

Masakane INOUE*: **Japanese species of *Huilia* (Lichenes) (3)****

井上正鉄*: 日本産フイリア属地衣について (3)

7) ***Huilia macrocarpa*** (DC.) Hertel, *Herzogia* 3: 374 (1975). (Figs. 1a-c, 2, 8a)

Patellaria macrocarpa DC. in Lam. et DC., *Flora Franç.* ed. 3, 2: 347 (1805). Type: France, "Alpes" (without precise locality)—holotype in G (Herb. DC.)—*Lecidea macrocarpa* (DC.) Steud., *Nomenclat. Bot.* 245 (1824).

Lecidea platycarpa Ach., *Lich. Univ.* 173 (1810). Type: Switzerland, leg. J. Schleicher—lectotype in H (Herb. Acharius 138A); Müll. Arg., *Nuov. Giorn. Bot. Ital.* 24: 197 (1892).

Lecidea macrocarpa f. *lignatilis* Nyl. ex Vain., *Meddel. Soc. Fauna Flora Fenn.* 10: 67 (1883). Type: Finland, Karelia borealis, Lieksa, Sillalla, (lignicola), leg. Vainio—lectotype in TUR (Herb. Vainio 24858), selected here—*Lecidea steriza* f. *lignatilis* (Nyl. ex Vain.) Vain., *Acta Soc. Fauna Flora Fenn.* 57: 161 (1934).

Thallus variable, obsolete to continuous or areolate-rimulose, smooth or slightly rugulose, tartareous, or rarely evanescent, whitish; medulla I—. Hypothallus indistinct.

Apothecia 0.9-2 (sometimes to 3) mm in diameter, adnate, black, prominently or moderately constricted at the base; disc epruinose or thinly pruinose, flat with a prominent entire margin at the juvenile stage, then becoming convex with a \pm obliterated margin. Excipulum 100-150 μ m thick, reddish to dark brown in external part and becoming gradually paler towards the center, but not colorless, K+ yellow; hyphae radiating, 5-7 μ m thick, with a thick wall. Epithecium greenish brown to brown. Hymenium 70-120 μ m high. Subhymenium 15-35 μ m high, colorless, composed of perpendicular hyphae. Hypothecium reddish to dark brown, variable in height, reaching 150 μ m high, K+ reddish; hyphae irregularly arranged. Paraphyses slender, 1.5-2 μ m thick, coherent, anastomosed; apices slightly swollen (3-3.5 μ m). Asci clavate, 70-90 \times 13-17 μ m. Spores ellipsoid with obtuse ends, 14-26 \times 6-11 μ m; walls about 1 μ m thick.

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** Continued from *Journ. Jap. Bot.* 58: 161-173, 1983.

Reaction: thallus and medulla P+ reddish, K+ yellow, KC-, C- (chemical race I); thallus and medulla P-, K-, KC-, C- (chemical race II). Chemical substances: stictic acid in chemical race I; no lichen substance in chemical race II.

Habitat. On non-calcareous rocks or rarely on bark in mountain and alpine regions.

