

1963

Notes on Iowa Diatoms IV. : The Diatoms in a Northwest Iowa Fen

W. Randall Shobe

University of Kansas City

Eugene F. Stoermer

Iowa State University

John D. Dodd

Iowa State University

Let us know how access to this document benefits you

Copyright ©1963 Iowa Academy of Science, Inc.

Follow this and additional works at: <https://scholarworks.uni.edu/pias>

Recommended Citation

Shobe, W. Randall; Stoermer, Eugene F.; and Dodd, John D. (1963) "Notes on Iowa Diatoms IV. : The Diatoms in a Northwest Iowa Fen," *Proceedings of the Iowa Academy of Science*, 70(1), 71-74.

Available at: <https://scholarworks.uni.edu/pias/vol70/iss1/16>

This Research is brought to you for free and open access by the IAS Journals & Newsletters at UNI ScholarWorks. It has been accepted for inclusion in Proceedings of the Iowa Academy of Science by an authorized editor of UNI ScholarWorks. For more information, please contact scholarworks@uni.edu.

Offensive Materials Statement: Materials located in UNI ScholarWorks come from a broad range of sources and time periods. Some of these materials may contain offensive stereotypes, ideas, visuals, or language.

NOTES ON IOWA DIATOMS IV.

The Diatoms in a Northwest Iowa Fen¹

W. RANDALL SHOBE², EUGENE F. STOERMER³ and JOHN D. DODD³

Abstract. The physical features of a fen are discussed including chemical and physical analyses of the water. Diatom samples were taken during the summer of 1962 and a list of 48 species distributed among 20 genera was compiled. A series of photomicrographs of some of the species is presented. Ecological and floristic differences between cold and warm pools are discussed and a comparison with the diatom flora of the Cabin Creek Raised Bog in Indiana (published by C. W. Reimer) is made.

A newly discovered complex of twenty-seven fens, located in sections 10 and 15 of Excelsior Township, Dickinson County, Iowa, was described in 1962 (7). Because of the specialized habitat and the abundant diatom flora in these fens a published record is believed to be of value.

Fen XI was chosen for intensive study because it approximated in many respects the Silver Lake Fen in neighboring Silver Lake Township which has been studied by many investigators (1, 2, 3, 4, 5). The Cabin Creek Raised Bog in Indiana was similar in nature also (6).

Fen XI was approximately 100 meters long by 80 meters wide at its extremities. The eastern boundary and a portion of the northern boundary was formed by Dug-Out Creek while the rest of the boundaries simply merged into the surrounding prairie. The highest point above the level of Dug-Out Creek was estimated to be 3 to 4 meters and it is here that spring water seeped from the ground as described (7). At this point (hereafter referred to as the outlet) the average temperature of the water during the summer was 9.8°C. The temperature of the water in the descending series of pools formed by drainage from the outlet increases rapidly and, during the period of investigation, the average temperature in the pools near the base of the fen was 28.4°C.

Chemical analysis of the water at the outlet and of the warm pools near the base of the fen were conducted. The apparatus used was a Hach Portable Water Laboratory (model DR-EL). The results obtained are listed in Table 1.

¹ The project of which this investigation is a part is supported by a Public Health Service grant from the Division of Water Supply and Pollution Control, Department of Health, Education and Welfare.

² University of Kansas City, Kansas City, Missouri. Participant during the summer of 1962 in the National Science Foundation Undergraduate Science Education Program (NSF-USEP) administered by Iowa State University. The major portion of this work was done at the Iowa Lakeside Laboratory.

³ Department of Botany and Plant Pathology, Iowa State University.

Table 1*
Ecological Data from Fen #XI, Excelsior Fens (N.W. Iowa)

	Outlet		Basal Pool	
Temperature	9.8	°C	28.4	°C
ph	7.35		7.95	
Total Alkalinity	380	ppm	285	ppm
Calcium Hardness	850	ppm	725	ppm
Total Hardness	960	ppm	870	ppm
Hydrogen Sulfide	0.5	ppm	0.5	ppm
Iron	0.9	ppm	0.28	ppm
Nitrate	0.7	ppm	0.58	ppm
Nitrite	0.004	ppm	0.028	ppm
Silica	24.5	ppm	39.4	ppm
Sulfate	880	ppm	1000+	ppm
Phosphate (ortho)	0.16	ppm	0.3	ppm
Chloride	3.2	ppm	0.8	ppm

* The above figures are the averages of repeated tests, (minimum number of tests—14) carried out over a period of 8 weeks from June 19 to August 1, 1962.

