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Hirotoshi Yamamoto: Review on *Gracilaria sublittoralis* Yamada et Segawa (*nom. nud.*), Gracilariaceae, Rhodophyta

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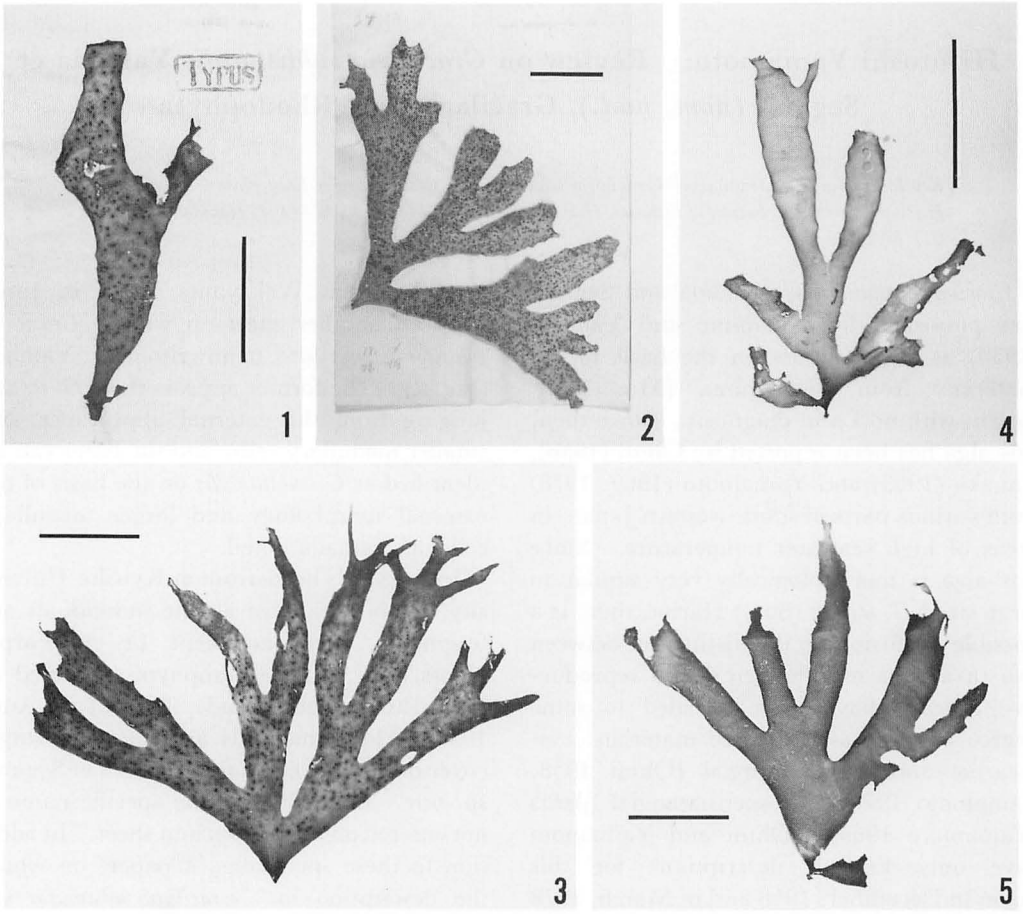
Gracilaria sublittoralis Yamada and Segawa was published by Takamine and Yamada (1950) as *nomen nudum* on the basis of the materials from Suga-shima (Mie Pref., Japan) with no Latin diagnosis. Since then, this alga has been reported by Ohmi (1958), Tanaka (1963) and Yamamoto (1969, 1978) from various parts of south-western Japan, in areas of high seawater temperature. Since this alga is morphologically very similar to large sized *G. textorii* (Sur.) Hariot, there is a possible confusion on the distinction between two taxa. Its morphological and reproductive features have been revealed to some degree on the basis of these materials: cystocarpic and tetrasporangial (Ohmi 1958, Yamamoto 1978) and spermatangial plants (Yamamoto 1969). Ohmi and Yamamoto gave only English descriptions for this taxon in December, 1958 and in March, 1978 respectively. Consequently it did not fulfill the requirement for valid publication of ICBN (Art. 36-2 in Greuter *et al.* 1988) because of the absence of Latin descriptions. Accordingly, I review the history on recognition of *G. sublittoralis*, and also propose to validate the name.

