Some Preliminary Observations on the Oxygenless Region of Center Lake, Kosciusko Co., Ind.

Herbert Glenn Imel.

It has been found that some of our lakes contain no free oxygen during the summer months.

Birge and Juday ('11) found that Beasley and Mendota Lakes not only had such oxygenless regions but that animal life existed in these regions. They report sixteen genera of living, active protozoa, three of worms, two rotifers, two crustacea and one mollusc.

Scott found in his studies of lakes of northern Indiana that Center Lake, Kosciusko county, had such a region, and under his direction the writer undertook, during the summer of 1915 to find out what forms of animal and plant life existed in this region.

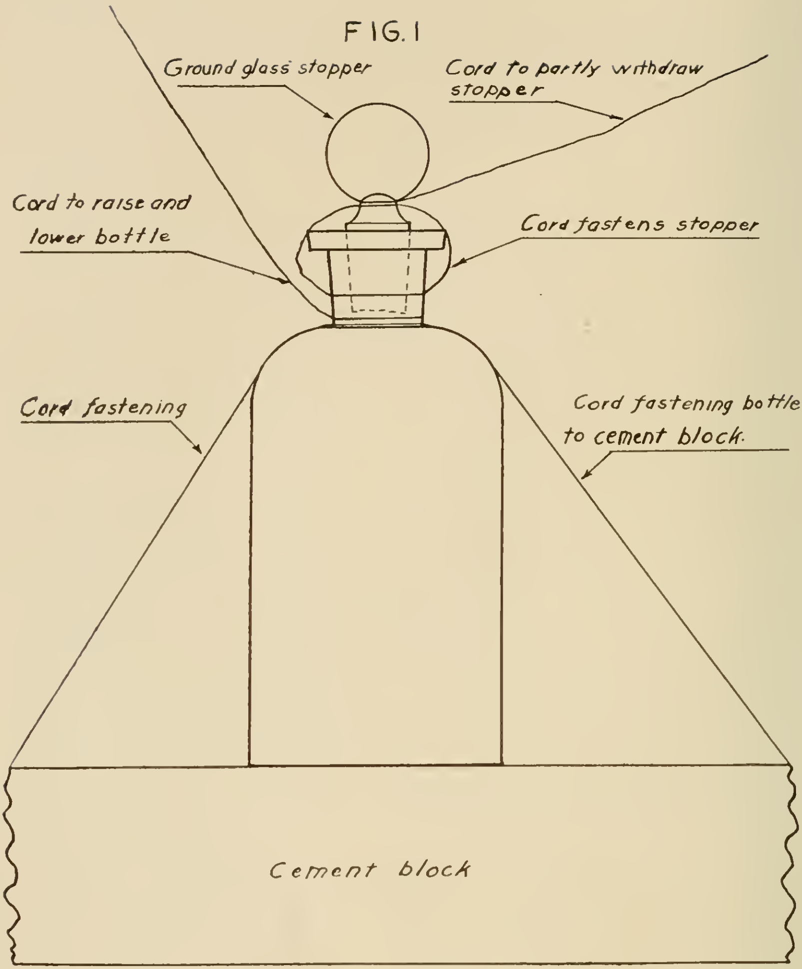
According to Birge and Juday ('11), after the autumnal overturn, during the winter, and until the approach of spring, the gas conditions are very nearly uniform throughout the lake, but with the approach of spring, and through the spring and summer, the oxygen content becomes less and less in the lower strata while the carbon dioxide, both free and fixed, becomes greater and greater until by July 15 or August 1, the free oxygen is zero while the carbon dioxide is very great. (See Figs. 6, 7, 8.)

This condition is brought about in three ways: (1) by the respiration of the plants and animals in it; (2) lack of surface contact with the air; (3) decomposition of the dead organisms in it.

Determinations of the temperature, free oxygen, free and fixed carbon dioxide, were made at the beginning and the end of the observation period, July 28 and August 26. The oxygen was determined by the Winkler method and the temperature was read by means of a thermophone. The results of these readings are shown on graphs attached hereto. (See Fig. 5.)

