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A Note on the Increase in Flake Size of *Aphanizomenon Flos-Aquae* (L) Ralfs

By JOHN D. DODD

Aphanizomenon flos-aquae is a blue green alga which forms a conspicuous part of the algal bloom in many of Iowa's lakes. It is associated with species of *Anabaena* and *Microcystis*; these three genera being widely known as "Fanny, Anny and Mike". The compound colonies of *Aphanizomenon*, which consist of hundreds of laterally coherent filaments lying in approximately one plane, have the macroscopic appearance of lawn grass clippings floating in the water. Although this organism is well known and has been well described, a somewhat spectacular aspect of its growth and reproduction is not touched upon in discussions which are readily available.

Rose (1934) described spore germination and early flake formation under laboratory conditions. Shortly after germination, groups of filaments were observed to be coherent in the form of small flakes. During a discussion with Mr. Rose, in the summer of 1952, he indicated that he had never had an opportunity to analyze satisfactorily the method by which these microscopic flakes increased in size to the macroscopic forms which consist of hundreds of filaments. Since this organism has an economic significance, it seemed that this aspect of the growth of *A. flos-aquae* might be examined further.

Shortly thereafter, Prof. L. H. Saxe, Jr., (SUI) and I had a chance to observe freshly collected material from the drainage water of East Lake Okoboji. We were impressed with the rapid changes in the shapes of the flakes due to the movements of the individual filaments. At one time a given flake might be 2 - 3 mm. long and half that width. As the filaments glided over one another this flake might stretch out and assume a slender, snake-like shape well over 10 mm. long. In a period of less than 5 minutes the same flake might stretch out, reverse direction, return to an approximation of the original shape, and then stretch out in the opposite direction.

All the filaments seem to be in motion at the same time, but those on one side of the flake move in the opposite direction from those on the other side. Each filament seems to move along the surface of its inner neighbor which is, in turn, moving along the surface of the filament interior to it. As a result, the cumulative

rate of movement through space of the outermost filaments is greater than that of those in the interior. When a flake is completely stretched out, the filaments reverse direction and move back toward the middle. At the time of maximum stretching, filaments at one end may be separated from filaments at the other end by several times their own lengths. When they reverse, they slide past each other and the width of the flake is thus increased.

As is typical of non-branching, filamentous blue-green algae, cell division occurs in one plane only, resulting in an increase in length of the filaments. The number of filaments in a flake is increased by the breaking of existing filaments. (In *Aphanizomenon*, the breaking point is usually at some point between heterocysts.) For a short time the fragments of the broken filaments (hormogonia) remain in approximately the same spatial relationship to one another. However, they continue to increase in length by cell division and to glide over adjacent filaments. As the whole flake continues to change shape they become separated and, eventually, may slide past each other. The shape of a flake is normally inconstant; the maximum measurement of each of the two major dimensions is reached in alternating fashion and is a function of both the total number of filaments and the number of cells per filament. The number of flakes is increased by mechanical fragmentation of existing flakes.

No information was obtained from these observations with respect to the very interesting physiological problems concerning movement of the filaments and their coherence into a flat plate. It was noted, however, that the movements practically ceased after a few hours' storage under laboratory conditions.

Literature Cited

- Rose, Earl T. 1934. Notes on the life history of *Aphanizomenon flosaquae*.
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