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The Frustular Morphology and Distribution of Cyclotella gamma Sov. (Bacillariophyceae)

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Diatom collections from several lentic aquatic habitats in northern lower Michigan were found to contain a large benthic centric diatom. Comparison with type material revealed this diatom to be Cyclotella gamma Sov. Specimens ranged in size from 20 to 35 µm and had striae densities of 5 to 8 in 10 µm. Valves are granular externally and possess central and marginal strutted processes internally; as well as a single, well-developed labiate process. The striae are alveolate in nature. Cyclotella gamma is probably more common than records indicate which may in part be attributable to its confusion with C. meneghiniana Kütz.

INDEX DESCRIPTORS: Diatoms, Cyclotella, frustule morphology

DEDICATION

It is with the greatest respect that I salute the long productive career of John D. Dodd. Because of his love of botany and his unique perception of "the nature of things," many individuals have become psychological captives of life through the microscope. Thank you, Professor Dodd, for providing the support, stability, and, most of all, the freedom, to develop and exercise curiosity.

Cyclotella gamma Sov. was first described in 1963 from samples collected in Lake Killebrew, San Juan County, Washington (Sovereign, 1963). This taxon has not been reported from any diatom surveys since the original description even though the frequency of diatom surveys has increased greatly in the past 15 years. During recent surveys in several lakes in northern lower Michigan, a large benthic species of Cyclotella was encountered. Careful examination revealed this diatom to be C. gamma (although this taxon is probably rather broadly distributed) which is the first report of its occurrence outside the type locality. It is my objective in this paper to discuss the distribution and frustular morphology of C. gamma.

MATERIALS AND METHODS

In the past six years (1974-79) a wide variety of aquatic habitats in northern Michigan were sampled. Many of these samples were taken in conjunction with teaching duties at the University of Michigan Biological Station. Collections were primarily benthic and usually epipelic or epilithic. In two instances collections were planktonic. Diatoms were cleaned by the hydrogen peroxide method of Werff (1955) and mounted in Hyrax. Samples were scanned and those containing specimens of C. gamma were analyzed to determine the relative abundance of this taxon. This analysis included the enumeration of 500 diatom frustules in a microscope. Samples for scanning electron microscopy were cleaned in a similar manner and stored on a #1 coverglass which was later bonded to an aluminum specimen stub with Tube Coat and coated with 150 Å of gold with a glow discharge sputtering device. Specimens were examined and photographed on an Hitachi HHS-2R scanning electron microscope. For purposes of comparative morphology, isotype specimens of C. gamma were obtained from the Sovereign collection at the California Academy of Sciences.

RESULTS

Distribution

Of the 27 aquatic habitats examined, C. gamma occurred in the following 7: Douglas and Burt Lakes from epipamnic communities, Dog, Cochran and Wycamp Lakes from artificial polyeurythane substrates, Lancaster Lake from epipelic communities, Long Lake from mixed benthic samples and Lakes Huron and Superior from near-shore plankton tows. In all samples analyzed C. gamma comprised less than 1% of the total community. These data suggest that this taxon is primarily a benthic form as it rarely appears in the plankton of these lakes. The occurrence of C. gamma in the plankton of Lakes Huron and Superior is possibly a phenomenon of periodic suspension of benthic forms. Florin (1970) illustrated a specimen of what appears to be C. gamma from Kirchner Marsh in southeastern Minnesota which she identified as Cyclotella meneghiniana Kütz.

DISCUSSION

Cyclotella gamma is probably widely distributed as a benthic alga of lentic habitats in the northern United States but its similarities to C. meneghiniana have conceivably contributed to the lack of distribution records. Cyclotella meneghiniana has many characteristics in common with C. gamma including a very similar valve ornamentation and an overlapping of the size ranges. Both taxa have striae composed of 2 or 3 parallel rows of punctae (Lowe, 1975). The central areas of both are ornamented by I to several isolated strutted processes. However, only C. gamma has the small granules dispersed over the valve surface.
Fig. 1, 2. Light micrographs of C. gamma; bar = 10 µm. Fig. 3. Scanning electron micrograph of external valve surface; bar = 5 µm. Fig. 4. Scanning electron micrograph of internal valve surface; bar = 5 µm. Fig. 5. Valve margin and labiate process; bar = 1 µm.
which have been a constant feature of northern lower Michigan specimens. Internally both taxa have marginal strutted processes on the costae and a single well developed labiated process. *Cyclotella meneghiniana* does not possess the internal siliceous membrane that covers a large portion of the striae in *C. gamma* which facilitates taxonomic separation with light microscopy.

*Cyclotella gamma* is morphologically most closely related to species of this genus with alveolate striae (Lowe, 1975). These species include among others *C. michiganiana* Skv., *C. operculata* (Ag.) Kütz, *C. kutzingiana* Thwaites and *C. comensis* Grun.

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REFERENCES