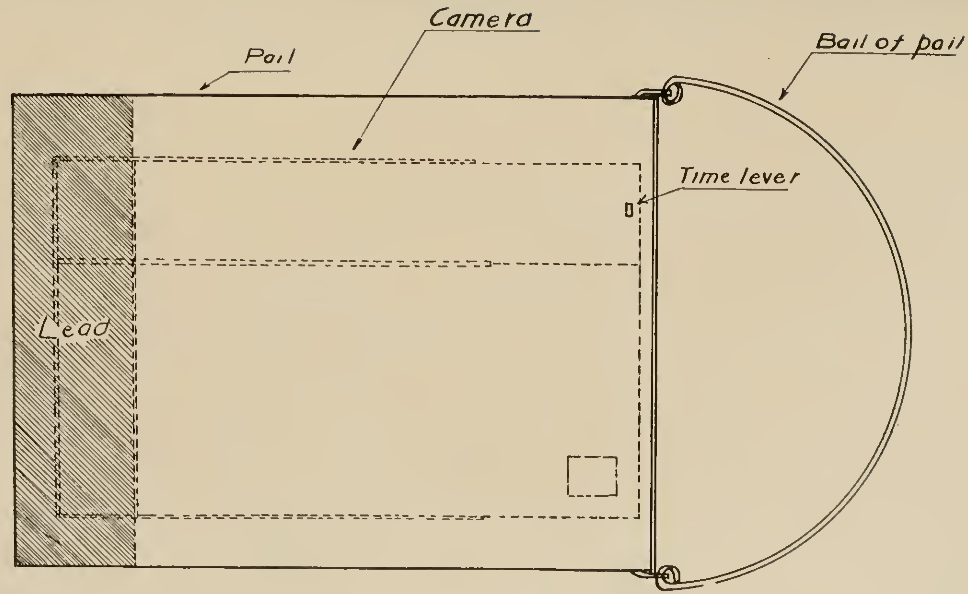
A pump, with a hose marked off in meters, was used in the collection of the water. The samples of plankton were collected by pumping a quantity of water through a plankton net at the desired depth and then rinsing off with the last stroke into a collecting bottle. This method was used for

