

## A New Species of *Karoowia* (*Parmeliaceae*, *Ascomycota*) from Kyushu, Japan

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*Karoowia umezuana* K. H. Moon & Kashiw. is described from Prov. Bungo (Oita Pref.), Kyushu, Japan. It is easily distinguished from allied species in having pustulate soredia and in producing usnic and fumarprotocetraric acids as major chemical substances.

**Key words:** Japan, *Karoowia umezuana*, lichen, new species.

*Karoowia* is a foliose lichen genus belonging to the family *Parmeliaceae*. It has a center of its distribution in the southern Hemisphere and comprises 20 species in the world (Elix 1997, 1999, 2000, Hale 1989). At present, only one species, *K. saxeti* (Stizenb.) Hale is known in Japan (Hale 1989).

During the course of our taxonomic study of the Japanese *Karoowia*, we found a peculiar specimen with pustulate soredia among the collection of late Mr. Y. Umezu in Oita Prefecture, Kyushu. Detailed studies of it revealed that it is a new species of the genus. In the present paper, we describe a new species, *Karoowia umezuana* K. H. Moon & Kashiw. from Japan based on a specimen collected by him. Brief note on the distribution of *K. saxeti* in Japan is also given.

The specimens used for the present study are kept in the Herbarium of the National Museum of Nature and Science (TNS) and unless otherwise cited.

1. ***Karoowia umezuana*** K. H. Moon & Kashiw., sp. nov. [Figs. 1A–1C]

Thallus ut in *Karoowia saxeti*, sed pustulato-sorediis et acidum fumarprotocetraricum continentibus differt.

Thallus saxicolous, greenish yellow, very closely adnate, 1–2 cm broad; lobes sublinear, effigurate, subdichotomously or irregularly divided, less than 0.5 mm wide, upper surface emaculate, more or less convex, black rimmed along the margin; pustules laminal, turning into granular soredia and forming hemiglobose soralia 1–1.6 mm in diameter; lower surface pale brown, often with dark brown rims, sparsely rhizinate, rhizines simple or branched near the tips, black, 0.1–0.2 mm long. Thallus 140–155 µm thick, upper cortex prosoplectenchymatous, 15–20 µm thick, medulla 110–125 µm thick, lower cortex weakly developed, subparaplectenchymatous, 8–12 µm thick. Apothecia not seen.

Chemistry: usnic acid, fumarprotocetraric acid (major), protocetraric acid (minor),

norlobaridone (trace) and 4-methyl aletronic acid (minor).

Type collection: Japan. Kyushu. Prov. Bungo (Pref. Oita): Chojabaru, Kokonoe-machi, Kusu-gun, on rocks, elevation about 1050 m, November 16, 2001, Y. Umezu 492b (TNS-holotype).

*Karoowia umezuana* (Fig. 1A) is characterized by 1) saxicolous habit in mountainous area, 2) narrow and discrete lobes, 3) soralia with granular soredia developed from pustules (Fig. 1B), 4) pale brown lower surface of lobes and 5) black rhizines which are simple or little branched near the tips (Fig. 1C) and 6) presence fumarprotocetraric acid as a major chemical substance.

*Karoowia umezuana* is easily distinguished from allied species in the genus by having pustules which soon turning into granular soredia and in producing fumarprotocetraric acid as a major chemical substance. It might be confused with *K. saxeti* (Fig. 1D), another species of the genus known in Japan, which differs in having isidia and in producing stictic acid. In addition, it grows on exposed lava in mountainous areas at elevations between 1000 to 1550 meters, whereas the latter species grows mostly on maritime rocks.

The present species resembles *Karoowia ganymedeae* (Brusse) Hale, a species distributed in Transvaal and Cape Province, South Africa, in having pustulate soredia, but the latter species is easily distinguished by producing evernic and obtusatic acids as major substances.

Although this species has been known only from a limited area of central Kyushu, it forms well developed colonies on exposed lava, where it grows together with *Cladonia crispata*, *C. ramulosa*, *Lecanora oreinoides*, *Rhizocarpon eupetraeoides*, *Umbilicaria torrefacta*, *Xanthoparmelia coreana*, etc.

This species is named in honor of late Mr. Y. Umezu who first found this.

Specimens examined. Japan. Kyushu. Prov. Bungo (Pref. Oita): Chojabaru, Kokonoe-machi, Kusu-gun, on

rocks, elevation about 1050 m, October 27, 2007, H. Kashiwadani 48322; the same locality, K. H. Moon 10082 (NIBR); the same locality, November 16, 2001, Y. Umezu 492b; Yubiyama, Mt. Mimata, Hosshyo, Kokonoe-machi, Kusu-gun, on rocks, elevation 1449 m, September 16, 2001, Y. Umezu 495a; Tenguiwa, Kuro-dake, Kuju-machi, Naoiri-gun, on rocks, elevation 1550 m, August 9, 1998, Y. Umezu 980809; Kuroiwayama, Makinoto, Kokonoe-machi, Kusu-gun, on rocks, elevation about 1500 m, November 1, 2007, K. Umezu 07110101, 07110102.

