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Dwight C. Ensign

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THE ROTATORIA OF THE LAKE OKOBOJI REGION*

DWIGHT C. ENSIGN

INTRODUCTION

This report is based upon a series of collections and studies made during the months of July and August, 1919, at the Iowa Lakeside Laboratory. It is incomplete, since numerous species which will doubtless be found in this locality have been missed by reason of the short time during which collections were made.

The region of the Iowa Lakeside Laboratory seems to be an especially good place for the study of the Rotatoria. A wide variety of habitats is within available distance of the laboratory grounds; the open lake, the quieter waters of the sand-bar pond and the canal, the numerous kettle holes, and the marshy swamps near the lake shore afford many different kinds of collecting. It is probable that succeeding years of study will as much as double the list of species found in this locality this year, one hundred and eight in all, of which five have not yet been satisfactorily identified and are not included in this report.

Little work has been done upon the Rotatoria of the state of Iowa, so that it is difficult to know how many forms to expect. The only other list of Iowa rotifers which was available for comparison was one prepared by Mr. Wright Stacy¹ of the State University of Iowa; twenty-eight species were listed, all except five of which were found at Okoboji also. The species recorded from Iowa City by Mr. Stacy which did not appear in this summer's collections are: *Brachionus urceus* (Linnaeus), *Monostyla arcuata* (Bryce), *Lepadella oblongata* (Ehrenberg), *Diurella weberi* (Jennings), and *Philodina erythophthalma* (Ehrenberg). It might be mentioned in passing that Mr. Stacy's *Brachionus urceus*² would seem from his figure to be the *Brachionus urceolaris* of Hudson and Gosse,³ which by Harring, in his *Synopsis of the Rotatoria*⁴ is assigned to *Brachionus capsuliflorus*, a species which occurred in great abundance at Okoboji.

* Based upon collections and studies made during the summer of 1919 at The Iowa Lakeside Laboratory.

¹ Stacy, Wright, Studies of the Rotifera of Iowa—A Thesis.

² *Idem.*, p. 42, plate V, figure 2.

³ Hudson and Gosse, The Rotifera, volume II, p. 118, plate XXVII, figure 6.

⁴ Harring, H. K., Synopsis of the Rotatoria: U. S. Natl. Museum Bull. 81, p. 20.

Collections were made at Okoboji from the several localities studied, bolting-silk tow-nets with 29,929 meshes to the square inch being used. A Birge bucket was also used to some extent; the bolting-silk in this was the same gauge as that of the tow-nets. Most of the material was studied in a fresh condition. No really satisfactory method of preserving the il-loricate forms was found; the best that could be done was to narcotize them with a solution of nicotine and then to gradually add alcohol until a strength of from fifty to sixty per cent was reached. This method had the disadvantage of shrinking many of the il-loricates, even though the alcohol was added very slowly. By far the most satisfactory studies were those made from living specimens.

This report consists of an itemized statement as to the occurrence and abundance of the several species. The revised terminology as brought out by Harring⁵ is used throughout. A thumb-nail sketch of each species recorded is to be found in the two plates (Plates VI and VII). These drawings were made, for the most part, from life; in many of the loricates, the sketch is merely the outline of the lorica. The sketches are included to give to those unfamiliar with the terminology a definite idea as to the wide variety of forms found in this rather limited region.

The numbered localities on the map (Fig. 49) indicate the principal collecting grounds. Following is a brief description of each of these; the numbers correspond with those on the map.

1. Lake Okoboji. Collections made in Lake Okoboji were confined to surface tows and tows at a depth of about five feet, usually not more than a few rods from the shore. *Ceratophyllum*, *Myriophyllum*, *Potamogeton*, *Vallisneria*, and numerous species of algae are found near the shore, and rotifers occur in considerable numbers among these plants.

2. Drainage canal. The drainage canal is the collecting ground *par excellence* for rotifers. It is almost a mile long, from ten to fifteen feet wide, and about ten feet deep, filled almost to the surface of the water with aquatic plants. The entrances from the lake are choked with sand; there is no current except such sluggish water movements as may be set up by the wind.

3. Sand-bar pond. This is a shallow pond with two openings from the main lake, situated on a sand-bar at the mouth of Miller's bay. Its shores are bordered by marsh grasses, sedges, and reeds; duckweed also is found here in great abundance. The depth of the pond is nowhere more than two or three feet.

⁵ *Idem*.

4. Kettle hole. Kettle hole 4 is small, rather shallow, bordered on one side by a section road and on the others by sedges and marsh grasses.

5. Kettle hole. Kettle hole 5 is across the road from kettle hole 4. It is much larger and deeper. Aquatic plants are found growing in it quite abundantly. While it is connected with 4 by a small culvert, there are some noticeable differences in the rotatorian faunæ of the two.

6. Kettle hole. Kettle hole 6 is a small muddy kettle hole in the middle of a pasture; very few species of rotifers were found here.

7. Kettle hole. Kettle hole 7 is rather shallow and muddy, and is located in the middle of a stock pasture. Three distinct varieties of *Brachionus havanaensis* were taken from this kettle hole, the only place in the district where this form occurred.

8. Kettle hole. Kettle hole 8 is a small marshy pool near Emerson's bay. Few rotifers were found here.

9. Creek near Egralharve. This is a small intermittent creek, not extensive in its rotatorian fauna.

10. Marshes near West Okoboji. Under this are grouped several marshy kettle holes and sloughs near the railroad station of West Okoboji, at the north end of Lake Okoboji.

11. Gull Point kettle hole. This is a rather large kettle hole on Gull Point, connected with the lake by a small channel. No very extensive study of it was made.

12. Green slough. This is a large body of water, connected in the early part of the season with Lake Okoboji by a channel about four feet wide and one foot deep; this channel becomes closed as the water level falls in the later part of the season. The slough is filled with aquatic plants and is bordered by sedges and reeds.

