

Gyalidea kawanae (Lichenized Ascomycota,
Solorinellaceae) sp. nov. from Chiba-ken,
Central Japan, with Notes on
Gyalidea pacifica

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Abstract Two species of *Gyalidea* from Japan are taxonomically treated. *Gyalidea kawanae* H. Harada et Vězda is described as new on the basis of specimens from Chiba-ken, central Japan. It is characterized by having goniocystangia, relatively large (0.35–1.00 mm diam.), adnate apothecia with \pm dark brown proper margin and pale brown discs, transversely 3–5(–7)-septate ascospores (15–24 \times 6.5–8 μ m), and by saxicolous habit. It was found on friable rocks in partial shade in forest in the warm temperate zone. *Gyalidea pacifica* H. Harada et Vězda, previously known only from Hachijo Island of Izu Islands, was collected in Chiba-ken, with a saxicolous specimen and a muscicolous one. This species is also shown to have goniocystangia.

Key words: lichens, lichenized Ascomycota, Solorinellaceae, *Gyalidea*, new species, Taxonomy, Japan.

The lichen genus *Gyalidea* in the family Solorinellaceae is characterized by its crustose thallus, coccoid green phycobiont, gyalectoid apothecia with non-amyloid hymenium, simple paraphyses, and hyaline, transversely septate to muriform ascospores (Vězda, 1966, 1991). It is represented by 28 species in the world (Etayo and Vězda, 1994; Malcolm and Vězda, 1995; van den Boom and Vězda, 1995; Vězda 1991), of which two species have been recorded from Japan: *G. japonica* H. Harada et Vězda from Shizuoka-ken, central Japan and *G. pacifica* H. Harada et Vězda from Hachijo Island of Izu Islands (Harada and Vězda, 1991, 1996). Recently, however, four specimens of this genus have been collected by Harada during field surveys in Chiba-ken, central Japan. All the specimens are very unique by having goniocystangia which have not previously been known for this genus. Careful examination has revealed that two of them belong to *G. pacifica*, and the others to an undescribed species. In this paper, these two species are taxonomically treated, with description of a

new species and notes on *G. pacifica*.

Materials and Methods

Descriptions of external morphology are based on air-dried material observed under a dissecting stereoscope. Sections were made with a razor blade under a dissecting stereoscope, mounted in lactophenol cotton-blue (LPCB), and used for anatomical description except for the color description which was based on the GAW (glycerol : ethanol : water = 1 : 1 : 1) preparations. For observing ascus, spores, paraphyses in more detail, sections of apothecia were mounted in 10% aqueous solution of KOH, squashed gently, and the mounting medium replaced by water, ethanol, and finally LPCB. The K, I, KI tests were conducted on sections of apothecia by using 10% aqueous solution of KOH and/or a diluted Lugol's solution. Specimens used in this study are deposited in the herbarium of the Natural History Museum and Institute, Chiba (CBM).

Taxonomy

1. *Gyalidea kawanae* H. Harada
et Vězda, sp. nov.

(Figs. 1–3)

Thallus saxicolus, crustaceus, tenuis, continuus, cinereo-albidus, goniocystangiis munitus; cellulae algarum globosae, 9–12 μm crassae, ad Chlorococcaceae pertinentes; goniocystangia ±rotundata, primum plana, crateriformia vel semiglobosa, 0.15–0.3 mm lata, demum goniocystis granuliformibus viridibus 10–25 μm crassis impleta. Cellulae algarum in goniocystis 2–6 μm crassae, per (1–)5–7 conglomeratae. Apothecia orbicularia, 0.35–1.0 mm lata, primum urceolata, basim versus constricta, marginibus crassis plerumque fusco-nigris vel nigris sed interdum dilute, nitidis, discis pallide fuscis, in maturitate marginibus tenuioribus, discis planis fusco-nigris. Excipulum fuscum. Hymenium 70–75 μm altum, hyalinum praeter zona epihymeniali infuscatum. Asci clavati, (6–)8-spori. Ascosporae ellipsoideae, (3–)5(–7) transverse septatae, rectae vel paulum arcuatae, 15–24 × 5–8 μm.

