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## Alpine Lecideoid Lichens from Southern Part of Mts. Akaishi, Central Japan

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### Abstract

Seventy alpine lecideoid lichens are reported from southern part of Mts. Akaishi. The genera *Bilimbia* De Not., *Bryonora* Poelt and *Sporastatia* A.Massal. are new to Japan. *Bilimbia lobulata* (Sommerf.) Hafellner & Coppins, *Bryonora castanea* (Hepp) Poelt, *Fuscidea lygaea* (Ach.) V.Wirth & Vezda, *Porpidia cinereoatra* (Ach.) Hertel & Leuckert, and *Ropalospora lugubris* (Sommerf.) Poelt are new addition to the flora of Asia. *Carbonea atronivea* (Arnold) Hertel, *Lecidea limosa* Ach., *Lecidea syncarpa* Zahlbr., *Mycobilimbia hypnorum* (Lib.) Kalb & Hafellner, *Rhizocarpon cinereovirens* (Müll.Arg.) Vainio, *Rhizocarpon superficiale* (Schaer.) Malme, *Sporastatia testudinea* (Ach.) A.Massal., and *Trapeliopsis granulosa* (Hoffm.) Lumbsch are new addition to the flora of Japan. Taxonomic and chemical data to 13 new taxa are provided.

**Key words:** alpine region, lecideoid lichen flora, Mts. Akaishi, Japan

The southern part of Akaishi Mountains is located west of Mt. Fuji, central Honshu. The senior author carried out a lichenological field survey through alpine vegetation in August 28 – September 2, 2001 along the trail from Mt. Hijiri (3,012 m alt.; 35°25'22"N lat., 138°08'23"E long.) to Mt. Tekari (2,591 m alt.;

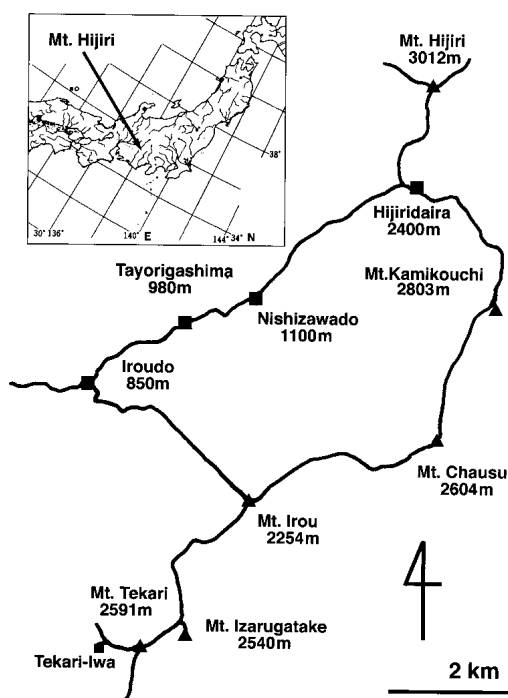


Fig. 1. A map showing the field investigation routes.

35°20'17"N lat., 138°05'02"E long.) (Fig. 1, 2A, B, D). This area is composed of non-volcanic mountains geologically, and a huge limestone outcrop named Tekari-Iwa (2470 - 2540 m alt.) protruding over the subalpine forest on Mt. Tekari (Fig. 2C). A *Pinus pumila*-community dominates at higher areas, and this area is in fact the southernmost locality for *P. pumila* (Pallas) Regel. The forest of somewhat lower areas is mainly composed of *Abies veitchii* Lindl., *A. mariesii* Masters, *Tsuga diversifolia* (Maxim.) Masters, and *Betula ermanii* Cham.

The following are taxonomic notes on the 70 species found in the area, 13 new and several rare lichens characterized by lecideine apothecia.

### A. Enumeration of the species

The list includes alpine lecideoid lichens known from the mountains. The species with an asterisk are those newly recorded from Japan or Asia, and these will be mentioned later. In the list of specimens examined, the locality name is followed by the herbarium number and substratum. Specimens are preserved in the herbarium of Akita University and in the herbarium of the National Science Museum, Tokyo (TNS).

1) *Amygdalaria aeolotera* (Vain.) Brodo & Hertel summit of Mt. Hijiri, nos.29632 & 29635, on rock; Mt. Hijiri - Mt. Tekari, nos.29925 & 29935, on rock.

2) *A. consentiens* (Nyl.) Hertel, Brodo & Mas-I-noue var. *consentiens* Mt. Hijiri - Mt. Tekari, no.29732, on rock.

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3) **A. consentiens** var. **japonica** Mas.Inoue Mt. Hijiri - Mt. Tekari, no.29864, on rock.

4) **A. elegantior** (H.Magn.) Hertel & Brodo summit of Mt. Hijiri, nos.29690 & 29629, on rock; Mt. Hijiri - Mt. Tekari, nos.29845 & 29942, on rock.

5) **A. subdissentiens** (Nyl.) Mas.Inoue & Brodo summit of Mt. Hijiri, nos.29656, 29658, 29678, 29689, 29690 & 29692, on rock; Mt. Hijiri - Mt. Tekari, nos.29812, 29920, 29925 & 29929, on rock.

