

NEW SPECIES AND VARIETIES OF MOLLUSCA FROM LAKE WINNEBAGO,
WISCONSIN, WITH NEW RECORDS FROM THIS STATE *

BY FRANK C. BAKER

Winnebago Lake is the largest inland body of fresh water in eastern America as it is also the shallowest in relation to its area. Its greatest length is about 28 miles, its greatest width about 10 miles, and its maximum depth 20½ feet. The lake is fed by several large streams, Wolf River emptying into Lake Poygon and Fox River entering Lake Butte des Morts. Lakes Butte des Morts, Poygon, and Winneconne extend to the west of Lake Winnebago and are marsh-bordered bodies of water. Butte des Morts has a maximum depth of 15 feet, as has also the lower part of the Fox River. All of these lakes are really widened-out parts of the Fox and Wolf rivers, which encountered these shallow basins when the ice receded to the north during the waning of the Wisconsin ice cap.

The Lake Winnebago region offers unusual opportunities for the study of ecological variation. The Fox River, which flows for many miles as a typical river, expands to form Lake Butte des Morts, then narrows to form another river, which at Oshkosh again widens into the great body of water known as Lake Winnebago; from this lake a river flows, the lower Fox, which empties into Green Bay of Lake Michigan. The river, both above and below the lakes, contains a typical river fauna of mollusks. The lake fauna, however, although but a continuation of the Fox River, it is not like the river fauna, the species being smaller and otherwise differing from the typical river species. This variation was almost universally noted among the naides, the lake shells being easily distinguished from the river shells. The gastropods also varied in like manner. The fauna reached its present location by way of the Wisconsin-Fox valley, following the retreat of the continental ice cap, and the varieties in Lake Winnebago and Lake Butte des Morts were probably evolved subsequently.

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Lake Winnebago.

Length 121, height 52, wid
Lake Winnebago.

Length 138, height 62, wid
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Length 135, height 59, wid

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Lampsilis gracilis lacustris 1

The study of this lake region was carried on under the auspices of the Wisconsin Geological and Natural History Survey as part of a wide field study to ascertain the distribution of the molluscan fauna of the State, preliminary to the preparation of a monograph of the aquatic species. An extensive paper is in preparation covering in detail the ecological features of the Winnebago fauna, both molluscan and general invertebrate, in which all of the molluscan species are discussed. This will be published in the Transactions of the Wisconsin Academy of Sciences, Art and Letters. Only new forms and the more interesting new records are discussed in this paper.

Truncilla triquetra Raf. A single specimen of this *Truncilla* was dredged at Omro, Fox River, from gravel bottom, at a depth of $8\frac{1}{2}$ feet. This is a young shell, measuring, length 23, height 17, width 12 mm. *Triquetra* has not heretofore been reported from Wisconsin and its presence in the Fox River is surprising. It is known from southern Michigan and from Will County, Illinois. The specimen was living when dredged.

Lampsilis recta (Lamarck). Lakes Winnebago and Butte des Morts. The *recta* inhabiting the lakes are uniformly smaller than individuals living in Fox River. The relative difference is shown in the table below in which the largest lake shells are measured:

Length 115, height 50, width 36 mm. Male, Doemel Point, Lake Winnebago.

Length 121, height 52, width 34 mm. Female, Long Point, Lake Winnebago.

Length 138, height 62, width 41 mm. Male, Princeton, Fox River.

Length 135, height 59, width 39 mm. Female, Princeton.

This is a dwarf form produced by lake conditions and is paralleled by *Lampsilis ventricosa canadensis* and *L. luteola rosacea*. The Winnebago shells are somewhat different from the Lake Erie form named *recta* by Lamarck, the posterior ridge not being as well marked, but they seem clearly referable to the same type. They are different from the ordinary river form of *recta* (*latissima*) which is abundant in Wisconsin.

Lampsilis gracilis lacustris n. var. Lakes Winnebago and

FROM LAKE WINNEBAGO,
IN THIS STATE *

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Butte des Morts. Common on rock and sand bottoms in water one to ten feet in depth.

As in *Proptera* and *Lampsilis*, the lake environment has produced a shell somewhat different from typical *gracilis*, which is a river species. Compared with *gracilis* from the Fox River at Omro, the lake shells are rounder, higher in proportion to their length, the dorsal margin is strikingly alate in the male, forming a distinct wing, the shell is more compressed, the color is usually pale straw-yellow with few or no radiating lines, and the rest periods are very distinctly marked. The largest specimen from Plummers Point, Lake Butte des Morts (the type) measures as noted below, a small specimen of *gracilis* from Omra being also added for comparison:

Length 94, height 61, width 30 mm. Butte des Morts. Type.

Length 100, height 67, width 35 mm. Omro, Fox River.