13. Swamps near Center Lake. Here are included several marshy bodies of water in the general vicinity of Center lake.

14. Marsh near Manhattan. This is really a large kettle hole with a very marshy, boggy shore. It is almost impossible to get near the edge of the kettle-hole proper. Such collections as could be made were from shallow puddles of water in the grass near the edge. Two species of *Mikrocodides* were found here.

15. Gar lakes. The Gar lakes are connected with East Lake Okoboji. Very little collecting was done here.

16. Fish ponds. The ponds of the State Fish Hatchery at Orleans, at the head of East Lake Okoboji, furnished many

species of rotifers, principally the loricate forms. These fish ponds are shallow artificial ponds; most of them have *Ceratophyllum* and other aquatic plants in them.

17. Sunken lake. This is a small, very deep lake, not far from the west shore of Spirit lake, having practically no aquatic vegetation near the shore, where the collecting was done.

18. Hottes Lake. Hottes lake is of good size, but is rather shallow. Its shores slope off very gradually, and many species of rotifers were taken from among the water plants near the bank.

19. Little Spirit Lake. A tow was taken from among *Ceratophyllum* and algæ near the bank of Little Spirit lake, bringing several species of rotifers.

20. Marble Lake. Marble lake is quite similar to Hottes lake, but is somewhat larger. Its banks are edged with reeds.

21. Little Sioux river. Five species of rotifers were found in water from Little Sioux river, a small rather sluggish stream about two and a half miles from the laboratory grounds.

LIST OF ROTATORIA

With notes on distribution, and other features

ORDER PLOIMA

Notommata aurita (Müller) (Plate VI, Fig. 1). Several individuals of this species were found in water from the swamps about Center lake (13).

Notommata brachyota Ehrenberg (Plate VI, Fig. 2). This species was found in abundance on *Rivularia echinulata*, floating in Miller's bay (1). The animal is a voracious feeder; several groups of *Rivularia* were found in which the trichomes were almost wholly eaten away, each with four or five rotifers on it. The animal is salmon pink in color. On the *Rivularia* were also found a few *Vorticellae*; one specimen of *Taphrocampa annulosa* was found here also. *Rivularia* from several other localities was examined, but rotifers were found only on that from Lake Okoboji.

Notommata copeus Ehrenberg (Plate VI, Fig. 3). Only one individual of this species was found, in water from the vicinity of Center lake (13).

Notommata najas Ehrenberg (Plate VI, Fig. 4). This large species was found in water from ponds and kettle holes near the north end of Lake Okoboji (10), several individuals being taken here. It was met with again in water from Little Spirit lake (19).

Notommata pachyura (Gosse) (Plate VI, Fig. 5). Found near the entrance of the drainage canal (2), eight individuals being recognized.

Notommata saccigera Ehrenberg (Plate VI, Fig. 6). This species was found in considerable numbers in a jar of algæ, chiefly *Mougeotia*, which had been brought into the laboratory; records failed to show from what

locality the algæ had come. This is the smallest species of the genus found here.

Taphrocampa annulosa Gosse (Plate VI, Fig. 7). This species was found first on *Ceratophyllum* from the mouth of the canal (2). It was later recognized on a globe of *Rivularia echinulata* along with *Notomata brachyota*, q.v.

Pleurotrocha sordida (Gosse) (Plate VI, Fig. 8). Found in tows made in the marsh near the north end of Lake Okoboji (10). Three individuals were taken.

Cephalodella catellina (Müller) (Plate VI, Fig. 9). Two individuals of this species were found among weeds in a pond opening from the drainage canal (2).

Cephalodella forficula (Ehrenberg) (Plate VI, Fig. 10). This species was found in Lake Okoboji (1), where it was rare; common in the drainage canal (2); a few individuals in kettle hole (7); and a few in kettle holes near West Okoboji (10).

Diaschiza gibba (Ehrenberg) (Plate VI, Fig. 11). Fairly abundant in the canal (2); a few individuals from kettle hole (8); two from Hottes lake (18).

Diaschiza gracilis (Ehrenberg) (Plate VI, Fig. 12). This very small form was found in considerable abundance both in the canal (2), and in the sand-bar pond (3).

Diaschiza tenuior Gosse (Plate VI, Fig. 13). Somewhat similar in appearance to *D. gracilis*, but larger; three specimens were found in water from a weedy pond along the canal (2).

Monommata orbis (Müller) (Plate VI, Fig. 14). This includes *Furcularia longiseta* and *Furcularia aequalis* of Hudson and Gosse;⁶ both varieties were found near the mouth of the canal (2).

Dicranophorus forcipatus (Müller) (Plate VI, Fig. 15). Found only near the mouth of the canal (2); one specimen.

Epiphanes brachionus (Ehrenberg) (Plate VI, Fig. 16). Found in a stagnant pool near the north end of Lake Okoboji (10); one specimen.

Epiphanes clavulata (Ehrenberg) (Plate VI, Fig. 17). Collected from the same stagnant pool with *E. brachionus*; two specimens of this were found.

Epiphanes senta (Müller) (Plate VI, Fig. 18). Nine specimens were found in the canal (2), and five in the sand-bar pond (3). The species was found once among red *Englenae*, the large stomach of the rotifer being colored red by them; when a specimen is found among green *Englenae*, the stomach is green.

Microcodon clavus Ehrenberg (Plate VI, Fig. 19). Two specimens were found at different times in water from the canal (2); this is the only place it was found. It can be recognized by the brilliant purple pigment spot in the head, the eye.

Mikrocodides chlaena (Gosse) (Plate VI, Fig. 20). Two specimens were found among weeds in a marshy pool near Manhattan (14).

Mikrocodides robustus (Glasscott) (Plate VI, Fig. 21). Three specimens were found with *M. chlaena*, in a weedy, marshy pool (14).