*A. subdissentiens* is disjunctively distributed in Konyambay and Kamchatka Peninsula of Siberia and the Pacific coast of northern North America, and is known to occur only in summit areas of high mountains in central Honshu.

6) **Arthrorhaphis citrinella** (Ach.) Poelt summit of Mt. Hijiri, no.29671, over humus; Mt. Hijiri - Mt. Tekari, nos.29701 & 29898, over humus.

*A. citrinella* is previously known from several mountains of northern Honshu (Mt. Iwate, Mt. Moriyoshi, Mt. Akitakoma, and Mt. Chokai). This is the first report from central Honshu for the species.

7) **Bacidia baculifera** (Nyl.) Zahlbr. Mt. Hijiri - Mt. Tekari, nos.29752, 29952, 30047, 30095 & 30123, on bark of *Abies veitchii*.

The occurrence of *B. baculifera* was only from Mt. Fuji as well as from Ozegahara Moor and adjacent areas. This is the third report for the species.

8) **Biatora vernalis** (L.) Fr. Tekari-Iwa, no.29948, over mosses or humus.

9) **Bilimbia lobulata** (Sommerf.) Hafellner & Coppins\*

10) **Bryonora castanea** (Hepp) Poelt\*

11) **Calvitimela aglaea** (Sommerf.) Hafellner Mt. Hijiri - Mt. Tekari, nos.29725, 29824, 29899 & 30056, on rock.

12) **C. armeniaca** (DC.) Hafellner in Hafellner & Türk summit of Mt. Hijiri, nos.29634 & 29666, on rock; Mt. Hijiri - Mt. Tekari, no.29891, on rock.

13) **Carbonea atronivea** (Arnold) Hertel\*

14) **C. vorticosa** (Flörke) Hertel Mt. Hijiri - Mt. Tekari, nos.29952, 29909 & 29932, on rock.

*C. vorticosa* was previously reported only from Mt. Iwate, Mt. Hiuchi near Ozegahara Moor and Mt. Fuji. However, it might be a rather common species in Japan.

15) **Catolechia wahlenbergii** (Ach.) Körb. summit of Mt. Hijiri, no.29674, over mosses.

*C. wahlenbergii* was previously reported from Mt. Tateyama, Mt. Norikura, Mt. Yari, Sensui Pass (Mt. Kaikoma), and Mt. Kisokoma. However, this species has not been reconfirmed from any of the above localities except Mt. Yari.

16) **Clauzadeana macula** (Taylor) Coppins & Rambold Mt. Hijiri - Mt. Tekari, nos.29763, 29774, 29826, 29848, 29857, 29919 & 30061, on rock; summit of Mt. Tekari, no.30048, on rock.

17) **Farnoldia jurana** (Schaer.) Hertel Hijiri-daira, no.29580, on rock.

*F. jurana* was known only from Mt. Shibutsu and Mt. Hiuchi near Ozegahara Moor. This is the second report for the species.

18) **Fuscidea circumflexa** (Nyl.) V.Wirth & Vezda summit of Mt. Tekari, no.30028, on rock.

19) **F. cyathoides** var. **suborientalis** (Zahlbr.) Mas.Inoue Mt. Hijiri - Mt. Tekari, no.29890, on bark of *Betula ermanii*.

20) **F. intercincta** (Nyl.) Poelt Mt. Hijiri - Mt. Tekari, no.29802, on rock.

*F. intercincta* is rather rare species in Japan. This species is known only from Mt. Kodake (Mts. Shirakami) and Mt. Shibutsu near Ozegahara Moor.

21) **F. lygaea** (Ach.) V.Wirth & Vezda\*

22) **F. mollis** (Wahlenb.) V.Wirth & Vezda Mt. Hijiri - Mt. Tekari, nos.29781 & 29843, on rock.

23) **F. submollis** Mas.Inoue Mt. Hijiri - Mt. Tekari, nos.29713, 29733 & 29872, on rock.

24) **F. verruciformis** Mas.Inoue Tekari-Iwa, no.29998, on bark of *Tsuga diversifolia*.

25) **Helocarpon crassipes** Th.Fr. summit of Mt. Hijiri, nos.29637 & 29694, over humus.

26) **Hypocomyce friesii** (Ach.) P.James & Goth.Schneid. Mt. Hijiri - Mt. Tekari, no.30101, on bark of *Tsuga diversifolia*.

27) **Immersaria athrocarpa** (Ach.) Rambold & Pietschm. summit of Mt. Hijiri, no.29651, on rock; Mt. Hijiri - Mt. Tekari, nos.29699, 29701, 29722, 29796, 29879, 30055 & 30622, on rock; summit of Mt. Tekari, no.30036, on rock.

28) **Lecidea atrobrunnea** (Lam. & DC.) Schaer. summit of Mt. Hijiri, no.29647, on rock.

The summit of Mt. Kitadake, which is the second highest peak in Japan, in the northern part of the Akaishi Mtns. was the only locality for *L. atrobrunnea*. This is the second report for the species.

29) **L. diducens** Nyl. Mt. Hijiri - Mt. Tekari, no.29873, on rock.