Gracilis from Illinois and other localities in the Hinkley collection (about 15 lots) are without the marked wing so well developed in the males of the Winnebago Lake individuals and are also much larger. Female shells of *lacustris* are smaller, more ovate and narrower, but there is not as great difference in the dorsal wing as in the male shells. They are uniformly yellowish and have well marked rest periods.

Ortmann (1920, p. 249) has noted a difference between the Lake Erie form of *gracilis* and the Ohio River form, but does not believe the difference of enough value to distinguish. The material from Wisconsin is quite strikingly different and the separation of the lake form seems warranted. This, as well as the other lake forms, are true ecological varieties, produced by the change in environment.

Strophitus edentulus rhombicus (Anthony). Lakes Winnebago and Butte des Morts, on a rocky or sand bottom, in one to five feet of water. The *edentulus* of the lakes differ markedly from those individuals living in rivers. They are much smaller, more regularly elongated or subelliptical, and the umbones are more depressed. A large individual from Lake Winnebago (Long Point Island) measures, length 57, height 35, width 23 mm. This is a characteristic lake form and is probably the same as that mentioned by Ortmann as living in Lake Erie

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Lasmigona costata er Winnebago. The two debris appear to be red Grier. Measurements Length 90, height 5 Length 80, height 4

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Elliptio gibbosus ster gravel bottom, in wa Morts, gravel and stc deep.

FISH-CATCHING MUS through San Francis Mare Island in prepar which were subsequ made a curious mista in closing their shells the head. It would most surprised by the

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(Ortmann, 1920, p. 200). Anthony's *rhombica* appears to fit this form and renders a new name unnecessary (see Amer. Journ. Conch., I, p. 158, pl. 12, fig. 5). The same form occurs in Lake Michigan near Chicago. Walker has apparently recognized the variety in Michigan (1911, p. 127).

Lasmigona costata eriganensis Grier. Long Point Island, Lake Winnebago. The two specimens of this form found in beach debris appear to be referable to the Lake Erie form described by Grier. Measurements are given below:

Length 90, height 53, width 30 mm.

Length 80, height 43, width 24 mm.

These conform to the diagnosis of Grier and are certainly distinguishable from the river form.

Elliptio gibbosus sterkii Grier. Lake Winnebago, sand and gravel bottom, in water as deep as 10 feet; Lake Butte des Morts, gravel and stone bottom, water from one to three feet deep.

(To be continued)

NOTES.

FISH-CATCHING MUSSELS.—When the U. S. S. *Albatross* went through San Francisco Bay from Sausalito into dry dock at Mare Island in preparation for the cruise of 1914, three mussels which were subsequently found attached to the bottom had made a curious mistake. They had each been so unfortunate in closing their shells as to catch a little fish called anchovy by the head. It would be interesting to know which animal was most surprised by the encounter.—EDWARD C. JOHNSTON.

Mr. Edward C. Johnston of the U. S. Bureau of Fisheries has recently transferred his large collection of shells to the California Academy of Sciences, San Francisco. The collection consists of about 30,000 specimens, chiefly land and fresh-water species of the Mississippi Valley. Almost all of the material was cataloged, identified and indexed, ready for reference at once. It is not often that a museum receives a collection which requires

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(Concluded from p. 133)

The lake forms of *gibbosus* are all referable to Grier's *sterkii*, which is the lake manifestation of this species, though they are smaller than the Lake Erie specimens listed. The Winnebago shells are like Ortmann's figures (1920, pl. 8, fig. 3). Measurements of the Winnebago form are given below:

Length 61, height 33, width 19 mm., per cent 31.

Length 63, height 32, width 20 mm., per cent 31.

Length 64, height 34, width 20 mm., per cent 31.

Fusconaia rubiginosa parvula Grier. Winnebago Lake, gravel and boulder bottom, one to ten feet in depth. The Lake Winnebago shells seem referable to the Lake Erie form distinguished by Grier. Measurements of the Wisconsin shells are given below:

Length 56, height 44, width 32 mm.

Length 55, height 40, width 25 mm.

Length 34, height 33, width 24 mm.

Length 38, height 32, width 19 mm.

Parvula is an offshoot of *rubiginosa* rather than of *trigona*, if the Lake Winnebago specimens are referable to the Lake Erie variety. *Rubiginosa* is common in the Fox River and it is from this stock that the lake shells have sprung. The *parvula* here considered are wider than the river form, more trigonal and strikingly swollen anteriorly. A single specimen from Lake Winnebago (number 3 in the measurements above) is markedly trigonal and approaches *trigona* in general shape. The epidermis is yellowish-brown, becoming darker in old specimens.

Amnicola judayi n. sp.

