Masakane INOUE*: **Japanese species of *Huilia* (Lichenes) (1)****

井上正鉄*: 日本産フイリア属地衣について (1)

*Huilia* was established by Zahlbruckner (1930), though he erroneously classified it under the Pannariaceae. Recently Hertel (1975) and Hawksworth et al. (1981) referred to the genus and assembled many species which had been reported under heterogeneous assemblage *Lecidea* (s. lat.). I have reported Japanese species of *Lecidea* (s. str.) (Inoue 1982), however, knowledges on Japanese species of *Huilia* was not sufficient. Only seven taxa have been reported from Japan (Inoue 1976, Hertel 1977). They are *Huilia aeolotera*, *H. albocaerulescens* var. *albocaerulescens*, *H. albocaerulescens* var. *polycarpiza*, *H. crustulata*, *H. flavocaerulescens*, *H. macrocarpa*, and *H. yezoensis*.

In my course of study, 11 species and one variety of *Huilia* are recognized as members of Japanese lichen flora. Most of them are distributed in mountains and alpine regions of the Japanese Archipelago, while *H. chungii* and *H. albocaerulescens* are distributed in lowland. All Japanese species are saxicolous except for the case of *H. macrocarpa*, for which two corticolous specimens have been collected besides a large number of saxicolous ones. In the present paper, on the other hand, *H. chungii*, *H. flavicunda*, and *H. percontigua* are proposed as new combinations. In addition, *H. chungii*, *H. elegantior*, *H. musiva*, *H. nigrocruenta*, *H. panaeola*, and *H. percontigua* will be introduced as new to the flora of Japan. In the enumeration of specimens, names of collectors are abbreviated as follows: hm, H. Miyawaki, k, S. Kurokawa, mi, M. Inoue, mn, M. Nakanishi, and mo, M. Oshio. Specimens are deposited in HIRO unless otherwise stated.

**Huilia** Zahlbr. in Handel-Mazzetti, Symbolae Sinicae 3: 80 (1930).

Type species: *Huilia insularis* Zahlbr. (=*Huilia aeolotera* (Vain.) Hertel).

Thallus endolithic or crustose, areolate, or verrucose, or granulose, or continuous, rimose, at times sorediate, or cephalodiate, ecorticate below; upper cortical layer composed of closely compacted hyphae running perpendicularly;

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algal layer rather uniform, mostly continuous; medulla composed of perpendicularly running hyphae, I−. Algae being protococcoid. Hypothallus black, distinct or indistinct.

Apothecia discoid, rounded, rarely more or less angular, adnate or appressed-adnate, usually slightly constricted at the base or not; disc plane or convex to hemispherical, bare or pruinose, with a prominent concolorous margin. Excipulum without thalloid margin, originating from hypothecium directly, rather continuous with hypothecium, usually more or less carbonaceous, brown or dark brown throughout, brighter externally; hyphae indistinctly radially arranged, highly anastomosing and conglutinating. Epithecium tinged with various colors. Hymenium usually colorless or rarely of the same color as the epithecium, with variable height, strongly amyloid (I+ blue). Subhymenium colorless, with variable height, strongly amyloid (I+ blue). Hypothecium carbonaceous, brown with various tinge; hyphae irregularly arranged. Paraphyses richly branched, anastomosed, coherent; apices swollen or not. Asci clavate; tholus prominent, I+ faintly blue. Spores hyaline and simple, ellipsoidish, usually with a halo.

The genus *Huilia* is clearly distinguished from *Lecidea* and *Lecidella* by the carbonaceous excipulum which is more or less continuous with hypothecium ("Graphidian-type" by Letrouit-Galinou 1968), the richly branched anastomosing and coherent paraphyses, and the rather larger spores which are surrounded by a halo. By anatomical features of the apothecia it is most reminiscent of the genus *Tremolecia* Choisy (Choisy 1953, Hertel 1977), but the genus *Tremolecia* can be easily distinguished from *Huilia* by the strongly developed and carbonaceous excipulum which is not continuous with hypothecium.

The genus *Huilia* may be considered to be closely related to *Rhizocarpon* because of the presence of a carbonaceous excipulum whose hyphal structure is similar to that of *Rhizocarpon*, richly branched and anastomosing paraphyses, and rather large spores with haloes. Poelt & Vězda (1981) correctly proposed Huiliaceae comprising these genera in the system of lichens. *Amygdalaria*, which was assigned to Lecideaceae in Poelt & Vězda (1981), seems to be related to some species of *Huilia*, because it has cephalodia, rather higher hymenium (100–170 $\mu$m high), strongly amyloid hymenium and subhymenium, richly branched anastomosing and coherent paraphyses, and thick walled larger spores (23–35×12–19 $\mu$m). Accordingly *Amygdalaria* may belong to Huiliaceae.

*Amygdalaria* can be distinguished from *Huilia* by having immersed apothecia with rudimentary excipulum. The Japanese species belonging to this genus will be reported in another paper.

Fig. 1 gives a comparative graphic representation of the substances in *Huilia* as revealed on plates run in the hexane-ether-formic acid solvent system. The major substances identified in *Huilia* are listed below.

Confluentic acid: *H. chungii* (trace), *H. elegantior, H. flavicunda, H. musiva.*

Gyrophoric acid: *H. elegantior, H. panaeola.*

Norstictic acid: *H. albocaerulescens* var. *albocaerulescens* (extremely small amount), *H. albocaerulescens* var. *polycarpiza, H. percontigua.*

Stictic acid: *H. albocaerulescens* var. *albocaerulescens, H. albocaerulescens* var. *polycarpiza* (extremely small amount), *H. crustulata, H. macrocarpa.*

Huilia-1: *H. chungii.*

Lecidea-2: *H. elegantior* (trace), *H. flavicunda* (trace).