*L. diducens* was previously known only from the summits of high mountains in the Hida Mtns, central Honshu. However, the range now includes the Akaishi Mtns.

30) **L. lactea** Schaer. Mt. Hijiri - Mt. Tekari, nos.29698b & 29832, on rock.

Most authors reduce *L. lactea*, which produces norstictic acid, to a synonym or an infra-specific taxon of *L. lapicida*, which produces stictic acid. Inoue (1982) mentioned that the apothecia of *L. lapicida* are adnate and slightly constricted at the base, while those of *L. lactea* are subimmersed to appressed. However, this character is not defining, because intermediate representatives are sometimes encountered.

31) **L. lapicida** (Ach.) Ach. summit of Mt. Hijiri, no.29673, on rock; Mt. Hijiri - Mt. Tekari, no.29716, on rock; summit of Mt. Tekari, no.30041, on rock.

32) **L. limosa** Ach.\*

33) **L. plana** (J.Lahm.) Nyl. summit of Mt. Hijiri,

nos.29654 & 29695, on rock.

**34) *L. subleucothallina*** Mas.Inoue Mt. Hijiri - Mt. Tekari, nos.29756, 29758, 29777 & 29831, on rock.

**35) *L. subpaupercola*** Mas.Inoue summit of Mt. Hijiri, no.29683, on rock.

**36) *L. syncarpa*** Zahlbr.\*

**37) *Lecidella carpathica*** Körb. Tekari-Iwa, no. 30021, on non-calcareous rock.

**38) *Lecidoma demissum*** (Rutstr.) Gotth. Schneid. & Hertel summit of Mt. Hijiri, no.29684, over humus; Mt. Hijiri - Mt. Tekari, nos.29862, 29896, 29903, 29904 & 29918, over humus.

**39) *Micarea melaena*** (Nyl.) Hedl. Mt. Hijiri - Mt. Tekari, no.30117, on bark of *Sorbus commixta*.

**40) *M. peliocarpa*** (Anzi) Coppins & R.Sant. Mt. Hijiri - Mt. Tekari, no.29916, over mosses.

**41) *M. synotheoides*** (Nyl.) Coppins Mt. Hijiri - Mt. Tekari, no.29808, on bark of *Abies mariesii*.

**42) *Mycobilimbia berengeriana*** (A.Massal.) Hafellner & V.Wirth Mt. Hijiri - Mt. Tekari, nos.29697, 29782 & 29841, over humus or mosses.

**43) *M. hypnorum*** (Lib.) Kalb. & Hafellner\*

**44) *Mycoblastus affinis*** (Schaer.) T.Schauer Mt. Hijiri - Mt. Tekari, no.29889, on bark of *Betula ermanii*; no.30069, on bark of *Sorbus commixta*.

**45) *M. japonicus*** Müll.Arg. Mt. Hijiri - Mt. Tekari, no.30122, on bark of *Abies mariesii*.

**46) *M. sanguinarius*** (L.) Norman summit of Mt. Hijiri, no.29691, on bark of *Pinus pumila*; Mt. Hijiri - Mt. Tekari, nos.29926 & 29748, on bark of *Pinus pumila*; nos.29888 & 29945, on bark of *Betula ermanii*; no.29780, on bark of *Abies veitchii*; no. 29706, over mosses; no.29783, on rock; Tekari-Iwa, no.30010, on bark of *Abies mariesii*.

**47) *Ophioparma lapponica*** (Räsänen) Hafellner & R.W.Rogers summit of Mt. Hijiri, no.29663, on rock; Mt. Hijiri - Mt. Tekari, no.29800, on rock.

**48) *Orphniospora moriopsis*** (A.Massal.) D.Hawksw. summit of Mt. Hijiri, no.29660, on rock.

*O. moriopsis* is known to occur in Mt. Hiuchi near Ozegahara Moor. This is the second report for the species.

**49) *Porpidia albocaerulescens*** (Wulfen) Hertel & Knoph Mt. Hijiri - Mt. Tekari, no.30100, on rock.

**50) *P. cinereoatra*** (Ach.) Hertel & Leuckert\*

**51) *P. crustulata*** (Ach.) Hertel & Knoph Hijiri-daira, nos.29494 & 29619, on rock; summit of Mt. Hijiri, no.29652, on rock; Mt. Hijiri - Mt. Tekari, nos.29806, 29846, 29865, 29941 & 30071, on rock.

**52) *P. flavocaerulescens*** (Hornem.) Hertel & A.J.Schwab summit of Mt. Hijiri, nos.29644 & 29687, on rock; Mt. Hijiri - Mt. Tekari, nos.29755, 29917, 29922, 29943 & 30080, on rock; summit of Mt. Tekari, no.30027, on rock.

**53) *P. macrocarpa*** (DC.) Hertel & A.J.Schwab Tekari-Iwa, no.29935, on rock.

**54) *P. musiva*** (Körb.) Hertel & Knoph summit of

Mt. Hijiri, nos.29636, 29643 & 29677, on rock; Mt. Hijiri - Mt. Tekari, nos.29816, 29847, 29881, 29905, 29907, 29930, 30057, 30062, 30083 & 30084, on rock.

