

**A new species of the section *Contorta* of the genus
Batrachospermum (Rhodophyta, Nemalionales)
from Nonoc Island, the Philippines**

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This paper is the first record of the genus *Batrachospermum* from the Philippines. In having the loosely agglomerated gonimoblast, *B. nonocense* resembles the taxa such as *B. iriomotense* (KUMANO 1982), *B. tabagatense* (KUMANO et BOWDEN-KERBY 1986) and *B. nechochoense* (KUMANO et BOWDEN-KERBY 1986).

For *B. nonocense* the gonimoblast filaments are hardly distinguished from the primary branchlets, because the loosely agglomerated gonimoblast filaments are as long as the primary branchlets, consist of 6–10 fusiform cells, and many chloroplasts are found in the cells of gonimoblast filaments as well as in those of the primary branchlets. These characteristics are peculiar to this species and are not reported for the other taxa of the section *Contorta*, so that the Nonoc specimen is described here as a new species, *B. nonocense*.

Key Index Words: *Batrachospermum nonocense*, *sp. nov.*; freshwater Rhodophyta; section *Contorta*; taxonomy; the Philippines.

KUMANO (1980) has summarized the freshwater taxa of Rhodophyta in South-east Asian countries and information regarding Japanese, southeast Asian and Micronesian taxa of the genus *Batrachospermum* has been accumulated by many authors. To date, however, there has been only one report of the freshwater Philippine Rhodophyta. SKUJA (1934) described *Nemalionopsis shawi*, as a new species and genus, based on herbarium specimens labelled as "*Batrachospermum philippinarum*", which were collected by von Shaw and Day on April 28th in 1907, from Province of Bataan, Luzon in the Philippines. Recently, SCHOENIG and TUMILAN (1984) made a collection of Rhodophyta found in

freshwater during an expedition to Nonoc Island. Examining the specimens collected from the same island, LIAO and LARGO (1985) reported an undescribed species of *Batrachospermum*. This paper deals with the description of the Nonoc specimen as a new species of *Batrachospermum* under section *Contorta*.