*Huilia aeolotera* and *H. nigrocruenta* have no colorless substances. *H. crustulata* and *H. macrocarpa* usually contain stictic acid, while a few of them are free from it.

Huilia-1, which is detected as a deep yellow or orange spot on chromatograms when the plates are heated after having been sprayed with aqueous sulphuric acid, gives a negative color reaction with reagents such as P, K, KC, or C. The Rf-value of this substance is very near to that of glomelliferic acid which gives red color reaction with KC (J. Santesson 1974). In GE and GAW solutions colorless needle-like crystals are precipitated (Fig. 2 a, b). Lecidea-2 (Inoue 1982), another unidentified sub-

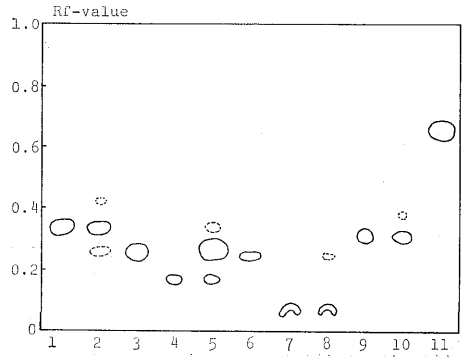


Fig. 1. Chromatograms of *Huilia* species in the hexane-ether-formic acid solvent system, compared with some chemically purified substances. 1. Glomelliferic acid. 2. *Huilia chungii*. 3. Confluentic acid. 4. Lecidea-2. 5. *H. flavicunda*. 6. Norstictic acid. 7. Stictic acid. 8. *H. albocaerulescens* var. *albocaerulescens*. 9. Gyrophoric acid. 10. *H. panaeola*. 11. Atranorin.

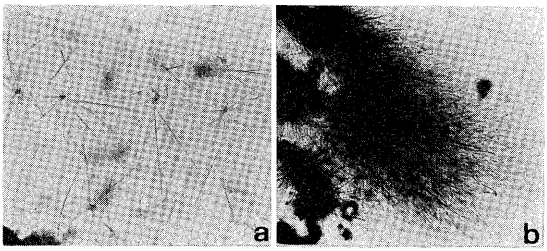


Fig. 2. An unknown substance, Huilia-1, obtained from *H. chungii*. a. Recrystalized in GAW. b. Recrystalized in GE. ×50.

stance, is detected as a pale brown spot on chromatograms when the plates are heated after having been sprayed with aqueous sulphuric acid. This substance usually occurs in trace amount in conjunction with confluentic acid except for the case of a chemical variant of *Lecidea athrocarpa* in which this substance is predominantly contained.

Key to the Japanese species of *Huilia*

1. Thallus cephalodiate ..... 2
1. Thallus not cephalodiate ..... 4
2. Thallus sorediate, mostly sterile ..... *H. panaeola*
2. Thallus esorediate, fertile ..... 3
3. Thallus rusty orange (=ochre-color), areolate; areolae plane .. *H. aeolotera*
3. Thallus whitish, bullate-areolate ..... *H. elegantior*
4. Thallus K+ yellow, then blood red, norstictic acid present ..... 5
4. Thallus K+ yellow or −, norstictic acid absent ..... 6
5. Excipulum dark brown to black from the beginning, hyphae of excipulum 5–6 μm thick ..... *H. percontigua*
5. Excipulum pale internally at the beginning, then becoming dark, hyphae of excipulum thinner, 2–4 μm thick ..... *H. albocaerulescens* var. *polycarpiza*
6. Thallus rusty orange ..... 7
6. Thallus not rusty orange ..... 8
7. Pruina of the disc whitish; spores small, 17–22×8–13 μm .... *H. flavicunda*
7. Pruina of the disc rusty orange; spores larger, 30–45×13–18 μm ..... ..... *H. aeolotera*
8. Thallus K+ yellow, stictic acid present ..... 9
8. Thallus K−, stictic acid absent ..... 11
9. Hyphae of excipulum firmly conglutinating, thinner, leptodermatous (Fig. 3 a) ..... *H. albocaerulescens* var. *albocaerulescens*
9. Hyphae of excipulum less conglutinating, more or less thick, rather pachy-

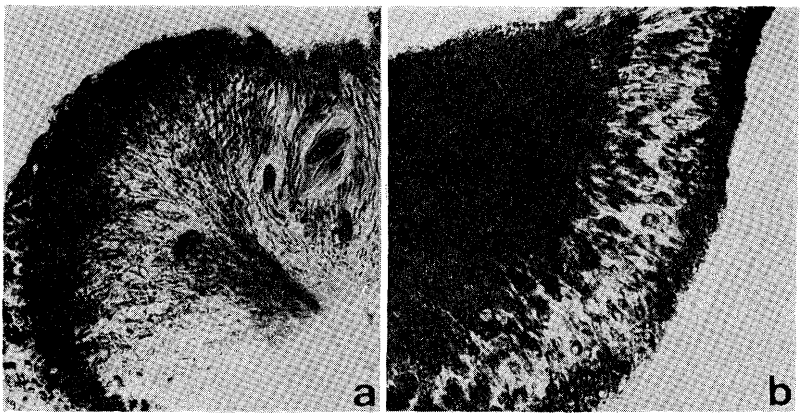


Fig. 3. Cross-section of an excipulum, stained by lactophenol cotton blue (×200). a. *Huilia albocaerulescens* var. *albocaerulescens* (mi 10069). b. *H. macrocarpa* (mi 10570).

dermatous (Fig. 3 b) ..... 10

10. Hymenium low, 50-80 μm; spores small, 11-17×5-9 μm ..... *H. crustulata*

10. Hymenium higher, 70-120 μm; spores larger, 14-26×6-11 μm ..... *H. macrocarpa*

11. Excipulum K+ violet ..... *H. nigrocruenta*

11. Excipulum K− or reddish ..... 12

12. Thallus verrucose-areolate; areolae bullate, dispersed; subhymenium low, 15-30 μm ..... *H. musiva*

12. Thallus verrucose-granulate; subhymenium higher, 50-80 μm .. *H. chungii*

1) **Huilia aeolotera** (Vain.) Hertel, Herzogia 3: 372 (1975)—*Lecidea aeolotera* Vain., Ann. Acad. Sci. Fenn., ser. A, 15: 137 (1921). Type: Philippine, "Luzon, subprov. Benguet, mons Pulog", leg. Merrill 6460—holotype in TUR (Herb. Vain. 25079). (Figs. 4 a-c, 8 a).