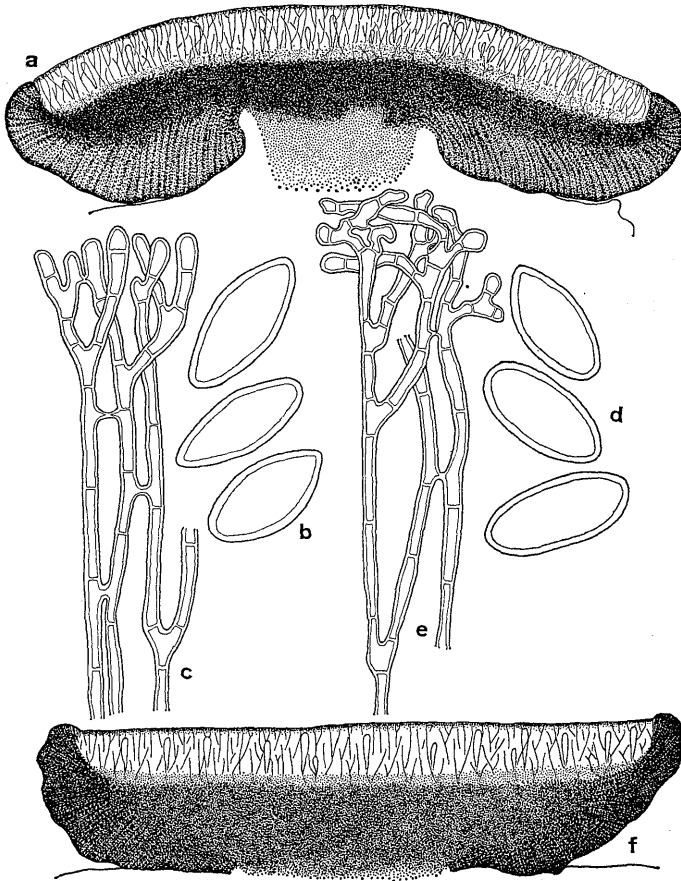


Fig. 1. *Huilia macrocarpa* (DC.) Hertel (a-c: drawn from HIRO-Inoue 10750) and *H. musiva* (Körb.) Vězda (d-f: drawn from HIRO-Inoue 10873). a and f. Vertical section of apothecia, $\times 60$. b and d. Spores, $\times 1000$. c and e. Upper part of paraphyses, $\times 1000$.

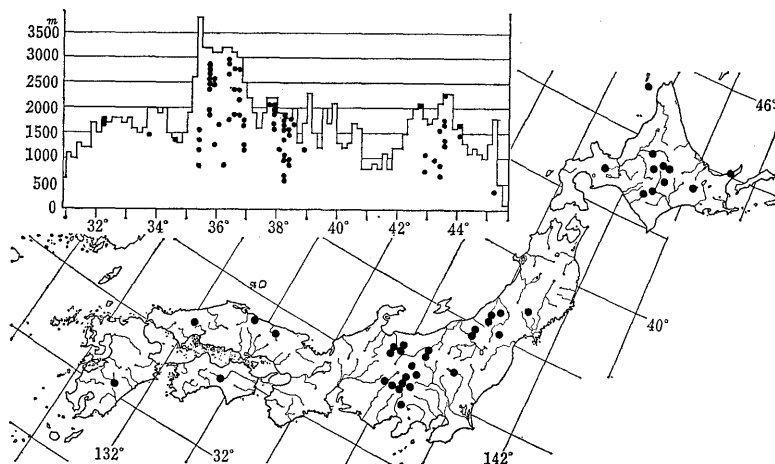


Fig. 2. Distribution of *Huilia macrocarpa* in Japan.

Range. Japan, Asia, Europe, North America, and Scandinavia.

Huilia macrocarpa is very closely related to *H. crustulata*, and differences between them were already discussed under *H. crustulata* (Inoue 1983).

This species seems to have a relatively wide ecological amplitude. It shows variable thalline morphology; it sometimes has a thick and areolate-rimulose thallus, sometimes a thin and smooth, or evanescent one (in the holotype specimen thallus thin, or in part evanescent, effuse, rimulose). However, a higher hymenium (reaching to 120 μm high), wider apothecia (1.5–2, rarely 3 mm wide), an excipulum composed of pachydermatous hyphae, and a production of stictic acid are common diagnostic characters of this species.

The holotype specimen of *H. macrocarpa* is very fragmentary, and I did not test it with TLC. But judging from the chemical reaction in the excipulum (K+ yellow), the specimen seems to contain stictic acid.

Besides many saxicolous specimens, two corticolous ones have been collected in beech (*Fagus crenata* Blume) forests in Japan. Vainio (1883) described a lignicolous taxon, *Lecidea macrocarpa* f. *lignatilis*, from Finland. Neither morphological, anatomical, nor chemical differences were detected among corticolous, lignicolous and saxicolous specimens.

Specimens examined. Hokkaido. Prov. Soya. Mt. Rishiri, mi 8158. Prov. Tokachi. Mt. Otofuke, mi 8400; Mt. Ishikari, mi 8474 & 8476; Mt. Hakuun by