Shell ovate conic, rather wide, widely umbilicated, with rather more than 5 very convex whorls separated by deeply impressed sutures; whitish or corneous, sometimes light brown, shining, lightly striate longitudinally; apex acute; aperture

year I took a boat trip to the Cor-
waters, about twenty miles south-
ing at the anchorage at high tide,
the question, so I went out with the
bottomed boat to a portion of the
the Gardens". The water is very
is from two to three fathoms deep
sea moss, grasses, shells and many
interesting.

ident, or spear, the skipper would
alone from the rocks, turn it over on
of the spear pierce the flesh of the
the boat. About a dozen fine speci-
ne being *Haliotis corrugata* Gray and
fulgens Phil. The backs of several
moss and other growths which I re-
fo from the backs of seven shells to
nation. The scrapings were treated
three-percent solution of formalde-
ughly dried, when they were shaken
ed for shells. From the material
ls I picked ninety-four specimens,
pecies which follow.

Crepidula dorsata Brod.

Columbella aurantiaca Dall.

Columbella gausapata Gld.

Eulithidium substriatum Cpr.

Acmacea paleacea Gld.

Acmacea rosacea Cpr.

Acmacea asmi Midd.

1.), *Saxicava rugosa* Linn.

3. *Philobrya setosa* Cpr.

Marginella regularis Cpr.

Cpr. *Psephis tantilla* Gld. (1 valve).

all. *Cardita subquadrata* Cpr.

roundly ovate, a trifle oblique; peristome continuous, somewhat flattened where it is in contact with the preceding whorl.

Length 5.0, width 3.3; length of aperture 2.0, width 1.5 mm. Holotype.

Length 4.4, width 3.1; length of aperture 2.0, width 1.6 mm. Paratype.

Off Doemel Point, Lake Winnebago, on a sandy mud bottom, in nine feet of water.

Associated with *Amnicola limosa porata* is a large form of *Amnicola* which cannot be referred to any described species. It resembles *cincinnatiensis* in general form, but is smaller with more rounded whorls and a wider umbilicus. It is larger than *winkleyi* Pilsbry (NAUT., Vol. 26, p. 1), with wider whorls and more open umbilicus. It resembles Tryon's figure of *schroekingeri* Ffld. (Con. Hald. Mon., pl. 17, fig. 1), but is very much larger than that species. It belongs to the group with projecting first whorl and not to the *limosa* group which is flat on the apex. *Judayi* is one of the most graceful of the *Amnicolas*, and I take great pleasure in dedicating it to Dr. Chancey Juday, of the University of Wisconsin.

Lioplax subcarinata (Say). Lakes Winnebago and Butte des Morts, sand and mud bottoms, in water one to 13 feet in depth; Omro, Fox River, mud bottom, water 2-3 feet deep. There appear to be several forms of *Lioplax* included under the name *subcarinata*. The Winnebago Lake shells have subcarinate whorls, which in a large majority of specimens are rounded without a sign of a ridge or carina. Say especially mentions the apex which he describes as "truncated and re-entering". is a peculiar feature which seems to be characteristic of all the material examined from Wisconsin. This is a physiologic character, the truncation and subsequent replacing of the spire with a rounded plug taking place after the shell has acquired five full whorls. All of the young have perfect spires with regularly coiled, rounded whorls. Young shells $8\frac{1}{2}$ mm. long have five whorls, mature shells 16 mm. long have but $4\frac{1}{2}$ whorls; the adult shells, if unmodified, would have 6-7 whorls. Binney's figure 118 fairly well represents the true *subcarinata*. The Winnebago shells measure as follows:

Length 18, width
Length 14, width

Subcarinata lives in
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Planorbis umbilicat
occurred in several
swales or quiet pools
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have fine, regularly d
the growth lines are s

Polygyra multilineat
the Winnebago region
and the spire is mor
variety *algonquinensis*

19, p. 141). Three s
Greatest diameter 2
Greatest diameter 2
Greatest diameter 18

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deman's Monograph.

Length 18, width 11.5; aperture length 8, width 6 mm.

Length 14, width 10.1; aperture length 7, width 5 mm.

Subcarinata lives in shallow water in the river and deep water in the lakes. Probably the deeper water of the lake provides the same cool temperature and oxygen supply as the shallow parts of the flowing river.

Planorbis umbilicatellus Ckll. This little-understood species occurred in several places near Lake Winnebago, always in swales or quiet pools. These specimens are somewhat larger than specimens from Colorado and the west. A few individuals have fine, regularly disposed ribs on the base of the shell, where the growth lines are somewhat raised.

Polygyra multilineata algonquinensis Nason. The shells from the Winnebago region are all smaller than typical *multilineata* and the spire is more elevated. These seem nearer Nason's variety *algonquinensis* than any other form (see NAUTILUS, Vol. 19, p. 141). Three specimens measured as follows:

Greatest diameter 21.5; height 15 mm.

Greatest diameter 22.0; height 15.5 mm.

Greatest diameter 18.5; height 13.0 mm.

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