The collections of diatoms were made at various times during the summer from June 6 to August 3, 1962. The samples included plant squeezings and the flocculent sludge from the bottom of the shallow pools. Portions of each collection were preserved in a 6:3:1 water, ethanol, and formalin solution. The remainder was prepared for study by removing the organic material, using the hydrogen peroxide-potassium dichromate method, and mounting in Hyrax.

The principle source used in identifying the listed species in Table 2 was Hustedt (8) with subsequent reference to various other sources (9, 10, 6, 11).

Table 2*
Comparison of the Diatom Flora of Two Calcareous Bogs
Excelsior Fen Cabin Creek
Raised Bog

Taxonomic Entities	Cold Outlet	Warm Pool	(Ref. 6)
<i>Achnanthes affinis</i> Grun.	x	—	—
<i>A. lanceolata</i> Breh.	x	—	x (plus one var.)
<i>A. microcephala</i> Kutz.	x	x	x
<i>Amphora ovalis</i> Kutz.	x	—	x
<i>Caloneis alpestris</i> (Grun.) Cleve ..	—	x	x
<i>C. bacillum</i> (Grun.) Meresch.	x	x	x
<i>C. schumaniana</i> (Grun.) Cleve ..	x	x	—
<i>Cocconeis placentula</i> Ehr.	x	—	—
<i>Cymbella cesati</i> var. <i>linearis</i> Reimer	x	x	x
<i>C. microcephala</i> Grun.	—	x	x
<i>C. naviculiformis</i> Auerswald	x	—	x
<i>C. norwegica</i> Grun.	—	x	x
<i>C. parva</i> (Wm. Smith) Cleve	x	x	—
<i>C. perpusilla</i> A. Cleve	—	x	—
<i>Denticula elegans</i> Kutz.	—	x	x
<i>Diploneis ovalis</i> (Hilse) Cleve	—	x	x
<i>Epithemia argus</i> Kutz.	—	x	x
<i>Eunotia lunaris</i> (Ehr.) Grun.	x	—	x
<i>Fragilaria bicapitata</i> A. Mayer	x	—	—
<i>Gomphonema angustatum</i> (Kutz.) Rabh.	x	—	x
<i>G. intricatum</i> Kutz.	—	x	x

1963]

DIATOMS IN AN IOWA FEN

73

<i>G. subclavatum</i> Grun.	—	x	—
<i>Gomphonema</i> sp.	—	x	x
<i>Hantzschia amphioxys</i> fo. <i>capitata</i> O. Mull.	—	x	—
<i>Mastogloia grevillei</i> Wm Smith	—	x	x
<i>M.</i> sp.	—	x	—
<i>Navicula cincta</i> var. <i>rostrata</i> Reimer	x	x	x
<i>N. dicephala</i> var. <i>subcapitata</i> Grun.	x	x	different var.
<i>N. oblonga</i> Kutz.	—	x	—
<i>N. oppugnata</i> Hust.	x	x	—
<i>N. potzgeri</i> Reimer	—	x	x
<i>N. pupula</i> fo. <i>capitata</i> Skv. and Meyer	—	x	x
<i>N. pupula</i> fo. <i>rectangularis</i> (Greg.) Grun.	x	—	x
<i>N. radiosa</i> var. <i>tenella</i> (Breb.) Grun.	x	x	x
<i>N. seminulum</i> Grun.	x	—	—
<i>N. simplex</i> Krasske	x	x	—
<i>N. stankovici</i> Hust.	x	x	—
<i>Neidium iridis</i> fo. <i>vernalis</i> Reichelt	—	x	x
<i>Nitzschia amphibia</i> Grun.	x	—	x
<i>N. denticula</i> Grun.	x	x	x
<i>N.</i> sp.	—	x	—
<i>Pinnularia stomatophora</i> Grun.	—	x	—
<i>P. subcapitata</i> Greg.	—	x	—
<i>P. viridis</i> (Nitzsch.) Ehr.	x	x	x
<i>Rhoicosphenia curvata</i> (Kutz.) Grun.	—	x	—
<i>Rhopalodia gibba</i> (Ehr.) O. Mull.	x	x	x
<i>R. gibberula</i> (Ehr.) O. Mull.	—	x	var.
<i>Stauroneis anceps</i> Ehr.	x	—	x
<i>S. phoenocenteron</i> fo. <i>gracilis</i> (Ehr.) Hust.	x	x	diff. var.

x*—indicates presence in sample. No estimate of relative abundance is given.