Shikaribetsu Lake, mi 9765; Mt. Tsurugi, near Obihiro, mi 8230. Prov. Kamikawa. Mt. Hakuun, Mts. Daisetsu, mi 8609; Mt. Midori, Mts. Daisetsu, mi 8535; Mt. Furano, mi 7969; Asahikawa, coll. H. Koidzumi (Yasuda 527), TNS. Prov. Abashiri. Mt. Rausu, mi 7751 & 7771. Prov. Ishikari. Mt. Tengu, Mts. Ishikari, mi 8064. Prov. Kushiro. Mt. Oakan, mi 8771 & 8798. Prov. Hidaka. Mt. Poroshiri, mi 7901. Honshu. Pref. Miyagi. Mt. Kurikoma, mi 10418; Mt. Zao, mi 10708. Pref. Yamagata. Mt. Gassan, mi 10787; Mt. Itou, mi 10468, 10470, 10481, 10482, 10489-91, 10503 & 10511; Mt. Kanko, mi 10428, 10443 & 10453; Mt. Asahi, mi 10530, 10545, 10553, 10558, 10564, 10568, 10572, 10580, 10599, 10603, 10614, 10615, 10617, 10618, 10632, 10633, 10635 & 10639; Mt. Iide, mi 10837, 10843, 10848, 10858, 10875, 10890, 10911, 10922 & 10923. Pref. Tochigi. Nikko, "Aug. 1890, n. 315", as *Lecidea platycarpa*, G. Pref. Niigata. Mt. Dainichi, mi 10670 & 10675. Pref. Nagano. Mt. Naeba, mi 304, 1813 & 1823; Tenguvara, Mts. Shirouma, mi 5668; Mt. Hakuba, mi 5785; Mt. Karamatsu, mi 5794; Mt. Kashimayari, mi 5357; Mt. Kitakazura, mi 5058; Mt. Otensho, mi 4845; Mt. Noguchigoro, mi 5889 & 5960; Mt. Kagonoto, Mts. Asama, mi 586; Mt. Akarusan, Saku, mi 11270; Mugikusa Pass, Mts. Yatsu, mi 856; Mt. Kinpu, mi 10734, 10736, 10747 & 10750; Mt. Kisokoma, mi 6588, 6590, 6594 & 6701; Mt. Utsugi, mi 6724, 6766, 6770 & 6888; Mt. Anpeiji, mi 13317. Pref. Yamanashi. Mt. Kokushi, mi 1307; Mt. Kitadake, mi 883, 1016, 1043; Sengataki, Kiyosato, mi 10935; Ichigome, Mt. Fuji, mi 10752, 10754, 10756, 10759, 10762-64. Pref. Tottori. Mt. Hyonosen, mi 7634, 7639 & 7656; Mt. Daisen, mi 7675. Pref. Hiroshima. Mt. Osorakan, mi 11135. Shikoku. Pref. Kochi. Mt. Shiraga, mi 11191, 11206, 11209, 11210 & 11221. Kyushu. Pref. Miyazaki. Mt. Ichifusa, mi 10298, 10320, 10321 & 10332. Corticolous specimens: Pref. Yamagata. Mt. Asahi, mi 10619. Pref. Nagano. Mt. Jii mi 5498.

8) **Huilia musiva** (Körb.) Vězda, Folia Geobot. Phytotax. 13: 397 (1978). (Figs. 1d-f, 4, 8b)

Lecidea musiva Körb.; Parerg. Lich. 220 (1861). Type: Germany, "Ibbenbüren", leg. Lahm—holotype in L (910.187.1909)—*Lecidea convexa* (Fr.) Th. Fr. var. *musiva* (Körb.) Th. Fr., Lich. Scand. 507 (1874)—*Haplocarpon musivum* (Körb.) Vězda, Lich. Sel. Exsic. LII (1975).

Thallus medium to thick, verrucose-areolate, whitish; areolae bullate, dispersed, or at times congregated; medulla I—. Hypothallus black, at first visible between the areolae, then indistinct.

Apothecia 1-1.5 mm in diameter, formed between the areolae, adnate, black, slightly or moderately constricted at the base; disc epruinose, or at times very thinly pruinose, flat at the juvenile stage, then becoming convex; margin prominent, entire. Excipulum 100-150 μm , strongly carbonaceous, reddish to dark brown in external part and becoming gradually paler towards the center, but not colorless, K+ reddish; hyphae leptodermatous, radiating, especially in basal part, conglutinating, 2-3 μm thick. Epithecium brown with green tinge. Hymenium 100-120 μm high. Subhymenium 10-20 μm high, colorless, composed of perpendicular hyphae. Hypothecium reddish to dark brown, reaching 200 μm high, K+ reddish; hyphae irregularly arranged. Paraphyses coherent, anastomosed, 1-1.5 μm thick; apices slightly swollen, 3-4 μm thick. Asci clavate, 80-90 \times 14-17 μm . Spores ellipsoid with obtuse ends, 15-20 \times 8-10 μm , walls ca 0.5 μm thick.

Reaction: thallus and medulla P-, K-, KC-, C-. Chemical substances: confluent acid, glomeriferic acid (small amount).

Habitat. On non-calcareous rocks in alpine regions.

Range. Japan and Europe.