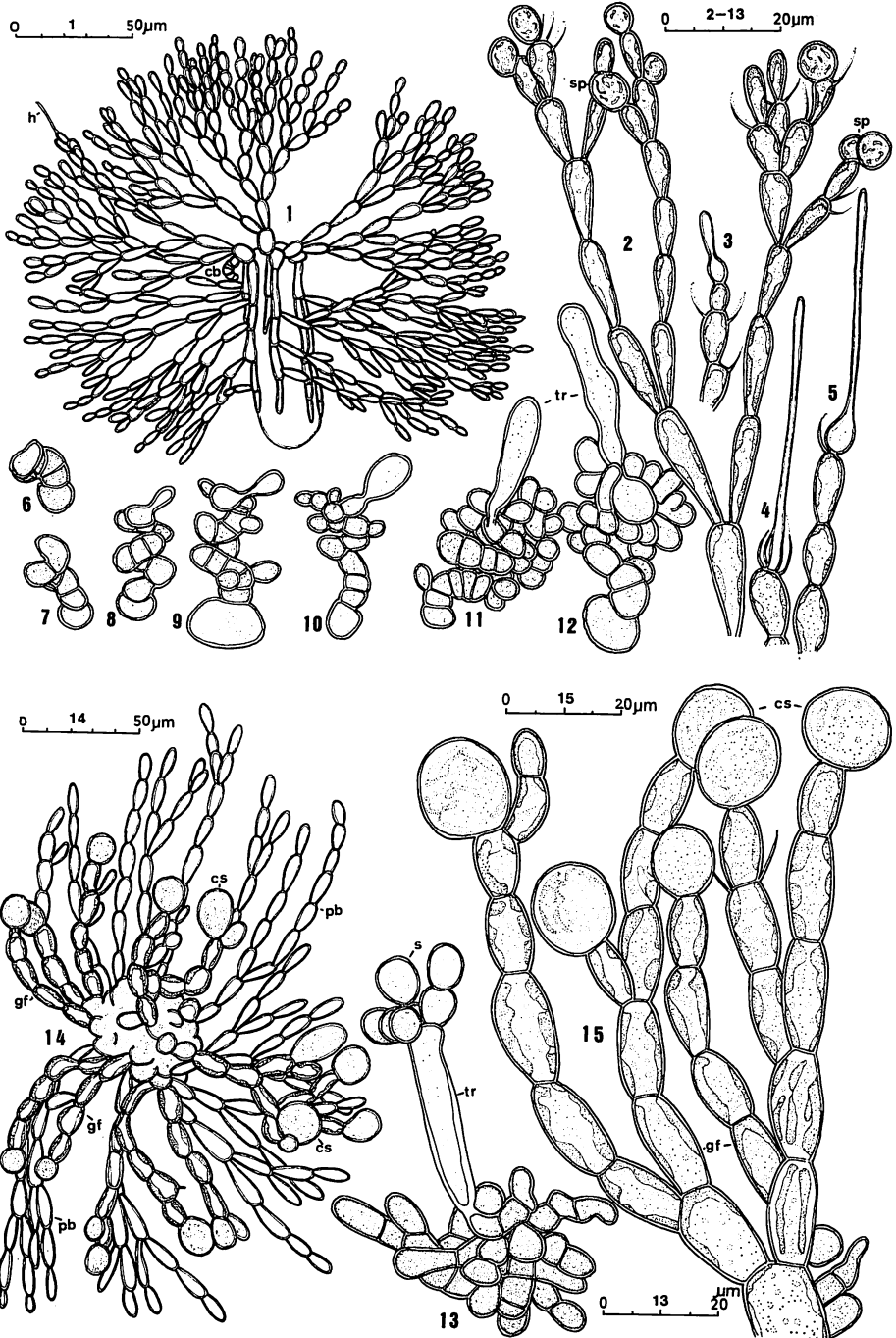
Habitat and Specimens Examined

Nonoc Island is about 10 km northeast of Surigao City, the capital of Surigao del Norte Province on the northeastern end of Mindanao Island in southern Philippines. It is located between latitudes 9°49'N and 9°56'N, and between longitudes 125°

34°E and 125°43'E (see Map 1). The total land area is about 44 km² with Mount Conico rising to an altitude of 335 m, as the most prominent peak on the island. The main streams drain either to the

north or to the south (SANTOS-YNIGO and ESQUERRA 1961).

The climate on Nonoc is distinctly tropical and is characterized by alternating wet and dry seasons. The mean annual tem-



perature over a period of 48 years is 26.7°C. Only the north-west portion of Nonoc is covered with *Dipterocarpus* forests (SCHOENIG and TUMILAP 1984). Soil is very metallic with a pH of 6.8. The entire island is rich in nickel deposits (WRIGHT et al. 1958, SANTOS-YNIGO and ESQUERRA 1961). A huge nickel mine and refinery operate on the island, the latter giving off gases heavy with ammonia and sulfur.

The specimens examined in the present study were collected on March 29th, 1984 by Mr. Danilo B. LARGO from an unnamed stream near an open pit nickel mine.

Water temperatures at the time of collection was around 28–30°C depending upon the extent of shade provided by vegetation lining the side of the stream.