Typus: JAPAN, Honshu, Chiba-ken, Futtsushi, Utougi, 35° 10' N, 139° 59' E, 130 m alt., on rocks in forest, 18 Oct. 1997, Harada 18439 (CBM-FL-10357, *holotypus*); 28 Oct. 1998, Harada 19296 (CBM-FL-11853, *paratypus*).

External Morphology. Thallus epilithic, crustose, continuous, following the surface of substratum, pale grayish green, dull, with goniocystangia, ±granulose in marginal areas, lacking prominent hypothallus; goniocystangia scattered, ±cup-shaped, 0.15–0.3 mm diam., ±hemispherical when filled with goniocysts, usually paler than thallus. Apothecia 0.35–1.0 mm diam., sessile, constricted at base, urceolate when young, sometimes proliferating; proper margin ca. 0.05 mm thick, usually brownish black to black (but at base ±concolorous with disc), but sometimes paler and almost concolorous with disc, smooth, glossy; disc concave when young, almost plane, pale brown, epruinose, glossy when young, becoming dull and ±semipellucid.

Anatomy. Thallus composed of variously orientated short hyphae, homoeomerous; phycobiont of coccoid green algal cells 9–12 μm diam., solitary or in small clusters. Goniocysts 10–25 μm diam., of (1–)5–7 algal cells; hyphae composed of ca. 2.5 μm wide and 3–5 μm long cells, constricted at septa; phycobiont cells ±spherical, 2–6 μm diam. Proper exciple annular, 70–110 μm thick in the sides and below, brownish and/or grayish in the outer and upper parts (and ±adjacent to hymenium), usually colorless in remainder; hyphae generally in rows arranged anticlinally to surface, branched and anastomosing to form a network, embedded in gela-

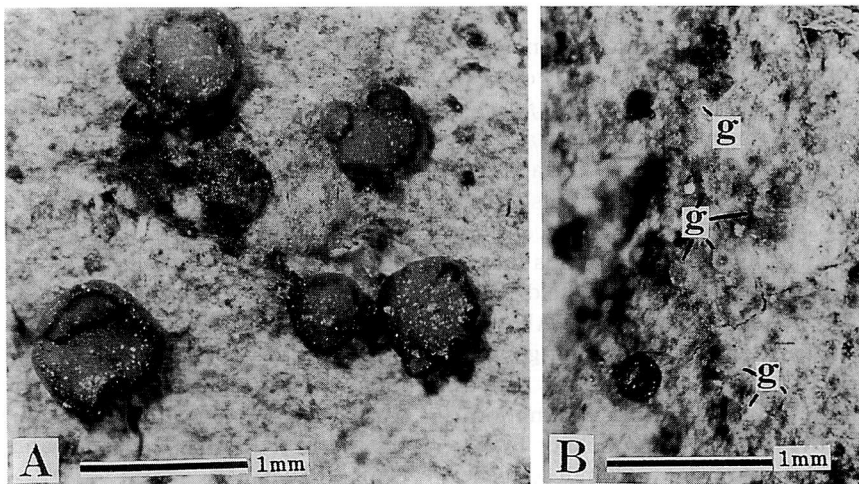


Fig. 1. Habit of *Gyalidea kawanae*. A, thallus with apothecia; B, thallus with goniocystangia (g) and young apothecium. (A–B, holotype).