Huilia musiva can be easily distinguished from *H. macrocarpa* and *H. crustulata* which are related to *H. musiva* by the strongly carbonaceous excipulum composed of conglutinating leptodermatous hyphae (while weakly carbonaceous and somewhat pachydermatous in the latter two) (Fig. 3). The diagnostic features of *H. musiva* are: a verrucose-areolate thallus with dispersed bullate areolae, strongly carbonaceous excipulum consisting of conglutinating leptodermatous hyphae, and a production of confluent acid as a major constituent. The Japanese specimens studied agree very well with the holotype except for the somewhat smaller areolae.

Specimens examined.
Hokkaido. Prov. Shiribeshi.
Mt. Mekunnai, mi 8892.

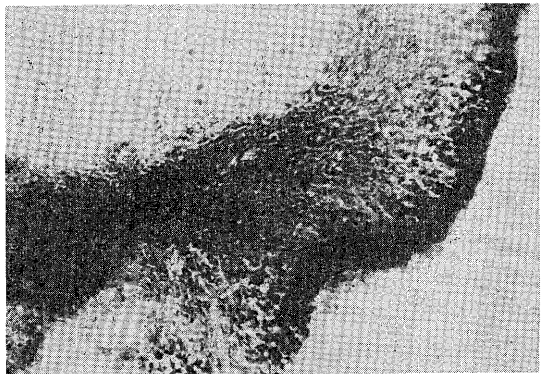


Fig. 3. Cross-section of an excipulum of *Huilia musiva* (mi 10873), stained by lactophenol cotton blue, \times 200.

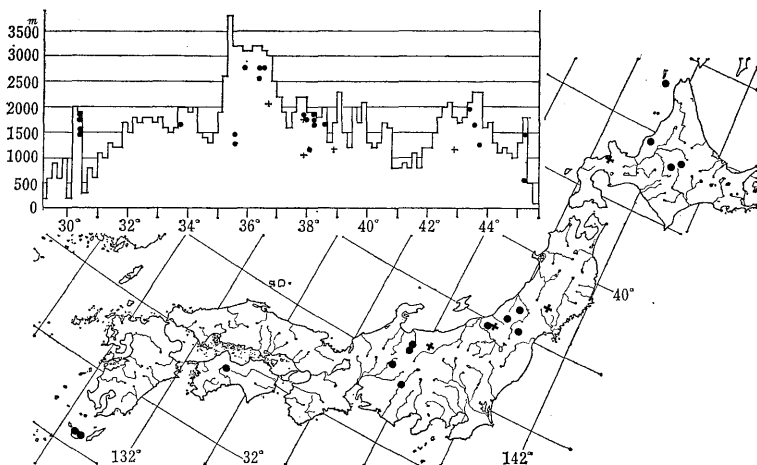


Fig. 4. Distribution of *Huiilia musiva* (+) and *H. nigrocruenta* (●) in Japan.

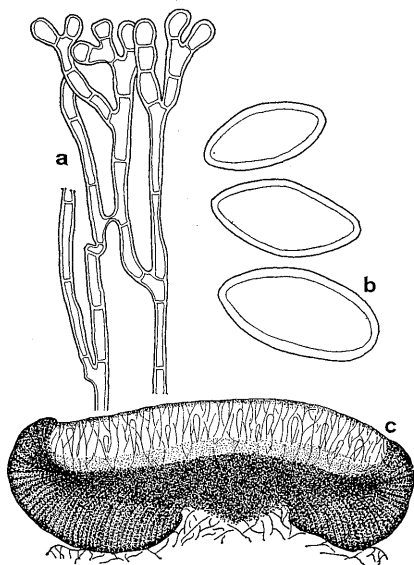


Fig. 5. *Huiilia nigrocruenta* (Anzi) Hertel (drawn from HIRO-Inoue 4809). a. Upper part of paraphyses, $\times 1000$. b. Spores, $\times 1000$. c. Vertical section of apothecium, $\times 60$.

Honshu. Pref. Miyagi. Mt. Kurikoma, mi 10419 & 10420. Pref. Yamagata. Mt. Iide, mi 10873 & 10894. Pref. Nagano. Mt. Togakushi, mi 11304.

9) ***Huiilia nigrocruenta*** (Anzi) Hertel, *Herzogia* 3: 374 (1975). (Figs. 4, 5, 8c)

Lecidea nigrocruenta Anzi, *Comment. Soc. Crittog. Ital.* 2(1): 18 (1864). Type: Italy, Novara, Suna-Cavadone, near Verbaria—*isotype* in M (Anzi, *Lich. Langob.* n. 402).

