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Notes on Iowa Diatoms VII I. Winter Bloom of Synedra acus in a Farm Pond

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Notes on Iowa Diatoms VIII. Winter Bloom of *Synedra acus* in a Farm Pond[1]

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Abstract. Diatoms were found to be the dominant plankters in Iowa farm ponds. A winter bloom of *Synedra acus* var. *radians* (Kutz.) Hust is described.

Many planktonic diatom pulses from lakes and rivers have been described (1, 2, 3, 4, 5, 6), but no record has been found of diatom blooms in farm ponds. Swingle (7) investigated 30-50 Alabama farm ponds at 2-3 week intervals over a five year period and concluded that diatoms were relatively unimportant in these ponds. During the winter of 1963-64 a bloom of *Synedra acus* var. *radians* (Kutz.) Hust. was observed in an Iowa farm pond. This bloom persisted during the entire period of ice cover.

The study site was a 5 acre pond with a maximum capacity of 15.67 acre feet located on the Fred Kruse farm, sec. 16, Yell twp., Boone county, Iowa. Maximum depth was 40 feet. The pond receives the runoff from 115 acres of crop land that annually receives nitrogen fertilizers. The predominant soil

Table 1. Results of chemical analysis of water from an Iowa farm pond (All results, with exception of pH, are stated in parts per million)

Ecological Factors	Dates Sampled									
	9/29/63	10/12/63	11/8/63	11/25/63	12/7/63	12/21/63	1/5/64	1/18/64	2/8/64	3/14/64
pH	8.3	8.0	7.3	7.2	8.1	8.1	6.6	7.8	8.8	8.0
Alkalinity	120	130	160	150	160	185	155	175	165	150
Ca hardness	80	70	90	90	120	125	90	115	110	100
Total Hardness	140	155	160	160	170	195	170	190	170	170
Chlorine	15	10	10	10	10	15	10	15	20	15
Nitrate	0.1	0.8	0.3	...	0.2	0.4	0.5	...	0.3	0.1
Nitrite	0	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03	T*
Silicon	2.0	1.5	1.5	0.4	0.8	0.6	0.6	0.7	1.0	1.3
Sulfate	30	25	27	55	27	25	35	40	65	35
Phosphate (0)	T	T	0	0	0	0	0	0	T	T
Iron	0.1	0.1	0.1	0.1	T	T	T	T	T	0.1
Oxygen	...	...	...	...	...	...	8	8	10	5
Carbon Dioxide	...	...	...	...	...	...	2	0	0	4
Turbidity	10	10	10	30	30	10	10	30	30	30

*T = Trace amount

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type of the drainage basin is Clarion and Webster with lesser areas of Hayden and Nicollet (personal communication with Garwin Carlson, Boone Co. SCS office). The results of chemical analyses of the water as shown in Table 1.

Attention to this pond was first drawn when the residents, who use water from the pond for laundry purposes, became alarmed by odors emitted from the water. Investigation by the author showed the objectionable organism at that time to be the dinoflagellate, *Ceratium hirundinella* (O.F.M.) Schrank. Succeeding plankton pulses of this pond were also investigated as part of a larger project on farm pond algae with special consideration of the possible effects of diatom populations on domestic uses of pond water.

Plankton and water samples were taken biweekly from September 30, 1963 thru March 16, 1964. During periods of open water all collections were made from the end of a low diving board extending approximately ten feet over the water. When work was done through an ice-cover, collections were made from the center of the pond.

Plankton collections were taken by two methods. Ten gallons of water from each of six different depths was raised by means of a pump and hose and strained through a No. 25 (200 meshes to the inch) silk bolting cloth net. The water was then poured through the net a second time in an attempt to minimize the loss of plankters through the net. Other samples were obtained by settling the plankton from one liter of water. Immediately upon collecting, Lugol's solution was added to hasten settling. The sample was then concentrated by decanting and the plankters determined. All counts were made by the Sedgewick Rafter technique.