I attempted to locate the type specimen of *G. sublittoralis* in the herbaria in which it could be deposited but failed. However, I confirmed that several herbarium sheets, which were annotated by either Yamada or Segawa, are kept both at the Faculty of Science, Hokkaido University (SAP) and at the Faculty of Agriculture, Kyushu University. In the herbarium SAP, there are two tetrasporangial plants collected at Suga-shima in July, 1934 on single sheet on which "*Gracilaria sublittoralis*" is handwritten by Yamada and one cystocarpic plant collected at Shirahama (Wakayama Pref.) in June, 1943 on another sheet on which "*Gracilaria sublittoralis*" is also handwritten by Yamada (Fig. 2). The former appears to be *G. textorii* judging from the external appearance and smaller medullary cells, and the latter can be identified as *G. sublittoralis* on the basis of the external morphology and larger medullary cells, as Yamada noted.

In Segawa's herbarium at Kyushu University, although almost all the individuals are fragments, there are kept 14 cystocarpic plants and 31 tetrasporophytes collected at Kozu-shima (Izu Islands, Tokyo) in Aug. 1936. These materials are placed in single cover on which "*Gracilaria* Yamada et Segawa sp. nov." is typed, but any specific name is not entered on any herbarium sheet. In addition to these specimens, a paper, on which the description for "*Gracilaria okamurai* sp. nov. Yamada et Segawa" was typed and added by Segawa's handwriting, is kept together in this cover. This diagnosis is in perfect accord with the features of Segawa's specimens. However, as far as I know, this species name has not been published.

Ohmi (1958) gave a description of *G. sublittoralis* mainly on the basis of the materials from Kozu-shima collected in Aug., 1936 and July, 1937, which were identified and provided by Segawa (*cf.* Ohmi 1958). These materials were probably a part of Segawa's herbarium deposited at Kyushu University because of the same collection site and date. According to Ohmi (1958), Takamine (pers. comm.), one of the authors (*cf.* Takamine and Yamada 1950) who listed *G. sublittoralis* for the first time, stated that this species was first collected at Suga-shima. Consequently I concluded that when Yamada and Segawa pub-



Figs. 1–5. *Gracilaria sublittoralis* Yamada and Segawa in Yamamoto. Fig. 1. Holotype (cystocarpic, SAP 059816) from Kozu-shima, showing branches decayed owing to age (*cf.* Ohmi 1958). Fig. 2. Cystocarpic plant (SAP 035361) from Shirahama. Fig. 3. Cystocarpic plant (SAP 059819) from Shirahama, showing typical form with dichotomous branching and attenuating tips. Fig. 4. Spermatangial plant (SAP 059820) from Shirahama Yamamoto (*cf.* Yamamoto 1969, 1978). Fig. 5. Tetrasporangial plant (SAP 059818) from Shirahama. Scale bars=5 cm for all.

lished the name, *G. sublittoralis*, they probably thought that this taxon was different from their *G. okamurai*, but merged the latter to the former afterwards. Thus *G. okamurai* was left unpublished.

Yamada's collection of specimens from Suga-shima (SAP) are identified by me as *G. textorii* as mentioned above. I attempted to collect *G. sublittoralis* at Suga-shima several times but failed. Accordingly I chose a plant (Fig. 1), which was already cited by Ohmi (1958), as holotype specimen among the materials of Kozu-shima collected earliest, and reestablished *G. sublittoralis*. As the epithet "*sublittoralis*" has been used several times, it is retained as the specific epithet.

Gracilaria sublittoralis Yamada and Segawa in Yamamoto sp. nov.

=*Gracilaria sublittoralis* Yamada and Segawa in Takamine and Yamada, Bot. Mag. Tokyo 63: p. 268, 1950. (*Nomen nudum*). As used by Ohmi 1958; Tanaka 1963; Yamamoto 1969, 1975, 1978).

=*Gracilaria okamurai* Yamada and Segawa sp. nov. unpublished manuscript in Herbarium, Faculty of Agriculture, Kyushu University, Fukuoka, Japan [=*okamurae*].

Frondes complanatae, 15-25 cm altae, 3-5 cm latae, aliquando usque ad 6 cm circum axillas, usque ad 1 mm crassae in parte supera, usque ad 1.6 mm crassae in parte inferna, generatim divisae dichotome 2-3 ordinibus in lobos; coriacescentes aetate.

Medulla composita 3-5 stratorum magnarum cellularum usque ad 830 μm diam. in parte supera, usque ad 1160 μm diam. in parte inferna.