Thallus obsolete, not continuous, very thin or medium, rarely continuous and rimulose, flat, not polished; medulla I-. Hypothallus indistinct.

Apothecia adnate, roundish, 0.5–1.5 mm in diameter, moderately to prominently constricted at the base;

disc epuriose, flat with a prominent entire margin at the juvenile stage, then becoming convex with a \pm obliterated margin. Excipulum 100–120 μm thick, reddish to violet-brown in external part and becoming gradually paler towards the center, but not colorless, or sometimes reddish to violet-brown throughout, K+ violet; hyphae radiating, 4–6 μm thick, with a somewhat thick wall. Epithecium greenish-brown to brown. Hymenium 70–100 (120) μm high. Subhymenium 10–30 μm high, colorless, composed of perpendicular hyphae. Hypothecium reddish to violet-brown, with various heights, reaching 200 μm high; hyphae irregularly arranged. Paraphyses 1.5–2 μm thick, coherent, anastomosed, branched, more or less moniliform and frequently branched at their apical part; apices not or slightly swollen. Asci clavate, 75–90 \times 12–20 μm . Spores ellipsoid with obtuse ends, 16–27 (30) \times 8–13 μm ; walls about 1 μm thick.

Reaction: thallus and medulla P–, K–, KC–, C–. Chemical substances: no lichen substance demonstrated.

Habitat. On non-calcareous rocks in subalpine and alpine regions.

Range. Japan, China, Europe, and USSR.

The Japanese materials agree very well with an isotype specimen of *H. nigrocruenta*. This species is easily recognized by a K+ violet reaction in the excipulum, paraphyses which are more or less moniliform at the apices, and a well-developed excipulum composed of radiating hyphae with somewhat pachydermatous walls.

On account of a similar hyphal structure in the excipulum, this species may be most closely related to *H. macrocarpa* and *H. crustulata*.

This species had been known only from Europe, but the range was extended to China in Asia by Hertel & Zhao (1982). This is the second report from Asia.

Specimens examined. Hokkaido. Prov. Soya. Mt. Rishiri, mi 8127 & 8160. Prov. Rumoi. Mt. Syokanbetsu, mi 8282. Prov. Kamikawa. Mt. Midori, Mts. Daisetsu, mi 8523; Mt. Furano, mi 7940. Honshu. Pref. Miyagi. Mt. Kurikoma, mi 10364, with *H. percontigua*; Mt. Zao, mi 10709. Pref. Yamagata. Mt. Gassan, mi 10809; Mt. Asahi, mi 10520, 10649 & 10651; Mt. Iide, mi 10897, 10900 & 10904. Pref. Toyama. Mts. Tateyama, mi 12817. Pref. Nagano. Mt. Eboshi, Mts. Hida, mi 6021; Mt. Momisawa, mi 4809; Mt. Ontake, mi 4694; Mt. Anpeiji, mi 13275 & 13329. Shikoku. Pref. Ehime. Mt. Kamegamori, mi 11066. Kyushu. Pref. Kagoshima. Mt. Nagata, Yakushima isl., mi 9960, 9987, 9990 & 9996; Mt. Miyanoura, Yakushima isl., mi 10009 & 10016.

10) **Huilia panaeola** (Ach.) Hertel, Khumbu Himal 6: 216 (1977). (Figs. 6, 8d)

Lecidea panaeola Ach., Kgl. Vetensk.-Akad. Nya Handl. 267 (1808). Type: Sweden—lectotype in H (Herb. Acharius 205C).

Differing from *H. elegantior* in having sorediate thallus, and the soralia are rotundate. Sterile, or if fertile, apothecia are very obliterated.

Reaction: thallus P-, K-, KC-, C+ chinese red; medulla P-, K-, KC-, C- (chemical race I); thallus and medulla P-, C-, KC-, C- (chemical race II); soralia C+ chinese red in both races. Chemical substances: gyrophoric acid in chemical race I; gyrophoric acid and confluent acid in chemical race II.

Habitat. On non-calcareous rocks in alpine regions.

Range. Japan, Europe, North America, Scandinavia, and Siberia.

As mentioned under *H. elegantior* (Inoue 1983), the present species can be considered the sorediate or secondary counterpart of *H. elegantior*, which is regarded as a primary non-sorediate counterpart according to the "species-pair" hypothesis proposed by Poelt (1970). Although Poelt (1970) mentioned that the sorediate or secondary counterpart species usually has wider range than that of the primary non-sorediate one, such distributional difference is not clearly observed for *H. panaeola* and *H. elegantior* at least in Japan.

