Jap. J. Phycol. (Sôrui) 31: 10-15. March 20, 1983

Studies on *Dotyophycus yamadae* (OHMI et ITONO) ABBOTT et YOSHIZAKI (Nemalionales, Rhodophycophyta) from southern Taiwan

Young-Meng CHIANG and Chin CHEN

Institute of Oceanography, National Taiwan University
Taipei, Taiwan, Republic of China

CHIANG, Y.-M. and CHEN, C. 1983. Studies on *Dotyophycus yamadae* (OHMI et ITONO) ABBOTT et YOSHIZAKI (Nemalionales, Rhodophycophyta) from southern Taiwan. Jap. J. Phycol. 31: 10-15.

Dotyophycus yamadae (OHMI et ITONO) ABBOTT et YOSHIZAKI is first reported for Taiwan. Studies on the material at hand showed that it possessed, in addition to the characteristics of this species, some features which had not been mentioned in the original description of this alga or elsewhere: it was dioecious and had a prominent fusion cell at basal portion of the mature cystocarp.

This study not only supports ABBOTT (1976) in that the carpogonial branch in *Dotyophycus* is equivalent to an entire assimilatory filament, but also interpretes each carpogonial branch in the cluster as being a branch equivalent to a branch of an assimilatory filament system.

Key Index Words: *assimilatory filament*; *carpogonial branch*; *cystocarp*; Dotyophycus yamadae; *Nemalionales*; *Rhodophycophyta*; *Taiwan*.

Dotyophycus was described by ABBOTT in 1976 on the basis of the material collected from deep-water of the Hawaiian Islands. She characterized the genus by the origin of the carpogonial branch, manner of the initiation of gonimoblast initial and the subsequent fusion of cells of the carpogonial branch and lower cells of the gonimoblast. So far only two species, *D. pacificum* ABBOTT the type species, and *D. yamadae* (OHMI et ITONO) ABBOTT et YOSHIZAKI reported from southern Japan and the Hawaiian Islands have been included in this genus.

In the course of a study on the family Helminthocladiaceae of Taiwan, we have collected a number of noteworthy algae from southern Taiwan. Among these collections some of *Liagora*-like specimens were found having female reproductive structures similar to those of *Dotyophycus*, and they were identified as *D. yamadae*.

Subsequent examinations of our material showed that it possessed some features which had not been mentioned in the original description of this alga or elsewhere.

Observations

The plants (Fig. 8) at hand are moderately incrusted with lime, but not very lubricous except near the apices. Fronds are caespitose, very often destituting lime at the very base, cylindrical, but somewhat compressed when dried, about 3-4 (6.5; 4.5) cm tall, 1.0-1.5 (1-2.5) mm wide (parenthetical numbers from descriptions of OHMI et ITONO and ABBOTT et YOSHIZAKI, respectively) and repeatedly ramified in a dichotomous manner with narrow axil or rarely in on irregular umbellate manner.

The central axis is composed of rather narrow filaments, and thinner rhizoidal ones. Cells of filaments are nearly cylindrical, about 16 to 32 μm thick. Assimilatory filaments are 5 or 6 times dichotomous or trichotomous.