**55) *P. tuberculosa*** (Sm.) Hertel & Knoph Mt. Hijiri - Mt. Tekari, no.29876, on rock.

**56) *Protoparmelia badia*** (Hoffm.) Hafellner Mt. Hijiri - Mt. Tekari, no.29707, on rock.

**57) *Rhizocarpon cinereovirens*** (Müll.Arg.) Vainio\*

**58) *R. eupetraeoides*** (Nyl.) Blomb. & Forssell Mt. Hijiri - Mt. Tekari, nos.29844 & 29933, on rock; summit of Mt. Tekari, nos.30032 & 30044, on rock.

**59) *R. fujiyamae*** Räsänen summit of Mt. Hijiri, nos.29630 & 29646, on rock; Mt. Hijiri - Mt. Tekari, nos.29735, 29736, 29908 & 29939, on rock; summit of Mt. Tekari, no. 30035, on rock.

**60) *R. geographicum*** (L.) DC. Mt. Hijiri - Mt. Tekari, nos.29500, 29809 & 29849, on rock.

**61) *R. grande*** (Flörke) Arnold Mt. Hijiri - Mt. Tekari, no.30076, on rock.

The occurrence of *R. grande* was reported from Mt. Kodake (Mts. Shirakami) in northern Honshu. This is the second report for the species.

**62) *R. hensseniae*** Brodo summit of Mt. Hijiri, no.29641, on rock; Mt. Hijiri - Mt. Tekari, nos.29811, 29902, 29923 & 29925, on rock.

**63) *R. hochstetteri*** (Körb.) Vain. summit of Mt. Hijiri, no.29672, on rock; Mt. Hijiri - Mt. Tekari, no.29894, on rock.

**64) *R. obscuratum*** (Ach.) A.Massal. Hijiri-daira, nos.29561 & 29581, on rock; Mt. Hijiri - Mt. Tekari, nos.29705 & 29854, on rock.

**65) *R. polycarpum*** (Hepp) Th.Fr. Mt. Hijiri - Mt. Tekari, nos.29729, 29737 & 29741, on rock.

**66) *R. superficiale*** (Schaer.) Vainio\*

**67) *Ropalospora lugubris*** (Sommerf.) Poelt\*

**68) *Sporastatia testudinea*** (Ach.) A.Massal.\*

**69) *Trapeliopsis granulosa*** (Hoffm.) Lumbsch\*

**70) *Tremolecia atrata*** (Ach.) Hertel summit of Mt. Hijiri, no.29666; Mt. Hijiri - Mt. Tekari, nos.29708, 29723, 29726, 29757, 29814, 29818 & 29929, on rock; summit of Mt. Tekari, no.30031, on rock.

## B. Genera new to Japan

**1) BILIMBIA** De Not., Giorn. Bot. Ital., ann. 2, 1(1): 190, 1846.

Type species: *Bilimbia hexamera* De Not. (= *Bilimbia sabuletorum* (Schreb.) Arnold)

**2) BRYONORA** Poelt, Nova Hedwigia 38: 73-111, 1983.

Type species: *Bryonora castanea* (Hepp) Poelt

**3) SPORASTATIA** A.Massal., Geneac. Lich. 9, 1854.

Type species: *Sporastatia testudinea* (Ach.) A.Massal.

## C. Species new to Japan

**1) *Bilimbia lobulata*** (Sommerf.) Hafellner & Coppins

Lichenologist 36: 195 (2004). *Lecidea lobulata* Sommerf., Kongel. Norske Vidensk. Skr. 2: 54 (1827). Type: non vidi.

*B. lobulata* is easily recognized by the greenish brown squamulose thallus and 2- to 3-septate spores with a finely warted episporium. This species was previously known from the Arctic, Europe, Russia, North America, Australia and maritime Antarctica. However, the range is now extended to include Asia.

Chemistry: no lichen substances demonstrated on TLC.

Habitat: over soil or humus associated with limestone.

Range: Greenland (Hansen, 2002), Svalbard (Elvebakk & Hertel, 1997), Sweden, Norway (Santesson, 1993), Finland (Vitikainen et al. 1997), UK (Purvis et al., 1992), France (Gueidan & Roux, 2002), Italy (Nimis & Tretiach, 2004), Portugal (Boom & Giralt, 1996), Spain (Llimona & Hladun, 2001), Czech (Vezda & Liska, 1999), Russia (Andreev et al., 2003; Zhurbenko, 2003; Kontlov, 2004), Canadian Arctic Archipelago (Thomson, 1997; Zhurbenko et al., 2006), New Mexico (Egan, 2002), Australia (Kantvilas et al., 2005), maritime Antarctica (Convey et al., 2000; Øvstedal & Smith, 2001).

Specimens examined: Tekari-Iwa, over soil, humus & mosses with limestone, M.Inoue nos. 29947, 29971 & 29977.

Additional specimens examined: Bohemoslovakia, coll. A.Vezda (Vezda, Lich. sel. Exsic. no. 234, as *Toninia lobulata*), TNS; U. S. A., Colorado, coll. R. & J. Anderson (Anderson, Lich. N. W. America, no. 21, as *Toninia lobulata*), TNS.

