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A Revision of Japanese Species of the Genus *Melanelia* (Parmeliaceae)

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Abstract Japanese species of *Melanelia* are revised and nine species are recognized. They are *Melanelia disjuncta* (Erichsen) Essl., *M. fuliginosa* (Fr. ex Duby) Essl., *M. hepatizon* (Ach.) Thell, *M. huei* (Asahina) Essl., *M. olivacea* (L.) Essl., *M. panniformis* (Nyl.) Essl., *M. predisjuncta* (Essl.) Essl., *M. sorediata* (Ach.) Goward & Ahti, and *M. stygia* (L.) Essl. Of these species *M. fuliginosa*, *M. panniformis* and *M. sorediata* are new to Japan. *M. disjuncta* is reported as a second record for the species in Japan.

Key words: *Melanelia disjuncta*, *M. fuliginosa*, *M. hepatizon*, *M. huei*, *M. olivacea*, *M. panniformis*, *M. predisjuncta*, *M. sorediata*, *M. stygia*, Japan.

The genus *Melanelia* belongs to the family Parmeliaceae. Although it had long been treated under the genus *Parmelia*, Esslinger (1978) treated it under as a distinct genus, *Melanelia*, which is one of the commonest lichen genus in Japan.

As the Japanese species of *Melanelia*, Nylander (1890) first reported *M. olivacea* based on a collection made by Almquist on Mt. Fuji under the name *Parmelia olivacea* (L.) Nyl. Asahina (1952) revised Japanese member of the genus and reported three species, *M. huei*, *M. olivacea* f. *albopunctata* Asahina, and *M. stygia* also under the genus *Parmelia*. Esslinger (1977) made a chemostystematic revision of the brown *Parmelia* and described *M. predisjuncta* from Japan. Kashiwadani & Sasaki (1987) added *M. disjuncta* in the Japanese lichen flora. In 1995 Thell transferred *Cetraria hepatizon* (Ach.) Vain. to *Melanelia*.

In the course of our study of the genus mainly based on recent collections by the authors, we found three more species, i.e. *M. fuliginosa*, *M. panniformis* and *M. sorediata* in Japan. At present, therefore, nine species of *Melanelia*, *M. disjuncta*, *M. fuliginosa*, *M. hepatizon*, *M. huei*, *M. olivacea*, *M. panniformis*, *M. predisjuncta*, *M. sorediata*, and *M. stygia* are known in Japan. Among them, *M. predisjuncta* is endemic to Japan, *M. panniformis* shows circumpolar distribution in the Northern Hemisphere, and the other 6 species is widely distributed in the Northern Hemisphere. In the present paper, taxonomic revision and known localities for the Japanese species of the genus are presented.

Material and Method

The present study is based on ca 300 specimens of the genus *Melanelia*. Most of the specimens for the present study, unless otherwise expressed, are kept in the National Science Museum, Tokyo (TNS). Specimens collected by K. Yoshida are located in the herbarium of Saitama Museum of Natural History (abbreviated as SAITM in the present paper). In addition, three specimens of *M. disjuncta* from private herbarium of K. Sasaki in Akita (abbreviated as SASK in this paper) were also studied. Chemical substance were studied by means of thin-layer chromatography (Culberson & Johnson, 1982), but using only B system. Sections of apothecia and thalli were cut by hand-razor and mounted in GAW or lactophenol cotton-blue solutions.

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Key to the Japanese Species of the Genus *Melanelia*

1. Thallus saxicolous; lobes narrower, less than 2 mm broad; upper surface brownish black to black....2.
   Thallus corticolous; lobes broader, more than 2.5 mm wide; upper surface olive-brown to reddish brown....7.
2(1) Pseudocyphellae numerous and distinct, laminal; perlatoric acid absent....3.
   Pseudocyphellae sparse or absent, submarginal (if present); perlatoric acid present....4.
3(2) Lobes concave; stictic acid present....3. *M. hepatizone* (Ach.) Thell
   Lobes convex; stictic acid absent....9. *M. stygia* (L.) Essl.
4(2) Soralia absent....5.
   Soralia present....6.
5(4) Pseudocyphellae sparse, submarginal....7. *M. predisjuncta* (Essl.) Essl.
   Pseudocyphellae absent....6. *M. panniformis* (Nyl.) Essl.
6(4) Soralia laminal to submarginal; pseudocyphellae sparse and submarginal....
   .... 1. *M. disjuncta* (Erichsen) Essl
   Soralia terminal; pseudocyphellae absent ....
   ....8. *M. sorediata* (Ach.) Goward & Ahti
7(1) Thallus without isidia....8.
   Thallus with isidia....2. *M. fuliginosa* (Fr. ex Duby) Essl.
8(7) Medulla C−, P+ orange red; fumarprotocetraric acid present....
   .... 5. *M. olivacea* (L.) Essl.
   Medulla C+ red, P−; lecanoric acid present ....4. *M. huei* (Asahina) Essl.