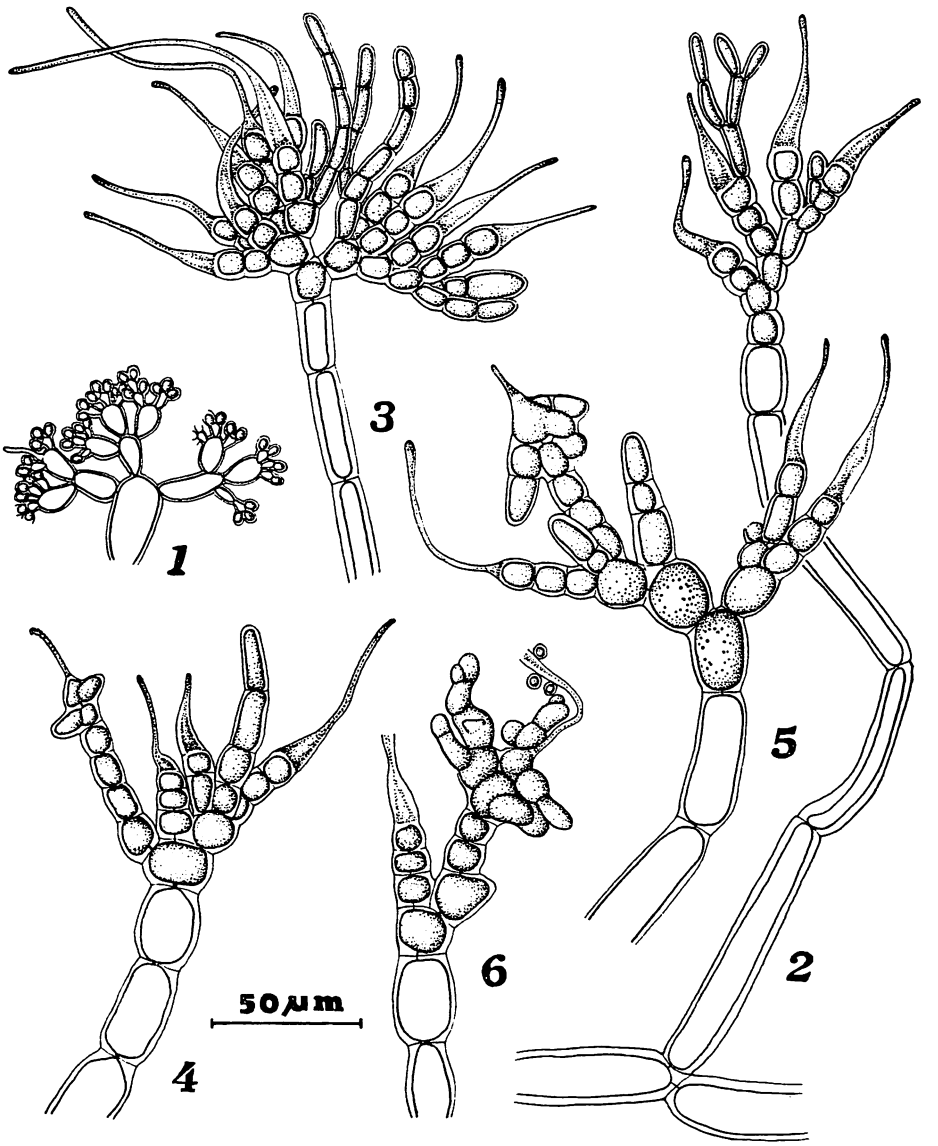

Fig. 1. Spermatangia.

Fig. 2. A cluster of carpogonial branches born on a medullary filament, showing an assimilatory filament arising from the hypogynous cell of a carpogonial branch of the third order.

Fig. 3. A cluster of carpogonial branches, showing as many as 11 carpogonial branches and several assimilatory filaments arising from a medullary filament.

Fig. 4. Gonimoblast initials arising from the two daughter cells of carpogonium, showing only one carpogonium in the cluster fertilized.

Figs. 5-6. Young stages of gonimoblast filaments, showing very little change in appearance of carpogonial branch after fertilization.

Cells in the lower and medial parts of the assimilatory filaments are usually large, inflated and irregular in shape, while those in the upper parts, ellipsoidal or obovoid. Ultimate cells are often provided with short or long colorless hairs. (Fig. 9)

The species is dioecious. Like many species of *Helminthora*, *Liagora* and *Liagoropsis* (cf.