It was observed that the diatom flora at the outlet was very different from that in the warm pools. Two major differences were particularly obvious. The diatom flora in the cold water of the outlet showed a predominance of the species *Cymbella parva*. *Neidium iridis* var. *vernalis* was found in great abundance in the flocculent sludge in most of the pools whose temperatures were 22°C or warmer. It was not observed at all in the pools colder than 22°C. Though the above results could stem from several factors, we feel that temperature had at least an indirect and possibly a direct bearing on this phenomenon.

A comparison with the diatom flora of the Cabin Creek Raised Bog is of genuine interest. From that area 135 taxonomic entities representing 20 genera were reported (6). We are reporting 20 genera and 48 taxonomic entities. Of the genera, 18 are common to both areas and 30 of the 48 entities we report were reported also by Reimer (6). Considering that we critically examined samples from only two pools in the Excelsior fen area, the resemblances of the two flora seems noteworthy.

We wish to thank Mr. Karl Holte for field assistance on numerous occasions.

Literature Cited

1. Anderson, W. A. 1943. *Am. Midland Nat.* 29:787-791.
2. Carter, Charles. 1939. *Proc. Iowa Acad. Sci.* 46:223-234.
3. Dodd, J. D. 1955. *Proc. Iowa Acad. Sci.* 62:98-103.
4. Gashwiler, K. and John D. Dodd. 1961. *Proc. Iowa Acad. Sci.* 68:129-131.
5. Hempstead, D. L. and T. L. Jahn. 1939. *Proc. Iowa Acad. Sci.* 46:413-416.
6. Reimer, C. W. 1961. *Proc. Indiana Acad. Sci.* 71:305-319.
7. Holte, K. and R. F. Thorne. 1962. *Proc. Iowa Acad. Sci.* 69:54-60.
8. Hustedt, F. 1930. *Bacillariophyta*. Heft 10 in A. Pascher's *Die Susswasser-Flora Mitteleuropas*. G. Fischer, Jena.
9. Boyer, C. A. 1916. *The Diatomaceae of Philadelphia and Vicinity*. Lippincott Co. (Phila.)
10. Hustedt, F. 1959. Band VII Teil 2 in L. Rabenhorst's *Kryptogamen-Flora*.
11. van Heurck, H. 1880. *Synopsis des Diatomées de Belgique*. Anvers, Belgium.

NOTES ON IOWA DIATOMS

V. Epilithic Diatom Biomass in the Des Moines River¹

RYAN W. DRUM²

Abstract. Luxuriant epilithic growths of the diatom, *Gomphonema olivaceum* (Lyngbye) Kutz., were observed to be growing throughout a 320 km section of the Des Moines River. Flat rocks covered with the diatom growth were collected and the live weight of the diatom biomass per square centimeter was determined to be 0.7 gm. This included 0.021 gm dry weight of organic matter. Using these values, the standing epilithic diatom biomass in one 6 km section of the river was estimated to be 1260 metric tons (live weight) containing 37.6 metric tons dry weight of organic matter. The bulk of the growth consisted of polysaccharide material secreted as tubular stalks by *G. olivaceum*. Extensive growths were usually limited to rocky shoals and riffle areas, composed of either cobbles and boulders of glacial origin, or of rock rubble of local origin.

For several weeks in the fall of 1962, conditions in the Des Moines River were optimal for the epilithic growth of the diatom, *Gomphonema olivaceum* (Lyngbye) Kutz. Uniformly low temperatures (4-8°C), clear water, a nearly stable water level, abundant nutrients (see Table 1), and the absence of significant grazing populations all contributed to the favorable environment. Vast quantities of *G. olivaceum* flourished in the Des Moines River from October 20 to December 12 and continued to flourish in areas of open water throughout the winter months.

¹ This work was supported by a Public Health Service grant from the Division of Water Supply and Pollution Control, Department of Health, Education and Welfare.

² Department of Botany and Plant Pathology, Iowa State University, Ames, Iowa