Judging from the the color reactions with C mentioned above, gyrophoric acid (C+ chinese red) seems to be present in the thallus and soralia in chemical race I, whereas it is produced only in soralia in chemical race II. Such location of gyrophoric acid in the thalli is stable in each chemical race so far as in Japanese representatives examined through the present study. In the lectotype specimen designated here, the thallus and soralia are C+ chinese red. The lectotype can be considered to belong to chemical race I.

Nylander (1890) reported *Lecidea panaeola* from Japan (Mt. Fuji). Unfortunately I have not had a chance to examine the specimen, the basis of the report, but according to his description, Nylander's *L. panaeola* is fertile and should not be identified with this species, but may be referred to *H. elegantior*.

Specimens examined. Hokkaido. Prov. Tokachi. Mt. Nipesotsu, mi 8989. Honshu. Pref. Toyama. Mts. Tateyama, mi 12767, 12809 & 12871. Pref. Nagano. Mt. Norikura, mi 12971; Mt. Hakuba, mi 14132; Mt. Kashimayari, mi 5299; Mt. Yari, mi 4846; Mt. Tateshina, mi 11584 & 11617; Mt. Ontake, mi 11451. Pref. Yamanashi. Sensui Pass, Mt. Kaikoma, mi 12309; Mt. Kitadake, mi 1004, 12156,

12209, 12232 & 12284.

11) ***Huilia percontigua***
(Nyl.) M. Inoue, comb. nov.
(Figs. 6, 7, 8e)

Lecidea percontigua Nyl.,
Flora 65: 457 (1882). Type:
France, "Gallia ad Pictaviam",
leg. Weddell—lectotype in H
(Herb. Nylander 16299).

Thallus effuse, thin to
medium, unequally granulate-
areolate, white with ash tinge
or sordid white; areolae con-
tiguous or at times subcat-
terated; medulla I-. Hypo-
thallus indistinct.

Apothecia up to 1.1(1.5)
mm in diameter, adnate,
black, medium to prominently
constricted at the base; disc
flat with a prominent entire
margin at the beginning, then
becoming convex with a \pm
indistinct margin, with white
pruina. Excipulum 100-150
 μm thick, reddish to dark
brown in external part and
becoming gradually paler to-
wards the center, but not
colorless, K+ blood red;
hyphae radiating, 3-6 μm
thick, with a somewhat thick
wall. Epithecium greenish-
brown. Hymenium 70-100 μm
high. Subhymenium 10-20 μm

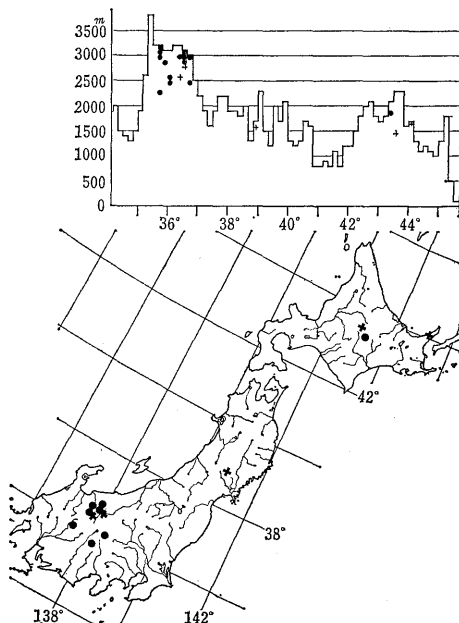


Fig. 6. Distribution of *Huilia panaeola* (●) and *H. percontigua* (+) in Japan.

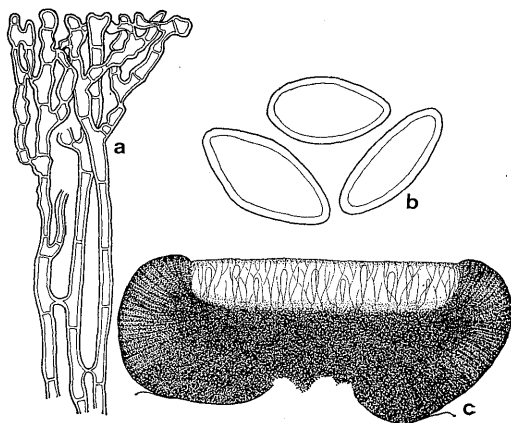


Fig. 7. *Huilia percontigua* (Nyl.) M. Inoue (drawn from HIRO-Inoue 5438). a. Upper part of paraphyses, $\times 1000$. b. Spores, $\times 1000$. c. Vertical section of apothecium, $\times 60$.