Chemical analyses of the pond water were done with a Hach Model Dr El (Portable Water Laboratory) water testing kit. Determination of thirteen different chemical constituents were made on eleven different dates. In most cases the water samples were taken from 12-18 inches below the surface by means of a hand pump, but on some occasions samples from various levels were taken with a Kemmerrer bottle. Determinations of amounts of carbon dioxide and oxygen in the water were completed in the field. Other chemical determinations were completed within 12 hours at the laboratory.

During the duration of this study the plankton from 18 other farm ponds was investigated. Diatoms were present in all collections and in most cases they constituted the major portion of each collection. (Exceptions to this were during blooms of *Ceratium hirundinella* or *Dinobryon* sp.) Yet only one other pond had a diatom bloom and this was of a warm water form

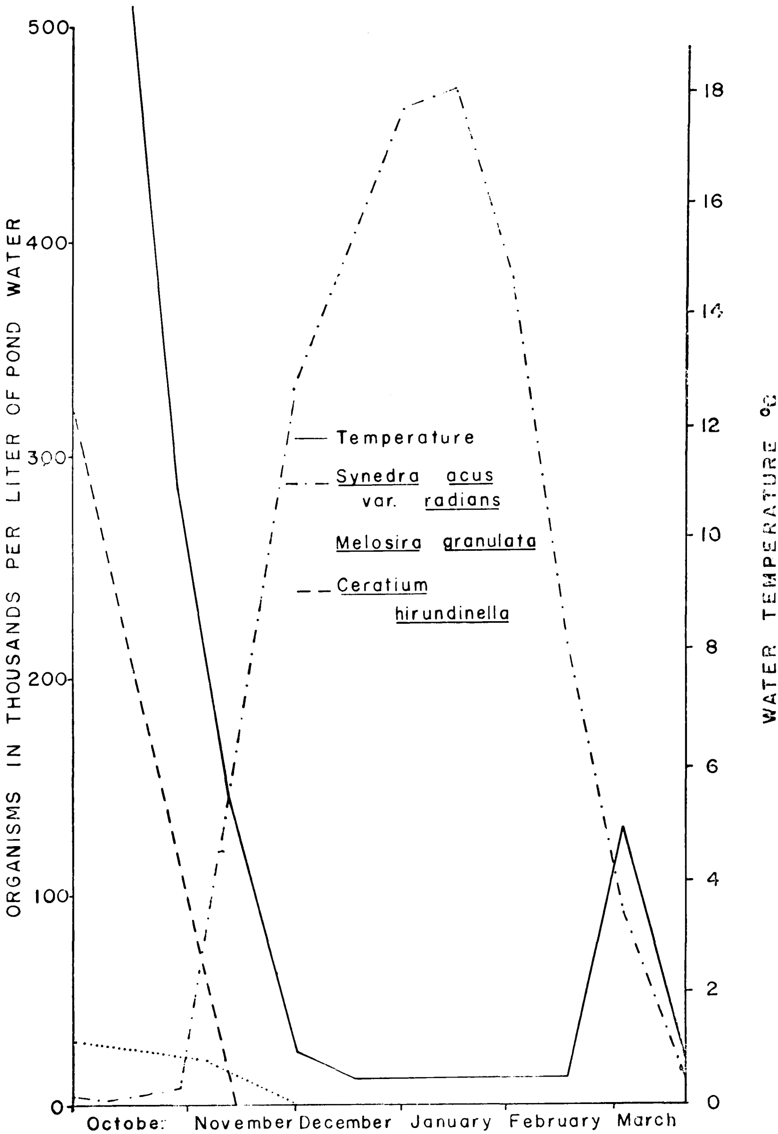

Figure 1. Standing crop of dominant planktonic forms in an Iowa farm pond during the winter of 1963 (All organisms expressed in thousands per unit)

(*Melosira granulata* (Ehr.) Ralfs that lasted for less than two weeks during August, 1963. In all ponds visited, *Synedra acus* var. *radians, Fragilaria capucina* var. *mesolepta* (Rabh,) Grun. and *Melosira granulata* were present in the plankton, but only in the Kruse pond was a plankton population maintained in bloom proportions throughout the winter.