Brachionus angularis Gosse (Plate VI, Fig. 22). Abundant in kettle

⁶ Hudson and Gosse, *The Rotifera*, volume II, p. 46, plate XVIII, figures 15 and 16.

holes (4) and (5); rare in Green slough (12); a few individuals in water from Little Sioux river (21).

Brachionus budapestinensis Daday (Plate VI, Fig. 23). This species was found in a tow from a small roadside pond near kettle hole (6); twelve individuals were found, this being the only rotifer in the tow.

Brachionus calyciflorus Pallas (Plate VI, Fig. 24). This is a very common species, being found in abundance in the canal (2), the sand-bar pond (3), kettle holes (4) and (5), a creek near Egralharve (9), and the fish ponds (16); it was met with more rarely in water from the marshes near West Okoboji (10), Gull Point kettle hole (11), Green slough (12), Gar lakes (15), Hottes lake (18), and Little Sioux river (21).

Brachionus capsuliflorus Pallas (Plate VI, Fig. 25). This species was found abundantly in the canal (2), the sand-bar pond (3), marshes near West Okoboji (10), and Green slough (12); and less frequently in kettle holes (4) and (5), Gull Point kettle hole (11), Gar lakes (15), and Marble lake (20).

Brachionus havanaensis Rousselet (Plate VI, Fig. 26). Three varieties of this species were found in great numbers in kettle hole (7); there is great variation as to length of posterior spines.

Brachionus patulus Müller (Plate VI, Fig. 27). This species was found most abundantly in August; it occurred in Lake Okoboji (1), the canal (2), creek near Egralharve (9), Gar lakes (15), the fish ponds (16), Sunken lake (17), Hottes lake (18), Little Spirit lake (19), and Marble lake (20).

Platylas quadricornis (Ehrenberg) (Plate VI, Fig. 28). Found abundantly in Lake Okoboji (1), and kettle hole (5); more rarely in marshes near West Okoboji (10) and in Little Spirit lake (19).

Keratella cochlearis (Gosse) (Plate VI, Fig. 29). Collected in great numbers from Lake Okoboji (1), the canal (2), the sand-bar pond (3), kettle holes (4) and (5), marshes near West Okoboji (10), Gull Point kettle hole (11), Gar lakes (15), fish ponds (16), Sunken lake (17), Hottes lake (18), Marble lake (20), and Little Sioux river (21). The variety *tecta* also was found, in which the posterior spine is lacking; this occurred in the canal (2).

Keratella quadrata (Müller) (Plate VI, Fig. 30). Three specimens were found in the canal (2).

Keratella serrulata (Ehrenberg) (Plate VI, Fig. 31). Found in water from a loop in the canal (2).

Notholca striata (Müller) (Plate VI, Fig. 32). Found in the canal (2), along with *Keratella cochlearis* and *K. quadrata*.

Anuraeopsis fissa (Gosse) (Plate VI, Fig. 33). Collected among weeds near the mouth of the canal (2), three specimens; kettle hole (5), one specimen; Hottes lake (18), one specimen.

Mytilina mucronata (Müller) (Plate VI, Fig. 34). Two specimens were found with *M. ventralis brevispina* in water from a weedy canal pond (2).

Mytilina trigona (Gosse) (Plate VI, Fig. 35). Four specimens were found with other *Mytilinidae* in a weedy canal pond (2).

Mytilina ventralis (Ehrenberg) (Plate VI, Fig. 36). Collected in marshes near West Okoboji (10), where it was found quite plentifully;

fairly abundant in kettle hole (7), and in Hottes lake (18); a few individuals found in water from Gar lakes (15) and from Little Spirit lake (19).

Mytilina ventralis brevispina (Ehrenberg) (Plate VI, Fig. 37). Four specimens were found among weeds in a small pond along the canal (2).

Euchlanis dilatata Ehrenberg (Plate VI, Fig. 38). Found abundantly in the canal (2), fish ponds (16), and Hottes lake (18).

Euchlanis pyriformis Gosse (Plate VI, Fig. 39). Several individuals of this species were found in water from the entrance of the canal (2); a few were found in Little Spirit lake (19).

Euchlanis triquetra (Ehrenberg) (Plate VI, Fig. 40). By far the commonest of the three representatives of the genus in the region, being found abundantly in Lake Okoboji (1), in kettle hole (7), in Green slough (12), and in the fish ponds (16); a few individuals were found in Gar lakes (15) and in Sunken lake (17); one was found in water from Hottes lake (18), and one in water from Little Spirit lake (19).

Dipleuchlanis propatula (Gosse) (Plate VI, Fig. 41). Two individuals were found in water from a marshy kettle hole near West Okoboji (10).

Lecane gissensis (Eckstein) (Plate VI, Fig. 42). One individual was found in a tow near the mouth of the canal (2).

Lecane luna (Müller) (Plate VI, Fig. 43). Quite common. Found in the canal (2), kettle hole (8), a pond near West Okoboji (10), fish ponds (16), Hottes lake (18), Little Spirit lake (19), Marble lake (20), and Little Sioux river (21). A few specimens were taken from Lake Okoboji (1), but the species is not common there.

Monostyla acus Harring (Plate VI, Fig. 44). Several individuals were found in water from the fish ponds (16).

Monostyla bulla Gosse (Plate VI, Fig. 45). Very common. Collected from the canal (2), the sand-bar pond (3), kettle hole (7), kettle hole at West Okoboji (10), Gull Point kettle hole (11), Green slough (12), Gar lakes (15), fish ponds (16), Sunken lake (17), and Marble lake (20). The species was found several times attached in considerable numbers to the outside of the aquatic worm, *Stylaria lacustris*; in such cases, it attaches itself to the body of the worm by means of its toe.

Monostyla cornuta (Müller) (Plate VI, Fig. 46). This is a small *Monostyla*, not very common here. It was found in a kettle hole at West Okoboji (10), and again in Hottes lake (18).