*Lecidea cephalophora* M. Lamb, Journ. Jap. Bot. 14: 555 (1938).

Thallus indeterminate, medium to thick, contiguous or rarely in part evanescent, irregularly cracked-areolate or areolate; areolae angular, flat or subconvex, smooth, more or less polished, rusty orange, rarely faded; medulla I−; hemispherical violet-brown cephalodia intermixed. Hypothallus ±indistinct.

Apothecia appressed-adnate, or adnate, on the thallus or among areolae, round, 0.5-1.5 mm in diameter (sometimes up to 2 mm), not constricted or

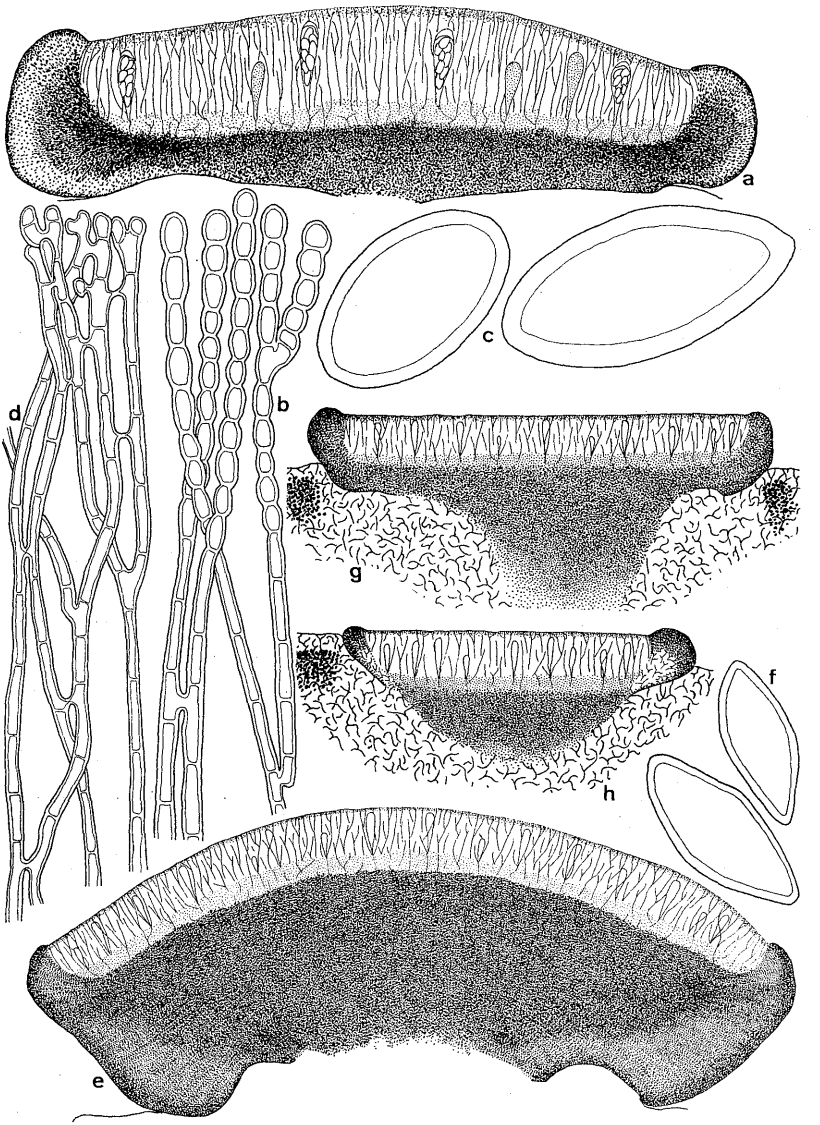


Fig. 4. *Huilia aeolotera* (Vain.) Hertel (a–c: drawn from HIRO-Inoue 6901), *H. albocaerulescens* (Wulf.) Hertel var. *albocaerulescens* (d–f: drawn from HIRO-Inoue 10069), *Lecidea caesiorida* Zahlbr. (g: drawn from KYO-Faurie 5878A, isotype), and *L. yezoensis* Zahlbr. (h: drawn from KYO-Faurie 1107, isotype). a, e, g, and h. Vertical section of apothecia, ×60. b and d. Upper part of paraphyses, ×1000. c and f. Spores, ×1000.

slightly constricted at the base; margin rather thick, prominent, blackish to dark brown; disc plane or subconcave, with intense rusty orange pruina, very rarely epruinose. Excipulum 100–150 μm thick, reddish-brown to brown in external part and becoming gradually pale internally, K+ reddish; hyphae intricate-radiating, 2–3 μm thick, with a rather thick wall. Epithecium brown to bright-brown, more or less thick. Hymenium (130) 150–200 (230) μm high. Subhymenium 30–60 μm high, colorless, with perpendicular hyphae. Hypothecium dark reddish-brown, with various heights, perhaps reaching to 300 μm high; hyphae irregularly arranged. Paraphyses coherent, anastomosed, branched, 1.5–2 μm thick, with a submoniliform apical cell; apices not or slightly thickened. Asci clavate, 120–150 × 30–35 μm. Spores ellipsoid, (25) 30–45 × (10) 13–18 (20) μm; with a thick wall, reaching 2 μm thick.