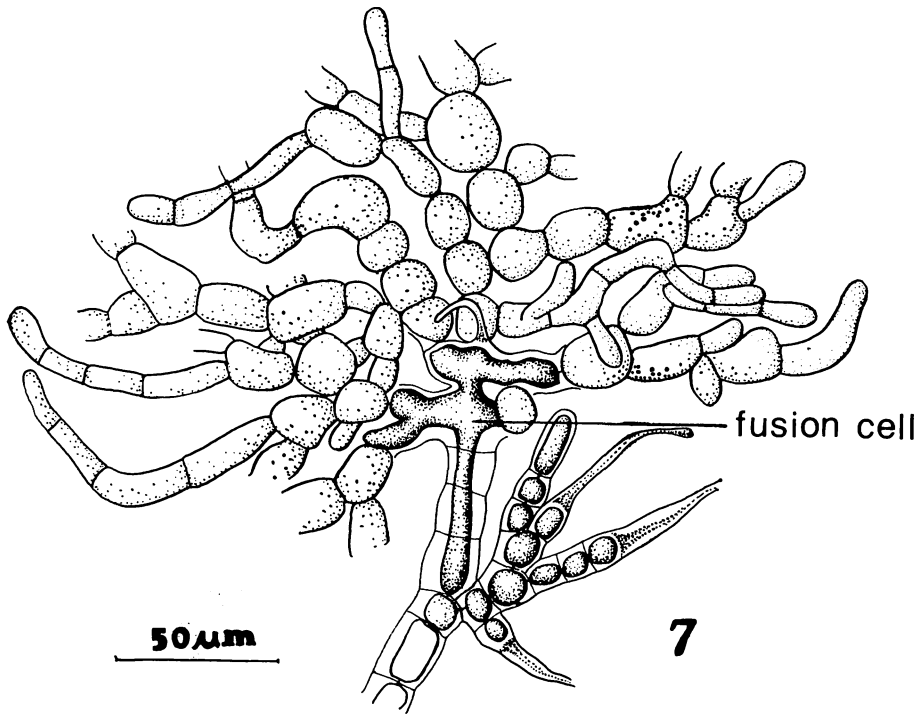

Fig. 7. Basal portion of mature gonimoblast, showing creeping filaments and irregularly branched fusion cell.

CHIANG, 1971), the spermatangia (Fig. 1) of this species are formed on the terminal part of the ultimate cell of the assimilatory filament and crowded in corymbose manner.

Carpogonial branches are composed of 2 to 7, mostly 3 to 5 (3 or 4) cells (parenthetical numbers from OHMI et ITONO's description) and are produced from a special unbranched filament arising directly from medullary filaments (Fig. 2). The supporting cell of the first order of carpogonial branch is usually round to ellipsoidal in shape (Figs. 2-6). From the supporting cell, usually 1 to 3 carpogonial branches, or an assimilatory filament, are produced (Figs. 3-5). In most occasions from the lowest or the cell second to the lowest one of the first order of carpogonial branches, one or two (rarely 3) secondary carpogonial branches, or an assimilatory filament or both are produced (Figs. 2-5). In the same manner the third and fourth orders of carpogonial branches may be laterally produced from the carpogonial branch of the second order or from the assimilatory filament produced from the carpogonial branch (Figs. 2-5), making the number of carpogonial branches up to 10 or more in a medullary filament system (Fig. 3). On rare occasions a single carpogonial branch arising terminally from a branch of an assimilatory filament was also observed (Fig. 9).

Only one carpogonial branch in a cluster of carpogonial branches was fertilized (Figs. 4-7). After fertilization, the carpogonium divided transversely to form two daughter cells, and gonimoblast initials were laterally issued from them (Figs. 4-6). The gonimoblast initials divided to form a profusedly branched, spreading gonimoblast mass (Figs. 6-7). Cells in the lower part of the gonimoblast are usually large, ellipsoidal to obovoid, about 20-25 μm in size and lightly stained. Carposporangia are produced terminally from the upright branches of the gonimoblast (Fig. 11). They are ellipsoidal to ovoid,