Monostyla crenata Harring (Plate VI, Fig. 47). Two specimens were found in a tow from Lake Okoboji (1), near the laboratory dock.

Monostyla lunaris Ehrenberg (Plate VI, Fig. 48). This species was found in the canal (2), kettle hole (5), a swamp near West Okoboji (10), and Hottes lake (18). The body in some specimens appeared clear and hyaline, and in others had a brick-red coloration.

Monostyla quadridentata Ehrenberg (Plate VI, Fig. 49). Rather common in this region, being found in Lake Okoboji (1), the canal (2), the sand-bar pond (3), and kettle hole (7).

Lepadella acuminata (Ehrenberg) (Plate VI, Fig. 50). This species was found in a jar of algæ which had been brought into the laboratory from the canal (2). It was collected also from a swamp near West Okoboji (10).

Lepadella ovalis (Müller) (Plate VI, Fig. 51). This was the most common species of the genus. It was found in great numbers in the canal (2), near West Okoboji (10), and in Green slough (12); less abundantly in the fish ponds (16), Sunken lake (17), and Little Spirit lake (19).

Lepadella patella (Müller) (Plate VI, Fig. 52). A few individuals were found in the canal (2), the fish ponds (16), and Hottes lake (18).

Lepadella triptera Ehrenberg (Plate VI, Fig. 53). This small *Lepadella* was found in water from a swamp near the head of Lake Okoboji (10), and in the fish ponds (16).

Lophocharis oxyterion (Gosse) (Plate VI, Fig. 54). This species was found first in kettle hole (4); later two individuals were collected in a kettle hole near West Okoboji (10), and one in Little Spirit lake (19).

Lophocharis salpina (Ehrenberg) (Plate VI, Fig. 55). This *Lophocharis* was found in a weedy marsh (14), in the fish ponds (16), and in Little Spirit lake (19); it is not abundant anywhere.

Colurella adriatica Ehrenberg (Plate VI, Fig. 56). This species was found only near the mouth of drainage canal (2). Two specimens were found at different times.

Colurella bicuspidata Ehrenberg (Plate VI, Fig. 57). This species, with *C. obtusa*, was found in a stagnant pool near West Okoboji (10). It seems to be very rare, as only one individual was found.

Colurella deflexa (Ehrenberg) (Plate VI, Fig. 58). This *Colurella* was collected among weeds in the sand-bar pond (3); it was also found in a marsh near West Okoboji (10). Fairly common.

Colurella obtusa (Gosse) (Plate VI, Fig. 59). This species was collected from a jar of *Spirogyra* which had been brought into the laboratory from the canal (2). It was later found in a stagnant pool near West Okoboji (10). Not common.

Trichotria pocillum (Müller) (Plate VI, Fig. 60). This form was found on some algæ brought from the canal (2). Three individuals were recognized. It was not found elsewhere.

Trichotria tetractis (Ehrenberg) (Plate VI, Fig. 61). Found in a weedy marsh near Manhattan (14); two specimens.

Macrochaetus collinsii (Gosse) (Plate VI, Fig. 62). This species was found in great abundance in the canal (2), but not until after the middle of August.

Scaridium longicaudum (Müller) (Plate VI, Fig. 63). Seven or eight specimens were found in water from the mouth of the canal (2).

Trichocerca elongata (Gosse) (Plate VI, Fig. 64). Found in a tow from a small roadside pond near kettle hole (5); two specimens from the canal (2), and one from Little Spirit lake (19).

Trichocerca lophoessa (Gosse) (Plate VI, Fig. 65). Only two individuals of this species were found, both from a small pool near Center lake (13).

Trichocerca rattus (Müller) (Plate VI, Fig. 66). This species is rather common. It was found first in a deep tow in Lake Okoboji (1); later, many specimens were found in the canal (2), in kettle hole (5), in Sunken lake (17), and in Hottes lake (18).

Trichocerca stylata (Gosse) (Plate VI, Fig. 67). Found in some abundance in Lake Okoboji (1), the canal (2), and the sand-bar pond (3).

Diurella brachyura (Gosse) (Plate VII, Fig. 1). This species was found in a small pond opening from the drainage canal (2), together with several other species of *Diurella*.

Diurella porcellus (Gosse) (Plate VII, Fig. 2). Four specimens of this were found in a small pond opening from the drainage canal (2). This is the species that is compared by Gosse to "a fat young pig"⁷ in appearance.

Diurella tenuior (Gosse) (Plate VII, Fig. 3). This species was found with others of the genus in a weedy canal pond (2). Four individuals.

Diurella tigris (Müller) (Plate VII, Fig. 4). This is a common species, especially in the earlier part of the summer. Found in canal (2), kettle hole (4), kettle hole (7), and the fish ponds (16).

Gastropus hyptopus (Ehrenberg) (Plate VII, Fig. 5). Two specimens were found in water from a swamp near West Okoboji (10).

Ascomorpha eucadis Perty (Plate VII, Fig. 6). Several specimens were found near the mouth of the canal (2).

Synchaeta pectinata Ehrenberg (Plate VII, Fig. 7). This species is common in Lake Okoboji (1), and in the sand-bar pond (3); a few individuals came from the marshes near West Okoboji (10). One of the most active and vigorous species found.

Polyarthra trigla Ehrenberg (Plate VII, Fig. 8). Common in Lake Okoboji (1) the canal (2), the sand-bar pond (3), and kettle hole (5); a few individuals were found in kettle hole (8) and in Hottes lake (18).

Asplanchna brightwellii Gosse (Plate VII, Fig. 9). A fairly common species in Lake Okoboji (1), the canal (2), and the sand-bar pond (3). One of the most fascinating species to study.

Asplanchna priodonta Gosse (Plate VII, Fig. 10). Found in kettle hole (4); one specimen.

Asplanchnopus multiceps (Schrank) (Plate VII, Fig. 11). From a marsh near Manhattan (14), and Marble lake (20); one specimen from each locality.

