Anaptychia neoleucomelaena Kurok. var. **neoleucomelaena**, l. c. 77 (1962)

Darjeeling: Phalut (May 10, 1960).

var. **squarrosa** (Vain.) Kurok., l. c. 78 (1962).

Darjeeling: Senchal (Apr. 6, 1960); Darjeeling (Apr. 8 & 16, 1960); Rimbick (May 6, 1960); Sandakphu (Jun. 6, 1960); Sandakphu-Tonglu, 3000 m (Jun. 7, 1960); Phalut (May 10, 1960). Sikkim: Bakkim-Jongri (May 20, 1960); Jongri (May 22, 1960); Olothang-Jongri (May 23, 1960).

Anaptychia obscurata (Nyl.) Vain.

Darjeeling (Apr. 2-8, 1960).

Anaptychia pellucida Awasthi

Darjeeling: Senchal (Apr. 16, 1960); Sikkim: Migothang (May 30, 1960); Migothang-Nayathang (Jun. 1, 1960).

Anaptychia pseudospeciosa Kurok. (1959); l. c. 25 (1962).

var. **pseudospeciosa**

Darjeeling: Senchal (Apr. 6, 1960).

var. **tremulans** (Müll. Arg.) Kurok., l. c. 26 (1962).

Darjeeling (Apr. 2-8, 1960). Sikkim: Gamothang (May 29, 1960).

Anaptychia punctifera Kurok., l. c. 45 (1962).

Darjeeling: Takdah (Apr. 18, 1960).

Anaptychia rubescens (Räs.) Kurok., l. c. 31 (1962).

Darjeeling (Apr. 2-8, 1960); Kurseong, 1500 m (Apr. 12, 1960); Takdah (Apr. 18, 1960). Sikkim: Gangtok, 1600 m (Jun. 14, 1960).

Anaptychia Togashii Kurok., l. c. 68 (1962).

Sikkim: Bakkim-Jongri (May 20, 1960); Jongri, 4000 m (May 21, 1960—holotypus in TNS and isotypus in TI and US); Jongri (May 22, 1960); Olothang-Jongri (May 23, 1960); Jongri-Base Camp, 4500 m (May 25, 1960); Jongri-Gamothang (May 26, 1960); Gamothang (May 29, 1960); Nayathang (Jun. 1, 1960); Migothang (Jun. 1, 1960).

Parmelia adaugescens Nyl.

Sikkim: Gamothang (May 29, 1960).

Parmelia adducta Nyl.

Darjeeling: Senchal (Apr. 16, 1960).

Parmelia aptata Krempelh.

Darjeeling: Observatory Hill (Apr. 2, 1960); Darjeeling (Apr. 8, 1960); Senchal (May 6, 1960). Sikkim: Pamianchi (May 13, 1960). E. Nepal: Dhankuta, 1200 m (Oct. 20 & 21, 1963); Dhara Pani-Illam (Dec. 5, 1963).

Parmelia aurulenta Tuck.

Darjeeling: Lopchu (Apr. 28, 1960). Sikkim: Yoksam (May 17, 1960).

Parmelia austrosinensis Zahlbr.

E. Nepal: Dhankuta, 1200 m (Oct. 21, 1963).

Parmelia boliviana Nyl.

Darjeeling: Kurseong, 1500 m (Apr. 12, 1960).

Parmelia caperata (L.) Ach.

Darjeeling: Senchal (Apr. 6, 1960).

Parmelia cirrhata Fr.

Sikkim: Tendong Peak, 2700 m (Mar. 26, 1963).

Parmelia dissecta Nyl.

Darjeeling (Apr. 2, 1960); Senchal, Darjeeling (Apr. 6, 1960).

Parmelia ecaperata Müll. Arg.

E. Nepal: Iladanda-Selap (Nov. 9, 1963).

Parmelia exsecta Tayl.

Darjeeling (Apr. 2, 1960); Senchal, Darjeeling (Apr. 6, 1960); Phalut (May 10, 1960). E. Nepal: Bhuspate Danra, 2600 m (Dec. 2, 1963).

Parmelia formosana Zahlbr.

Darjeeling (Apr. 2, 1960); Senchal, Darjeeling (Apr. 6, 1960).

Parmelia flexilis Kurokawa, sp. nov.

[Fig. 45]

Thallus corticola, laxe adnatus, albido-cinerascens, plus minusve flexilis, irregulariter lobatus, isidiis sorediisque destitutus, 3-5 cm diametro, subtus niger et modice vel dense rhizinosus, rhizinis nigris, dichotome ramosis. Apothecia numerosa, adnata; sporae $8-11 \times 15-21 \mu$.