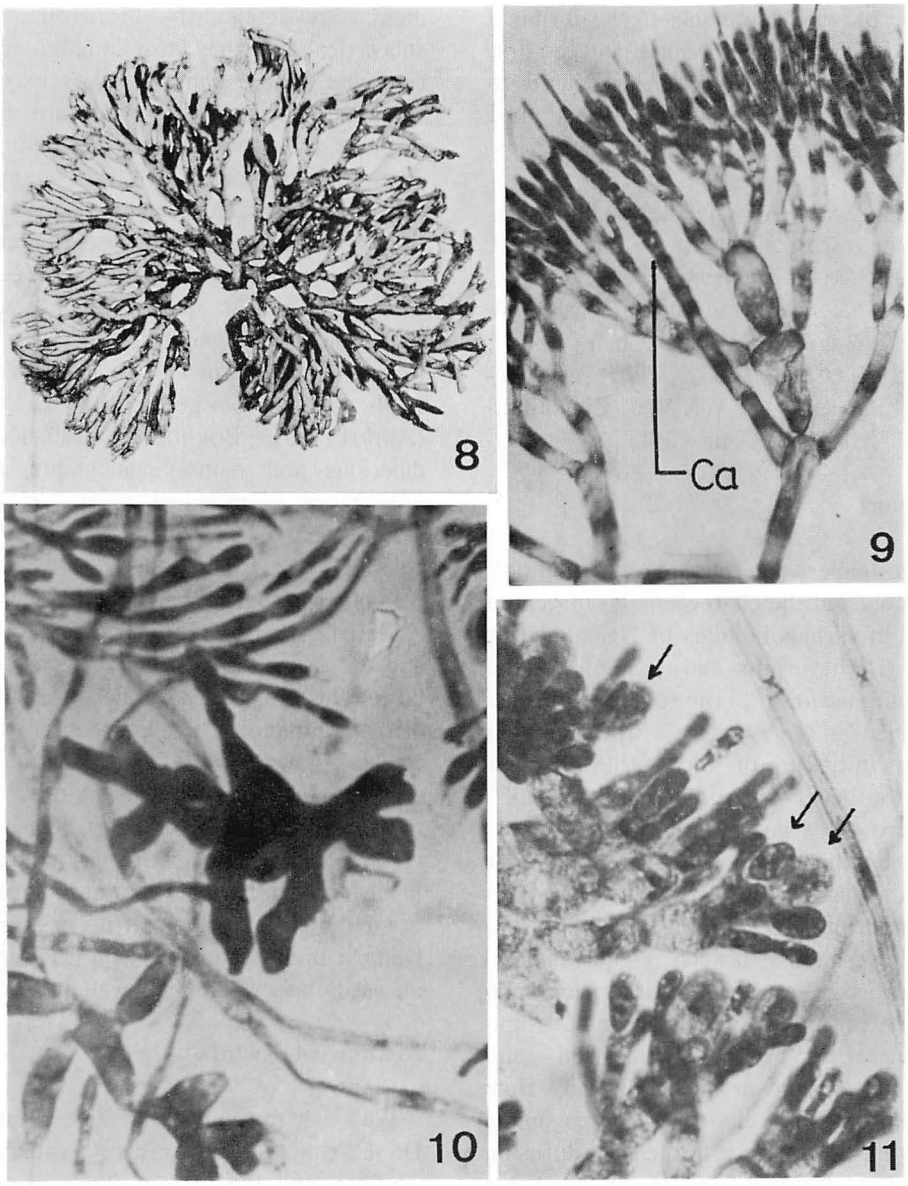

Fig. 8. Habit of a plant, collected at Chuan-fan-shih, Pingtong Hsien, Taiwan. ×1.

Fig. 9. A cluster of assimilatory filaments, showing trichogyne-like hairs and a single carpogonial branch (Ca) which arises terminally from a branch of the cluster. ×400.

Fig. 10. A fusion cell. ×500.

Fig. 11. Upper portion of mature gonimoblast, showing carposporangia arising terminally from erect branches of the gonimoblast and also carposporangia (arrows) whose cytoplasm divides irregularly. ×500.

about 8-12×14-18 μm. Very often the cytoplasm of the carposporangia divides transversely or obliquely in two, or irregularly into four, parts but without clear septation among them (Fig. 11). This phenomenon is also illustrated in Fig. 9 by ABBOTT (1976). No widening of the pit conection between carpogonium and adjacent cells occurred at early stages of the development of the carposporophyte (Figs. 4-6), but at

maturity of the gonimoblast, the terminal cells of the carpogonial branch and the first formed cells of the gonimoblast fused to form an irregularly branched, darkly stained mass at the base of the carposporphyte (Figs. 7 and 10).