Testudinella mucronata (Gosse) (Plate VII, Fig. 12). Found with *T. patina* and *T. truncata* in water from the canal (2); rare.

Testudinella patina (Hermann) (Plate VII, Fig. 13). Quite common; found in Lake Okoboji (1), canal (2), sand-bar pond (3), kettle hole (5), kettle hole (7), marshes at West Okoboji (10), Gull Point kettle hole (11), Green slough (12), Gar lakes (15), fish ponds (16), and Little Spirit lake (19). This beautiful creature was described by Müller as "animalculum crystallinum, splendore nulli secundum;"⁸ a description which it really merits.

Testudinella truncata (Gosse) (Plate VII, Fig. 14). Found with the other two representatives of the genus in the canal (2); rare.

Pompholyx sulcata Hudson (Plate VII, Fig. 15). Found in a marsh near the upper end of Lake Okoboji (10); two individuals.

Pedalia mira (Hudson) (Plate VII, Fig. 16). This remarkably interesting "skipping rotifer" was found near the entrance of the canal (2),

⁷ Hudson and Gosse, The Rotifera, volume II, p. 67.

⁸ Quoted in Hudson and Gosse, The Rotifera, volume II, p. 112.

in tows made on two consecutive days only, near the middle of August. Several specimens were found on each of the two days.

Filinia cornuta (Weisse) (Plate VII, Fig. 17). A few individuals were found near the entrance of the canal (2).

Filinia longiseta (Ehrenberg) (Plate VII, Fig. 18). This species was abundant in Lake Okoboji (1), the canal (2), the sand-bar pond (3), and Gull Point kettle hole (11); a few individuals were found in kettle hole (6), in a creek near Egralharve (9), in the fish ponds (16), and in Little Sioux river (21).

Filinia passa (Müller) (Plate VII, Fig. 19). Not quite so abundant as *F. longiseta*; found in Lake Okoboji (1), in kettle hole (5), and in a kettle hole near West Okoboji (10).

ORDER FLOSCULARIACEA

Floscularia ringens (Linnaeus) (Plate VII, Fig. 20). Found on *Ceratophyllum*, *Myriophyllum*, and others of the larger aquatic plants, but never on fresh, green, young plants. Collected from Miller's bay, Lake Okoboji (1), and from the sand-bar pond (3).

Limnias ceratophylli Schrank (Plate VII, Fig. 21). Found on *Ceratophyllum*, often with *Floscularia*. Collected from Miller's bay, Lake Okoboji (1), and from the sand-bar pond (3).

Ptygura longicornis (Davis) (Plate VII, Fig. 22). Found in great abundance among floccose material on old *Ceratophyllum*; not collected here on any other water plant. Sand-bar pond (3).

Sinantherina socialis (Linnaeus) (Plate VII, Fig. 23). Clusters are found on the tips of *Ceratophyllum* leaf-lobes, like globular balls of gray jelly. Fairly rare here. Sand-bar pond (3).

Lacinularia flosculosa (Müller) (Plate VII, Fig. 24). Collected from Lake Okoboji (1), the canal (2), and the sand-bar pond (3). This species was found in great abundance on the tips of the leaf-lobes of *Ceratophyllum*, being the most common of all attached rotifers in this region. It seems to be profusely distributed in the lake. Of sixty-eight colonies of social rotifers examined from one collection, sixty-seven were of this species, and one was *Sinantherina socialis*. The color of the colony is brownish yellow to salmon; the species is easily recognized by the color and by the four opaque warts or collar knobs. The collar knobs of the specimens from the sand-bar pond (3) and from the canal (2) are almost black; those of specimens found on *Ceratophyllum* in the open lake (1) are light brown. Colonies were found also on the roots of the common duckweed and of *Lemna trisulca*.

Conochilus hippocrepis (Schrank) (Plate VII, Fig. 25). Found in great numbers in kettle hole (6) on one day only, July 7, a sunny, cool day.

Conochiloides dossuaris (Hudson) (Plate VII, Fig. 26). This species was first found in kettle hole (4); later it was found rarely in the canal (2), Marble lake (20) and one specimen from Lake Okoboji (1).

ORDER COLLOTHECACEA

Collotheca algicola (Hudson) (Plate VII, Fig. 27). Found in colonies of *Rivularia pisum*, the animal being embedded in the gelatine of the

Rivularia. This species is very uncommon in this region, as more than a hundred and fifty growths of *Rivularia* were examined, and only two were found with *C. algicola* inhabiting them. The two growths which did have rotifers in them were on *Ceratophyllum* from the canal (2); one growth had five rotifers in it, the other two.

Collotheca campanulata (Dobie) (Plate VII, Fig. 28). Found on duckweed roots, together with *Vorticella*. Two specimens were found, both from a stagnant pool near West Okoboji (10).

ORDER BDELLOIDA

Adineta vaga (Davis) (Plate VII, Fig. 29). This species was obtained by collecting a handful of dried leaves, twigs, etc., from the eaves of the cottage on the laboratory grounds and soaking the material in water for twenty-four hours. Along with *Adineta vaga* were found *Rotaria rotatoria* (see below), and numerous protozoa, notably *Paramecium*.

Philodina citrina Ehrenberg (Plate VII, Fig. 30). This species was found (rare) in water from Green slough (12), Hottes lake (18), and Little Spirit lake (19). Its yellowish color is perhaps its most outstanding characteristic.

Philodina megalotrocha Ehrenberg (Plate VII, Fig. 31). Found only in the sand-bar (3). The smallest representative of the genus found here.

