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On the vertical distribution of the pelagic crustacea of lake Mendota, Wis., during July, 1894.

By **E. A. Birge**,

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During the month of July 1894 a careful study was made of the vertical distribution of the pelagic crustacea of lake Mendota, a body of water about 10 kilometers long by 6 in width. The greatest depth does not much exceed 25 meters. Not far from the laboratory of the University of Wisconsin a depth of over 18 meters can be found and here most of the observations were made.

By means of an automatic vertical dredge the crustacea were obtained from the different depths of the lake, intervals of three meters being used. This gave six levels in the total depth. The number of crustacea from each level was determined by counting. Four species were found numerous enough to be used in determining the vertical distribution. These were *Diaptomus oregonensis* Lillj., *Cyclops brevispinosus* Herrick and *leuckartii* Sars. (counted together), *Daphnia hyalina* Leydig, and *D. pulex* var. *pulicaria* Forbes. The last species is near *D. Schoedleri* Sars.

The results may be summarized as follows:

1) 59 complete series of catches were made, 26 of which were between 9 p. m. and 3 a. m., and 33 between 6 a. m. and 6 p. m. They were made at intervals of three hours on observing days, except when strong winds made it impossible to go out.

2) The dredge had an opening of 400 square centimeters and a net made of fine cloth known as „India linen“. The average number of *Diaptomus* caught in the series of six hauls was, in round numbers, 4200; of *Cyclops*, 2000; *D. hyalina*, 220; *D. pulicaria*, 100. The last species almost disappeared in the last days, Aug. 1—4. In the other series it averaged about 125.

3) The following table shows the distribution expressed in percentages of the total number caught.

Depth	<i>Diaptomus</i>			<i>Cyclops</i>			<i>D. hyalina</i>	<i>D. pulicaria</i>
	Average	Day	Night	Average	Average	Average	Average	Average
0—3 m	53 %	57 %	47 %	43 %	42 %	1.9 %		
3—6 „	29 „	30 „	29 „	30 „	30 „	5.8 „		
6—9 „	14 „	10 „	19 „	16 „	21 „	35.9 „		
9—12 „	3 „	2.5 „	4 „	9 „	6 „	40.8 „		
12—15 „	0.14 „	0.13 „	0.15 „	1.38 „	0.9 „	15.5 „		
15—18 „	0.09 „	0.08 „	0.1 „	0.1 „	0.45 „	0.0 „		

In *Diaptomus* the averages for the day and night are further apart than in any other species and for that reason are given. The other species are practically alike in distribution by day and night. The percentages in the table are usually expressed in the nearest whole number rather than give small fractions of a percent.

4) It is evident from this table: a) The distribution of *Cyclops*, *Diaptomus*, and *D. hyalina* is alike and strikingly different from that of *D. pulicaria*. b) About 90% of the first named forms are in the upper 9 meters of the lake and below 12 meters there were practically no crustacea. This was also found true in the deeper parts of the lake down to 22 meters. This distribution changes in the autumn as the temperature of the lake falls and when the temperature has become uniform throughout the entire depth the crustacea are distributed with approximate uniformity. c) There is no evidence of a diurnal movement of the crustacea in a vertical direction. At all hours of day and night the upper — 0—3-meter — level contained more crustacea than any other. The maximum percentage found in it was 78% at 9 a. m. The lowest was 31%, found twice at 9 a. m. and 9 p. m. There was no case of an observation which showed indication of a downward movement by day and an upward one by night. d) There is no indication that the crustacea seek the cooler water of the deeper parts of the lake. On the contrary the upper level was always crowded with crustacea in the middle of the day with a temperature of the air which was often above 30° C. The crustacea were practically confined to that part of the lake which was of a high temperature — the part above the so-called „Sprungkluft“ of temperature.

5) The algae of the lake were found in the same region as the crustacea and with amounts in the different levels roughly corresponding to the number of crustacea. They were chiefly species of *Lyngbya*, *Anabaena*, and allied forms. No attempt was made to estimate exactly their distribution.

6) No species of *Bosmina* or *Ceriodaphnia* has been found in the pelagic fauna of the lake. *Leptodora* was not collected in numbers sufficient to determine its distribution.

7) These results are quite different from those announced by Francé in the Biologisches Centralblatt for Jan. 15, 1894. The study was undertaken with the purpose of testing his results in a body of water about twice as deep as lake Balaton, and with the expectation that they would be in general confirmed. The study of the crustacea has been continued to the present time (Jan. 1895) with results exactly agreeing with those of the summer. During the late fall and winter no night observations have been made but the upper part of the water has always contained its full proportion of crustacea by day.

8) The results of this study will appear in full in the forthcoming 10th volume of the Transactions of the Wisconsin Academy of Sciences, Arts, and Letters.

Madison, Wis., U. S. A., Jan. 13, 1895.

Ueber Ferrier's neue Studien zur Physiologie des Kleinhirns.

Kritik und Berichtigung von L. Luciani.

Prof. Ferrier machte bei Uebernahme des Vorsitzes der Londoner neurologischen Gesellschaft meine in den letzten Jahren veröffentlichten Arbeiten über das Kleinhirn zum Gegenstand seiner Antrittsrede. Der Leser wird begreifen, mit wie großer Teilnahme und mit welcher Eile, als ich kaum von dieser neuesten Kundgebung des berühmten englischen Neurologen gehört hatte, ich dieselbe kennen zu lernen suchte, um seine neuesten Beobachtungen und Ansichten über das schwierige Thema auf ihren Wert prüfen zu können. Denn es ist bekannt, dass ich in meiner Schrift über das Kleinhirn¹⁾ Ferrier's frühere geistreiche Meinungen — honoris causa — gründlich geprüft und auf Grund der von mir aus Licht geförderten neuen Thatsachen erschöpfend widerlegt habe, indem ich das, was ich für wahr und wertvoll darin fand, von dem Irrtümlichen ausschied.

Wenn ich nun über Ferrier's neue Arbeit zu schreiben mich veranlasst fühle, so geschieht das darum, weil ich so vieles Ungenau-

1) Luciani, Il cervelletto. Firenze 1891. Deutsche Ausgabe. Das Kleinhirn besorgt v. M. O. Fraenkel. E. Besold (A. Georgi). Leipzig 1893.

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