## 2. *Karoowia saxeti* (Stizenb.) Hale in Mycotaxon **35** (1): 190 (1989). [Fig. 1D]

This species has been well known by Japanese lichenologists under the name, *Parmelia seto-maritima* Asahina (Type collection: Marugame, Shikoku, Japan, Togashi 61511 (TNS-holotype !)) which was reduced to a synonymy of *K. saxeti* by Hale (1989). In Japan, it is rather common on maritime rocks and sporadically distributed also on rocks in low land at elevations below 100 m in south-western Japan, including the Ryukyu Islands. The following specimens in TNS are now identified as this species.

Specimens examined: Japan. Honshu. Prov. Mikawa: Horikiri, Atsumi Peninsula, on rocks, elevation about 100 m, March 5, 1969, S. Kurokawa 69014. Prov. Kii: Cape Shiono-Misaki, Nishi-Muro-gun, on rocks along the coast, March 23, 1971, S. Kurokawa 71031. Prov. Harima: Himeji-shi, Matogata, Matogata coast, on rocks, May 2, 1965, S. Nakanishi s.n.; Tajimanokami, Amida-cho, Takasago city, on rocks, elevation about 50 m, October 10, 1974, H. Kashiwadani 12554. Prov. Aki: Miyajima Island, Saiki-gun, elevation about 3 m, September 24, 1971, H. Kashiwadani 9350. Shikoku. Prov. Tosa: Isa, Hata-gun, August 25, 1931, F. Fujikawa s.n.; Ashizuri cape, Tosashimizu-city, on seaside rocks, August 29, 1981, H. Shibuichi 6991; Nishidomari, Otsuki-machi, Hata-gun, November 22, 1972, S. Kurokawa 72278. Kyushu. Prov. Satsuma (Pref. Kagoshima): Bohnotsu-cho, Minamisatsuma-shi (31°15'32.9"N, 130°14'11.7"E), on rocks (lava) along the coast, elevation about 5 m, June 16, 2008, K. H. Moon 10354, 10359 (NIBR); Hisashi, Bohnotsu-cho, Minamisatsuma-shi (31°17'10.9"N, 130°12'36.3"E), on rocks along the coast, elevation about 10 m, June 16, 2008, K. H. Moon 10363, 10364 (NIBR). Prov. Ohsumi: Onoaida, Yaku-shima Island, on sea side rocks, July 27, 1979, H. Shibuichi 5899; Miyanoura-cho, Yakushima Island, on rocks (sandstone), elevation about 10

