A NEW SPECIES OF *BASICLADIA* FROM THE SNAIL *VIVIPARUS MALLEATUS* REEVE

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The Genus *Basicladia* of the Chlorophyta has been known for its specificity of habitat; the carapace of turtles. The alga was first described from turtles collected in Michigan by Collins (1907) who placed it in the Genus, *Chaetomorpha*. In 1909 he again reported it from turtles collected in Massachusetts and Tiffany (1926) reported it from Iowa.

Hoffman and Tilden (1930), studying material collected in Minnesota, noticed a regular tendency of branching in the basal holdfast cells of the algae. This basal branching, which was also described by Collins (1907), did not correlate with the characteristics of *Chaetomorpha*. The alga was redescribed as the Genus, *Basicladia*.

The genus contained two species which were separated by the diameter of the coenocytes and the relative length of the filaments. *Basicladia crassa* Hoffman and Tilden, has a coenocyte diameter range of 50 to 120 μ while the filament length ranges up to 2 cm. *Basicladia chelonum* (Collins) Hoffman and Tilden has a coenocyte diameter range of 20 to 35 μ from the base to the apical cell, and a filament length of approximately 2 mm. Later, N. L. Gardner (1937) described a new alga, *Chaetomorpha sinensis*, which G. M. Smith (1950) reassigned to the genus *Basicladia*. *Basicladia sinensis* (Gardner) G. M. Smith has a coenocyte diameter range of 60 to 95 μ while the filament length ranges from 8 to 12 cm. The members of this genus have cells which are irregular, anastomosing, and with rhizoidal tendencies. The upright filaments arise sporadically from the holdfast cells. The individual coenocytes of a filament become shorter and broader from basal to apical region resulting in a definite clublike appearance. Zoospores escape through a lateral pore from sporangialike cells usually located in the upper part of the filament.

On June 21, 1956, a specimen of *Viviparus malleatus* Reeve was taken from Terwillegar's Pond on South Bass Island, Lake Erie. Routine examination of the algae growing on the shell disclosed one that resembled a described species of the Genus, *Basicladia*. This was odd as the known species of the genus were well-known for their specificity of habitat; the carapace of turtles. This discovery instigated a more intense study of the alga.

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The alga consisted of clumps of nonbranching upright filaments having approximately 12 to 20 cells. The gross appearance of the clump is extremely diminutive and appears as "moss patches" under a magnification of 150 X. The shape of the cells is distinctive as they become progressively shorter and boarder towards the apex of the filament. This results in the characteristic clublike outline which is characteristic of the genus and is in direct correlation to the described species on turtles.

The upright filaments arise from a loose basal mat composed of irregular cells which exhibit a tendency towards polygonal outline. The basal cells create a bed of anastomosing, rhizoidal-like branches which produces the "moss patch" effect on the substrate. The upright filaments arise indiscriminately from the individual cells of the basal mat. The chloroplast is smooth in the lower vegetative cells but is granulated and coarse in the upper coenocytes of the filament. However, the chloroplast is a reticulum in both when observed under oil immersion. These granulated cells progress from ovular in the mid-filament region to sperhical at the distal end. Many of the cells have a small, lateral, papillose swelling that later terminates in a pore. They should probably be considered as being sporangia. This is in agreement with the description of the turtle species by Hoffman and Tilden.

The habitat of the host snail, *Viviparus malleatus*, is a small, shallow pond which is continuous with Lake Erie by means of a narrow channel. The pond is fairly well infested with both emmergent and submerged aquatic vegetation, and the bottom consists of mud and silt. At times, heavy wind action on the lake indirectly causes periods of water-level fluctuation and turbidity in the pond. The host snails, for the most part, are distributed along the shallow west and south pond margins. Most of the specimens collected were covered with a liberal amount of silt and mud.

The following culture system was adopted in an attempt to determine whether the alga discovered on the snail constituted a new and separate species of the Genus, *Basicladia*. Several slant cultures, of both the snail and turtle species, were prepared utilizing an inorganic agar base and the sterilized scrapings from the shells of both the host snail and turtles. Three patches per culture tube of either turtle or snail periostricum scrapings were placed directly on the agar. The tubes were then innoculated with a *Basicladia* specimen. Control tubes containing only the agar base were also prepared. All the tubes were kept moist and plugged with sterile cotton. The types of cultures and the respective results are given below. In each instance the word "Material" indicates the respective shell scrapings.

1. *Snail* Basicladia *on Snail Material.*—The alga grew very well. The filaments increased in length from approximately 50 μ to 370 μ. At this point linear growth ceased although the nutritive material seemed to be plentiful. The upper coenocytes increased in width and attained a sperhical shape. The chloroplast became granulated and the whole seemed to resolve into a sporangium. At this point a tendency existed for the filaments to break into their component coenocytes. This particular condition was observed in all cultures whether they were of the snail or of the turtle species.