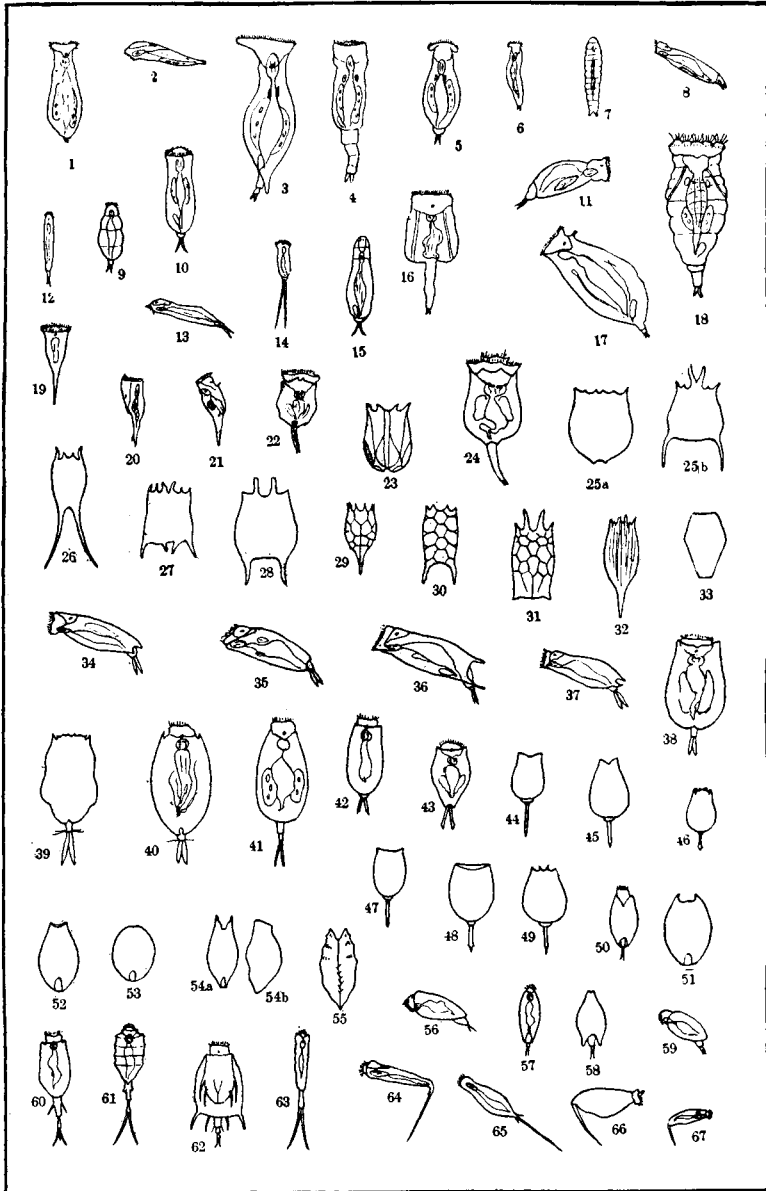
Philodina roseola Ehrenberg (Plate VII, Fig. 32). Found on weeds and in tows from the sand-bar pond (3), kettle hole (4), and Little Spirit lake (19). This species bears repeated drying and revivifying.

Rotaria macroceros (Gosse) (Plate VII, Fig. 33). Two specimens were found in a marshy, weedy pool near Manhattan (14).

Rotaria macrura (Ehrenberg) (Plate VII, Fig. 34). Found in the canal (2), the sand-bar pond (3), Gull Point kettle hole (11), Green slough (12), and Gar lakes (15). This species is viviparous. One individual which was under the microscope for observation had a fully developed young rotifer in her coelomic cavity. During the course of the study, the body wall of the mother ruptured (probably due to pressure from the cover glass caused by drying of the preparation) and the young rotifer swam out. It progressed for a short distance through the water, swimming by means of its ciliary wreath, and then anchored itself and commenced to take food. The mother continued to move her ciliary wreath for several minutes, but soon died.

Rotaria rotatoria (Pallas) (Plate VII, Fig. 35). This species is very common. Besides being found in the material from the eaves of the cottage (see above, under *Adineta vaga*), it was found in Lake Okoboji (1), the canal (2), the sand-bar pond (3), kettle hole (4), kettle hole (5), kettle hole (6), kettle hole (7), marshes at West Okoboji (10), Green slough (12), Gar lakes (15), fish ponds (16), Hottes lake (18), Little Spirit lake (19), and Marble lake (20).

Rotaria tardigrada (Ehrenberg) (Plate VII, Fig. 36). Found on water weeds and in sediment from the canal (2), kettle hole (4), kettle hole (7), swamp at West Okoboji (10), and Little Spirit lake (19).