Reaction: thallus & medulla P−, K−, KC−, C−. Chemical substances: no lichen substances demonstrated on TLC.

Habitat. On non-calcareous rocks in alpine regions.

Range. Japan, China, Himalaya, and Philippines.

Diagnostic characteristics for this species are: irregularly cracked-areolate thallus which is rusty orange, thick marginate apothecia with rusty orange pruina on the disc, hemispherical violet-brownish cephalodia, higher hymenium (150–200 μm), paraphyses with submoniliform apical part, and larger spores (30–45 × 13–18 μm) with thick walls.

Among many collections from Mt. Ontake one collection (no. 11479) lacks cephalodia. I, however, could not detect any other characters for affirming it as a different species, notwithstanding Jahns (1973) stated that the cephalodia formation appeared to be genetically determined and was therefore of important taxonomic value.

Lamb (1938) gave a very detailed description of *Lecidea cephalophora* when he described it from Japan. Later Hertel (1977) reduced it as a synonym of *Huilia aeolotera*, however, I could not reexamine any type material.

Up to now *H. aeolotera* has been known only from higher mountains in eastern Asia, such as Philippines, China and Japan (Vainio 1921, Inoue 1976, Hertel 1977), namely it has disjunctive distribution in eastern Asia. Further occurrence of this species is highly expected on higher mountains in Taiwan (Formosa).

Specimens examined. Hokkaido. Prov. Soya. Mt. Rishiri, mi 8132. Prov.

Kamikawa. Mt. Tomuraushi, mi 8652. Honshu. Pref. Miyagi. Mt. Kurikoma, mi 10362 & 10363. Pref. Yamagata. Mt. Chokai, mi 15923; Mt. Gassan, mi 10793, 10803 & 10804; Mt. Asahi, mi 10539. Pref. Toyama. Mts. Tateyama, mi 12779; Mt. Tsurugi, mi 12887. Pref. Nagano. Mt. Hakuba, mi 14173; Mt. Norikura, mi 12921 & 12976; Mt. Takatsuma, mi 11313; Mt. Renge, mi 5074; Mt. Washiba, mi 5892 & 5976; Mt. Yari, mi 4929; Mt. Kagonoto, Mts. Asama, mi 630; Mt. Tateshina, mi 11582 & 11612; Mt. Ontake, mi 4591, 4654, 4671, 11445, 11467, 11469, 11476, 11479, 11495, 11504, 11512, 11516, 11526 & 11556; Mt. Anpeiji, mi 14641; Mt. Hoken, mi 6744, 6812 & 6901; Mt. Utsugi, mi 6751. Pref. Yamanashi. Sensui Pass, Mt. Kaikoma, mi 12337.

2) **Huilia albocaerulescens** (Wulf.) Hertel, Herzogia 3: 373 (1975)—*Lichen albo-caerulescens* Wulf. in Jacquin, Coll. Bot. 2: 184, tab. XV, fig. 1 (1788)—*Lecidea albo-caerulescens* (Wulf.) Ach., Meth. Lich. 52 (1803). Type: Austria, Kärnten, Kreuberg oberhalb Ziguln bei (heute innerhalb) Klagenfurt, auf chloritschieferfelsen im Walde, ca 500 m alt., leg. F. Arnold in 29. 7. 1881,—neotype in M (Arn. Lich. Exs. 894, selected by Hertel 1977).

*Lecidea yezoensis* Zahlbr., Ann. Mycol. 14: 51 (1916). Type: Japan, Hokkaido, near Hakodate, leg. U. Faurie 1107—holotype in W; isotype in KYO. —*Huilia yezoensis* (Zahlbr.) Hertel, Khumbu Himal 6: 224 (1977).

*Lecidea alboflavescens* Vain., Bot. Mag. Tokyo 32: 160 (1918). Type: Japan, Honshu, Pref. Tottori, Mt. Daisen, leg. A. Yasuda 54—holotype in TUR (Herb.

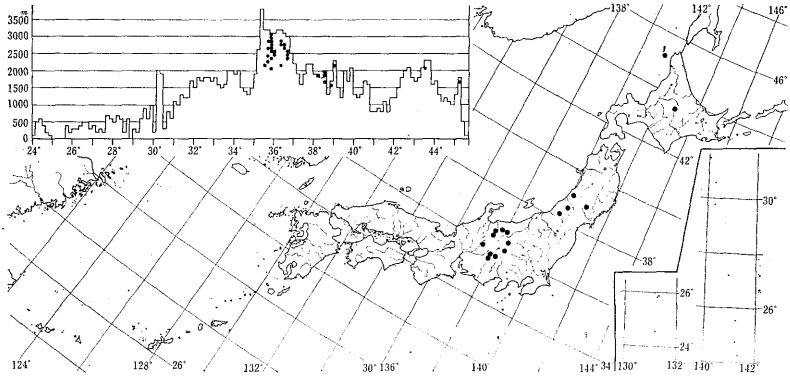


Fig. 5. Distribution of *Huilia aeolotera* in Japan.

Vain. 23930).

*Lecidea caesiororida* Zahlbr., Bot. Mag. Tokyo 41: 328 (1927). Type: Japan, Honshu, Pref. Yamagata, Takayu (Zao Hot Spring), leg. U. Faurie 5878, —holotype in W; isotype in KYO.

*Lecidea galactochrysea* Zahlbr. in Handel-Mazzetti, Symbol. Sinic. 3: 105 (1930). Type: China, NW-Yünnan, 2650 m alt., leg. Handel-Mazz. 9608—lectotype (Hertel, 1977) in W; isolectotype in WU.