Material examined: Chuan-fan-shih, Pingtong Hsien, (21°56'N, 120°48.9'E) 13. V. 1979, Chen 79098♀; 3. V. 1980, Chen 80267a♂, Chen 80267b♀. Nanwan (about 6 km WNW of Chuan-fan-shin), 12. V. 1979, Chen 79087♀; 18. XI. 1979, Chen 79133♀, 79134♀. Tantzu-wan (about 4.5 km WNW of Chuan-fan-shih), 13. XII. 1979, Chen 79145♀.

Discussion

In her paper on *Dotyophycus*, ABBOTT (1976) discussed the characteristics of genera included in various families of Nemalionales. That is (1) the origin and position of the carpogonial branch; (2) the sequence of early development in the zygote; (3) the time and place of initiation of the sterile filament around the developing gonimoblast and (4) the nature of carposporangia.

Based on these four points, we found that our plants fit very well with the characteristics of the genus *Dotyophycus*. That is: (1) the carpogonial branch is equivalent to an entire assimilatory filament, arising from the medulla in the same fashion as an assimilatory filament; (2) after fertilization, gonimoblast initials are produced laterally from the two daughter cells of the carpogonium and divide to form a branched, diffusing gonimoblast mass; (3) no sterile filaments are produced in the vicinity of the developing gonimoblast, nor around the mature cystocarp and (4) carposporangia are produced terminally from the erect branches of the gonimoblast.

So far only two species, *D. pacificum* ABBOTT and *D. yamadae* (OHMI et ITONO) ABBOTT etYOSHIZAKI, are included in this genus. From ABBOTT and YOSHIZAKI (1981), we find that our plants resemble the latter in: (1) carpogonial branches which usually have several laterals; (2) assimilatory filaments are irregularly branched; (3) the subcortical layer has large, inflated, irregular cells and (4) the gonimoblast is extensively spread. However our plants are dioecious whereas the Japanese ones are monoecious. A prominent fusion cell (Figs. 7 and 10) is usually present at the basal portion of the cystocarp in our plants whereas none or an obscure one (cf. ABBOTT et YOSHIZAKI 1981) are present in those collected from Japan and the Hawaiian Islands respectively. Since some species of *Trichogloea* (PAPENFUSS, 1946) and *Liagora*, such as *L. farinosa* (ABBOTT, 1945; BOERGESEN, 1949), have both dioecious and monoecious plants, and no importance is attached to it (ABBOTT et DOTY 1960). We thus regard our plants belonging to *D. yamadae*.

In our plants a carpogonial branch usually repeatedly issues other carpogonial filaments and/or assimilatory filaments to form a large cluster (Fig. 3) which is reminiscent of the assimilatory filaments constructing the cortical layer. This kind of carpogonial cluster not only supports ABBOTT (1976) that the carpogonial branch of *Dotyophycus* is equivalent to an entire assimilatory filament but also indicates that each carpogonial branch in the cluster can be interpreted as being a branch homologous with a branch of an assimilatory filament system.

Acknowledgements

We wish to express our sincere thanks to Dr. I. ABBOTT for her many valuable suggestions and the loan of the manuscript of ABBOTT and YOSHIZAKI's paper.

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江　永棉・陳　　晴：台湾産ニセコナハダ（紅藻ウミゾウメン目）

本種が台湾から初めて記載報告された。得られた標本では原記載を初めこれまでの報告で記述されていないいくつかのことがわかった。すなわち雌雄異株であることと成熟した嚢果の基部に顕著な癒合細胞がある。この研究はニセコナハダのカルポゴン枝は同化系に相当し，各カルポゴン枝は同化系組織の枝に相当するというABBOTT (1976) の見解を支持している。（中華民国台湾台北国立台湾大学海洋研究所）