high, colorless, with perpendicular hyphae. Hypothecium reddish to dark brown, with various heights, reaching $150\ \mu\text{m}$ high; hyphae irregularly arranged. Paraphyses slender, $1.5\text{--}2\ \mu\text{m}$ thick, coherent, anastomosed; apices not or slightly

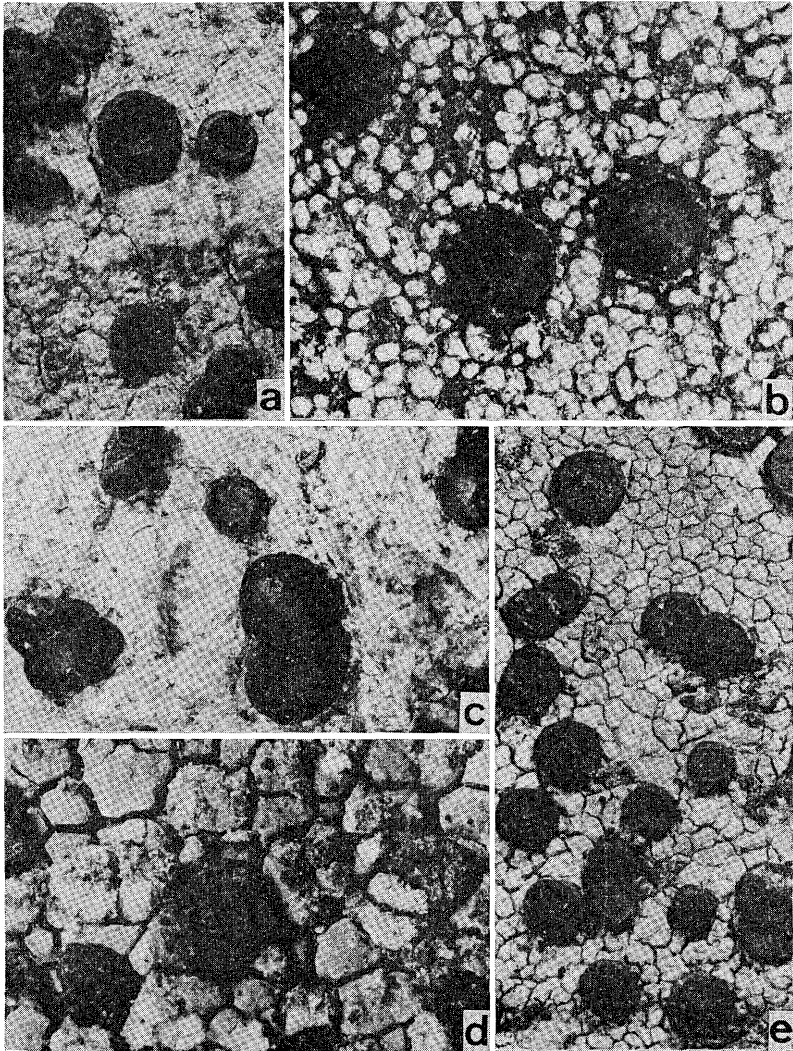


Fig. 8. a. *Huilia macrocarpa* (DC.) Hertel (mi 10750), b. *Huilia musiva* (Körb.) Vězda (mi 10873), c. *Huilia nigrocruenta* (Anzi) Hertel (mi 4809), d. *Huilia panaeola* (Ach.) Hertel (mi 11584), e. *Huilia percontigua* (Nyl.) M. Inoue (mi 5438). $\times 15$.

swollen. Asci clavate, $65-80 \times 12-16 \mu\text{m}$. Spores ellipsoid with subacute ends, $16-20 \times 7-10 \mu\text{m}$; walls about $1 \mu\text{m}$ thick.

Reaction: thallus and medulla P+ deep yellow, K+ yellow, then blood red, KC-, C-. Chemical substances: norstictic acid.

Habitat. On non-calcareous rocks in alpine regions.

Range. Japan and Europe.

The lectotype specimen, which is designated here, contains norstictic and stictic acids. Even though, stictic acid has not been demonstrated in Japanese specimens, morphological, including anatomical, features are quite similar in Japanese and European representatives.