*Lecidea ochropolia* Zahlbr. in Handel-Mazzetti, Symbol. Sinic. 3: 96 (1930). Type: China, Yünnan, 2100 m alt., leg. Handel-Mazz. 204—isotype in W.

var. **albocaerulescens** (Figs. 4 d-f, 8 b)

Thallus indeterminate to subdeterminate, medium to thick, more or less continuous, cracked with narrow fissures, or rarely cracked-areolate, smooth or subtartareous, or rarely tartareous, opaque, sordid-white or glaucous, at times mouse-gray or pale greenish-gray; medulla I− or weakly reacted. Hypothallus blackish, encircled.

Apothecia appressed-adnate, sometimes subimmersed, not constricted at the base, or rarely adnate on the thinner thallus with slightly constricted base, up to 2 mm in diameter; margin prominent, thin to medium, entire, sometimes flexuous, naked, blackish; disc flat at the beginning, then becoming slightly convex, pruinose; pruina ash-white or very rarely somewhat rusty orange. Excipulum 100–150 μm thick, reddish-brown to dark brown in external part and becoming gradually paler internally, but not colorless, K+ yellow, hyphae subradiating, irregularly entangled, 2–4 μm thick, with a thin wall. Epithecium greenish-brown to brown. Hymenium (60)70–120(140) μm high. Subhymenium (15)20–50(60) μm high, colorless, with perpendicular hyphae. Hypothecium dark reddish-brown to dark brown, with various heights, perhaps reaching 250 μm high, K+ reddish; hyphae irregularly arranged. Paraphyses coherent, anastomosed, 1.5–2.5 μm thick, not swollen at apices. Asci clavate, 60–100×15–20 μm. Spores ellipsoid with subacute ends, (15)20–26(29) × (6)8–11(13) μm.

Reaction: thallus & medulla P+ brick red, K+ yellow, KC−, C−. Chemical substances: stictic acid and norstictic acid (extremely small amount or −).

Habitat. On non-calcareous rocks, rarely on serpentines in the lowlands and subalpine coniferous forests.

Range. Japan and temperate regions.

Hertel (1977) maintained *H. yezoensis* as an autonomous species with the following statement, "*Huilia yezoensis* weicht jedoch habituell vom Normaltyp der *Huilia albocaerulescens*, von der wir sehr viel Material (auch ausserhalb Asiens) sahen, so stark ab, dass wir es für nötig erachten, durch Aufrechterhalten diese Zahlbrucknerschen Namens, zur weiteren Diskussion dieses Taxons zuzuregen". According to Hertel (1977), *Huilia yezoensis* (including *Lecidea caesiororida* Zahlbr.) has the "bleigrau" thallus, the smaller apothecia (up to 1.3 mm in diameter), the lower hymenium (70–85 $\mu$m), and the higher subhymenium (40–90 $\mu$m), while *H. albocaerulescens* has the "bläunlich weiss, schmutzig hell braun" thallus, the larger apothecia (up to 2.6 mm), the higher hymenium (80–120 $\mu$m), and the lower subhymenium (15–35 $\mu$m). Of the Japanese representatives studied (about 300 specimens), most specimens are easily identified with *H. albocaerulescens* in the sense of Hertel. However, about 20 specimens are similar to *H. yezoensis* externally, and about 40 specimens are of intermediate features. The height of hymenium and subhymenium of the "*yezoensis*-like" specimens also fits well into the variation amplitude of *H. albocaerulescens*. External appearance of the type specimens of *H. yezoensis* is evidently different from that of *H. albocaerulescens*. *H. albocaerulescens*, however, seems to have the widest distribution and its ecological amplitude may be very wide; some occur in dark forests, some in humid valley, and the others in open dry grassland. *Huilia yezoensis* is thus considered to be only a habitat modification (perhaps in shady and humid conditions). Therefore, it can be reduced as a synonym of *H. albocaerulescens* as compared in Tab. 1.

The var. *albocaerulescens* is one of the commonest lichens in Japan, but the occurrence in the alpine regions is rather rare as is shown in the distribution map (Fig. 6).

Representative specimens examined. Hokkaido. Prov. Soya. Mt. Rishiri, mi 8121, 8138 & 8176. Prov. Rumoi. Mt. Syokanbetsu, mi 8280 & 8310. Prov. Tokachi. Mt. Enbo, mi 6265; Futamata, near Tomuraushi Hot Spring, mi 4426–28. Prov. Kamikawa. Mt. Midori, Mts. Daisetsu, mi 8552; Numanohara, Mts. Daisetsu, mi 6457; Mt. Tsurugi, near Obihiro, mi 8210. Prov. Abashiri. Mt. Rausu, mi 7744; Mt. Syari, mi 8361. Prov. Nemuro. Aidomari, Shiretoko Peninsula, mi 9165. Prov. Kushiro. Akkeshi, mi 9038; Mt. Oakan, mi 8778. Prov. Hidaka. Mt. Poroshiri, mi 7822. Prov. Shiribeshi. Kamoenai, mi 9124; Mt. Mekunnai, mi 8874 & 8897. Prov. Ishikari. Mt. Tengu, mi 8037 & 8084. Prov.