Absorbentia fila praesentia.

Spermatangia portata in conceptaculis similibus ollis; conceptacula usque ad 50 μm alta, usque ad 62 μm lata.

Tetrasporangia dispersa super superficiebus ambabus frondis, regulatim cruciformia.

Fronds complanate, generally solitary, with very short terete stipe 1-2 mm diam., reaching 5 mm in length, attached to substratum by small disc 5 mm maximum diam.; fronds 15-25 cm high, 3-5 cm wide, sometimes 6 cm in greatest width around axillae, up to 1 mm thick in the upper portion, up to 1.6 mm thick in the lower portion, divided dichotomously and rarely trichotomously in 2-3 orders into lobes; lobes gradually increasing in width to the middle portion and tapering toward the tip, axillae round; apices attenuated or sometimes bifurcate, margins generally entire, but rarely proliferous; reddish brown or yellowish brown to pale brown; becoming coriaceous with age.

Cortical layer composed of 1-2 rows of cells; cells 5.6-9.8 μm long, 5.6-9 μm wide, containing 1-2 nuclei; medulla composed of 3-5 layers of large cells up to 830 μm diam. in the upper portion of frond, up to 1160 μm diam. in lower portion of frond; transition in cell size from cortex to medulla abrupt; hairs present; basal cell 13-20 $\times$ 15-17 μm.

Carpogonial branches two-celled; cystocarps borne on both surfaces of frond except basal and apical portions, up to 1.4(-1.6)mm high, up to 1.8(-2)mm wide, constricted at base, slightly beaked or non-beaked; absorbing filaments abundant, extending into the pericarp, that generally not penetrating deeply; pericarps consisting of flattened cells which are ca. 25 $\times$ 35 μm.

Spermatangia borne in pot-like conceptacles (*Verrucosa* type) on both surfaces of frond except basal and apical portions; conceptacles up to 50 μm deep, up to 62 μm wide, surrounded by elongated and curved cortical cells.

Tetrasporangia scattered over both surfaces except basal and apical portions, up to 63 μm high, up to 35(-53)μm wide, cruciately divided, surrounded by slightly elongated cortical cells.

Type locality: Kozu-shima (Izu Islands, Tokyo).

Holotype: cystocarpic (SAP 059816, Aug., 1936, Fig. 1).

Isotype: cystocarpic and tetrasporangial (Faculty of Agriculture, Kyushu Univ.).

Other materials examined: cystocarpic (SAP 035361, June, 1943, Shirahama; SAP 059819, May, 1968, Shirahama), spermatangial (SAP 059820, May, 1968, Shirahama; SAP 059817, April, 1987, Hirado), tetrasporangial (SAP 059818, May, 1968, Shirahama; April 1987, Hirado).

Habitat: 40-50 m in depth at Kozu-shima (Segawa's personal memorandum); Uwajima in Kagawa Pref. (*cf.* Ohmi 1958); Kagoshima Bay, Tanegashima and Mageshima in Kagoshima Pref. (*cf.* Tanaka 1963); *ca* 10 m in depth at Shirahama in Wakayama Pref. (Yamamoto 1978); Sado Island in Niigata Pref. (*cf.* Yamamoto 1978); *ca* 10 m in depth at Hirado in Nagasaki Pref.

This species is morphologically very close to *G. textorii*, but from which it is different in thicker, broader and coriaceous external features, and in larger medullary cells in the internal structure and especially in having a *Verrucosa* type spermatangial conceptacle rather than *Textorii* type one, which is a shallow saucer-shaped grouping of spermatangia.

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山本弘敏：シンカイカバノリ *Gracilaria sublittoralis* の再検討

シンカイカバノリ *Gracilaria sublittoralis* Yamada and Segawa は一般に使われている種名である。しかし，新種として発表された際，およびその後もラテン語による記載が付けられていなかったため，国際植物命名規約により裸名 (*nomen nudum*) として扱われている。このような理由から，本種の歴史的経過と複数の標本庫に保存されている標本を検討し，新種 *Gracilaria sublittoralis* Yamada and Segawa in Yamamoto sp. nov. とした。

本種は幅が広く厚いこと，柔細胞が大きいことにより類似のカバノリ *Gracilaria textorii* と区別することができる上，雄性生殖器官は深いつぼ状を呈し，浅い皿状のカバノリとは形状が基本的に異なる。(041 函館市港町3-1-1 北海道大学水産学部水産植物学講座)

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