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Notes on Iowa Diatoms

I. An Interesting Collection from a Moss-Lichen Habitat¹

JOHN D. DODD² AND EUGENE F. STOERMER²

Abstract. A diatom flora associated with a lichen (*Collema* sp.) and various mosses on a sandstone outcrop in Boone County, Iowa, is analyzed. Species rated "common in collection", are *Melosira roseana* Rabh., *Pinnularia lata* Breb., *Navicula gibbula* Cleve, *Navicula mutica* Kutz., *N. mutica*, var. *Cohnii* (Hilse) Grun., *Navicula contenta* var. *biceps* Arnott, *Achnanthes* (*Achnanthidium*) *coarctata* Breb., and *Hantzschia amphioxys* (Ehr.) Grun. Less common species are *Hantzschia amphioxys* var. *major* Grun., *Caloneis bacillum* (Grun.) Meresch, *Neidium knuthii*, var. *heilprinensis* Foged, *Navicula mutica* var. *nivalis* (Ehr.) Hustedt, and *Navicula fritschii* Lund. The occurrence of several isolated valves of *Hantzschia* possessing numerous spines is noted.

In 1960, a project entitled, "Ecology of Diatoms in Hardwater Habitats", was initiated under the general supervision of the senior author. This project has three phases: 1. An investigation of the diatoms of Lake Okoboji, Iowa, involving a comparison of the modern flora with the fossil flora found in post glacial sediments.

2. An investigation of the diatoms of the Des Moines River involving possible correlations between species composition and various environmental factors.

3. An investigation of the diatoms occurring in farm ponds with

¹ The project of which this investigation is a part receives support from the National Institutes of Health, Division of Water Supply and Pollution Control.

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consideration of possible effects of diatom populations on the potability of such waters.

It is intended that each of these phases will result in a doctoral thesis and/or a major publication. However, it is expected that many interesting habitats with specialized diatom floras will be encountered during the progress of the investigations noted above. Brief reports of such collection will be made from time to time in the form of "Notes on Iowa Diatoms". The information accumulated in such notes will serve in conjunction with that derived from the major investigations as a basis for an eventual survey of Iowa diatoms, one of the few "deserts" of biological information remaining in the state.

The present report stems from a collection made in the vicinity of Table Rock, in Ledges State Park, Boone County, Iowa, on October 28, 1961. A dark colored, gelatinous material growing among mosses on a sandstone outcrop was presumed to be a species of *Nostoc* and was collected for class use. Closer examination revealed that the material was, actually, a species of lichen in which *Nostoc* is the algal component. The lichen was identified by Miss Karen Juhl as belonging to the genus, *Collema*. Microscopic examination revealed that an interesting diatom flora inhabited the surfaces of the lichen and the interstices between the bases of the mosses and lichens. Inasmuch as this collection contains some "rare" species and at least one species which is a new record for the United States, this brief report is deemed worthwhile. The collection has been assigned the reference number 61-10-28-81.

The material was prepared for critical examination using a method described by van der Werff (1958). First, the sample was "cleaned", i. e., all organic matter was removed, leaving only the siliceous frustules, by treating with 30% hydrogen peroxide to which a small amount of potassium dichromate was added. Following the cleaning process the sample was "washed", i. e., distilled water was added and the diatoms were allowed to settle out. The supernatant fluid was decanted and the whole process repeated at least once. A drop of water containing suspended diatoms was placed on a cover slip and allowed to dry in air at room temperature. When fully dry the cover slip was inverted over a drop of heated Hyrax on a slide. Upon hardening a permanent slide resulted.

The species identified in the collections are listed in Table 1 with an indication of the reference work used in each determination. Certain of the species are illustrated in Figures 1-13.

DISCUSSION

The only centric diatom in this collection is *Melosira roseana*,

a species common in such habitats. Many of the specimens appear on the slides with valves uppermost. This is of interest to the

Table 1
Species of diatoms occurring among mosses and lichens near Table Rock
in Ledges State Park, Boone County, Iowa.

Species (species common on slides)	Authority Used in Determination of Species	Figure Number
<i>Melosira roseana</i> Rabh.	Hustedt (in Rabh.)	13
<i>Pinnularia lata</i> Breb.	VanHeurck (1880-81) (Plate Vi, fig. 1)	4
<i>Navicula gibbula</i> Cleve	Hustedt (in Rabh.)	3
<i>Navicula mutica</i> Kutz.	Hustedt (in Pascher)	6-8
<i>N. mutica</i> var. <i>Cohnii</i> (Hilse) Grun.	Hustedt (in Pascher)	—
<i>Navicula contenta</i> var. <i>biceps</i> Arnott	Hustedt (in Pascher)	2
<i>Achnanthes</i> (<i>Achnantheidium</i>) <i>coarctata</i> Breb.	Hustedt (in Pascher)	1
<i>Hantzschia amphioxys</i> (Ehr.) Grun. (species occurring once or a few times per slide)	Hustedt (in Pascher)	12
<i>Hantzschia amphioxys</i> var. <i>major</i> Grun.	Hustedt (in Pascher)	—
<i>Caloneis bacillum</i> (Grun.) Meresch	Hustedt (in Pascher)	—
<i>Neidium knuthii</i> var. <i>heilprinensis</i> Foged	verified by Dr. Charles Reimer	10
<i>Navicula mutica</i> var. <i>nivalis</i> (Ehr.) Hustedt	Hustedt (in Pascher)	5
<i>Navicula fritschii</i> Lund	Lund (1946)	9

senior author in particular since *Melosira* frustules usually are oriented with girdle bands uppermost and this is the first species in our varied collections in which the valve view may be examined readily.