EXPLANATION OF PLATES*

PLATE VI. ORDER PLOIMA

- | | | | |
|-------|-------------------------------------|------|--|
| Fig. | | Fig. | |
| 1. | <i>Notommata aurita</i> . | 3. | <i>Notommata copeus</i> . |
| 2. | <i>Notommata brachyota</i> . | 4. | <i>Notommata najas</i> . |
| 5. | <i>Notommata pachyura</i> . | 37. | <i>Mytilina ventralis brevispina</i> . |
| 6. | <i>Notommata saccigera</i> . | 38. | <i>Euchlanis dilatata</i> . |
| 7. | <i>Taphrocampa annulosa</i> . | 39. | <i>Euchlanis pyriformis</i> . |
| 8. | <i>Pleurotrocha sordida</i> . | 40. | <i>Euchlanis triquetra</i> . |
| 9. | <i>Cephalodella catellina</i> . | 41. | <i>Dipleuchlanis propatula</i> . |
| 10. | <i>Cephalodella forficula</i> . | 42. | <i>Lecane gissensis</i> . |
| 11. | <i>Diaschiza gibba</i> . | 43. | <i>Lecane luna</i> . |
| 12. | <i>Diaschiza gracilis</i> . | 44. | <i>Monostyla acus</i> . |
| 13. | <i>Diaschiza tenuior</i> . | 45. | <i>Monostyla bulla</i> . |
| 14. | <i>Monommata orbis</i> . | 46. | <i>Monostyla cornuta</i> . |
| 15. | <i>Dicranophorus forcipatus</i> . | 47. | <i>Monostyla crenata</i> . |
| 16. | <i>Epiphanes brachionus</i> . | 48. | <i>Monostyla lunaris</i> . |
| 17. | <i>Epiphanes clavulata</i> . | 49. | <i>Monostyla quadridentata</i> . |
| 18. | <i>Epiphanes senta</i> . | 50. | <i>Lepadella acuminata</i> . |
| 19. | <i>Mikrocodon clavus</i> . | 51. | <i>Lepadella ovalis</i> . |
| 20. | <i>Mikrocodides chlaena</i> . | 52. | <i>Lepadella patella</i> . |
| 21. | <i>Mikrocodides robustus</i> . | 53. | <i>Lepadella triptera</i> . |
| 22. | <i>Brachionus angularis</i> . | 54. | <i>Lophocharis oxysternon</i> . |
| 23. | <i>Brachionus budapestinensis</i> . | a. | Dorsal view. |
| 24. | <i>Brachionus calyciflorus</i> . | b. | Lateral view. |
| 25. | <i>Brachionus capsuliflorus</i> . | 55. | <i>Lophocharis salpina</i> . |
| a, b. | Varieties. | 56. | <i>Colurella adriatica</i> . |
| 26. | <i>Brachionus havanaensis</i> . | 57. | <i>Colurella bicuspidata</i> . |
| 27. | <i>Brachionus patulus</i> . | 58. | <i>Colurella deflexa</i> . |
| 28. | <i>Platylas quadricornus</i> . | 59. | <i>Colurella obtusa</i> . |
| 29. | <i>Keratella cochlearis</i> . | 60. | <i>Trichotria pocillum</i> . |
| 30. | <i>Keratella quadrata</i> . | 61. | <i>Trichotria tetractis</i> . |
| 31. | <i>Keratella serrulata</i> . | 62. | <i>Macrochaetus collinsii</i> . |
| 32. | <i>Notholca striata</i> . | 63. | <i>Scaridium longicaudum</i> . |
| 33. | <i>Anuraeopsis fissa</i> . | 64. | <i>Trichocerca elongata</i> . |
| 34. | <i>Mytilina mucronata</i> . | 65. | <i>Trichocerca lophoessa</i> . |
| 35. | <i>Mytilina trigona</i> . | 66. | <i>Trichocerca rattus</i> . |
| 36. | <i>Mytilina ventralis</i> . | 67. | <i>Trichocerca stylata</i> . |

* For convenience in figuring, a sliding scale is used in Plates VI and VII. An animal 100 micra in length is figured as 10 mm.; for each additional 100 micra, 2.5 mm. are added. This gives some idea as to comparative size, yet the figures are all of convenient proportions.