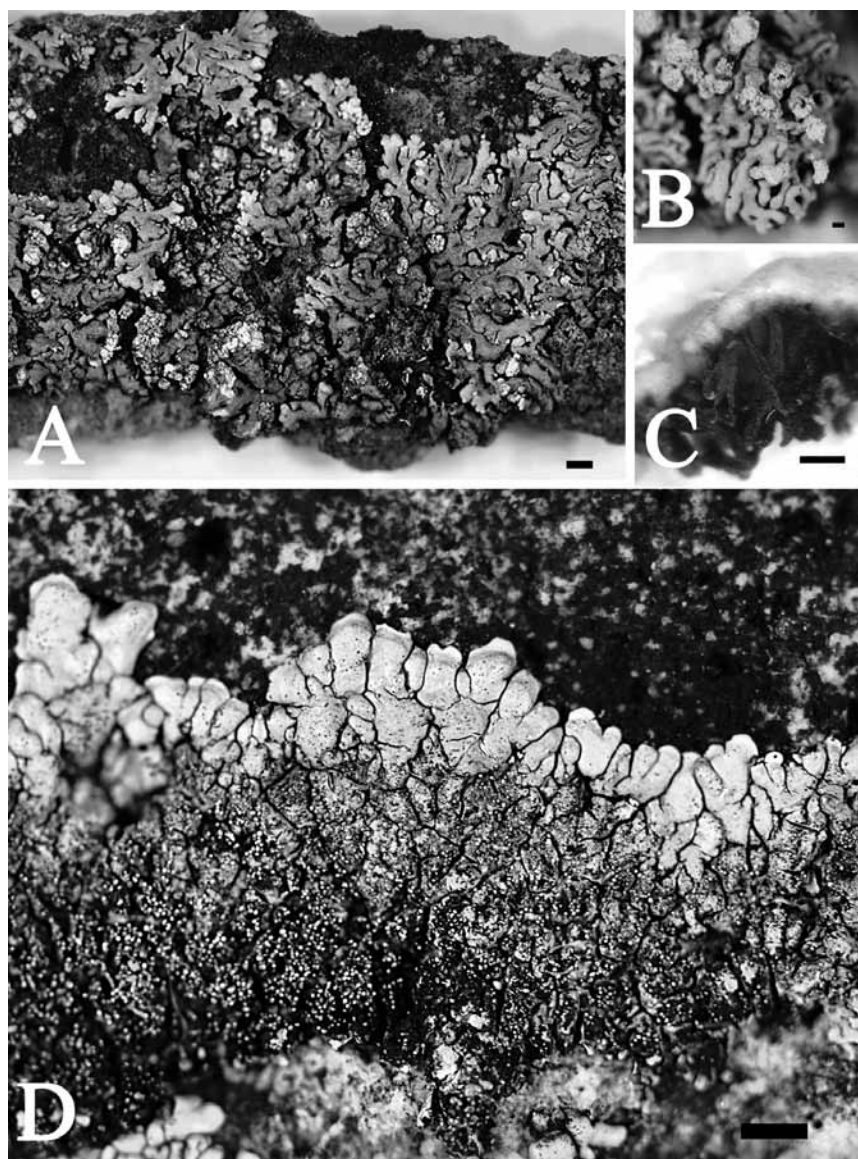


Fig. 1. *Karooiwa umezuana* K. H. Moon & Kashiw. (A–C) and *K. saxeti* (Stizenb.) Hale (D). A. Holotype of *K. umezuana* (Y. Umezu 492b, TNS). B. Granular soralia developed from pustules. C. Black rhizines. D. Habit of *K. saxeti*, showing adnate lobes with cylindrical isidia on the surface (H. Kashiwadani 48515, TNS). Scales = 1 mm (A, B, D); 0.5 mm (C).

m, September 26, 2005, K. Yoshida 13778. Goto Islands: Tainohana, Tamanoura-cho, Fukue Island, November 26, 1982, S. Kurokawa 82111. Ryukyu (Pref. Okinawa): Tonnaha Forest Park, Kumejima Island, Shimajiri-gun (26°20'53.7"N, 126°47'05.7"E), on rocks, elevation about 120 m, December 3, 2007, H. Kashiwadani 48504, 48506, 48509, Torinoguchi, Kumejima Island, Shimajiri-gun (26°17'31.2"N, 126°48'40.9"E), on rocks, elevation

about 20 m, December 3, 2007, H. Kashiwadani 48513, 48515, 48516; Kuroishi-mui, Shimo-Aka, Kumejima Island, Shimajiri-gun (26°21'57.6"N, 126°48'29"E), on rocks along the coast, elevation about 15 m, December 4, 2007, H. Kashiwadani HK 48520, 48523; Cape Irizaki, Yonakuni Island, on rocks (sand stone), elevation about 50 m, January 18, 2008, H. Kashiwadani 48605. Ryukyu Island: Izena Island, August 30, 1973, S. Kurokawa 73126:

Kabira, Ishigaki Island, August 24, 1973, S. Kurokawa 73099.

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文 光喜<sup>a</sup>, 柏谷博之<sup>b</sup>: ハマキクバゴケ属の新種, ウメズハマキクバゴケ (新称, ウメノキゴケ科)

ハマキクバゴケ属の新種, ウメズハマキクバゴケ *Karoowia umezuana* K. H. Moon & Kashiw. を記載した. 本種は本属特有の幅 0.5 mm 以下の細長くて基物に密着する地衣体を持つが, パスチュールから発達する粉芽を生じ, 地衣成分としてフマルプロトセトラール酸を含むので近縁種からは容易に区別できる. ハマキクバゴケ属のうち, 粉芽を持つ種としては, 南アフリカ産の *K. ganymedeia* (Brusse) Hale が報告されているが, この種は地衣成分としてエベルン酸とオプツザート酸を含むので容易に区別できる. ウメズハマキクバゴケは福岡県築上郡吉富町在住の故梅津幸雄氏が大分県玖珠郡九重町で最初に採集され, その後筆者等の調査により九重山系の数カ所にも生育が

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確認されている. 生育場所はいずれも灌木からつきだした溶岩上で, 日当たりの良い部位に集中して生育している.

本属の日本産種としてはハマキクバゴケ *K. saxeti* (Stizenb.) Hale が本州中部以南の海岸岩上に産することが知られているが, ウメズハマカラタチゴケとは裂芽を持ちスチクチン酸を含む点で区別できる. ハマキクバゴケの日本国内の産地はこれまでに数ヶ所しか知られていなかったが, 本研究により本州中部以南, 中国地方 (瀬戸内沿岸), 四国, 九州, 南西諸島の酸性岩上にも生育することが確認された.

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