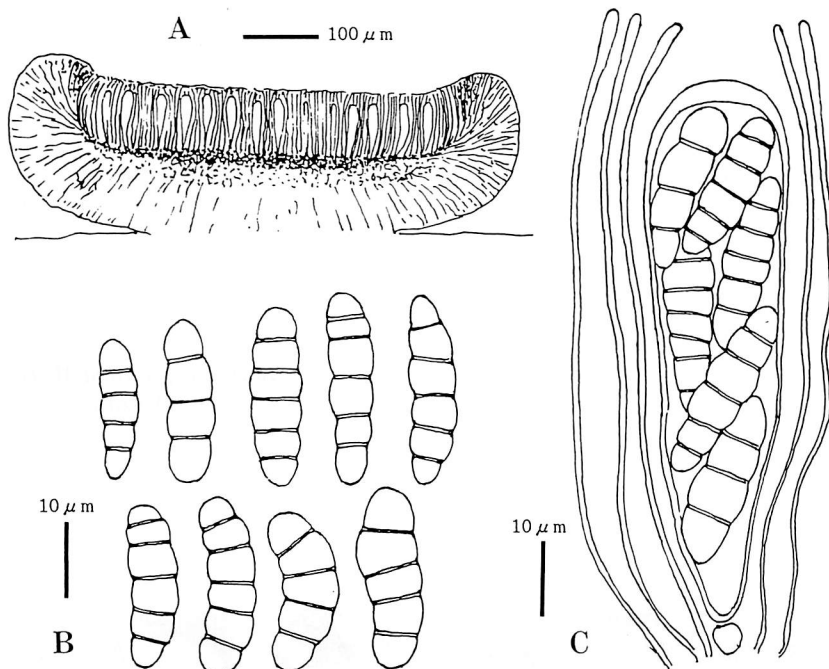


Fig. 2. Anatomy of *Gyalidea kawanae*. A, vertical section of apothecium; B, ascospores; C, ascus and paraphyses. (A-C, LPCB preparations from holotype).

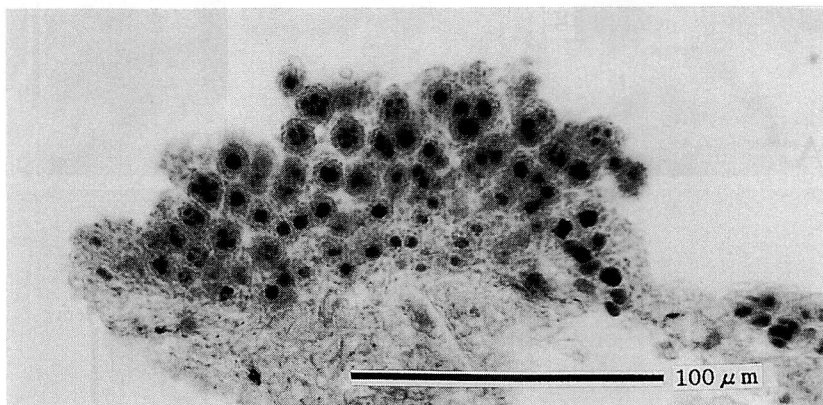


Fig. 3. Goniocystangium of *Gyalidea kawanae*. (Vertical section in LPCB, from holotype).

tinous matrix; lumina of hyphae usually 0.5–1 μm diam. Hypothecium not sharply delimited from exciple, almost colorless, composed of variously orientated hyphae embedded in gelatinous matrix. Subhymenium almost colorless, 10–20 μm thick. Hymenium \pm brownish (K–) in uppermost part, colorless below, 70–75 μm high. Paraphyses mostly unbranched, \pm indistinctly clavate at the apices (cell lumina 1.5–2 μm wide), almost even in thickness below (cell lumina 0.5–1

μm wide), colorless, but usually with brown outer walls in apical part. Asci clavate, ca. 60 \times 15 μm , with tholus. Ascospores (6–)8 per ascus, ellipsoidal, 15–24 \times 5–8 μm , transversely (3–)5(–7)–septate, \pm slightly constricted at septa, colorless.

Distribution. Chiba-ken, central Japan.

Habitat. On friable rocks in (\pm partial) shade in a forest dominated by *Castanopsis sieboldii* and *Quercus serrata*, along a mountain path on slope about 10 m high from

stream, in the warm temperate zone.—At the type locality, this species grows on several rocks less than 1 m diam. which are almost bare or partly covered by mosses. Follicolous lichens inhabit leaves of trees along the stream: *Byssoloma rotuliforme*, *Dimerella epiphylla*, *Fellhanera bouteillei* and *Porina coruscans* (Harada *et al.*, 1998).