Description of Species

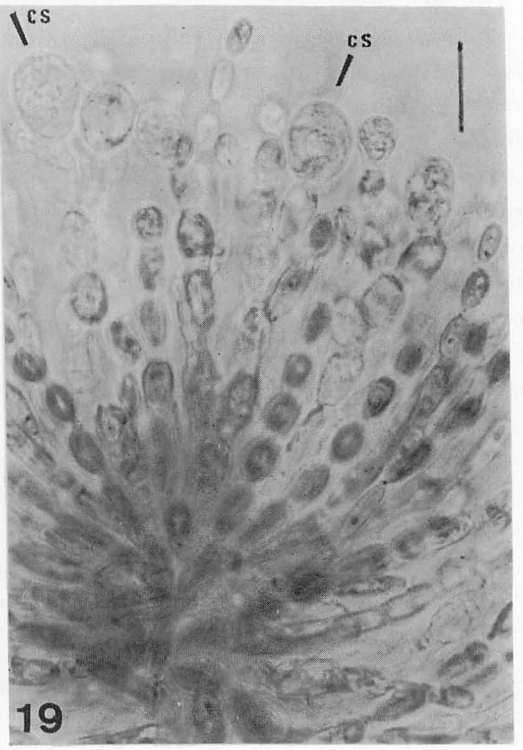
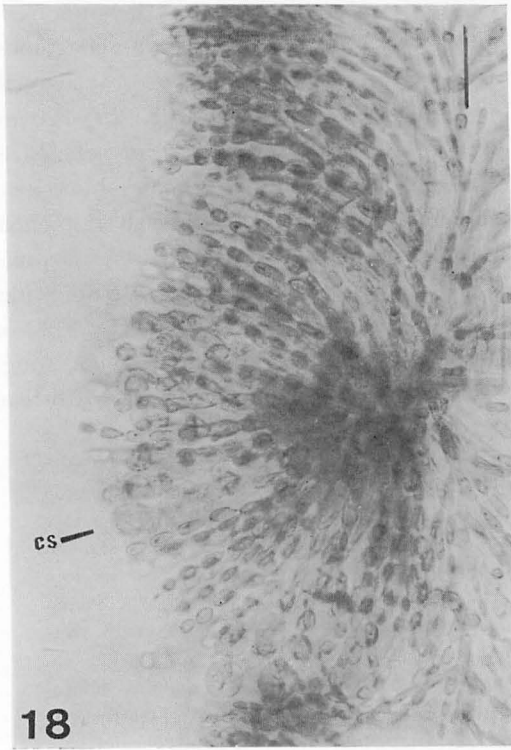
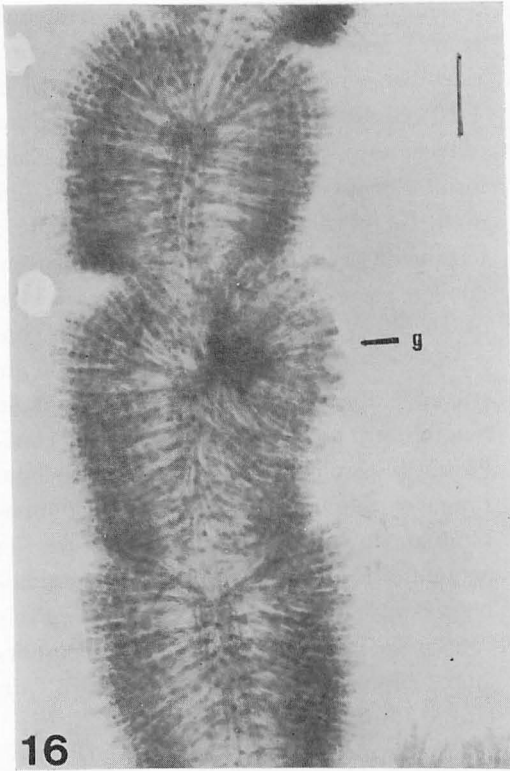
Batrachospermum nonocense KUMANO et LIAO, sp. nov. (Figs. 1–19)

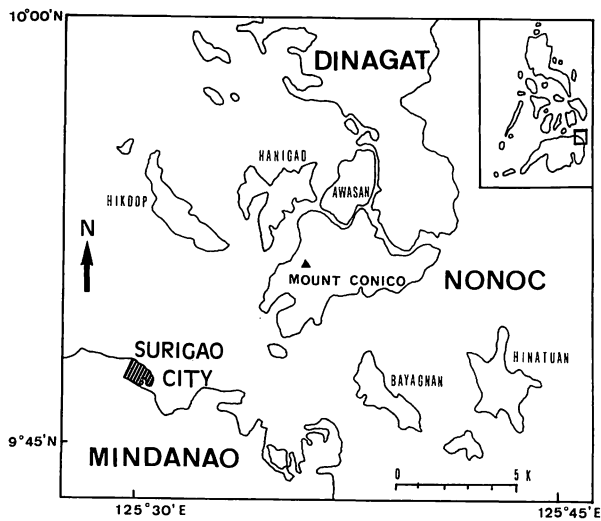
Frons monoica, 7 cm alta, 300–370 μm crassa, plus minusve dichotome ramosa, modice mucosa, aeruginosa. Cellulae axiales cylindricae, 30–100 μm crassae, 230–320 μm longae. Verticilli pyriformes, in parte vetustiore frondis obconici. Ramuli primarii dichotome vel trichotome ramificantes, ex 6–10 cellulis constantes; cellulae proximales claviformes, 3–6 μm crassae, 9–17 μm longae, cellulae distales fusiformes vel ellipsoideae,