1. *Melanelia disjuncta* (Erichsen) Essl.

The characteristic features for this species are, 1) the saxicolous habit, 2) the sparse and submarginal pseudocyphellae, 3) the laminal to submarginal soralia, and 4) the presence of perlatoric and stenosporic acids.

This species is widely distributed in the Northern Hemisphere, having been reported from central Europe, Siberia, Canada, and North America (Esslinger, 1977). In Japan, however, it has been reported only from Mt. Hakkoda, northern Honshu (Kashiwadani & Sasaki, 1987). It was also collected at Sogoya-dani gorge in Chichibu, central Honshu.

Specimens examined. Honshu. Prov. Mutsu: Hakkoda Mts., K. Sasaki 7382, 8965 (SASK). Prov. Musashi: Sogoya-dani valley, K. Yoshida 9413.

2. *Melanelia fuliginosa* (Fr. ex Duby) Essl.

The name of the present species is proposed by Egan as a new combination, and *Melaneria glabratula* (Lamb) Essl. known to since Esslinger (1978) is synonymed. (Egan, 1987, Esslinger 1990).

The present species is characterized by 1) the corticolous habit, 2) the sparse submarginal pseudocyphellae, 3) the broader lobes with dense cylindrical isidia, and 4) the presence of lecanoric acid.

According to Esslinger (1977), this species is widely distributed in the Northern Hemisphere including North America, Europe and Russia. However, it has not been reported for Japan. Recently, however, Yoshida collected this species at Azusayama, central Honshu in Japan. The specimen is quite identical both in morphology and chemistry with those from Europe except for the absence of rhodophyscin which is often reported in specimens collected in Europe. The concentration of this pigment in *Melanelia* seems to be very variable as discussed by Esslinger (1977).

Specimens examined. Honshu. Prov. Shinano: Azusayama, K. Yoshida 7707.2 (SAITM).

3. *Melanelia hepatizon* (Ach.) Thell

This species is well known to Japanese lichenologists as *Cetraria hepatizon* (Ach.) Vain. Recently, Thell (1995) treated it under the genus *Melanelia* stressing characters found in the species, namely one-layered paraplectenchymatous upper cortex, broadly clavate asci and dumbbell shaped pycnoconidia.

The present species is characterized by (1) the saxicolous habit, (2) the concave lobes with marginal and laminal pycnidia, (3) the marginal pseudocyphellae, (4) the absence of soredia, and (5) the presense of sticitic and norstictic acids.

Melanelia hepatizon is widely distributed in arctic and alpine areas in the Northern Hemispher. In Japan, it is known from Hokkaido to Shikoku.

Specimens examined. Hokkaido. Prov. Ishikari: Mt. Ashibetsu-dake, Y. Asahina n.s., H. Shibuichi 6194, K. Yoshida 4469.; Daisetsu Mts., S. Kurokawa 71127, H.