Remarks. *Gyalidea kawanae* H. Harada et Vězda is characterized by (1) thallus with goniocystangia, (2) apothecia medium-sized to relatively large (0.35–1.0 mm diam.), (3) disc pale brown, (4) proper margin \pm blackish (usually darker than disk), (5) ascospores $15\text{--}24 \times 6.5\text{--}8 \mu\text{m}$, transversely septate, and (6) saxicolous habit.

Gyalidea pacifica H. Harada et Vězda is most closely related to *G. kawanae*. However,

it has submuriform ascospores, and thicker paraphyses (with lumina $2\text{--}5 \mu\text{m}$ wide at the apical parts, ca. $1 \mu\text{m}$ wide below) (Harada and Vězda, 1996).

Goniocysts are here reported for the first time in *Gyalidea*. Although they have been variously defined (Sérusiaux, 1985), here we follow the definition of Vězda (1980) for goniocysts, as originating from single algal cells which are surrounded by a plectenchymatous envelope.

2. *Gyalidea pacifica* H. Harada
et Vězda
(Fig. 4)

Gyalidea pacifica H. Harada et Vězda, Bryologist 99: 193 (1996). Type: Japan, Izu Islands, Hachijo Island, Mihara-yama, 690 m alt., on

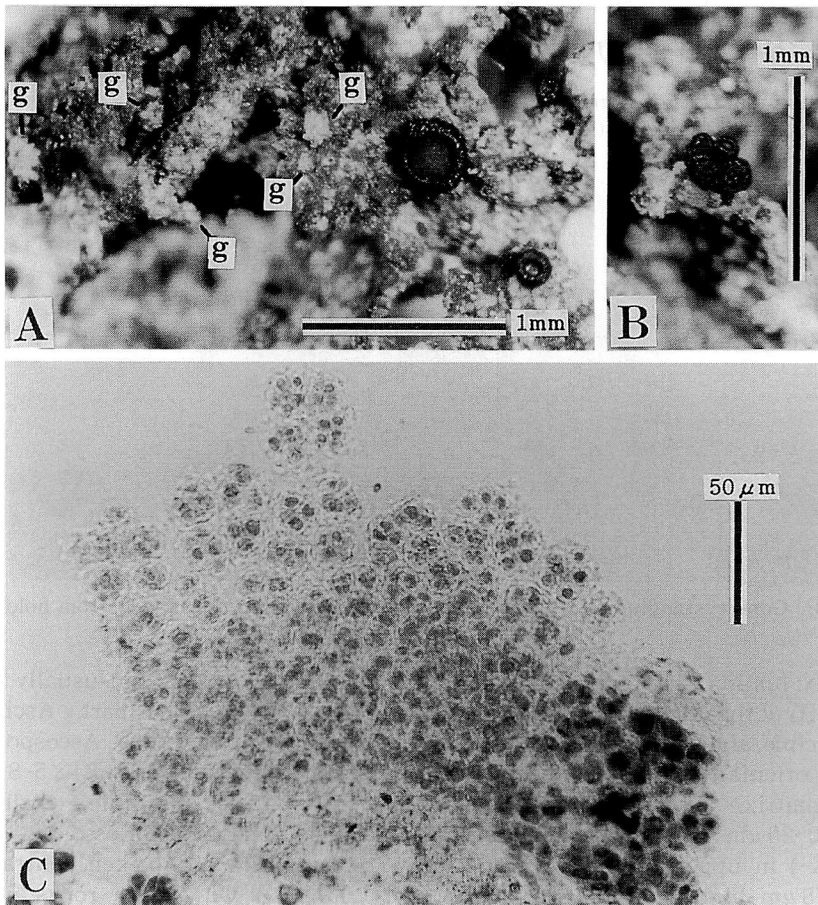


Fig. 4. *Gyalidea pacifica*. A, muscicolous thallus with goniocystangia (g); B, proliferating apothecium; C, vertical section of goniocystangium. (A–C, Harada 18617. A, B, air-dried material; C, GAW preparation).

non-calcareous stones at open site around the summit, 13 Feb. 1992, Harada 12102 (CBM-FL-2706—holotype).