5–8 μm crassae, 9–13 μm longae; pili praesentes, longitudine variantes. Fila corticales bene evoluta. Ramuli secundarii ex 4–10 cellulis constantes, totum internodium obtegentes; cellulae fasciculorum claviformes. Spermatangia globosa, 5–7 μm diametro, in ramulis primariis et secundariis terminalia vel lateralia. Ramuli carpogoniferi e cellulis basi ramulorum orientes, ex cellulis 9–13 disc- vel doliiformibus constantes, tortuosi; carpogonium basi 5–7 μm crassum, apice 5–8 μm crassum, 25–40 μm longum; trichogyne ellipsoidea vel claviformis, plus minusve indistincte pedicellata. Bractee numerosae et breves. Gonimoblastus singulus, verticillum similis et aequans, 150–250 μm altus; fila gonimoblastorum longa, ex 6–10 cellulis fusiformis constantes, laxa agglomerata. Carposporangia globosa vel ellipsoidea, 13–18 μm crassa, 15–18 μm longa.

Fronde monoecious, 7 cm high, 300–370 μm wide, more or less dichotomously branched, moderately mucilaginous, green with a bluish tinge. Axial cells cylindrical, 30–100 μm wide, 230–320 μm long. Whorls pear-shaped or obconical in the aged fronds. Primary branchlets dichotomously or trichotomously branched, consisting of 6–10 cell-stories; proximal cells of fascicles club-shaped, 3–6 μm wide, 9–17 μm long, distal cells fusiform or ellipsoidal, 5–8 μm wide, 9–13 μm long; hairs present, varying in length. Cortical

Figs. 1–15. *Batrachospermum nonocense* KUMANO et LIAO, sp. nov. 1. A part of thallus showing an axial cell, primary branchlets, cortical filaments, secondary branchlets and a carpogonium-bearing branch at very early stage of development; 2. Spermatangia terminal or lateral on secondary branchlets, whose cells are club-shaped; 3–5. Terminal hairs varying in length; 6–7. Carpogonium-bearing branches at very early stages of development; 8–11. Early stages of development of spirally twisted carpogonium-bearing branches with young carpogonia; 12. A carpogonium-bearing branch with a mature carpogonium; 13. A fertilized carpogonium with spermatia; 14. Gonimoblast filaments at a young stage of development and primary branchlets; 15. Carposporangia terminal on gonimoblast filaments, consisting of fusiform cells, containing chloroplasts. (cb: carpogonium-bearing branch, cs: carposporangium, gf: gonimoblast filament, h: hairs, pb: primary branchlet, s: spermatium, sp: spermatangium, tr: trichogyne. Scale bar; 50 μm for Figs. 1, 14; 20 μm for Figs. 2–13, 15)





Map 1. Map of Nonoc Island.

filaments well-developed. Secondary branchlets consisting of 4–10 cell-stories, covering all the internodes; cells of fascicles club-shaped. Spermatangia globose, 5–7 μm in diameter, terminal or lateral on primary and secondary branchlets. Carpogonium-bearing branch arising from the basal cell of the primary branchlet, consisting of 9–13 disc- or barrel-shaped cells, spirally twisted; carpogonium 5–7 μm wide at the base, 5–8 μm wide at the apex, 25–40 μm long; trichogyne ellipsoidal or club-shaped, more or less indistinctly stalked. Bracts numerous but very short. Gonimoblasts single, indistinguishable from the whorl and equal in length, 150–250 μm high; gonimoblast filaments long, consisting of 6–10 fusiform cells, radially branched and loosely agglomerated. Carpospores globose or ellipsoidal, 13–18 μm wide, 15–18 μm long.