Kashiwadani 16497, 16505. Honshu. Prov. Mutsu: Mt. Nuidoiwa, S. Kurokawa 56363. Prov. Uzen: Mt. Nishi-Azuma, C. Konno 251, H. Kashiwadani 15424, K. Yoshida 7547. Prov. Iwashiro: Iide Mts., H. Shibuichi 5151. Prov. Shimotsuke: Mt. Shirane, K. Yoshida 5092; Mt. Ohmanako, F. Fujikawa n.s. Prov. Musashi: Jumonji Pass, K. Yoshida 3486, 10849; Mt. Ohyama, K. Yoshida 3833; Mt. Sanpo, H. Shibuichi 9175, K. Yoshida 10816; Mt. Kobushi-dake, K. Yoshida 10729; Mt. Kumotori K. Yoshida 1345. Prov. Echigo: Iide Mts., H. Kashiwadani 9192, 9230. Prov. Etchu: Shirouma-dake Mts., H. Shibuichi 7094, K. Yoshida 5635, 5636, 5637. Mt. Yakushi, H. Kashiwadani 996, 13459; Tateyama Mts., S. Kurokawa 82064, K. Yoshida 2020, 2021. Prov. Shinano: Kitazawa Pass, K. Yoshida 3957; Mt. Senjyo-dake, H. Shibuichi 9777, 9778, 9793; Mt. Tsubakuro-dake, H. Shibuichi 4897, K. Yoshida 1193; Mt.Higashizawa-dake K. Yoshida 1194; Yatsugatake Mts., Y. Okada n.s., H. Shibuichi 8733, K. Yoshida 8683, 8684, 9065, 10136.; Mt. Jonen-dake, H. Shibuichi 5818.; Mt. Kinpu, H. Shibuichi 4274, K. Yoshida 3016.; Azusayama, K. Yoshida 3229; Kawahake, K. Yoshida 11227; Kiso-Komagatake Mts., S. kurokawa 69074, H. Shibuichi 3897. Prov. Kai: Kaikoma-dake Mts., K. Yoshida 3958; Mt. Asayo-mine, K. Yoshida 1463; Mt. Kokushi-dake, H. Shibuichi 4689. Prov. Suruga: Mt. Fuji, H. Kashiwadani 16553, H. Shibuichi, 4614. Shikoku. Prov. Iyo: Mt. Kamegamori, S. Kurokawa 72235.

4. *Melanelia huei* (Asahina) Essl.

This species was originally described by Asahina as *Parmelia huei* Asahina (1951) based on a collection from central Japan (Prov. Kai: Lakeside of Yamanaka-ko, Y. Asahina 1017, lectotype in TNS). It is characterized by 1) the corticolous habit, 2) the absence of soredia and isidia, 3) the absence of pseudocyphellae, and 4) the presence of lecanoric acid.

Esslinger (1977) reported common occurrence of rhodophyscin in this species. Rhodophyscin was demonstrated in 22 of 54 specimens examined through the present study.

Melanelia huei is endemic to Japan and Saghalien. In Japan, it is widely distributed from Hokkaido to western Honshu. The distribution is quite similar to that of *M. olivacea* which is found at a little higher elevations at least in central Honshu (Fig. 1).

Specimens examined. Hokkaido. Prov. Kitami: Vicinity of Kabuka, Rebun Isl., S. Kurokawa 70757; Oshidomari, Rishiri Isl., H. Shibuichi 7245, 7246, K. Yoshida 5947, 5979 & 5980.; Otoineppu Cape, S. Kurokawa 70864; Hamatonbetsu, H. Shibuichi 7482, K. Yoshida 6092, S. Kurokawa 70853; Sarufutsu, H. Kashiwadani 8112. Prov. Teshio: Wakasakanai, S. Kurokawa 70656, H. Kashiwadani 7955 & 16182. Prov. Kushiro: Chinbe, H. Kashiwadani 7567. Prov. Tokachi: Mt. Rakko, S. Kurokawa 70579. Prov. Ishikari: Minamifurno-cho, K. Yoshida 4681. Prov. Hidaka: Mt. Apoi, S. Kurokawa 70492, 70493; Mt. Petegari S. Kurokawa 70261.; Mitsuishi, S. Takahashi 7,8. Prov. Shiribeshi: Okushiri Isl., H. Kashiwadani 14737. Prov. O-

