

1961

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### Recommended Citation

Gashwiler, Keturah and Dodd, John D. (1961) "Algae From the Warm Pools of Silver Lake Fen," *Proceedings of the Iowa Academy of Science*, 68(1), 129-131.  
Available at: <https://scholarworks.uni.edu/pias/vol68/iss1/20>

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## Algae From the Warm Pools of Silver Lake Fen<sup>1</sup>

KETURAH GASHWILER<sup>2</sup> AND JOHN D. DODD<sup>3</sup>

*Abstract.* A description of the physical features, including a chemical water analysis, is given. Collections were made during the summer of 1959 and comprise a list of 23 species of algae.

A fen on the southwest shore of Silver Lake has been of interest to biologists for a number of years and is visited frequently by class groups from the Iowa Lakeside Laboratory. Geographically, its location is R-38-W, T-100-N, Section 32, Dickinson County, Iowa. Physical features of the fen have been discussed by Carter (1939) and, among the published records dealing with biological aspects, are papers by Hempstead and Jahn (1939), Anderson (1943), and Dodd (1955). Since the algal flora is of unusual interest, a published record is deemed to be of value.

At several points in the fen, water from an underground source rises to the surface of mounds which are at various heights above the lake level. The water then seeps downward and accumulates in small, shallow pools along the slopes of the mounds. The water is always cold as it wells to the surface; for instance, it was 8°C in mid-August. The temperature of the seepage water increases rapidly, however, and ranged from 20°C to 27°C in the shallow pools during the period of investigation.

The pools are, for the most part, less than a foot in depth with a flocculent sludge at the bottom. In exceptionally dry seasons some of the pools may lose enough water to expose the sludge layer. The water above the sludge layer is always clear. An analysis of the water in the pools was made by Mr. Thomas Lammers, also an NSF-URP participant, in the summer of 1960 (Table 1). The apparatus used was a Hach Portable Water Laboratory (Model DR-E1). Previously, analyses of the water have been presented by Hempstead and Jahn (1939) and Carter (1939). The approximate neutrality of the water (pH 6.9) is remarkable in light of the high solute content and the fact that the water in the adjacent lake has a pH of 8.5.

The flocculent sludge in the bottom of the pools contains a dense concentration of algae, mostly blue-greens and diatoms. Observations over several years and in different seasons have shown the composition of the major species to be essentially

<sup>1</sup> The major portion of this work was done at the Iowa Lakeside Laboratory.

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constant. This material can be kept in a living condition for several months in a closed container stored in a refrigerator. When removed and exposed to daylight or artificial light a week or so before use, it provides an outstanding source of algae for classwork.

Table 1. Chemical analysis of the water from the warm pools of Silver Lake Fen, June 29, 1960.

Temperature	20°C	Iron	0.15 ppm
Alkalinity (T)	290 ppm	Nitrate	0.03 ppm
Chloride	5 ppm	Nitrite	0.005 ppm
pH	6.9	Total phosphate	0.8 ppm
Ca Hardness	905 ppm	Silica	31 ppm.
Total Hardness	1000+ ppm	Sulfate	1100 ppm

The following list (Table 2) includes the algae, other than diatoms, identified in collections from the shallow pools during the months of June, July, and August, 1959. During this period, ninety-seven collections on fifteen different dates were made. Most species were identified in the living condition, but the collections have been preserved in FAA. The identifications were made through the use of the keys in Prescott (1951) and the names in the first column are as cited in that work. The revision of the coccoid blue-green algae by Drouet and Daily (1956) is a recent work of major significance, and the revised names of the affected species are given in the second column. The diatoms of both the warm pools and the cold water outlets are the subject of a separate investigation.

We wish to thank Mrs. Fay Kenoyer Daily and Dr. Francis Drouet for the respective identifications of *Chara hypnoides* and *Johannesbaptistia pellucida*. The *Chara* cited occurs in the majority of the pools while *J. pellucida* occurs only in a few of the pools. It is not known to occur elsewhere in Iowa. This alga is characterized by discoid cells arranged as pseudofilaments in gelatinous matrices.

Determinations of the specific identities of the majority of the filamentous green algae collected depend largely on reproductive structures and these were not present in any of the collections.

The species of *Oocystis* was common in the pools but never abundant. Usually it occurred as isolated cells with an accumulation of haematochrome pigments. These pigments disappeared in gross cultures with artificial light and the cells assumed the coloration typical of green algae. The shape and dimensions of the cells are such that it does not fit any of the available descriptions of species of *Oocystis*. However, the method of division of the cells leaves little doubt as to the genus.

*Asterocystis* is an interesting genus of freshwater red algae having conspicuous blue-green chromatophores. The species en-

Table 2 .Algae from the shallow pools in the Silver Lake Fen.

Species as named in Prescott (1951)	Species as named in the revision by Drouet and Daily (1956)
* <i>Chroococcus turgidus</i> (Kuetz.) Naegeli	<i>Anacystis dimidiata</i> Drouet and Daily
* <i>Aphanothece nidulans</i> P. Richter	<i>Anacystis marina</i> Drouet and Daily
* <i>Aphanocapsa elachista</i> West and West	<i>Anacystis montana</i> (Lightf.) Drouet and Daily
* <i>Aphanothece stagnina</i> (Spreng.) A. Braun	<i>Coccochloris stagnina</i> Sprengel
* <i>Aphanothece gelatinosa</i> (Henn.) Lemmermann	<i>Anacystis montana</i> f. <i>gelatinosa</i> Drouet and Daily
* <i>Merismopedia tenuissima</i> Lemmermann	<i>Agmenellum quadruplicatum</i> Brebisson
* <i>Gomphosphaeria aponina</i> var. <i>cordiformis</i> Wolle	<i>Gomphosphaeria aponina</i> Kützing
* <i>Oscillatoria princeps</i> Vaucher	<i>Johannesbaptistia pellucida</i> W. R. Taylor and Drouet
* <i>Oscillatoria limnetica</i> Lemmermann	
* <i>Phormidium tenue</i> (Menegh.) Gomont	
* <i>Lyngbya Bergei</i> G. M. Smith	
** <i>Spirulina subsala</i> Oerstad	
<i>Nostoc paludosum</i> Kuetzing	
<i>Euglena acus</i> Ehrenberg	
<i>Euglena elastica</i> Prescott	
<i>Spirogyra</i> sp.	
<i>Mougeotia</i> sp.	
<i>Oedogonium</i> sp.	
<i>Rhizoclonium</i> sp.	
<i>Oocystis</i> sp.	
<i>Asterocystis</i> sp.	
* <i>Chara hypnoides</i> C. B. Robinson	

\* Found in abundance in most pools.

\*\* Found in only one collection.

countered has not been identified but resembles *A. smaragdina* (Reinsch) Forti. It occurred in one location as a salmon-colored, gelatinous mass at the edge of one of the pools. The cells appeared to be encysted and had very thick walls. In gross culture they frequently emerged from the cysts and assumed the characteristic color mentioned above.

In conclusion, perhaps the most interesting feature of the algal flora of these pools is the abundant occurrence of individuals of *Chroococcus turgidus*, whose cells are among the largest known among the blue-green algae.

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