FIG. 1



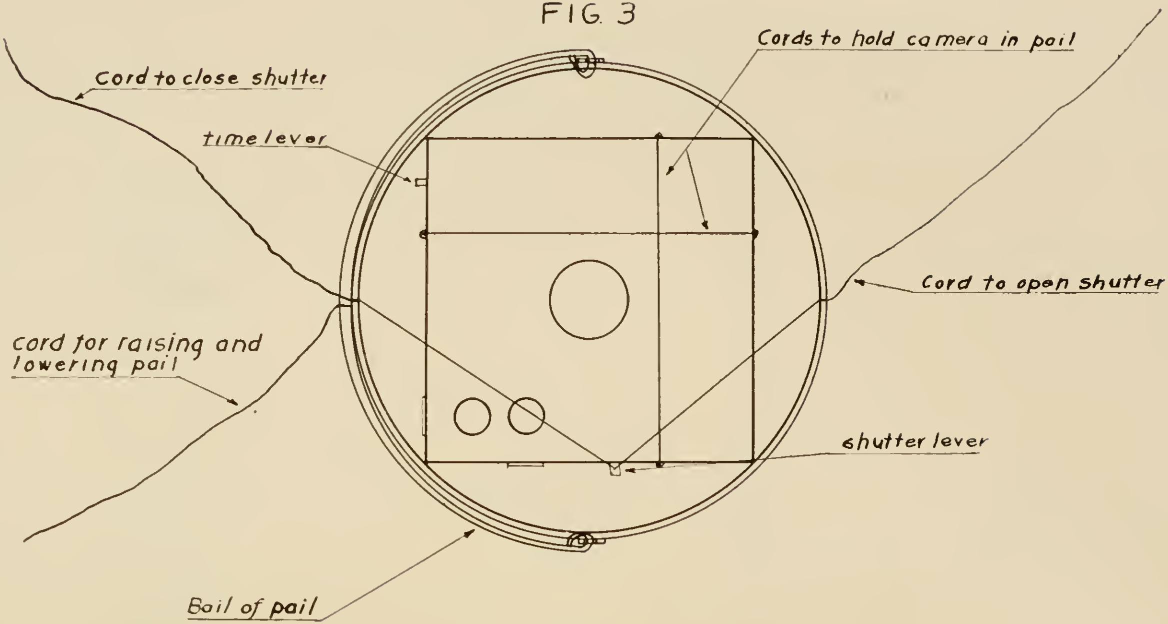
BOTTOM COLLECTING OUTFIT

FIG 2



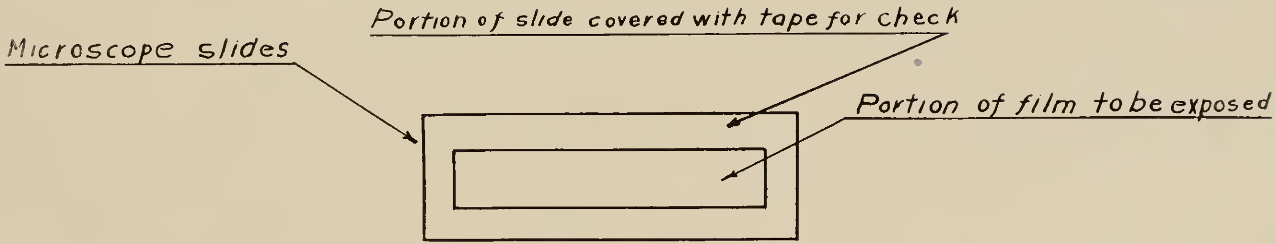
Side view of under water camera apparatus showing camera in position and means of operating.

FIG. 3



Top view of under water camera apparatus showing camera in position and means of operating.

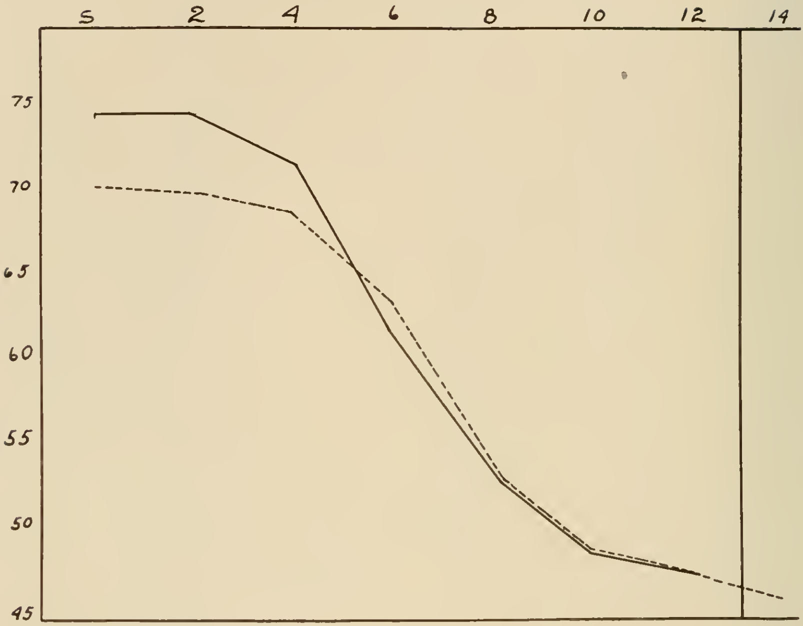
FIG. 4.



Camera plate made of two microscope slides with film of same size between Edges taped to prevemt wetting and act as a check

FIG 5

TEMPERATURE CURVE



———— READING JULY, 28.