Tab. 1. A comparison of the major traits in *Huilia albocaerulescens*, *Lecidea caesiororida*, and *L. yezoensis*.

| | *H. albocaerulescens* (neotype) | *L. caesiororida* (holo- and isotype) | *L. yezoensis* (holo- and isotype) |
|---|---|---|---|
| Thallus | sordid-white or glaucous, smooth or subtartareous | mouse-gray or pale greenish gray, subtartareous or tartareous | mouse-gray or pale greenish gray, tartareous |
| Apothecia | appressed-adnate, slightly constricted basally, reaching 1.2 mm wide | appressed-adnate, slightly constricted basally or not, reaching 1 mm wide | appressed-adnate or subimmersed, not constricted basally, reaching 1.3 mm wide |
| Hymenium | 70–100 μm high | 90–100 μm high | 70–90 μm high |
| Subhymenium | 20–30 μm high | 30–40 μm high | 20–35 μm high (40–90 μm high by Hertel,1977) |
| Spores | 22×11 μm | 18–22×8–11 μm | 17–24×8–12 μm |

Oshima. Oonuma, mi 14851; Hakodate, Faurie 1107 (as *Lecidea yezoensis*) (KYO & W). Honshu. Pref. Akita. Mt. Moriyoshi, mi 15927, 15933-34; Komata Gorge, mi 15935; by the Lake Towada, mi 15923; Mt. Iwaya, mi 15920; Oga Peninsula, mi 15925; Dakigaeri Gorge, mi 14832 & 15924; Mt. Nyuto, mi 15870; Mt. Koma, mi 14836 & 15928. Pref. Miyagi. Mt. Kurikoma, mi 10402; Mt. Zao, mi 10714. Pref. Yamagata. Mt. Chokai, mi 15915; Zao Hot Spring (Takayu), Faurie 5878 (as *Lecidea caesiororida*) (KYO & W); Mts. Asahi, mi 10517; Mt. Itou, mi 10499; Mt. Iide, mi 10855. Pref. Niigata, Mt. Kinpoku, Sado isl., mo 9063. Pref. Toyama. Ooiwa, Kamiichi, mi 12016. Pref. Nagano. Mt. Naeba, mi 360; Mt. Asahi, near Nagano, mi 9191; Mt. Norikura, mi 5766; Mt. Hakuba, mi 14067; Mt. Goryu, k 51500 (TNS); Mt. Harinoki mi 6075; Mt. Kitakazura, mi 5056; Mt. Chausu, Utsukushi, mi 15926; Mt. Asama, mi 1368; Mt. Hirao, mi 1722; Uchiyama Gorge, mi 506; Mt. Arafune, mi 5221; Iida, mi 14497; Mt. Fuetsu, mi 13745; Mt. Anpeiji, mi 13975; Mt. Kisokoma, mi 10994; Nagiso-machi, mi 449; Mt. Surikogi, mi 14551. Pref. Saitama. Mt. Mikuni, mi 1515; Mt. Mitsumine, T. Komiya s. n. (TNS); east valley of Ohchigawa River, k 50434 (TNS); Kawamoto, hm 2771; Nagatoro, k 50308 (TNS); Mt. Hodosan, Chichibu, k 50337 (TNS); Urayama-guchi, Chichibu, k 70931 (TNS). Pref. Kanagawa. Mt. Kamiyama, Hakone, k 70165 (TNS). Pref. Shizuoka. Mt. Kinkan, Idzu, mi 11433; Uriki Cape,

T. Komiya s. n. (TNS) ; north of Yahatano, k 70977. Metro. Tokyo. Tama-reien, Fuchu, Sugiyama & Ura 359 (TNS) ; Hachijo isl., mo 10892 & 10912, mi 15929 (coll. M. Higuchi). Pref. Ibaraki, Mt. Yamizo, mo 2414. Pref. Gunma. Mt Miyogi, mi 11256. Pref. Yamanashi. Kiyosato, mi 413; Mt. Fuji, mi 10771; Lake side of Motosu, k s. n. (TNS) ; Mt. Kitadake, mi 964; Sensui Pass, mi 12308; Mt. Notori, mi 1171. Pref. Aichi. Mt. Horaiji, mo 6648. Pref. Shiga. Hikone, mi 9215. Pref. Mie. Mt. Yunoyama, A. Yasuda s. n. (TNS). Pref. Kyoto. Kiyotaki-Takao, mi 2877. Pref. Nara. Shinoha-Kitamatagawa, T. Seki 27496. Pref. Tottori. Mt. Hyonosen, mi 7635; Tottori, mi 8003; Misasa, mi 12093 (coll. Y. Hada) ; Mt. Daisen, A. Yasuda 54 (as *Lecidea alboflavescens*) (TUR Herb. Vain. 23930). Pref. Shimane. Irima, mi 12090 (coll. N. Nishimura) ; near Dangyo Gorge, mi 11795. Pref. Okayama. Kakui isl., mi 12097 (coll. Y. Hada) ; Nishigochi, mi 12092 (coll. Y. Hada) ; Kamisaibara, mi 12095 (coll. Y. Hada) ; Nagaya, mo 9106. Pref. Yamaguchi. Hirahara, mi 12622; Itane, mi 12621; Nagato, mi 12620; Iwakuni, mi 10936; Iwayakannonkutsu, mi 12063; Datoko, mi 12066; Miwa, mi 12023. Pref. Hiroshima. Miyajima isl., mi 188; Ninoshima isl., mi 225; Taisyaku Gorge, mi 11668; Mt. Hiba, mi 7517; Mt. Oozuchi, mi 7214; Mt. Une, mi 1903; Buttuji, mi 128; Iguchi isl., mi 7185; Sandankyo Gorge, mi 12027; Mt. Osorakan, mi 11113; Yuki Hot Spring, mi 11657; Mt. Noro, mi 1990; Mt. Tenjo, mi 7266; Mt. Mikura, mi 11154; Kake, mi 11995. Shikoku. Pref. Tokushima. Zasu, near Kawashima, mi 12415 (coll. T. Bando), Takegashima isl., mi 11240; Kotohira, mo 7387; Mt. Dairyuji, mi 12643. Pref. Ehime. Hakata isl., mi 11885; Matsuyama, mi 6995; Mt. Onigajo, mi 2315; Mt. Ishizuchi, mi 2123. Pref. Kochi. Mt. Ishidate, mi 12417; Mt. Shiraga, mi 11190; Nangoku, mo 7489; Tosa, mi 11754. Kyushu. Pref. Ooita. Mt. Tsurumi, hm 33; Mt. Sobo, T. Seki 3895. Pref. Nagasaki. Tsushima isls., mi 10966-67 (coll. K. Terada) ; Ooseto, mi 9297; Mt. Unzen, mi 9820. Pref. Miyazaki. Murasyo, mi 10337; Mt. Ishido, mi 10156; Mt. Ichifusa, mi 10310. Pref. Kagoshima. Uchinoura, mo 1109; Mt. Takakuma, mn 675; Yakushima isl. (Isso, mi 10069; Mt. Miyanoura, mi 10024; Mt. Nagata, mi 9989; Anbo, mi 10131; Ookawa Fall, mi 10037). Pref. Okinawa. Kanpira Fall, Iriomote isl., mi 15931 (coll. H. Miyawaki).