2. *Snail* Basicladia *on Turtle Material.*—The alga grew very well but did not attain a size beyond that of an average filament from the host snail. The filaments and the individual coenocytes behaved as those in culture type 1.

3. *Turtle* Basicladia *on Snail Material.*—The alga did not exhibit any appreciable growth although it continued to survive. It is possible that a growth substance exists in the snail material and that it supplies only the minimum requirements for this particular species. This limiting factor, if such a factor exists at all, may explain the absence of the turtle species of *Basicladia* on the *Viviparus* snail.

4. *Turtle* Basicladia *on Turtle Material.*—The alga grew very well and completely covered the patches of carapace scrapings. The filaments attained an approximate length of 1/6 cm.

5. *Snail* Basicladia *on Plain Agar Base.*—The alga did not grow at all. At the end of approximately 30 to 40 days it died.

The dimensions of the filaments, as well as those of the individual coenocytes, were distinctly different than those of the known *Basicladia* species. The coenocyte diameter ranged from 5 to 28 μ from basal to apical coenocyte. An average filament was approximately 0.3 mm in length from primary to apical coenocyte.

Since the morphological characteristics of this epizooic alga on the snail correlated definitely with the requirements of the Genus, *Basicladia*, it was identified with this genus. However, since the habitat of this alga is opposed to the known specific habitats of the described species, *B. sinensis*, *B. crassa*, and *B. chelonum*, and the diagnostic diameter size range is definitely below these species, and furthermore, since the cultures showed that the snail alga was specific and unique to its type habitat, the alga is proposed as a distinct and new species of the Genus, *Basicladia.*

Summary of Species

On Turtles:

1. Upright filaments reaching a diameter of 60–95 μ; filament length 8–12 cm..... *B. sinensis*
2. Upright filaments reaching a diameter of 50–120 μ; filament length 1–2 cm..... *B. crassa*
3. Upright filaments reaching a diameter of 35 μ or less; 12–20 μ at base *B. chelonum*

On Snail, Viviparus malleatus:

4. Upright filaments reaching diameter of 28 μ or less; 5–10 μ at base..... *B. vivipara*

Basicladia vivipara sp. nov.

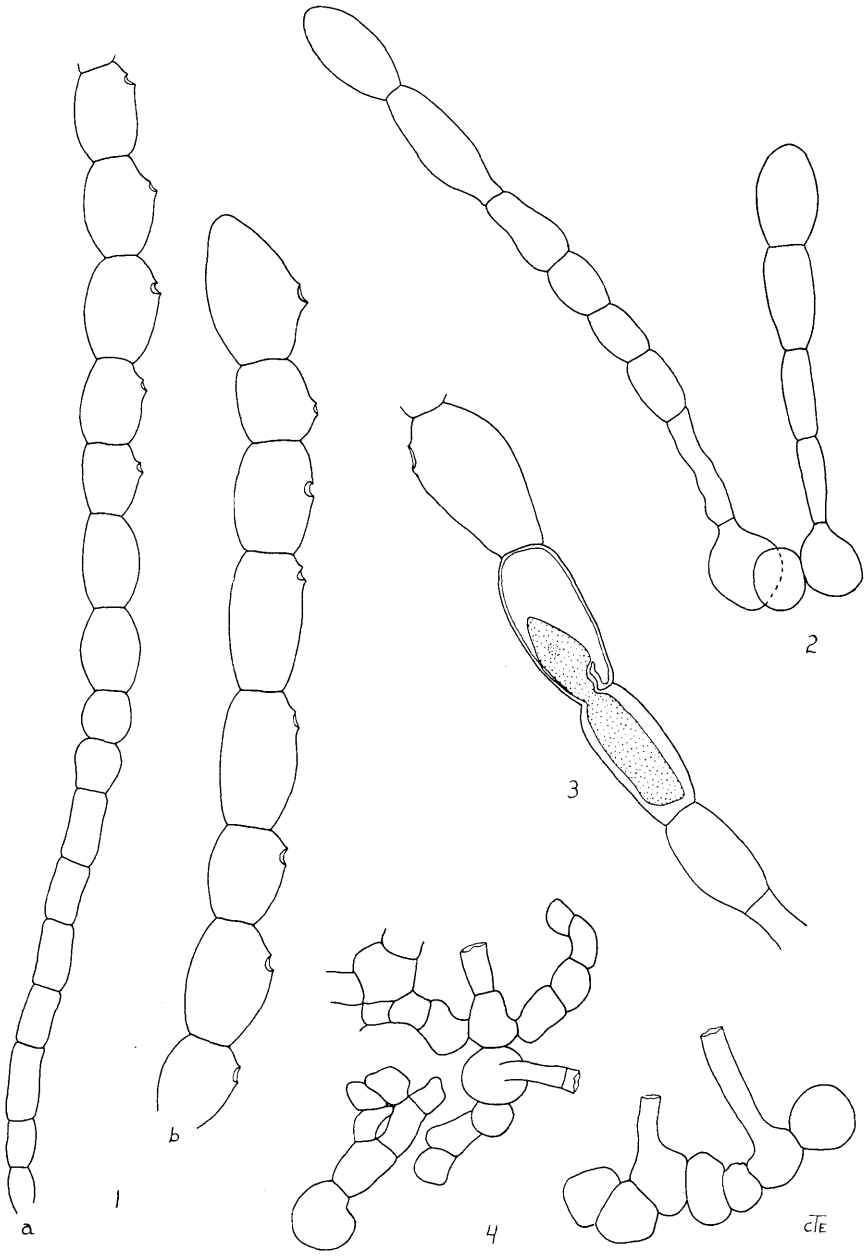
Filamentis erectis 0.3 to 0.35 mm alta; filamentis amplis, septatis, prostratis, irregularibus plus minusve ramosis adjunctis; filamentis substrato superficiebus adhaerentibus; filamentorum erectorum segmentis basim 5 to 10 μ diametro, superne diametro 28 μ.