Holotype: LARGO and LIAO, 29/III, 1984, Herbarium of Faculty of Science, Kobe University, Japan.

Isotype: LARGO and LIAO, 29/III, 1984, Herbarium of Department of Biology, University of San Carlos, Cebu City, the Philippines (CEBU, abbreviation proposed for Index Herbarium).

Type locality: Nonoc Island, Mindanao, the Philippines.

Distribution: Known from the type locality only.

The hitherto-known taxa of the section *Contorta* constitute two distinct groups, the first group having the curved carpogonium-bearing branch and the second group having the twisted or spirally coiled carpogonium-bearing branch. The second group can be subdivided into two subgroups, the first subgroup having the compactly agglomerated gonimoblasts and

Figs. 16–19. *Batrachospermum nonocense* KUMANO et LIAO, sp. nov. 16. A part of thallus showing obconical whorls with a gonimoblast indistinguishable from the whorl; 17. A part of whorls showing a carpogonium-bearing branch with a mature trichogyne, cortical filaments and secondary branchlets; 18. Gonimoblast filaments hardly distinguishable from primary branchlets; 19. Carposporangia terminal on loosely agglomerated gonimoblast filaments as long as primary branchlets. (cs: carposporangium, g: gonimoblast, tr: trichogyne. Scale bar; 100 μm for Fig. 16; 20 μm for Fig. 17; 40 μm for Fig. 18; 20 μm for Fig. 19)

the second subgroup having the loosely agglomerated gonimoblasts. In having the loosely agglomerated gonimoblast, *B. nonocense* resembles the taxa of the second subgroup such as *B. iriomotense* KUMANO (1982) from Iriomote Jima in subtropical Japan, *B. tabagatenense* KUMANO et BOWDEN-KERBY (1986) from Babeldaob Island of Palau, Western Caroline Islands and *B. nechochoense* KUMANO et BOWDEN-KERBY (1986) from Moen Island and Tol Island of Truk, Eastern Caroline Islands. *B. nonocense* differs from *B. iriomotense* in the size of the thalli and gonimoblasts. In the case of *B. nonocense*, thalli are 300–370 μm wide and gonimoblasts are 150–250 μm high, while for *B. iriomotense* thalli are 150–240 μm wide and gonimoblasts are 70–130 μm high. Moreover, the gonimoblast filaments of *B. nonocense* are so similar to the primary branchlets that it is hard to distinguish the former from the latter by means of low magnifying power microscope, because the loosely agglomerated gonimoblast filaments are as long as the primary branchlets, consisting of 6–10 fusiform cells, which is comparable to the number of cells of the primary branchlets, and many chloroplasts are found in the cells of the gonimoblast filaments as well as in those of the primary branchlets. These characteristics are peculiar to this species, and have not been reported for the other taxa of the section *Contorta*, thus the Nonoc specimen is described here as a new species, *B. nonocense*.

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熊野 茂* L. M. LIAO** : フィリッピン, ノノック島のカワモヅク属, コントルタ節
(紅藻・ウミゾウメン目) の 1 新種。

フィリッピン, ノノック島からカワモヅク属・コントルタ節の 1 新種, *B. nonocense*, が記載された。緩やかに集合する造胞糸を持つ点で, 本種は *B. iriomotense* KUMANO, *B. tabagatenense* KUMANO et BOWDEN-KERBY, 及び *B. nechochoense* KUMANO et BOWDEN-KERBY に似る。しかし, *B. nonocense* の緩やかに集合する造胞糸は, 1 次輪生枝の細胞によく似た紡錘形の細胞で構成され, 1 次輪生枝と殆んど同じ長さであり, 更にその細胞には 1 次輪生枝の細胞に見られるような色素体を含む。従って, 本種の造胞糸は, 低倍率の視野では, 1 次輪生枝と殆んど区別出来ないぐらいに良く似ている。このような形質は本種に特有のものであって, コントルタ節の上記の種には認められない形質であるので, 本種を新種として記載した。(*657 神戸市灘区六甲台 神戸大学理学部生物学教室, **Department of Biological Sciences, University of San Carlos)