

water, but during the past two years no difficulty has been experienced in tilling them; two or three feet of water flowed over the Gordoniere Marsh, which is now dry with beach lines forming along its margin; and boats were rowed over all parts of the Johnson Marsh, while at present hardly any of its surface is submerged.

CONSULT HYDROGRAPHIC MAP NEXT TO FRONT COVER.

TEMPERATURE OF TURKEY LAKE. BY J. P. DOLAN.\*

In making these observations a Charles Wilder standard, protected, thermometer was employed. They were begun the 13th of July, during which month four soundings were taken in the deepest parts of the lake from the surface to the bottom at every five feet. Then on October 5 two records were made at about the same points, and again on November 2.

September 17 a rain gauge was set up and from that day to the present a regular record of temperature, precipitation, direction of wind and rise and fall of lake has been kept, but the observations have been confined to the northwest part of the lake; properly, Syracuse Lake.

1. TEMPERATURES OF TURKEY LAKE, 1895.

	JULY.				OCT. 5.		NOV. 2.	DEC. 14.	DEC. 24.
	INDIANA UNIVERSITY BIOLOGICAL STATION.				I. U. BIO. STAT'N.	JARRETT'S BAY.	I. U. BIO. STAT'N.	BLACK STUMP POINT.	
	13th, 10 A. M.	16th, 8:45 A. M.	17th, 9:30 A. M.	23d, 8:45 A. M.	11 A. M.	1:45 P. M.	11:10 A. M.	10 A. M.	
Air .....	Deg. 81½	Deg. 83½	Deg. 78½	Deg. 72	Deg. 65	Deg. 50	Deg. 28		
Surface .....	74	75	75	76½	60½	61½	43	34½	
5 feet .....					60	60¼		34½	
10 " .....	73	74	75	71	60	59	43	24½	
15 " .....	72½	74	74½	70	59	59			
20 " .....	71	71	73½	67½	58½	58½	43		
25 " .....	68	65	68½	61½	58½	58½	43½	35	
30 " .....	65	63	68½		58½	58½			
35 " .....	60	62		58½	58½	58½		35½	
40 " .....	60	60			58	58			
45 " .....	59	57		58	58½	58		35½	
50 " .....	59			58	58½	58			
55 " .....	58				58½	58			
60 " .....	58			58	58½	57½			
65 " .....	58			58	58¼	56¼			
67½ " .....						53¼			

\*Contributions from the Zoological Laboratory of the Indiana University, No. 15.

## VI. SUMMARY OF SOUNDINGS OF TURKEY LAKE.

	Difference in Degrees First 20 ft.	20 to 25 ft.	25 to 30 ft.	30 to 35 ft.	35 to 40 ft.	40 to 45 ft.	45 to 50 ft.	50 to 55 ft.	55 to 60 ft.	60 to 65 ft.	Total.	Maximum.	Minimum.	Mean.	Average.
I. U. Bio. Station..	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg
July 13.....	3	3	3	5	2	2	2	2	2	2	16	74	5	66	71.9
July 16.....	4	4	2	1	2	2	2	2	2	2	16	75	57	69	66
July 23.....	6½	2½	6	3	3	3	3	3	3	3	18½	76½	58	67½	65.06
Oct. 5.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	2½	60½	58	59½	58.84
Nov. 2, A. M.....	0	½	0	0	0	0	0	0	0	0	0	43	43	.....	.....
Nov. 2, P. M.....	0	0	0	0	0	0	0	0	0	0	0	43	43	.....	.....
Dec. 14.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dec. 24.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

° Bottom.