**2) *Bryonora castanea*** (Hepp) Poelt

Nova Hedwigia 38: 86 (1983). *Biatora castanea* Hepp, Flecht Europe, 270 (1857). Type: non vidi.

The diagnostic features of *B. castanea* are: violet brown adnate, persistently marginate apothecia, distinct conglutinated cortex of the exiple, and the short-ellipsoid spores (17-25 x 7-8 µm). This species was previously known from the Arctic, Europe, North America and the maritime Antarctica. However, the range has now extended to Asia.

Habitat: humus.

Range: Greenland (Hansen, 2002), Svalbard (Elvebakk & Hertel, 1997), Sweden, Norway (Santesson, 1993), Spain (Llimona & Hladun, 2001), Canadian Arctic Archipelago (Thomson, 1997; Zhurbenko et al., 2006), North America (Thomson, 1997), maritime Antarctica (Øvstedal & Smith, 2001).

Specimen examined: summit range of Mt. Hijiri, over humus, M.Inoue no. 29675.

Additional specimens examined: Sweden, Lapponia torneensis, coll. G. Lang (Cryptog. exs. Vindob.

no. 2171, TNS); Spitzbergen, Prins Karl Forland, coll. Th.M. Fries (Zahlbruckner Lich. rar. no. 290, TNS)

**3) *Carbonea atronivea*** (Arnold) Hertel

Mit. Bot. Staatssaml. München, 19:442 (1983).

*Lecidea atronivea* Arnold, Flora 53: 123 (1870). Type: Arnold: Salzburger Schieferalpen, Grosser Rettenstein (Austria), bei Kitzbühl, 2050 m, 8.1869, lectotype in **M**, non vidi, paratype in **M**, vidi.

Asci of *C. atronivea* have a distinctive lecanora-type apical structure, and also has an excipulum of less conglutinating hyphae, which are more or less thick and rather pachydermatous. This species was previously known from the Arctic, Europe, and Russia including Siberia. However, the range is now extended to include Japan.

Chemistry: no lichen substances demonstrated on TLC.

Habitat: non calcareous rocks.

Range: Svalbard (Elvebakk & Hertel, 1997), Europe (Hertel, 1967), Austria (Hafellner, 2004), France (Gueidan & Roux, 2002), Spain (Llimona & Hladun, 2001), Russia (Andreev et al., 2003; Siberia etc.), American Arctic (Thomson, 1997).

Specimen examined: summit of Mt. Hijiri, on rock, M.Inoue no.30026.

Additional specimens examined: Switzerland, Graubunden, coll. M. Steiner & A. Vezda (Vezda, Lich. sel. Exsic. no. 635, TNS); Tirol, coll. Arnold (H-Nyl 20099, **H**); Tirol, Stubai Alpen, coll. H. Hertel & I. Bertermann no. 1475, **M**.

**4) *Fuscidea lygaea*** (Ach.) V.Wirth & Vezda

Beitr. Naturk. Forsch. SüdwDtl. 31: 92 (1972).

*Lecidea lygaea* Ach., Syn. Lich. 34 (1814). Type: Switzerland ("Helvetia"), on rock, - lectotype in **H** (H-Ach. 210 D), vidi.

*F. lygaea* is distinguished by the apothecia, which are immersed to subimmersed in the thallus, and by its somewhat subglobose spores (8-9 x 6-7 µm). This species was previously known only from Europe, but the range is now extended to Asia.

Chemistry: divaricatic acid and unknown minor constituents.

Habitat: non-calcareous rocks.

Range: U.K. (Dobson, 2005; Hawksworth et al., 1980; Purvis et al., 1992), Spain (Llimona & Hladun, 2001), Czech (Vezda & Liska, 1999).

Specimen examined: summit range of Mt. Tekari, on rock, M.Inoue no. 30042.

An additional specimen examined: France ("Galia - Corsica"), coll. G. Clauzade et al. (Vezda, Lich. sel. Exsic. no. 809), TNS.

**5) *Lecidea limosa*** Ach.

Lichenographia Univ., 182 (1810). Type: Switzerland "Helvetia", coll. Schleicher, H-Ach 281, - holotype

in **H**, vidi.

*L. limosa* is growing over mosses or humus. This species is easily recognized by the thallus of which areoles are granular-verrucose and by the adnate, black, strongly convex apothecia. This species has been reported from the Arctic, Europe, Russia including Siberia, and North America. However, the range has now extended to Japan.

Chemistry: no lichen substances demonstrated on TLC.

Habitat: over mosses and humus.

Range: Svalbard (Elvebakk & Hertel, 1997), Finland (Vitikainen et al., 1997), UK (Hawksworth et al., 1980; Purvis et al., 1992), Germany (Wirth, 1987), Czech (Vezda & Liska, 1999), Murmansk, Russia (Andreev et al., 1998: Behling Straight, Central Asia Siberia, etc.; Zhdanov, 2004), American Arctic (Thomson, 1997), southeast Alaska, North America (Geiser et al., 1998).