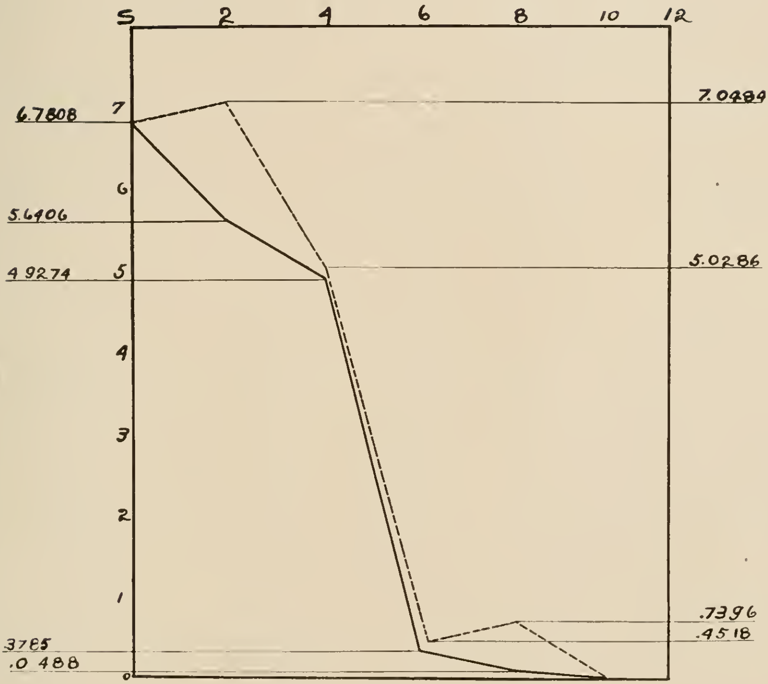
- - - - - READING AUG. 26

READ DEGREES FROM TOP TO BOTTOM.

READ METERS FROM LEFT TO RIGHT.

FIG. 6

FREE OXYGEN CURVE



——— READING JULY, 28

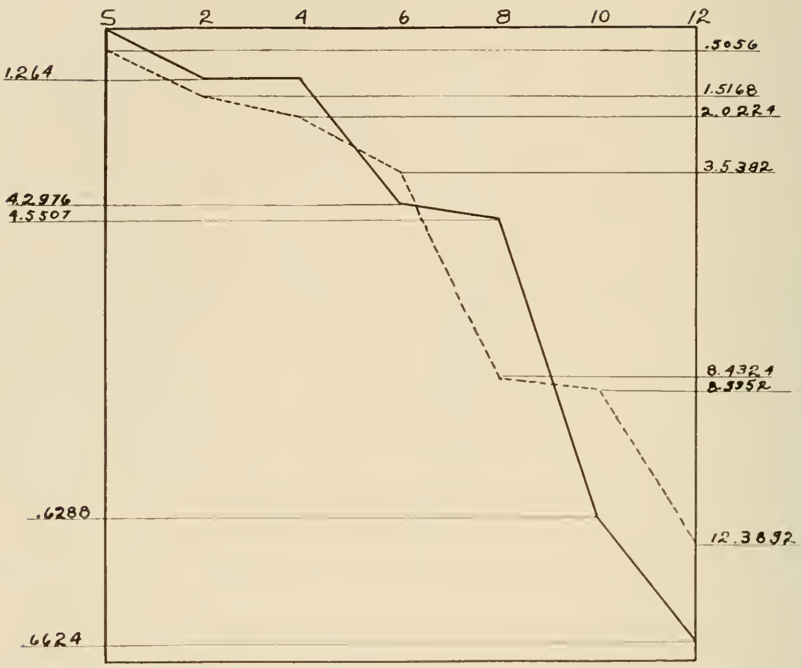
- - - - READING AUG. 29

FIGURES AT TOP REPRESENT METERS DEEP.