External Morphology. Goniocystangia scattered over the thallus, \pm cup-shaped, 0.05–0.25 mm diam., \pm hemispherical when filled with goniocysts, usually paler than thallus.

Anatomy. Goniocysts 15–30 μ m diam., of (1–)5–8 algal cells; hyphae composed of ca. 2.5 μ m wide and 3–5 μ m long cells, constricted at septa; phycobiont cells \pm spherical, 4–6 μ m diam.

Distribution. Japan (Chiba-ken in central Japan; Hachijo Island of Izu Islands).

Habitat. On non-calcareous stones and rocks, also on turf of mosses on road-side bank, at \pm sunny and exposed site, near the top of a mountain or in forested hills in the warm temperate zone. —This lichen has previously been known as a saxicolous species. However, it was found on mosses covering rocks in one of the specimens from Chiba-ken. It is noteworthy that this species grows both on rocks and mosses, since all other species of this genus are known to be either saxicolous, muscicolous, or foliicolous, depending on species (Vězda, 1991).

Remarks. In the two specimens of *Gyalidea pacifica* from Chiba-ken, the thalli bear goniocystangia which had not been observed at the time of its original description (Harada and Vězda, 1996). Now, the holotype has been reexamined, and remnants of this organ were recognized. These were obscured by a thin gelatinous cover of lichenicolous algae and/or cyanobacteria. A description of these goniocystangia is presented above in the external morphology and the anatomy. See also under *Gyalidea kawanae*.

Proliferating apothecia are found in the muscicolous specimen from Chiba, but not in saxicolous ones from Chiba and Hachijo. It is uncertain whether this is correlated with environmental differences or genetic ones.

Additional specimens examined. JAPAN. Honshu. Chiba-ken, Futtsu-shi, Toyooka, Shikumi, 90 m alt., on rock by road, Harada 18612 (CBM-FL-10668); Futtsu-shi, Toyooka, Horikiri, 130 m alt., on turf of mosses on road-side bank, Harada 18637 (CBM-FL-10693).

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日本産コザラゴケ属地衣類 2 種の
分類学的検討
—千葉県産の一新種 *Gyalidea kawanae*
の新種記載, および
Gyalidea pacifica について—

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コザラゴケ属 *Gyalidea* 地衣類は以下の形質を有する: 痂状の地衣体, 共生藻は緑藻, レキデア型 (広義) の子器, 側糸が分枝癒合, 子嚢は 2 重壁, 子嚢胞子は平行多室から石垣状多室. 今回, 千葉県産の標本に基

づき, 地衣類 *Gyalidea kawanae* H. Harada et Vězda sp. nov. を新種記載した. 世界に約 65 種知られる本属の中で本種は, 以下の形質によって特徴づけられる: 地衣体は平滑, カップ状の goniocystangia を有す, 子器盤は淡褐色, 果殻縁部は暗褐色, 子嚢胞子は平行多室; 岩上生. 本種に最も近縁な *Gyalidea pacifica* H. Harada et Vězda は, 子嚢胞子が多少石垣状多室となり, 側糸が太いことで区別できる. 本新種の基準産地は千葉県南部の丘陵地に位置し, 森林内の岩上に生育していた. *Gyalidea pacifica* は, 八丈島産の一標本に基づき記載された以外は記録が無かったが, 今回, 千葉県内で標本 2 点を得た. この発見により, 岩上だけでなく, 蘚苔類上にも生育することが分かった. また, 本種にも goniocystangia の存在を確認した. 正基準標本を再検討したところ, 地衣体が薄い藻類の膜によって覆われているため, この器官が見過ごされていたことが判明した.