Thallus loosely adnate on twigs, more or less flexible, pearl grey, turning deep-

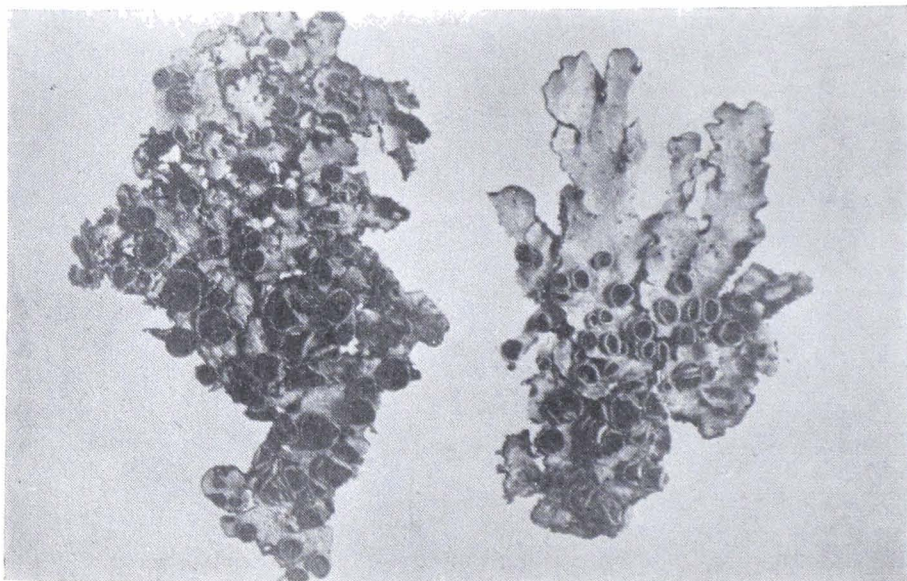


Fig. 45. *Parmelia flexilis* Kurokawa, $\times 1.2$. Holotypus.

olive-buff in the herbarium, 3–5 cm in diameter, lobes irregularly branched, 3–6 mm wide, margins more or less crenate, uppersurface plane and smooth, more or less shiny, sometimes faintly maculate, isidia and soredia lacking; medulla white; undersurface black, moderately or densely rhizinate, rhizines black, shiny, moderately branched, 0.2–0.4 mm long. Apothecia numerous, adnate, 2–6 mm in diameter; margins smooth, disc snuff-brown to bister; hymenium about 65–75 μ high; spores 8–11 \times 15–21 μ .

Thallus K+ yellow; medulla P-, K-, C-, KC-. Atranorin and protolichestic acid present.

Darjeeling: (Apr. 2, 1960); Senchal, 2400 m (H. Hara et al. Apr. 6, 1960—holotypus in TNS and isotypus in TI).

Externally this new species resembles *P. keitauensis* Asah. They both have fairly large spores and lack isidia. While *P. keitauensis* has positive color reaction with P in the medulla, producing protocetraric acid, however, the medulla of *P. flexilis* is P-. *Parmelia flexilis* seems to be a rare species distributed in tropical eastern Asia and New Guinea.

Additional specimens examined. Formosa. Taitung Pref.: Bayu Lake, about 2200 m. Jan. 21, 1965. *S. Kurokawa* 2396 (TNS) and 2398 (TNS). New Guinea. Al River Valley NW of Nondugl, West Highland District. Alt. 2000 m. Apr. 3, 1953. *R. D. Hoogland* 3208 (TNS).

***Parmelia imbricatula* Zahlbr.**

E. Nepal: Helok-Baroya Khimty (Nov. 15, 1963).

***Parmelia incognita* Kurokawa, nom. nov.**

[Fig. 46]

Parmelia koyaensis f. *inactiva* Asah. in Journ. Jap. Bot. **28**: 68 (1953)—lectotypus. Japan. Prov. Sagami: Moto-Hakone (Aug. 12, 1925. *Y. Asahina* 2033, TNS).

Darjeeling: Batasi (May 6, 1960); Rimbick (May 6, 1960).