This species is in many respects similar to *H. macrocarpa*, which, however, differs in containing only stictic acid rather than norstictic acid or mixture of norstictic and stictic acids and in having the excipulum composed of less conglomerated hyphae.

On account of containing norstictic acid in addition to the morphological similarity, *Huilia percontigua* seems to approach *H. platycarpoides* (Bagl.) Hertel (sec. original descr., Baglietto 1879, type locality: Italy, Sardinia isl., type specimens has never been reexamined). In 1975, Hertel suggested that *Lecidea percontigua* and *Haplocarpon platycarpoides* (Bagl.) Hertel might be synonymous because of morphological and chemical similarity. Following Hertel's opinion, Hawksworth et al. (1980) reduced *L. percontigua* as a synonym of *H. platycarpoides*. Even though I have not had a chance to examine the type specimen of *H. platycarpoides*, the treatment by Hawksworth et al. is not followed here and *H. percontigua* is treated as a distinct species, because it occurs in southwestern France to northern England (Nylander 1882, Smith 1926, Ozenda & Clauzade 1970) and *H. platycarpoides* can be, in contrast, considered to be a low-land species, having been recorded from Mediterranean regions (Zahlbruckner 1925) where Japanese subalpine species have been scarcely found.

Specimens examined. Hokkaido. Prov. Kamikawa. Numanohara, Mts. Daisetsu, mi 6413. Prov. Abashiri. Mt. Rausu, mi 7763. Honshu. Pref. Miyagi. Mt. Kurikoma, mi 10364. Pref. Nagano. Mt. Kashimayari, mi 5438; Mt. Yari, mi 4898.

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Hertel, H. (1975) Ein vorläufiger Bestimmungsschlüssel für die Kryptothallinen, schwarz fruchtigern, saxicolen Arten der Sammelgattung *Lecidea* (Lichens) in der Holarkis. *Decheniana* 125: 37-78. — (1977) Gesteinsbewohnende Arten der Sammelgattung *Lecidea* (Lichens) aus Zentral-, Ost-, und Südasien. *Khumbu Himal* 6: 145-378. — & C. -F. Zhao (1982) Lichens from Changbai Shan —some additions to the Lichen Flora of North-East China. *Lichenologist* 14: 139-152. Inoue, M. (1983) Japanese species of *Huilia* (Lichenes) (2). *Journ. Jap. Bot.* 58: 161-173. Nylander, W. (1882) *Addenda nova ad Lichenographiam europaeam*. *Flora* 65: 451-458. — (1890) *Lichenes Japoniae*. Paris. Ozenda, P. & G. Clauzade (1970) *Les Lichens—étude biologique et flore illustrée*. Paris. Poelt, J. (1970) Das Konzept der Artenpaare bei den Flechten. *Dtsch. Bot. Ges. Neue Floge*, Nr. 4, 187-198. Smith, A.L. (1926) *A monograph of the British lichens*, part II, ed. 2. London. Vainio, E. A. (1883) *Adjumenta ad Lichenographiam Lapponiae fennicae atque Fenniae borealis II*. *Meddel. Soc. Fauna et Flora Fennic.* 10: 1-230. Zahlbruckner, A. (1925) *Catalogus Lichenum Universalis*, III. Leipzig.

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日本産フイリア属の 5 種について、各々の形態・地衣成分・地理分布を記載し、近縁種との関係を論じた。*Huilia macrocarpa*, *H. musiva* をはじめとする種群は非常に多型的で分類の困難なグループのひとつである。筆者は子器殻 (excipulum) を構成する菌糸の膜の厚さ、配列状態、特に組織化・炭質化の程度、そして地衣成分の異同に着目してこの群の分類を進めているが、*H. musiva* と *H. macrocarpa* は子器殻を構成する菌糸が前者は薄膜で、組織化・炭質化が著しいのに対して、後者では厚膜で、隣り合う菌糸のゆ着・炭質化の程度が低い点、地衣成分として前者はコンフルエンチン酸を、後者はスチクチン酸を含有する点、そして前者の地衣体が小粒状で散生するのに対し、後者は一様に広がり亀裂が生じるなどの点で区別される。*H. percontigua* は日本の高山域に分布している。Hawksworth et al. (1981) は本種を *H. platycarpoides* の異名としているが、*H. platycarpoides* はサルジニア島など気候の温暖な地中海域に分布している事と、基準標本の所在が不明のため、筆者は混乱を防ぐために基準標本が確かで、フランス中南部からイングランド北部にかけて分布する *H. percontigua* を日本産として報告した。