Specimens examined: Mt. Mae-hijiri to Mt. Tekari, over mosses and humus, M.Inoue nos. 29724 & 29785.

Additional specimens examined: Slovakia, coll. A.Vezda (Vezda, Lich. Vohemoslovakia Ex. no. 130), **TNS**; Poland, coll. A.Vezda (Vezda, Lich. sel. Exsic. no. 87), **TNS**; Austria, coll. A.Vezda (Vezda, Lich. sel. Exsic. no. 2158), **TNS**; Austria, Salzburg, coll. K. Kalb & G. Blobst (Plant. Graec. Lic. ex. no. 88), **TNS**.

#### 6) *Lecidea syncarpa* Zahlbr.

Verhandl. Zool-Bot. Ges. Wien 68: 10 (1918).

Type: Austria, Niedersösterreich, coll. H. Lojka 267, - holotype in **W**, vidi.

*L. syncarpa* is easily recognized by the pale brown thallus which has an epinecral layer, appressed adnate apothecia, well-developed subhypocheal medulla, and norstictic acid as a chemical substance. This species is previously known from the Arctic, Europe, Russia including Siberia, and North America. However, the range is now extended to include Japan.

Chemistry: norstictic acid.

Habitat: non-calcareous rocks.

Range: Svalbard (Elvebakk & Hertel, 1997), Spain (Llimona & Hladun, 2001), "Europe" (Hertel, 1995), Russia (Andreev et al., 1998: Siberia, Kamchatka Peninsula, etc.), U.S.A. (Leuckert & Hertel, 2003; Egan, 2002).

Specimens examined: summit range of Mt. Hijiri, M.Inoue no. 29762; Hijiridaira - Mt. Chausu, M.Inoue no. 29815; Mt. Chausu - Mt. Tekari, M.Inoue no. 29946.

#### 7) *Mycobilimbia hypnorum* (Lib.) Kalb & Hafellner

In V. Wirth, Die Flechten Baden-Württembergs, 511 (1987). *Lecidea hypnorum* Lib., Plantae Cryptog. quae in Ardena Colleg. Type: non vidi.

Diagnostic characteristics for *M. hypnorum* are:

dark brown apothecia in combination with violet pigments in the upper part of the hymenium, hypothecium and exipulum. This species is widely distributed in the Arctic, Europe, Russia including Siberia, North America, Australia, and maritime Antarctica. However, the range has now been extended to include Japan.

Chemistry: no lichen substances demonstrated on TLC.

Habitat: over mosses and humus associated with limestone.

Range: Greenland (Alstrup, 1986), Svalbard (Elvebakk & Hertel, 1997), Sweden, Norway (Santesson, 1993), Finland (Vitikainen et al., 1997), UK (Dobson, 2005), Italy (Nimis & Tretiach, 2004), Germany (Wirth, 1987), Spain (Llimona & Hladun, 2001), Czech (Vezda & Liska, 1999), Russia (Andreev et al., 2003: Central Asia, Siberia, etc.; Zhdanov, 2004), American Arctic (Thomson, 1997), USA (Egan, 2002), U.S.A., Slovakia, Austria, Australia & Montenegro (Kantvilas et al., 2005), Australia (Allen et al., 2001), South Orkney of Antarctica (Øvstedal & Smith, 2001)

Specimens examined: Tekari-Iwa, M.Inoue nos. 30012, 30017 & 30018, over mosses and humus associated with limestone.

Additional specimens examined: Rumania, Mt. Retezat, coll. A.Vezda (Vezda, Lich. sel. Exsic. no. 1233, as *Lecidea hypnorum*), **TNS**; U. S. A., Michigan, Delta County, coll. R.C.Harris (Vezda, Lich. sel. Exsic. no. 1953, as *Lecidea hypnorum*), **TNS**.

#### 8) *Porpidia cinereoatra* (Ach.) Hertel & Leuckert

In Hertel, Beih. Nova Hedwigia 79: 437 (1984).

*Lecidea cinereoatra* Ach., Lich. Univ. 167 (1810).

Type: Germany, Lausitz, Mosigi 52, H-Ach 100, - lectotype in **H**, vidi.

*P. cinereoatra* is easily recognized by the grey cracked-areolate thallus, appressed-adnate, persistently marginate apothecia with whitish grey pruina, and by the presence of confluent acid as a chemical substance. This species was previously known only from Europe, Russia including Central Asia, and Australia. However, the range is now extended to include East Asia.

Chemistry: confluent acid and unidentified minor constituents.

Habitat: non calcareous rocks.

Range: Fenoscandia (Gowan & Ahti, 1993; Vitikainen et al., 1997), UK (Dobson, 2005; Fryday, 2005; Purvis et al., 1992), Germany (Wirth, 1987), Spain (Llimona & Hladun, 2001), Italy (Nimis & Tretiach, 2004), Czech (Vezda & Liska, 1999), Russia (Andreev et al., 1998: Central Asia etc.; Zhdanov, 2004), Australia (Allen et al., 2001),

Specimens examined: Hijiridaira - Mt. Chausu, M.Inoue no. 29828.