In 1959 Asahina reduced *P. koyaensis* f. *inactiva* as a synonym of *P. nodakensis* Asah. When Asahina described *P. koyaensis* f. *inactiva*, however, he cited four

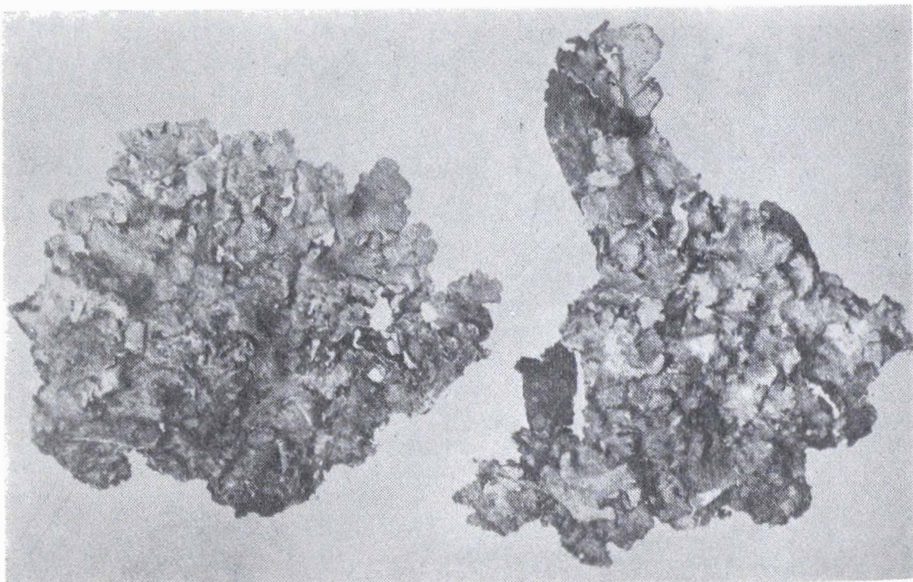


Fig. 46. *Parmelia koyaensis* f. *inactiva* Asahina, \times 1.2. Lectotypus.

specimens: Moto-Hakone, Prov. Sagami; Mt. Koya and Tanabe, Prov. Kii; Nippara, Prov. Musashi. A specimen collected at Nippara has negative color reaction with C and KC and the lower surface has a rather broad naked zone. Therefore, this specimen can be identified with *P. Ikomae* Asah. A specimen from Tanabe, Prov. Kii is apparently *P. subaurulenta*, because of the pale yellow medulla and the presence of atranorin and zeorin. The medulla is C- and KC- in a specimen collected on Mt. Koya, which is identified with *P. infirma* Kurok. The other specimen, designated here as the lectotype of *P. koyaensis* f. *inactiva*, shows pale rose color reaction with C and contains gyrophoric acid along with atranorin and protolichestic acid. In contrast, the medulla of *P. nodakensis* is C-, but KC+rose, containing unknown substances.

The specific epithet *inactiva* is preempted by *Parmelia inactiva* (Zahlbr.) Vain., a synonym of *P. saccatiloba* Tayl.

Parmelia infirma Kurok. in Hale et Kurokawa in Contr. U. S. Nat. Herb. 36: 179 (1964).

Darjeeling: Kurseong (Apr. 2, 1960, H. Hara et al.—holotypus in TNS and isotypus in TI and US); Takdah (Apr. 18, 1960); Rimbick (May 6, 1960).

When *P. infirma* was described, it was known only from the type locality (see above). However, this species is now known from Japan, Formosa, Thailand, and Indonesia. Therefore, this species is widely distributed in tropical or subtropical areas in eastern Asia.

Parmelia isidiza Nyl.

Darjeeling: Takdah (Apr. 18, 1960); Lopchu (Apr. 28, 1960).

Parmelia koyaensis Asah.

Darjeeling: Batasi (May 4, 1960); Rimbick (May 6, 1960).

Parmelia meizospora (Nyl.) Nyl.

Darjeeling (Apr. 2, 1960); Batasi (May 6, 1960). Sikkim: Pamianchi, 2000 m (May 13, 1960); Yoksam, 1800 m (May 17, 1960.); Gangtok, 1600 m (Jun. 14, 1960).

Parmelia nepalensis Tayl.

Darjeeling: Senchal, 2400 m (Apr. 16, 1960); Lopchu (Apr. 28, 1960). Sikkim: Yoksam, 1800 m (May 17, 1960); below Bakkim (May 19, 1960); Jongri (May 20, 1960); Jongri, 4000 m (May 22, 1960); Gamothang, 3900 m (May 29, 1960). E. Nepal: Walunchung Gola-Zongi (Nov. 11, 1963).

Parmelia nilgherrensis Nyl.

Darjeeling: Rimbick (May 6, 1960). E. Nepal: Bilbatay Bhanjang, 2200 m (Oct. 26, 1963); below Siling Tzokupa-Siling Tzokupa (Nov. 21, 1963); Halhale Bhanjang-Bhuspate Danra (Dec. 1, 1963); Bhuspate Danra, Taplejung Dist. (Dec. 2, 1963).