var. **polycarpiza** (Vain.) Hertel, Herzogia **3** : 373 (1975).—*Lecidea polycarpiza* Vain., Ann. Acad. Sci. Fenn., ser. A. **15** : 136 (1921). Type: Philippine, "Luzon, Subprov. Benguet, Kabayan", leg. E. Merrill 4928,—holotype in TUR (Herb. Vain. 25027).

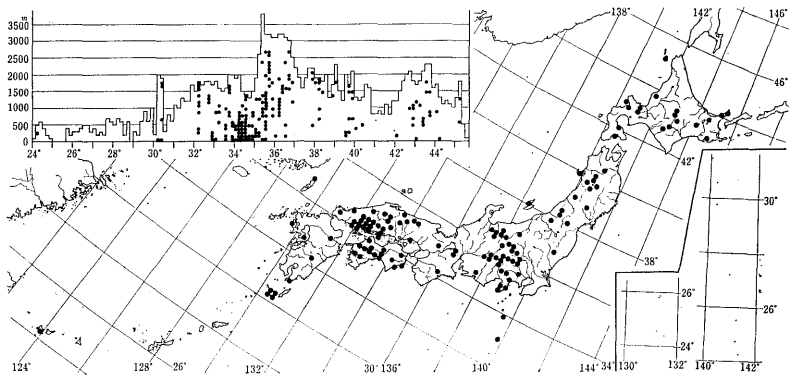

Fig. 6. Distribution of *Huilia albocaerulescens* var. *albocaerulescens* in Japan.

*Lecidea daliangensis* Zahlbr. in Handel-Mazzetti, Symbol. Sinic. 3 : 93 (1930). Type : China, SW-Sichuan, 3000 m alt., leg. Handel-Mazz. 1770—isotype in W.

*Lecidea rosaceocinerea* Zahlbr. in Handel-Mazzetti, Symbol. Sinic. 3 : 94 (1930). Type : China, SW-Sichuan, 2250 m alt., leg. Handel-Mazzetti 1585—isotype in W.

Except for the existence of norstictic acid (K+ yellow, then blood red), var. *polycarpiza* is identical with var. *albocaerulescens* morphologically and anatomically.

Reaction : thallus & medulla P+ deep yellow, K+ yellow, then blood red, KC−, C−. Chemical substances : norstictic acid and stictic acid (extremely small amount or −).

Habitat. On non-calcareous rocks in mountain regions in southwestern Japan.

Range. Japan, America, Asia, and seuthern Europe.

*Lecidea polycarpiza* Vainio was considered by Hertel (1975) as a variety of *Huilia albocaerulescens*, and later he (1977) precisely discussed about the relationship between the var. *albocaerulescens* and the present variety by using rich materials. There is another opinion that the present variety should be a distinct species which is very closely related to *H. albocaerulescens*. A similar case of chemical difference in two taxa can be seen between *Lecidea lapicida* and *L. lactea*, the former containing stictic acid and the latter containing norstictic acid. However, I have here followed Hertel and maintained his treatment as a variety, because the Japanese materials available at present are too sparse to make a

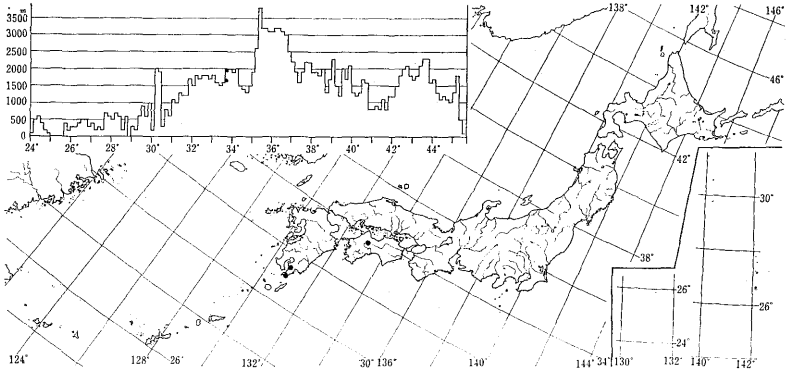


Fig. 7. Distribution of *Huilia albocaerulescens* var. *polycarpiza* in Japan.