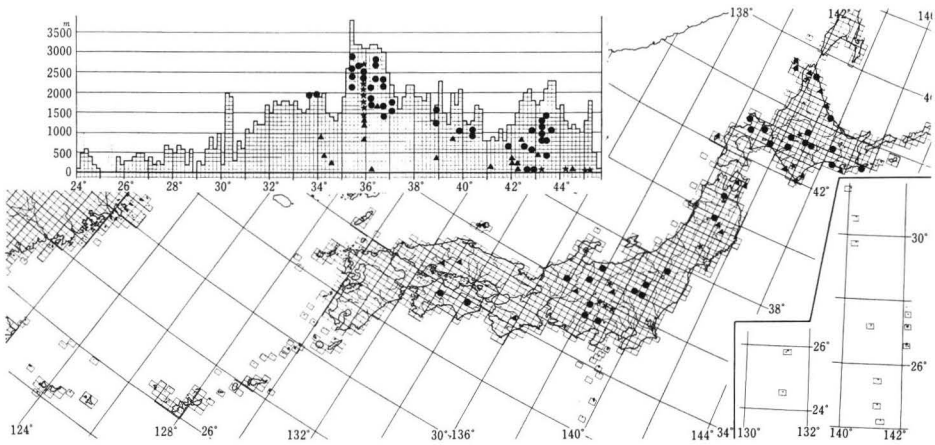

Fig. 1. Distribution of *Melanelia huei* (▲) and *M. olivacea* (●) in Japan (★; both species occurred)

shima: Hakodate, U. Faurie 14. Honshu. Prov. Mutsu: Dake Hot Spring, H. Kashiwadani 34383; Tanabu, S. Kurokawa 550301.; Ohminato, Y. Asahina 20; Mena, Y. Kuwano *et al.* (S. Kurokawa 550352 & 55353). Prov. Rikuchu: Mt. Hayachine, S. Kurokawa 67117; Morioka city, G. Toba 48. Prov. Ugo: Akinomiya, K. Yoshida 3354. Prov. Musashi: Mt. Hakutai, K. Yoshida 1803.; Karisaka Pass, H. Shibuichi 4105; Mt. Mitsumine, H. Shibuichi 634; Mikuni Pass, K. Yoshida 11086. Jumonji Pass, K. Yoshida 1804. Prov. Shinano: Sugadaira, S. Kurokawa 50272; Mt. Azumaya, S. Kurokawa 50238; Mt. Asama, H. Kashiwadani 9643. Yatusuga-take Mts., Y. Asahina 5496, S. Kurokawa 51250. K. Yoshida 8913 & 10137; Azusayama, K. Yoshida 7707.1 ; Kawahake, H. Shibuichi 4624, K. Yoshida 11201. Prov. Hida: Mt. Ontake, Yatabe 271. Prov. Yamato: Mt. Ohmine, H. Kashiwadani 6095. Prov. Oki: Kaminishi, H. Kashiwadani 20997. Prov. Bingo: Kamiyama-mura, T. Sato 88.; Taishaku-kyo Gorge, H. Kashiwadani 6730. Prov. Aki: Haji, H. Kashiwadani 8663, 8713, 8715 & 8720.

5. *Melanelia olivacea* (L.) Essl.

This species is well known to Japanese lichenologists as *Parmelia olivacea* var. *albopunctata* (Asahina) Ahti. In 1977, Esslinger reduced it to a synonym of *M. olivacea*. It resembles *M. huei*, from which it is easily distinguished by C−, P+reaction in the medulla caused by the presence of fumarprotocetraric acid.

This species is widely distributed in the Northern Hemisphere, having been reported from Alaska, central and eastern Canada, northeastern United State, northern Europe, Siberia, and Japan (Ahti, 1966). In Japan, it is common on high mountains to subalpine regions from Hokkaido to Shikoku.

Exsiccata examined. S. Kurokawa & H. Kashiwadani, Lich. Rar. et Crit. Exs. 31

(TNS) as *Parmelia olivacea*; the same 279, 427 & 481 (TNS) as *Parmelia olivacea* var. *albopunctata*.

Specimens examined. Russia. Saghalien: No detail locality, Y. Asahina 5742, 5743, 5744 & 5745. Etorofu Island: Y. Asahina 5749, 5750 & 5751.