FIGURES AT SIDE REPRESENT C C FREE O. PER LITER

FIG 7

FREE CO_2 CURVE



READING JULY, 28

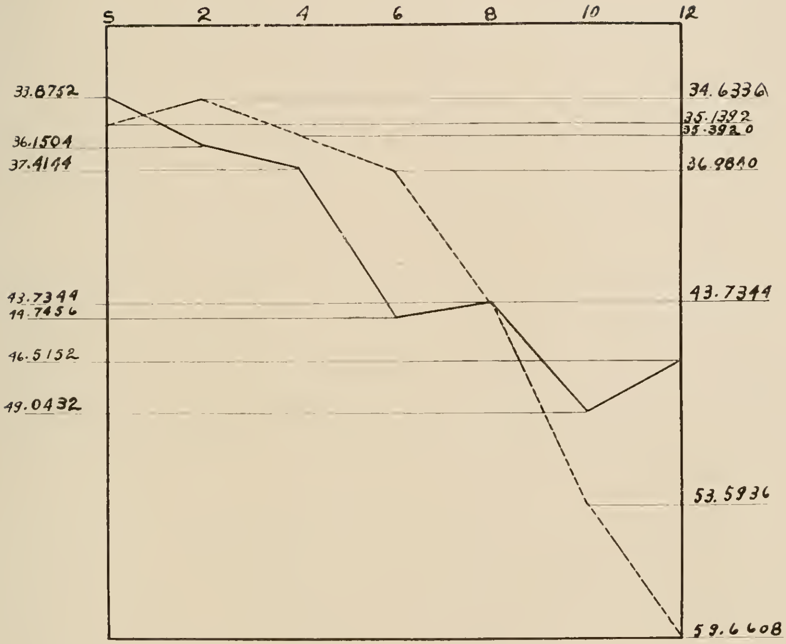
READING AUG 26

FIGURES AT TOP REPRESENT METERS DEEP

FIGURES AT SIDES REPRESENT CC FREE CO_2 PEP LITER

FIG 8

FIXED CO_2 CURVES



——— READING TAKEN JULY, 28

- - - - - READING TAKEN AUG. 26

FIGURES AT TOP REPRESENT METERS DEEP

FIGURES AT SIDES REPRESENT C C

all but the bottom collection, which was taken in the manner described below and as illustrated by the figures.

A sixteen-ounce reagent bottle (see Fig. 1) with a ground glass stopper was securely fastened to a block of cement weighing approximately 30 lbs. The stopper was so tied that it could be partly pulled out. A strong cord was attached to the neck of the bottle to permit raising and lowering the bottle. A second cord was attached to the stopper so that when the empty bottle was at the bottom the stopper could be pulled as far as its fastenings would permit, allowing the bottle to be filled with the bottom ooze. When the bottle was filled the cord attached to the stopper was loosened, thus allowing it to snap back in place and securely close the bottle, and with the cord around the neck the bottle was drawn to the surface. The stopper and neck of the collecting bottle were rinsed off first with alcohol, then distilled water. The contents were then transferred to smaller reagent bottles, corked and sealed with paraffin to insure their being air tight.

The contents of the collections, especially the bottom collection, were examined microscopically and the plants and animals that seemed alive were listed. As a check, some bottles of the same collection were kept fifteen days in darkness and at approximately the same temperature as the lake bottom. Their contents were then examined and the plants and animals found therein were apparently as active as when first collected. The animals were all seen moving with more or less rapidity, the protozoans quite rapidly, the higher forms not so much so. Their activity increased with exposure to light and air.

From the total examinations made, the following were found, demonstrated to be alive and classified. Nine protozoa, one rotifer, one crustacea, twenty algae and fourteen diatoms.

Animals Classified after Conn and Webster.

Protozoa:

Dactylasphaerium radiosum Ehr.

Difflugia globostoma Leidy.

Amoeba proteus Ehr.

Helizoa:

Actinosphaerium eichornii.

Mastigophora-flagellata:

Peranema sp.(?)

Ciliata:

Colpidium sp.(?)