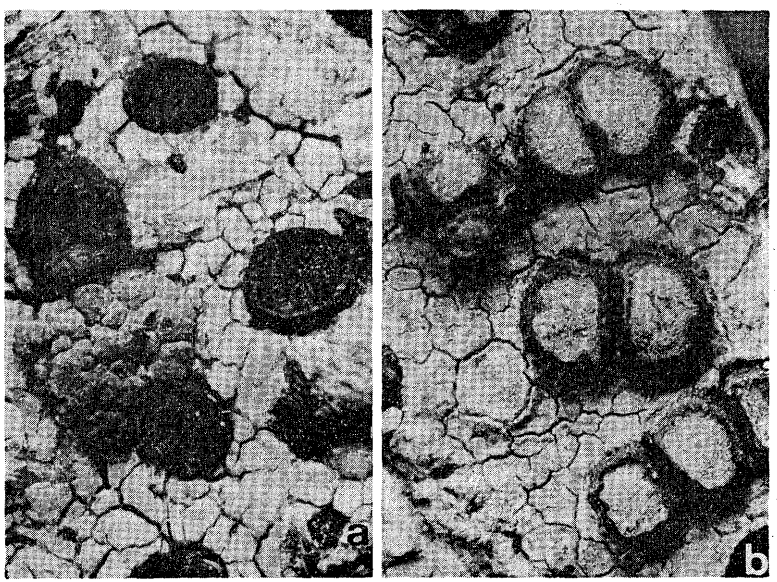


Fig. 8. a. *Huilia aeolotera* (Vain.) Hertel (mi 6901), ×15. b. *Huilia albocaerulescens* (Wulf.) Hertel var. *albocaerulescens* (mi 10069), ×15.

definite decision.

Specimens examined. Shikoku. Pref. Ehime. Mt. Ishizuchi, mi 11014; Mt. Kamegamori, mi 11076. Kyushu. Pref. Kagoshima. Mt. Takakuma, mn 676; Mt.

Rokuroukan, mo 1048.

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## References

Choisy, M. (1953) Catalogue des Lichens de la region Lyonnaise. Bull. Mens. Soc. Linn. Lyon. **22**: 177. Hawksworth, D.L., James, P.W. & Coppins, B.J. (1980) Checklist of British lichen-forming, lichenicolous and allied fungi. Lichenologist **12**: 1-115. Hertel, H. (1975) Beiträge zur Kenntnis der Flechtenfamilie Lecideaceae VI. Herzogia **3**: 365-406. —— (1977) Gesteinsbewohnende Arten der Sammelgattung *Lecidea* (Lichenes) aus Zentral-, Ost-, und Südasien. Khumbu Himal **6**: 145-378. Inoue, M. (1976) On Japanese *Lecidea flavocaerulescens* Hornem. and some allied species. Misc. Bryol. Lichenol. **7**: 112-113. (in Japanese). —— (1982) The Genera *Lecidea*, *Lecidella* and *Huilia* (Lichens) in Japan I. *Lecidea*. Journ. Sci. Hiroshima Univ., ser. B, div. 2 (Botany) **18**: 1-55. Jahns, H.M. (1973) Anatomy, Morphology, and Development. In Ahmadjian & Hale (eds.): The Lichens. Academic Press, New York. Lamb, M. (1938) A new cephalodiate *Lecidea* from Japan. J. Jap. Bot. **14**: 555-558. Letrouit-Galinou, M.-A. (1968) The apothecia of the discolichens. Bryologist **71**: 297-327. Poelt, J. & Vězda, A. (1981) Bestimmungsschlüssel europäischer Flechten, Ergänzungsheft II. J. Cramer, Vaduz. Vainio, E.A. (1921) Lichens insularum Philippinarum III. Ann. Acad. Sci. Fenn., Ser. A **15**: 1-368. Zahlbruckner, A. (1930) Lichenes. In H. Handel-

Mazzetti, Symbolae Sinicae. Botanische Ergebnisse der Expedition der Akademie Wissenschaften in Wien nach Südwest-China 1914/1918 3: 1-254.

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フイリア属は Zahlbruckner (1930) によってハナビラゴケ科に設定された属である。しかしその基準種はヘリトリゴケ属（広義）の *Lecidea aeolotera* Vain. と同一である事が明らかになり，ヘリトリゴケ属（広義）のもとに置かれていた多くの種がフイリア属に移されている (Hertel 1975, 1977; Hawksworth et al. 1981)。本属の分類学的位置に関しては最近，チズゴケ属などとともに Huiliaceae を新設する意見が Poelt & Vězda (1981) によって出されている。

筆者は Huiliaceae, フイリア属に同意し，属の特徴・類縁関係を述べた。そしてフイリア属に類似するいくつかの形態的特徴をもつ *Amygdalaria* (Poelt & Vězda はこれをヘリトリゴケ科に所属させている) も Huiliaceae に入れるべきである旨を述べた。また日本産の2種について形態・地衣成分・地理分布を記載し，近縁種との関係を論じた。その際，Hertel (1977) によって認められた *H. yezoensis* (=*Lecidea caesiororida* Zahlbr.) は *H. albocaerulescens* の変異型の一にすぎないとして，これの異名とした。なお，現時点で明らかになっている日本産フイリア属11種1変種の検索表を作成した。

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□Ono, Mikio (ed.): **A preliminary report of taxomomic and ecological studies on the Lomas vegetation in the Pacific coast of Peru**（小野幹雄：南米太平洋岸砂漠に成立する季節草原ロマスの生態と種分化に関する研究．予報）. 40 pp. 1982. 私費出版，非売品．Lomas というのは主としてペルーの太平洋岸で，アンデス山脈の500 m 以下の砂漠であるが，春先の8月終りから11月中頃まで海霧がかかり，急に花が咲き急いで結実するという地帯である。それを7人の論文で纏めているが，組織，類型，植生，核型，植物現存量，種子集団等と中々多方面である。生育種数は余り多くはないが，ペルーに特殊なフロラとして注目に値するところである。ことに核型でアオイ科の *Palava malvifolia* が 2n=10 であることを確めたのは，或はロマスも亦顕花植物の発生地の一つであることを推理させるかも知れない点で甚だ興味のあることであった。

（前川文夫）