Specimens examined. Hokkaido. Prov. Kitami: Numanoue, H. Kashiwadani 8062.; Saruhutsu, H. Kashiwadani 8102. Prov. Teshio: Wakasakanai, H. Kashiwadani 16189. Prov. Nemuro: Ochiishi, H. Kashiwadani 8020. Prov. Tokachi: Mt. Higashi-Nupukaushi, H. Kashiwadani 15361, 15501 & 15528; Lakeside of Shinonome-ko, H. Kashiwadani 15305. Prov. Kushiro: Mt. O-Akan, S. Kurokawa 65643; Katsurakoi, H. Kashiwadani 8049. Prov. Ishikari: Mt. Furano, S. Kurokawa 65368; Matsuyama Hot Spring, Y. Asahina 5754; Mt. Tomuraushi, H. Shibuichi 9668, K. Yoshida 11407.; Mt. Tairoku, H. Shibuichi 6135.; Mt. Ashibetsu-dake, Y. Asahina 5755, H. Shibuichi 6174, K. Yoshida 4685; Mt. Teine, Y. Asahina 5753. Prov. Hidaka: Mt. Petegari, S. Kurokawa 70429. Prov. Iburi: Mt. Chise-Nupuri, N. Hiratuska 54; Shishamonai H. Kashiwadani 8331; Numanohata, H. Kashiwadani 13193; Hidaka Pass, K. Yoshida 4684. Prov. Oshima: Minamikayabe-cho, H. Shibuichi 8689. Honshu. Prov. Mutsu: Hakkoda Mts., K. Sasaki 7154 & 7387 (SASK); Kose, S. Murai 251. Prov. Rikuchu: Mt. Kurikoma, H. Kashiwadani 9035 & 20245. Ohnuma Hot Spring, H. Shibuichi 7724. Prov. Iwashiro: Azuma Mts., S. Kurokawa 58168. Prov. Shimotsuke: Sanno Pass, S. Kurokawa 64063; Senjogahara, H. Kashiwadani 16852; Yumoto Hot Spring, A. Hashimoto n.s., Kashiwadani 16936; Mt. Nantai, F. Fujikawa n.s.; Lakeside of Kirikomi-ko, Y. Asahina 5760; Nikko, H. Kashiwadani 16936, K. Yoshida 5230; Shirane Mts., Y. Asahina 5759, M. Ogata n.s., 87, 87-a, H. Shibuichi 6472, 6474, 6526 & 6538, K. Yoshida 5231 & 5232.; Ohmanako, F. Fujikawa n.s. Prov. Kozuke: Mt. Mikuni, H. Shibuichi 5961, K. Yoshida 4200. Prov. Musashi: Jumonji Pass, H. Kashiwadani 19867, H. Shibuichi 5848, K. Yoshida 1809, 3562 & 10836; Mt. Oh-yama, K. Yoshida 1603 & 1604; Mt. Sanpo, K. Yoshida 1810, 10801; Mt. Bushin-Shiraiwa, K. Yoshida 2201; Mt. Kobushi-dake, H. Shibuichi 9088, K. Yoshida 3899 & 10664; Mikuni Pass, K. Yoshida 895; Mitsumine Mts., K. Yoshida 2472; Karisaka Pass, K. Yoshida 2202, 7750, 10961; Mt. Kumotori, K. Yoshida 8099. Prov. Echigo: Shirouma-dake Mts., K. Yoshida 5720 & 5721. Prov. Kaga: Mt. Hakusan, H. Kashiwadani 2755 & 6790. Prov. Shinano: Mt. Azumaya, S. Kurokawa 50239; Suga-daira, S. Kurokawa 50273; Mt. Gaki-dake, H. Shibuichi 4926; Tsubakuro-dake Mts., K. Yoshida 1300, H. Shibuichi 4879; Mt. Yarigatake, S. Kurokawa 520461; Mt. Tadeshina, S. Kurokawa 51768, H. Shibuichi 5478, K. Yoshida 458; Oku-Tadeshian, S. Kurokawa 80002; Yatsuga-take Mts., Y. Okada, H. Kashiwadani 812 & 13359, H. Shibuichi 8385, 8522, 8563, 8906 & 8911, K. Yoshida 7502, 8918, 8919, 8920, 10300 & 10301.; Mt. Kinpu, H. Shibuichi 4239; Kawahake K. Yoshida 11202; Azusayama, H. Shibuichi 8599, K. Yoshida 7708; Mt. Asama H. Kashiwadani 9643. Prov. Kai: Komaga-take Mts., H. Shibuichi 5008, K. Yoshida 1536; Mt. Hiryu-dake, K. Yoshida 3781. Prov. Suruga: Mt. Fuji, Y. Asahina 45, K. Hisauchi n.s., H.