#### 9) *Rhizocarpon cinereovirens* (Müll.Arg.) Vainio

Acta Soc. Fauna Fl. Fenn. 53: 336 (1922).

*Patellaria cinereovirens* Müll.Arg., Flora 51: 49 (1868).  
Type: non vidi.

*R. cinereovirens* is characterized by a bullate-areolate dark grey thallus surrounded by black hypothalline lines, 1-septate, hyaline or slightly darkening halonate spores, and norstictic acid as a chemical substance. This species was previously known from the Arctic, Europe, Russia including Siberia, and North America. However, the range has now been extended to include Japan.

Chemistry: norstictic acid.

Habitat: non calcareous rocks.

Range: Greenland (Alstrup, 1986), Svalbard (Elvebakk & Hertel, 1997), Sweden (Fryday, 2002; Santesson, 1993), Norway (Santesson, 1993), Finland (Vitikainen et al., 1997), Germany (Feuerer, 1978), Switzerland (Fryday, 2002), Russia (Andreev et al., 2003: Siberia etc.), UK (Fryday, 2002; Purvis et al., 1992), Czech (Vezda & Liska, 1999), American Arctic (Thomson, 1997), Canada (Fryday, 2002; Wong & Brodo, 1992), USA (Fryday, 2002).

Specimens examined: Hijiridaira - Mt. Chausu, M.Inoue no. 29863; Mt. Chausu, M.Inoue no. 29914.

Additional specimens examined: Finland, Karelia, coll. A. Pankakoski, (Räsänen, Lich. Fen. Exsic. no. 649), **TNS**; Sweden, Narke, Svennevad, Norra Berg, coll. G. Kjellmert in 1952, mi-31514.

#### 10) *Rhizocarpon superficiale* (Schaer.) Vainio

Acta Soc. Fauna Fl. Fenn. 53: 319 (1922).

*Lecidea superficiale* Schaer., Lich. Helv. Spic. 125 (1828). Type non vidi.

The diagnostic features for *R. superficiale* are: the prominent black hypothallus around and between dispersed bright yellow areolae, marginate apothecia situated more or less between the areolae, 1-septate brown spores with halos, and norstictic acid and rhizocarpic acid. This species was known from the Arctic, Europe, Russia including Siberia, North & South America, China, Australia, New Zealand and the Antarctic Peninsula. However, the range has now been extended to include Japan.

Chemistry: norstictic acid and rhizocarpic acid.

Habitat: non calcareous rocks.

Range: Greenland (Hansen, 2002), Svalbard (Elvebakk & Hertel, 1997), Sweden & Norway (Santesson, 1993), UK (Purvis et al., 1992), Spain (Llimona & Hladun, 2001), Russia (Andreev et al., 2003: Siberia etc.), American Arctic (Geiser et al., 1998; Thomson, 1997), USA (Egan, 2002), Bolivia (Flakus & Wilk, 2006), China (Hertel & Zhao, 1982), Australia (Filson, 1996), New Zealand (Hertel, 1985), Antartic Peninsula (Øvstedal & Smith, 2001).

Specimen examined: Mt. Izarugatake near Mt. Tekari, M.Inoue no. 30082.

Additional specimens examined: Austria, Tüxer Alpen, Nordtirol, coll. M.Steiner (Poelt, Lich. Alp. no.

164), mi- 31976; Venezuela, Anden, Estado Merida, Sierra de Santo Domingo, coll. H.Hertel & F.Oberwinkler (Hertel no. 10567), mi-31515.

#### 11) *Ropalospora lugubris* (Sommerf.) Poelt

In Hertel, Sched. Lecideaceae Exsic. Fasc. 2, no. 40 (1980). *Lecidea lugubris* Sommerf., Suppl. Fl. Lapp. 143 (1826). Type: non vidi.

*R. lugubris* is distinguished by greyish brown cracked-areolate thallus and narrowly clavate 7- to 8-celled spores attenuated at one end. This species was previously known from the Arctic, Europe, Russia, North America and Tasmania. The range is now extended into Asia.

Habitat: non calcareous rocks.

Range: Iceland (Hertel, 2000), Sweden (Hertel, 2000; Santesson, 1993), Norway (Santesson, 1993), Finland (Vitikainen et al. 1997), UK (Purvis et al., 1992), Russia (Hertel, 1991; Zhdanov, 2004), American Arctic (Thomson, 1997), Canada (Hertel, 1991), Tasmania (Kantvilas, 2001).

Specimens examined. Summit of Mt. Tekari, M.Inoue nos. 30024 & 30033.

Additional specimens examined: Norway, Paaberglinder, coll. J.J.Havaas (Havaas, Lich. exsic. Norv. no. 160), **H**.

#### 12) *Sporastatia testudinea* (Ach.) A.Massal.

Geneac. Lich. 9 (1854). *Lecidea cechumena* var. *testudinea* Ach. Kongl. Vetensk. Acad. Nya Handl., 232 (1808). Type non vidi.