Filaments green; upright filaments fairly rigid, clubshaped, clumped; individual coenocytes of filaments becoming shorter and broader from base to apex; chloroplast of basal coencyte smooth under low magnification, reticulate under oil immersion; chloroplast of medial to apical coenocytes coarse and granulated; apical cells become sporangia; filament length approximately 0.3 to 0.35 mm; coenocytes diameter 5 to 28 μ from base to apical coenocyte, basal coenocytes 5 to 10 μ; upright filaments nonbranching, primary basal coenocyte confluent with coenocytic substrate mat; mat showing rhizoidal tendencies; upright filaments arising indiscriminately from rhizoidal cells; rhizoidal cells irregular with polygonal tendencies, diameter range 1.2 to 12.2 μ.

Habitat: Shell of *Viviparus malleatus*, Terwillegar's Pond, South Bass Island, Put-in-bay, Ohio. Collected June 21, 1956 by Elizabeth Williams.

Type: At The Ohio State University, Botany and Zoology Departments, Columbus, Ohio.

Basicladia vivipara thrives on the snails during the summer months, but by the end of this period the filaments seemed to be disappearing. During the winter months the host snail, which was kept in an aquarium, was subjected to fairly continuous light and a constant temperature. Examination of the shell of the snail showed what appeared to be rhizoidal mats, but no filamentous growth was observed. Shortly thereafter the snail died. Growth over a short period



EXPLANATION OF FIGURES IN PLATE

1. a-b. Mature, erect filament showing lateral pores.
2. Young filament showing attachment to basal cells.
3. Portion of mature filament showing protoplast of one cell entering the cell above. Note the broken cross wall.
4. Prostate branching system showing the remains of four upright filaments.

was observed during the spring on the empty shell that had been left in the aquarium. The shell was degenerating, and the green clumps soon disappeared. It is significant that the alga growth was observed only on the larger snail specimens collected. There is a possibility that the periostricum of the snail shell contains a growth factor for the characteristic growth of this alga. Its presence in sufficient quantity on the large snail versus that on a small snail is directly correlated with the previous observation. With this fact in mind, a turtle should be a suitable habitat for the species. Perhaps it does exist in such a habitat, but due to its minute size it has been overlooked.

The questions pertaining to the life history, distribution, and growth-host-size relationship warrant further study. It is hoped that present information can be supplemented by further investigation.

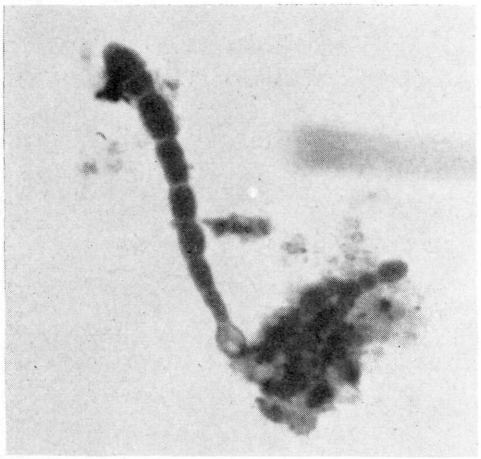


FIGURE 5. Photomicrograph of *Basicladia vivipara* Normandin and Taft showing the club-like appearance of the filament (Approx. ×128).

SUMMARY

In June 1956 a specimen of the snail *Viviparus malleatus* Reeve was obtained from a pond on South Bass Island, Lake Erie. An alga growing on the snail shell was identified with the Genus, *Basicladia* described by Hoffman and Tilden (1930). This habitat is new for this genus which previously had been recorded as being present only on the carapace of turtles.

The alga was cultured in an effort to determine whether it represented a new species for the genus. The culture technique consisted of agar slant tubes upon which were placed sterilized shell scrappings from both turtles and the *Viviparus* snail. The tubes were then innoculated with the alga.

It was determined from these cultures that the alga was unique and specific to the genus both in species characteristics and habitat. It was described as the species *Basicladia vivipara.*

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