## II. TURKEY LAKE TEMPERATURES, 1895.

September.....	22	23	24	25	26	27	28	29	30							
Air.....	86	45	37	.....	.....	55	.....	.....	.....							
Surface.....	73	68	65	68	68	.....	.....	.....	56							
Bottom.....	69	69	68	67	67	.....	.....	.....	57							
Precipitation.....	.....	.01	.....	1.40	.....	.....	.03	.09	.....	Total in inches 1.53						
October.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Air.....	56	58	68	68	65	62	64	45	38	45	49	45	40	54	48	46
Surface.....	54	.....	63	60½	60½	57½	.....	56	55	53	.....	52	51½	.....	53	52
Bottom.....	55	.....	58	56	58½	56	.....	56½	56	53½	.....	52½	51	.....	53	52½
Near shore.....	.....	.....	.....	.....	.....	.....	.....	48	.....	.....	.....	45	47	.....	.....	50
Precipitation.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
October.....	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Air.....	45	49	26	28	28	.....	.....	.....	60	60	48	40	38	34	34	
Surface.....	51	.....	.....	46	46½	.....	.....	.....	45	44	43	43	.....	.....	39	
Bottom.....	51½	.....	.....	48	47	.....	.....	.....	46½	46	44	.....	.....	.....	39	
Near shore.....	.....	.....	.....	40	45	.....	.....	.....	40	.....	.....	.....	.....	.....	.....	
Precipitation.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
November.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Air.....	30	22	54	60	61	60	60	45	32	32	28	26	.....	.....	.....	.....
Surface, 25 ft.....	38	43	43	41½	42	43	43	43	42	42	42½	.....	.....	.....	.....	.....
Bottom, 25 ft.....	43	43	43	42	41	45	43	43	44	43	.....	43	.....	.....	.....	.....
Surface near shore.....	.....	36	.....	.....	42	.....	50	.....	38	.....	.....	.....	.....	.....	.....	.....
Precipitation.....	.....	.....	.....	.....	.....	.02	.78	1.10	.....	.....	.....	.....	.02	.....	.07	.....

November.....	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Air .....	.....	52	34	22	20	35	33	35	35	22	16	35	36	32		
Surface .....	.....	43½	41	39	.....	.....	39	*	*	*	.....	.....	.....	34		
Bottom .....	.....	43	42	39	.....	.....	39	*	*	*	38†	.....	.....	35		
Surface near shore .....	.....	46	38	34	.....	.....	.....	*	*	36†	36½	.....	.....	.....		
Precipitation .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
December.....	1	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18
Air { 7:30 A.M. ....	.....	6	.....	12	36	28	24	28	32	18	2	28	32	24	40	45
{ 5:00 P.M. ....	.....	12	.....	26	33	24	18	26	36	20	24	36	26	39	43	52
Surface .....	.....	.....	.....	34	33	33	33	33	34	33½	.....	34½	34	.....	33½	33½
Bottom .....	.....	.....	.....	35	36	35	36	36	36	35½	.....	35½	35	.....	35	35
Near shore ..	.....	34	.....	.....	32	33	33	.....	.....	.....	.....	.....	.....	.....	.....	.....
Precipitation ..	.....	.56	.....	.07	.....	.....	.....	.....	.11	.....	.....	.....	.07	.....	.13	1.15
December .....	19	20	21	23												
Air { 7:30 A.M. ....	52	52	40	.....												
{ 5:00 P.M. ....	54	52	39	.....												
Surface .....	33½	35½	37	.....												
Bottom .....	35	37½	37	.....												
Near shore ..	.....	43	.....	38												
Precipitation ..	1.87	.96	.12	.58												

\* Broken thermometer. † Under ice. ‡ Common thermometer.

## SUMMARY OF TEMPERATURES.

	SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.		
	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	
MAXIMUM.	Air .....	22	86	3	68	5	61	19	54
	Surface, 25 ft	22	73	3	63	18	43½	21	37
	Bottom .....	22	69	8	56½	26	45	20	37½
MINIMUM.	Air .....	24	37	19	26	27	16	{ 6 13	12
	Surface, 25 ft	30	56	31	39	30	34	{ 7, 8, 9, 10	33
	Bottom, 25 ft	30	57	31	39	26	36	{ 6, 8, 9, 15, 17, 18, 19	35
AVERAGES.	Air .....	.....	56	.....	47.8	.....	36.7	.....	31½
	Surface .....	.....	66½	.....	51.7	.....	41.2	.....	33
	Bottom .....	.....	66½	.....	51.57	.....	41.93	.....	35