*S. testudinea* is a member of the Acarosporaceae. Diagnostic features for this species are: prominent black hypothallus around and between dispersed glossy yellow-brown elongated areolae radiating at the margin, immersed apothecia, numerous spores per ascus, and gyrophoric acid. This species was known from the Arctic, Europe, China, North & South America, Australia, New Zealand, and maritime Antarctica. However, the range is now extended to include Japan.

Chemistry: gyrophoric acid.

Habitat: non calcareous rocks.

Range: Greenland (Hansen, 2002), Svalbard (Elvebakk & Hertel, 1997), Finland (Vitikainen et al., 1997), Spain (Llimona & Hladun, 2001), Italy (Nimis & Poelt, 1987), UK (Purvis et al., 1992), Czech (Vezda & Liska, 1999), Tibet of China (Obermayer, 2004), American Arctic (Hansen, 2000; Thomson, 1997), Sonoran Desert of USA (Nashi III, 2004), Argentina (Hertel, 1989), Australia (Filson, 1996), New Zealand (Hertel, 1989), maritime Antarctica (Øvstedal & Smith, 2001; Søchting et al., 2004).

Specimens examined: summit of Mt. Hijiri, M.Inoue nos. 29751 & 29757; Mt. Kamikouchidake - Mt. Chausu, M.Inoue no. 29810.

An additional specimen examined: Norway, Paasteveir, coll. J.J. Havaas (Havaas, Lich. exsic. Norv.

no. 45), **H.**

**13) *Trapeliopsis granulosa* (Hoffm.) Lumbsch**

In Hertel, Lecid. Exsicc. Fasc. 5. No. 99 (1983).

*Verrucaria granulosa* Hoffm., Descr. Pl. Cl. Crypt. 2: 21 (1794). Type non vidi.

Diagnostic characteristics for *T. granulosa* are: verrucose-granulate thallus with soralia, single to conglomerate convex immarginate apothecia, and gyrophoric acid. This species was previously known from the Arctic, Europe, Russia including Siberia, North & South America, New Guinea, Australia, and the Antarctic Peninsula. The range has now been extended to include Japan.

Chemistry: gyrophoric acid.

Habitat: over humus.

Range: Greenland (Thomson, 1997), Finland (Vitikainen et al., 1997), UK (Dobson, 2005; Purvis et al., 1992), Germany (Wirth, 1987), Spain (Llimona & Hladun, 2001), Italy (Nimis & Poelt, 1987), Czech (Vezda & Liska, 1999), Russia (Andreev et al., 2003; Central Asia, Siberia, etc.; Zhdanov, 2004), American Arctic (Thomson, 1997), Southern Ontario, Canada (Wong & Brodo, 1992), USA (Nash III et al., 2004), New Guinea (Aptroot et al., 1997), Australia (Allen et

al., 2001; Filson, 1996), Garapagos (Elix & McCarthy, 1998), Tierra del Fuego (Messuti, et al., 2003), Antarctic Peninsula (Øvstedal & Smith, 2001),

A specimen examined: summit of Mt. Hijiri, M.Inoue no. 29653.

Additional specimens examined: Finland, Ostrobothnia australis, Isokyro, Orismala, coll. P.Nederstrom, mi-31516; Finland, Turk, Maaria, coll. L.E. Kari, s. n., **TNS**; Sweden, Oland, Boda parish, coll. R. Santesson, no. 16245, **TNS**; Denmark, Herring hede, coll. S.Svane, s. n., **TNS**.

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Fig. 2. A. Mt. Hijiri (Mae-hijiri). B. The ridgeline from Mt. Kamikouchi (left) to Mt. Tekari (right). C. A huge limestone outcrop Tekari-Iwa protruding over the subalpine forest on Mt. Tekari. D. A landscape of the alpine location.

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井上正鉄\*・柏谷博之\*\*・文 光喜\*\*\*：赤石山脈南部の高山生ヘリトリゴケ地衣類

長野県飯田市遠山郷（旧，南信濃村）域内の赤石山脈南部，聖岳（海拔3012m）から光岳（海拔2591m）に至る山稜部の，総延長およそ14～15kmの登山道に沿って地衣類を採集し，高山生のヘリトリゴケ類及びその近縁種70種類を報告した。この内，*Bilimbia* De Not., *Bryonora* Poelt, *Sporastatia* A.Massal. の3属は日本新産属，*Bilimbia lobulata* (Sommerf.) Hafellner & Coppins, *Bryonora castanea* (Hepp) Poelt, *Fuscidea lygaea* (Ach.) V.Wirth & Vezda, *Porpidia cinereoatra* (Ach.) Hertel & Leuckert, *Ropalospora lugubris* (Sommerf.) Poelt の5種類はアジア新産種，そして *Carbonea atronivea* (Arnold) Hertel, *Lecidea limosa* Ach., *Lecidea syncarpa* Zahlbr., *Mycobilimbia hypnorum* (Lib.) Kalb & Hafellner, *Rhizocarpon cinereovirens* (Müll.Arg.) Vainio, *Rhizocarpon superficiale* (Schaer.) Malme, *Sporastatia testudinea* (Ach.) A.Massal., *Trapeziopsis granulosa* (Hoffm.) Lumbsch の8種類は日本新産種である。

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