Kashiwadani 15968 & 16558; Mt. Arakawa-dake, H. Kashiwadani 12735, 12965 & 13044. Shikoku. Prov. Awa: Mt. Tsurugi, F. Fujikawa n.s., H. Kashiwadani 6930. Prov. Iyo: Mt. Ishizuchi, H. Kashiwadani 5339.

6. *Melanelia panniformis* (Nyl.) Essl.

Melanelia panniformis is characterized by 1) the saxicolous habit, 2) the narrow and imbricate lobes which often form coalescencing patches, 3) the absence of pseudocyphellae, 3) the absence of soredia and isidia, and 4) the presence of perlatolic and stenosporic acids.

Although this species shows circumpolar distribution in the Northern Hemisphere(Esslinger, 1977), it has not been reported from Japan. However, one specimen collected at Mt. Kinpu, central Honshu in Japan has characteristic features shown above and can be identified with *M. panniformis*. The Japanese specimen is quite identical with a specimen from Finland cited below.

Exsiccata examined. *Norrlin & Nylander, Lich. Fenn.* 207a (TNS).

Specimen examined. Japan. Honshu. Prov. Shinano: Mt. Kinpu, H. Shibuichi 5750.

7. *Melanelia predisjuncta* (Essl.) Essl.

The characteristic features for this species are, 1) the saxicolous habit, 2) the lobes without soredia and isidia, 3) the sparse submarginal pseudocyphellae, and 4) the presence of perlatoric and stenosporic acids.

This species is apparently closely related to *M. disjuncta* because they both have similar lobes with submarginal pseudocyphellae and produce perlatoric and stenosporic acids. However, it can be easily distinguished from the latter by the absence of soredia. Distinction from *M. stygia* is discussed under the species.

This species is endemic to Japan. Esslinger (1977) reported five localities for it, but the distribution range seems to be much broader. It is now known from Hokkaido to the Yatsugatake Mts., in central Honshu.

Specimens examined. Hokkaido. Prov. Tokachi: Mt. Haku-un, H. Kashiwadani 15438. Prov. Hidaka: Mt. Apoi, S. Kurokawa 70491. Prov. Ishikari: Mt. Tomuraushi, K. Yoshida 11409. Honshu. Prov. Mutsu: Mt. Iwaki-san, H. Kashiwadani 34354, K. Sasaki 8956 (SASK). Prov. Rikuchu: Mt. Hayachine, K. Yoshida 8311. Prov. Musashi: Mt. Mitsumine, S. Kurokawa 56143, H. Kashiwadani 14606, H. Shibuichi 3715, K. Yoshida 3125; Mt. Kumotori, H. Shibuichi 2603, K. Yoshida 1362, 10073; Riverside of Ohbora-gawa, K. Yoshida 3124; Jumonji Pass, K. Yoshida 10837, 10838 & 10839; Mt. Sanpo, K. Yoshida 10802. Prov. Shinano: Azusayama, S. Kurokawa 59241 (holotype) & 65320, Y. Jinzenji 222, H. Kashiwadani 19894, H. Shibuichi 4201, K. Yoshida 3266 & 3267; Mt. Kinpu, H. Shibuichi 4221, 4237, 4276 & 4277, K. Yoshida 800; Yatsuga-take Mts., H. Shibuichi 8511, K. Yoshida 8926 & 10302; Mt. Eboshi-dake, H. Shibuichi 3475 & 3476.

8. *Melanelia sorediata* (Ach.) Goward & Ahti

This name is proposed by Ahti *et al.* (1987) as a new combination, and *Melanelia sorediosa* (Almb.) Essl. is synonymed.

The present species is characterized by 1) the saxicolous habit, 2) the thin and flat lobes with terminal soralia, 3) the absence of pseudocyphellae, and 4) the presence of perlatoric and stenosporic acids.

Although this species is widely distributed in the Northern Hemisphere, it has not been reported from Japan. However, two specimens collected at Mt. Ohyama, central Honshu in Japan agree very well in morphology and chemistry to European specimens of *M. sorediata*. In Japan, this species is known only from nearby two localities on a mountain at present.