S. *acus* and its varieties have been investigated ecologically and several factors have been determined as being favorable for rapid production. A comparison of these conditions with those existing in the Kruse pond follows:

1. Patrick (5) recognized high calcium content and low light intensity as being conducive to growth of S. *acus*. The calcium hardness of the pond investigated was high and averaged approximately 100 ppm. The light intensity was reduced by the thick ice (40 cm. of columnar ice) and the low angle of incidence of the winter sun.

2. Huber-Pestalozzi (4) and others have shown rapid growth of S. *acus* to be related to low temperatures. The population of S. *acus* rose with the decrease in temperature (Fig. 1). This effect could be either direct or indirect. The direct effect may be that S. *acus* is a cold stenotherm; the indirect may be that temperature affects bacterial decomposition, solubility of gases and salts, and the metabolism of competing organisms.

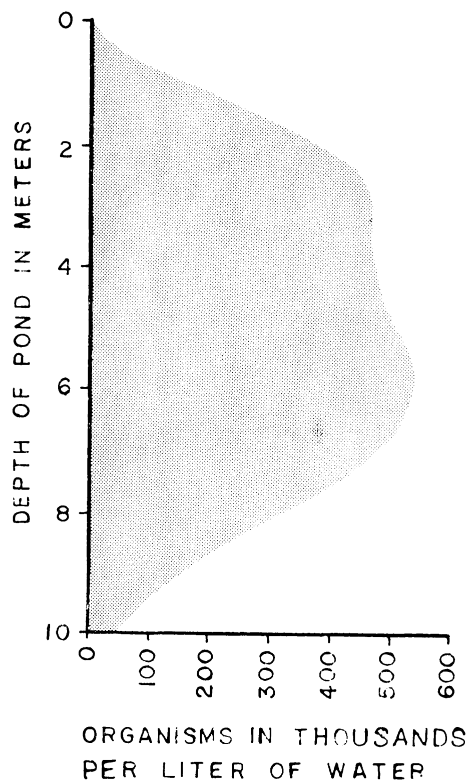

Figure 2. Vertical distribution of *Synedra acus* var. *radians* under ice cover in an Iowa farm pond

3. Chandler (8) and Eddy (3) have related rapid growth of *S. acus* to high turbidity. The differences in turbidity readings are not considered significant in this study in that they reflect variation in population density of planktonic organisms rather than changes in the inert particulate matter.

4. Nitrogen and phosphorus are not reported to act as limiting factors, but *S. acus* is usually found in eutrophic habitats where deficiencies of these metabolites would not be expected to exist.

The evidence that a vertical stratification of *S. acus* did exist beneath the ice cover is of interest in view of the findings of Huber-Pestalozzi (4), who found that no stratification of this organism existed in the Swiss cold water lakes.

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Notes on Fleshy Fungi in Iowa. II[1]

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Abstract. Sixty-four sporocarps of fleshy fungi were collected during the summer and fall of 1963. In the collections were seven species, *Cortinarius adustus* Pk., *Cortinarius albidipes* Pk., *Cortinarius praepallens* Pk., *Hygrophorus sordidus* Pk., *Russula aeruginea Lindb.* (non Fr.), *Russula pulverulenta* Pk., and *Russula sororia* Fr. not previously reported for the state of Iowa.

Sporocarps of fleshy fungi have been collected for the past two summers in six widely spaced sites in Iowa. Seven species and one genus not previously recorded for the State of Iowa were reported last year from the 1962 summer collections (1). Sixty-four sporocarps were collected in the same sites during the summer of 1963. Among the 1963 specimens were seven species not previously reported for Iowa. Previous reports

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