Paramoecium Bursaria Ehr.

Stentor coerulus Ehr.

Vorticella sp.(?)

Gastotricha: One form belonging to this group was abundant.

Crustaceae:

Copepoda—

Cyclops biënspidatus.

Algae—classified after Conn and Webster.

Cyanophyceae (Blue-green):

Oscillatoria subtilissima Kütz.

Oscillatoria aeruginoso caerulea.

Merismopedia nagelii.

Microcystis aeruginoso Kütz.

Nostoc rupestre Kütz.

Nostoc rupestre sp.(?)

Chlorophyceae (Green Algae):

Scenodesmus caudatus.

Pediastrum pertusum var. clarthratum A. Br.

Pediastrum Boryanum Turp. (two types).

Pediastrum Boryanum Turp. var. granulatum Kütz.

Ulthorix sp.(?)

Zygnemeae stellium var. genuinum Kirch.

Spirogyra variens (Hass) Kütz.

Heterokontae (Yellow green):

Tribonema minus (Wille) Haz.

Bacillarieae (Diatomaceae) classified after Wolle:

Navicula Sillimanorum Ehrb.

Navicula Tabellaria.

Navicula Tabellaria var. Macilenta.

Gomphonema Geminatum (two types).

Asterionella Formosa.

Asterionella Formosa var. Ralfsii (two types)

Asterionella Formosa var. Bleakeleyi.

Asterionella Formosa var. Gracillima.

Fragalaria Capucina Desmaz.

Stephanodiscus Niagara Ehr. (two types).

Thus far we have established the following: (a) Center Lake, during part of the year, has a region devoid of free oxygen. (b) A number of living organisms are found in it during this time.

Many of these organisms are chlorophyl bearing. This made it desirable to determine, if possible, whether or not any light reached the bottom of this rather turbid lake.

To answer this question a Brownie No. 0 camera, boiled in paraffine to make it impervious to water, was fastened into a pail weighted in the bottom with lead to sink it. (See Fig. 2.) The lever of the shutter was arranged with strings running through opposite sides of the top of the pail (see Fig. 3), so that when the camera was sunk to the desired depth the shutter could be opened, exposing a bit of film arranged between two microscopic slides which were taped around the edges, serving the double purpose of keeping the film dry and acting as a check. (See Fig. 4.)

After an exposure of five minutes, the shutter was closed by means of the other cord and the camera raised to the surface. The film was developed. The exposed part of the film was distinctly darkened, showing that there is some light at the bottom of the lake. The intensity and quality of this light remains to be determined.

Bibliography.

Birge, E. A., and Juday, C.:

('11) The Inland Lakes of Indiana. Wisconsin Survey Bulletin No. 22.

Conn, H. W., and Webster, L. W.:

('08) A Preliminary Report on the Algae of the Fresh Waters of Connecticut. Conn. State Geology & Nat. History Surv., pp. 1-78.

('05) The Protozoa of the Fresh Waters of Connecticut.

Edmondson, C. H.:

('06) The Protozoa of Iowa. Proceedings of the Davenport Academy of Science. Vol. XI, pp. 1-24.

Wolle, F.:

('94) The Diatomaceae of N. A. Comenius Press, Bethlehem, Pa.

Sedgwick, A.:

THE OCCURRENCE OF MORE THAN ONE LEAF IN OPHIOGLOSSUM.

It is usually stated that in the Ophioglossales one leaf develops each year. In collecting material of Ophioglossum vulgatum near Gary, Ind., during the summer of 1914, it was observed that there was a large proportion of plants with more than one leaf, so a count was made. Of a total of two hundred plants, selected at random, ninety-one had one leaf above ground, one hundred and five had two leaves, and four had three leaves. A similar proportion was found the same year in plants collected in a wood adjoining the Earlham College campus. Material collected during the summers of 1913 and 1915 showed few plants with more than one leaf.

M. S. MARKLE.

Earlham College,
Richmond, Ind.