Parmelia perisidians Nyl.

Sikkim: Pamianchi (May 13, 1960).

Parmelia praesorediosa Nyl.

Darjeeling: Takdah (Apr. 18, 1960); Lopchu (Apr. 28, 1960). Sikkim: Yoksam, 1800 m (May 17, 1960).

Parmelia rampoddensis Nyl.

Darjeeling: Senchal (Apr. 6, 1960).

Parmelia reticulata Tayl.

Darjeeling (Apr. 2 & 8, 1960); Takdah (Apr. 18, 1960); Lopchu (Apr. 28, 1960).

Sikkim: Yoksam, 1800 m (May 17, 1960).

Parmelia rudecta Ach.

East Nepal: Iladanda-Selap (Nov. 9, 1963).

Parmelia sancti-angeli Lynge

Darjeeling: Kurseong, 1500 m (Apr. 12, 1960); Takdah (Apr. 18, 1960); Lopchu (Apr. 28, 1960). Sikkim: Pamianchi (May 13, 1960); Yoksam, 1800 m (May 17, 1960). E. Nepal: Dhankuta, 1200 m (Oct. 21, 1963).

Parmelia saxatilis Ach.

Sikkim: Olothang-Jongri (May 23, 1960).

Parmelia scytodes Kurok. in Hale et Kurok., l. c. 185 (1964).

Darjeeling: Batasi (May 6, 1960, Hara et al.—holotypus in TNS and isotypus in TI and US).

Parmelia scytophylla Kurok. in Hale et Kurok., l. c. 185 (1964).

Darjeeling: Phalut 3500 m (May 10 & Jun. 2, 1960); Sandakphu-Tonglu, 3000 m (Jun. 7, 1960). Sikkim: Migothang, 3900 m (May 30, 1960, H. Hara et al.—holotypus in TNS and isotypus in TI and US).

Parmelia setschwanensis Zahlbr.

Darjeeling: Senchal (Apr. 6, 1960); Darjeeling (Apr. 8, 1960); Kurseong, 1500 m (Apr. 12, 1960); Rimbick (May 6, 1960).

Parmelia subaurulenta Nyl.

Darjeeling: Phalut, 3000–3500 m (May 9 & 10, 1960).

Parmelia submutata Hue.

E. Nepal: Selap-Walunchung Gola (Nov. 10, 1963).

Parmelia subsumpta Nyl.

Darjeeling: Senchal (Apr. 6, 1960).

Parmelia subtinctoria Zahlbr.

E. Nepal: Dhankuta, 1200 m (Oct. 21, 1963).

Parmelia tinctorum Nyl.

Darjeeling (Apr. 2 & 8, 1960); Kurseong, 1500 m (Apr. 12, 1960); Takdah (Apr. 18, 1960); Lopchu (Apr. 28, 1960). Sikkim: Pamianchi, 2000 m (May 13, 1960); Yoksam, 1800 m (May 17, 1960); Gangtok, 1900 m (Jun. 13 & 14, 1960). C. Nepal: Kathmandu Airport (Oct. 13, 1963). E. Nepal: Dhankuta, 1200 m (Oct. 20 & 21, 1963); Hati Sar-Minchin Dhap (Oct. 28, 1963); Iladanda-Selap (Nov. 9, 1963); Helok-Baroya Khimty (Nov. 15, 1963); Bhuspate Danra, 2600 m (Dec. 2, 1963); Dhara Pani-Illam (Dec. 5, 1963).

Parmelia vexans Zahlbr.

Darjeeling (Apr. 2, 1960).

Parmelia Wallichiana Tayl.

Darjeeling (Apr. 2 & 8, 1960); Senchal, Darjeeling (Apr. 6 & 16, 1960); Kurseong, 1500 m (Apr. 12, 1960); Takdah (Apr. 18, 1960); Lopchu, (Apr. 28, 1960). Sikkim: Yoksam, 1800 m (May 17, 1960). E. Nepal: Dhankuta, 1200 m (Oct. 21, 1963); Bilbatay Bhanjang, 2200 m (Oct. 25, 1963); Selap-Walunchung Gola (Nov. 10, 1963); Helok-Baroya Khimty (Nov. 15, 1963).

Parmelia xantholepis Mont. et v. d. Bosch.

Darjeeling (Apr. 2, 1960); Kurseong, 1500 m (Apr. 12, 1960); Takdah, (Apr. 18, 1960); Rimbick (May 6, 1960).