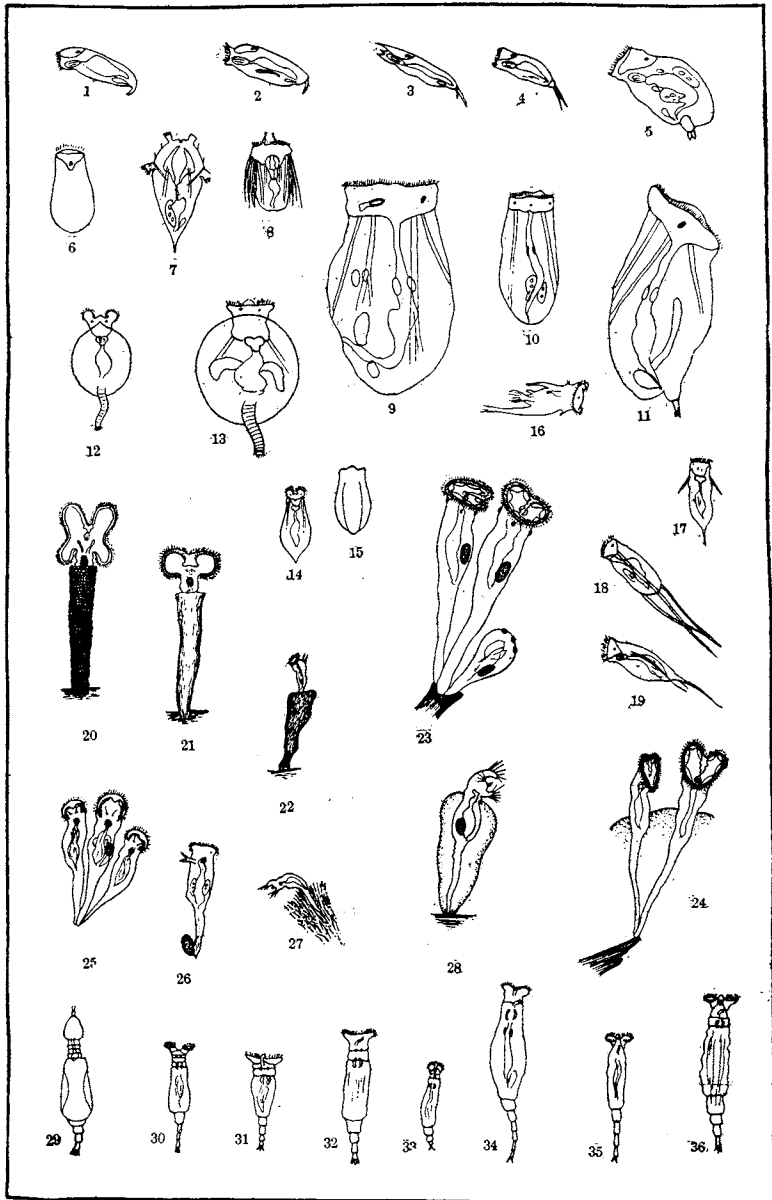


PLATE VII. ORDERS PLOIMA, FLOSCULARIACEA,
COLLOTHECACEA, AND BDELLOIDA

- | | | | |
|------|---------------------------------|------|--------------------------------|
| Fig. | | Fig. | |
| 1. | <i>Diurella brachyura.</i> | 19. | <i>Filinia passa.</i> |
| 2. | <i>Diurella porcellus.</i> | 20. | <i>Floscularia ringens.</i> |
| 3. | <i>Diurella tenuior.</i> | 21. | <i>Limnias ceratophylli.</i> |
| 4. | <i>Diurella tigris.</i> | 22. | <i>Ptygura longicornis.</i> |
| 5. | <i>Gastropus hyptopus.</i> | 23. | <i>Sinatherina socialis.</i> |
| 6. | <i>Ascomorpha eucadis.</i> | 24. | <i>Lacinularia flosculosa.</i> |
| 7. | <i>Synchaeta pectinata.</i> | 25. | <i>Conchilus hippocrepis.</i> |
| 8. | <i>Polyarthra trigla.</i> | 26. | <i>Conchiloides dossuaris.</i> |
| 9. | <i>Asplanchna brightwellii.</i> | 27. | <i>Collotheca algicola.</i> |
| 10. | <i>Asplanchna priodonta.</i> | 28. | <i>Collotheca campanulata.</i> |
| 11. | <i>Asplanchna multiceps.</i> | 29. | <i>Adineta vaga.</i> |
| 12. | <i>Testudinella mucronata.</i> | 30. | <i>Philodina citrina.</i> |
| 13. | <i>Testudinella patina.</i> | 31. | <i>Philodina megalotrocha.</i> |
| 14. | <i>Testudinella truncata.</i> | 32. | <i>Philodina roseola.</i> |
| 15. | <i>Pompholyx sulcata.</i> | 33. | <i>Rotaria macroceros.</i> |
| 16. | <i>Pedalia mira.</i> | 34. | <i>Rotaria macrura.</i> |
| 17. | <i>Filinia cornuta.</i> | 35. | <i>Rotaria rotatoria.</i> |
| 18. | <i>Filinia longiseta.</i> | 36. | <i>Rotaria tardigrada.</i> |

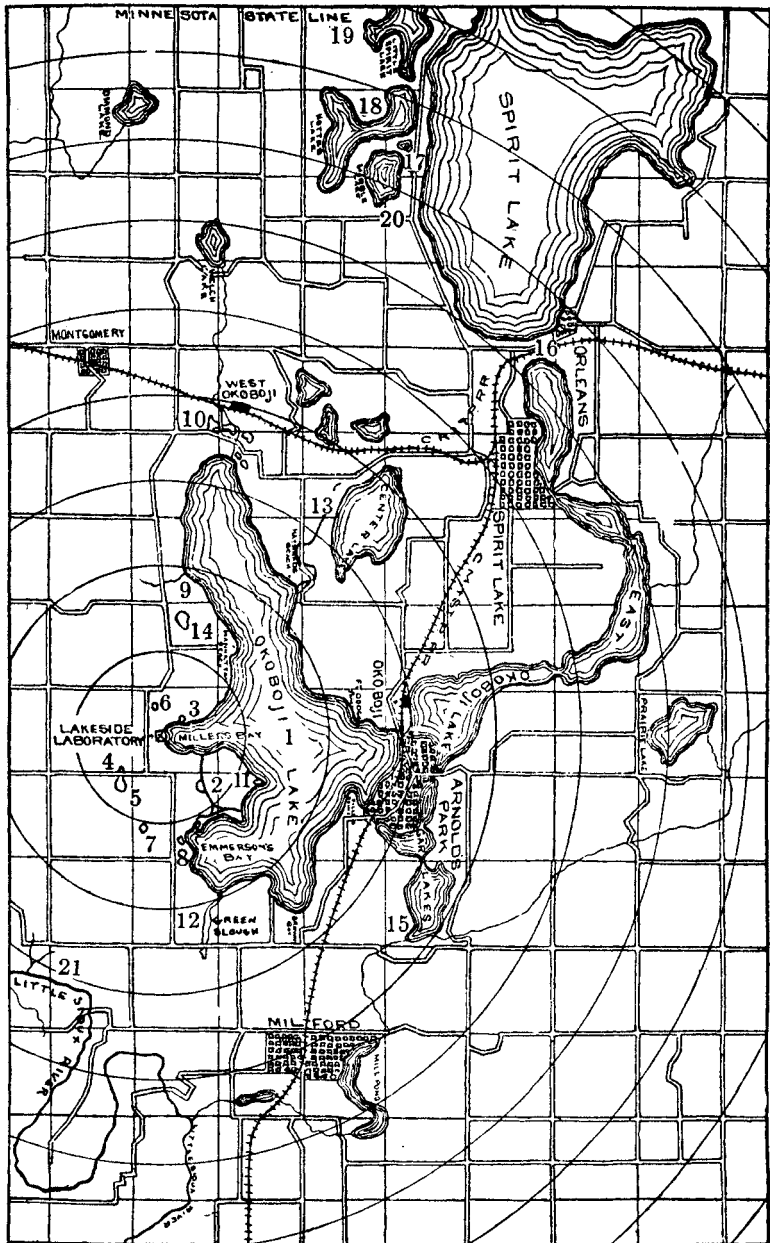


Fig. 49. MAP OF THE LAKE OKOBOJI REGION, SHOWING COLLECTING GROUNDS. 1. Lake Okoboji. 2. Drainage canal. 3. Sand-bar pond. 4. Kettle hole. 5. Kettle hole. 6. Kettle hole. 7. Kettle hole. 8. Kettle hole. 9. Creek. 10. Marshes and kettle holes. 11. Gull Point kettle hole. 12. Green slough. 13. Center Lake. 14. Marsh. 15. Gar lakes. 16. Fish ponds at Orleans. 17. Sunken Lake. 18. Hottes Lake. 19. Little Spirit Lake. 20. Marble Lake. 21. Little Sioux River.