Specimens examined. Honshu. Prov. Musashi: Mt. Ohyama, H. Shibuichi 4717; the same, Y. Ohmura 2894.

9. *Melanelia stygia* (L.) Essl.

The diagnostic features of this species are 1) the saxicolous habit, 2) the lobes without isidia and soredia, 3) the laminal and prominent pseudocyphellae, and 4) the absence of perlatoric and stenosporic acids.

This species is easily confused with other saxicolous species of *Melanelia* in Japan, but it is clearly distinguished from them by the presence of numerous distinct pseudocyphellae and the absence of perlatoric and stenosporic acids.

As reported by Esslinger (1977), three of six chemical races are found for Japanese material. In Japan, distribution of each races show no distinct difference according to the chemical races.

This is one of the well-known species of *Melanelia* in the Northern Hemisphere, being widely distributed from Hokkaido to Kyushu in Japan.

Exsiccata examined. *Kurokawa & Kashiwadani, Lich. Rar. Crit. Exs.* 428. as *Parmelia stygia*.

Specimens examined. Hokkaido. Prov. Kitami: Mt. Mitsumine, H. Kashiwadani 20019. Prov. Kushiro: Mt. Me-Akan, S. Kurokawa 65561 & 65562; Mt. O-Akan, S. Kurokawa 65644. Prov. Ishikari: Daisetsu Mts., H. Kashiwadani 1207, 1226 & 16734.; Mt. Tomuraushi, Fujikawa (herb. Y. Asahina 6075), K. Yoshida 11409; Tokachi-dake Mts., H. Shibuichi 6263, K. Yoshida 4688. Honshu. Prov. Mutsu: Mt. Hakkoda, H. Kashiwadani 34137, K. Sasaki 7234 (SASK). Prov. Rikuchu: Mt. Kurikoma, H. Kashiwadani 9046. Prov. Uzen: Mt. Nishi-Azuma, H. Kashiwadani 15415, K.Yoshida 7596. Prov. Iwashiro: Azuma Mts., S. Kurokawa 58184. Prov. Shimotsuke: Mt. Shirane, E. Ochiai n.s., H. Shibuichi 6499, 6508, K. Yoshida 5238.; Mt. Nyoho, F. Fujikawa n.s. Prov. Musashi: Mt. Sanpo, K. Yoshida 10803; Mt. Ohyama, H. Shibuichi 4960. Jumonji Pass, H. Shibuichi 4418, K. Yoshida 3568, 3901. Prov. Echigo: Shirouma-dake Mts., K. Yoshida 5733. Prov. Etchu: Mt. Yakushi, H. Kashiwadani 960 & 1013. Mt. Tateyama, M. Nishijima 146, S. Kurokawa 82065, K.

Yoshida 2109; Mt. Etchuzawa-dake, H. Kashiwadani 13386. K. Yoshida 2110. Prov. Kaga: Mt. Hakusan, H. Kashiwadani 3188, 3204, 3262, 3272 & 6751. Prov. Shinano: Kisokomaga-take Mts., H. Shibuichi 3898 & 3899; Mt. Jonen, H. Koizumi 71260 & 71263; Mt. Karamatsu-dake, 51383; Mt. Tsubakuro-dake, K. Yoshida 1301, H. Shibuichi 4891 & 4892; Mt. Shirouma Y. Asahina (6085 & 6086); Yamada Pass, H. Kashiwadani 9952; Mt. Mitsu-dake, S. Kurokawa 521511; Yatsuga-take Mts., H. Shibuichi 8857 & 8858, K. Yoshida 8927, 8928, 9188, 1039 & 10308.; Mt. Kinpu, H. Shibuichi 1518, 4221, 4237, 4276 & 4277, K. Yoshida 801 & 3052; Mt. Kokushi, S. Kurokawa 520185. Prov. Kai: Mt. Fuji, K. Yoshida 251; Mt. Asayo-Mine, K. Yoshida 1539. Prov. Suruga: Mt. Arakawa, H. Kashiwadani 12703 & 13034. Kyushu. Prov. Bungo: Kuju Mts., S. Kurokawa 62353.

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