N. B.—Water general average for three months higher than air.

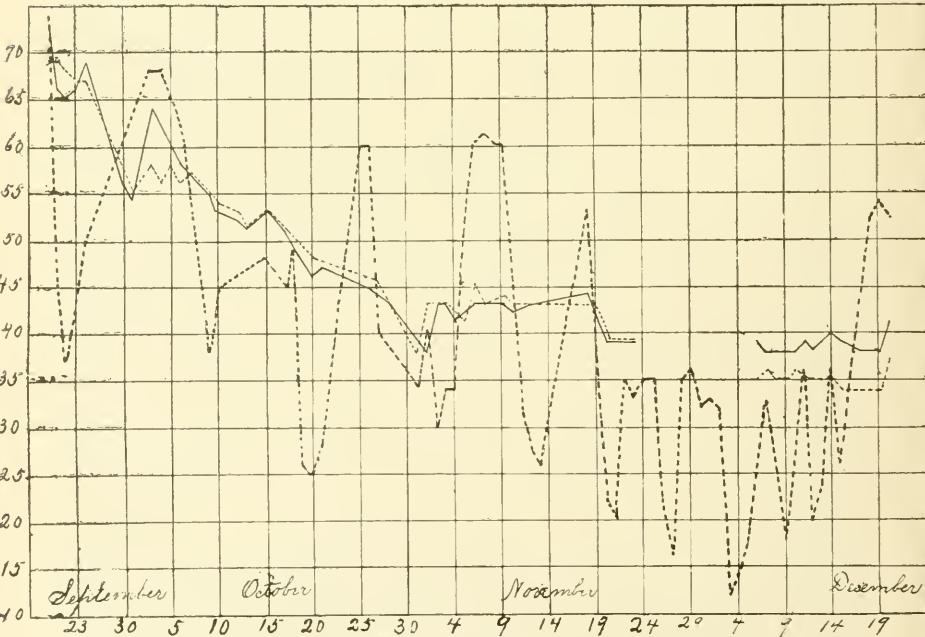
	AIR.	SURFACE.	BOTTOM.
Grand average for four months.....	42.94	48.87	48.87

From December 3 to noon of the 20th the lake was covered with ice. During this period the surface temperature varied from 33° to 34½° and the bottom from 35° to 36°.

At 5:00 P. M. of the 20th, ten hours after the ice started to move in a body from the lake, the surface showed 35½°, a gain of 2½°; the bottom 37½°, another gain of 2½°, and in the shallow water, fifty feet from south shore, where it had been 32°, 33°, 33° on the 7, 8 and 9th respectively, it was now 43°, a gain of 10°.

The next day surface and bottom both registered 37° degrees at the twenty-five-foot station.

The results of these observations are embodied in the accompanying profile chart, in which it has been attempted to show the absolute and relative movements of the air, surface, and bottom of lake at a depth of twenty-five feet.



Temperatures from September 23 to December 23. Broken line, temperature of air; dotted line, temperature of water 25 feet below surface on the bottom; continuous line, temperature of water at the surface at the same place.

(*c*) A few well-known facts are emphasized, the variableness of the atmosphere and the persistence of the water; that water is a poor (*b*) radiator and an indifferent conductor of heat, and responds slowly to atmospheric changes.

(*d*) It shows also that the great volume of Syracuse lake at no time has been stagnant, but that a condition of activity has obtained throughout the entire period of observation.

(*e*) For the four months in which a large number of observations were made the general average of the water, both surface and bottom, is higher than that of the air.

A difference of  $10^{\circ}$  between the water one foot deep near the shore and the surface mid-lake during a rain the day the ice left the lake, shows that the surface drainage is no small factor in winter and spring in raising the temperature of the whole body.

## PART II. THE INHABITANTS OF TURKEY LAKE.\*

### PLANKTON.

By plankton, Hensen, the author of the word, means everything floating in the sea and passively driven about by the waves and currents. Haeckel includes under plankton all organisms swimming in the sea. Haeckel says: "The totality of the swimming and floating population of the fresh water may be called limnoplankton." Limnoplanktonic studies have been made whenever a collector scooped for protozoa, diatoms or other minute organisms. Planktonic studies of this sort have been carried on for a long time. Recently plankton has been studied in a new way, first in the ocean and more recently in fresh water. This more recent study has been the quantitative and qualitative estimation of the plankton in a given volume of water. There seem to have developed in a remarkably short time two schools of planktonists, the one headed by Hensen asserting that planktonic organisms are uniformly distributed, the other, headed by Haeckel, being equally sure that planktonic creatures are to be found in clouds or schools. We are interested in plankton only in so far as it is part of the environment of the vertebrates inhabiting the lake. That it is not an unimportant element of the environment is due to the fact that it forms the primitive food of most of the fishes and that at the most plastic period in the life of the individual. The amount of plankton, as well as its composition from year

---

\*Contributions from the Zoölogical Laboratory of the Indiana University, No. 16.