The rest of the species are pennate diatoms and, in all cases, are species with one or both valves having a true raphe, i.e., no members of the *Araphidineae* are present. The significance of this point is discussed in the following paper (Stoermer, 1962) as well as in such papers as those of Hayek and Hulbary (1956), and Lund (1945).

The report of *Navicula gibbula* constitutes, insofar as can be determined, a new record for the United States. This may be true, also, for *Navicula fritschii*. However, the single specimen of this species was not encountered until recently and time for a thorough search of the literature was not available.

Assignment of the *Pinnularia* species to *P. lata*, rather than to *P. borealis* (Ehr.) was based on the close similarity of our specimens to the illustration of Van Heurck (1880-85, Plate VI, Fig. 1). The illustrations of Hustedt (1930) indicate easily recognizable distinctions but he notes in his descriptions that some forms of these species are difficult to distinguish.

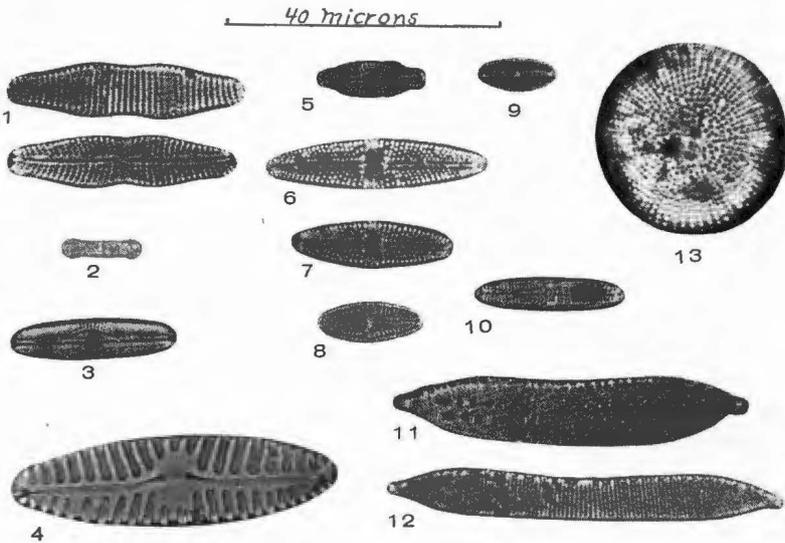


Figure 1. *Achnanthes coarctata* Breb. (pseudoraphe valve and raphe valve).
 Figure 2. *Navicula contenta* var. *biceps* Amott.
 Figure 3. *Navicula gibbula* Cleve
 Figure 4. *Pinnularia lata* Breb.
 Figure 5. *Navicula mutica* var. *nivalis* (Ehr.) Hustedt
 Figures 6-8. *Navicula mutica* Kutz.
 Figure 9. *Navicula fritschii* Lund.
 Figure 10. *Neidium knuthii* var. *heilprinensis* Foged.
 Figure 11. *Hantzschia* sp. ? (with spines on valve surface).
 Figure 12. *Hantzschia amphioxys* (Ehr.) Grun.
 Figure 13. *Melosira roseana* Rabh. (possibly an immature auxospore).

As is evident in figures 6-8, *Navicula mutica* is a species exhibiting considerable variability in size and shape. It was reported by Lund (1946) to be one of the most common soil diatoms. *N. mutica* var. *nivalis* (Fig. 5) is a much rarer form.

Several specimens similar to the valve of *Hantzschia* sp.? illustrated in figure 11 were noted. They are of interest because of the presence of numerous spines on the valve surface. In one instance a pair of such valves was seen to enclose a more "normal" frustule. The possibility that the whole apparatus represents a drought survival mechanism warrants further investigation.

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Notes on Iowa Diatoms II. Species Distribution in a Subaerial Habitat.¹

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Abstract. A collection made near the base of a small waterfall in Marion County, Iowa, was examined. A total of 22,294, specimens of diatoms were studied and found to include 40 species and varieties representing 13 genera. It was found that approximately half of the entities determined are well represented in the local aquatic flora. The remainder comprise entities described by previous authors as being characteristically found in northern, alpine, or aerial environments. In the case of five of the entities no specific determination was made.

The collections from which this study was made were obtained from the vicinity of a small waterfall, locally known as South Falls, located in Section 21, Township 76 N, Range 18 W; near the town of Pella in Marion County, Iowa. Material was collected from a gelatinous growth of diatoms and bluegreen algae that extended about one meter upwards on the undercut rock face of the falls from the small pool at its base. This area is evidently furnished with considerable moisture as spray from the falls and seepage water from the rock strata.

After collection the material was cleaned and mounted by standard methods. These involve the oxidation of organic matter by treatment with 30% H₂O₂ and potassium dichromate and mounting in Hyrax, a mounting medium of high refractive index.

In order to determine the distribution of species present in this rather specialized habitat the following procedure was used. A slide with an evenly distributed population was prepared from the cleaned material and observed under oil immersion (11-25X). A series of traverses were made across the slide by means of the mechanical stage on the microscope. All specimens that fell within the field of view were identified and counted. Five

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