DEPARTMENT OF SCIENCES.

A LIST OF THE CRUSTACEA OF WISCONSIN.

With Notes on some New or Little Known Species.

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The crustacean fauna of Wisconsin has as yet received so little attention that it is at present impossible to present, with even approximate completeness, a list of the species inhabiting her waters. The various dredgings in Lake Superior under the auspices of the general government, and a dredging expedition off Racine previously reported to this academy by Dr. P. R. Hoy, have furnished almost our whole knowledge of the crustacean fauna of the lakes on our borders, while the interior of the state remains almost entirely unexplored. A species of cambarus (C. virilis) from Sugar river, another (C. propinquus) from Madison, and an amphipod, (Orchestes dentatus), from the latter place, are, I believe, the only crustaceans that have been accredited to the interior of the state till within a very recent period. That our streams and lakes are extremely rich in crustacean life, is abundantly attested by the fact that not a single locality has been explored with any degree of thoroughness without revealing the presence of several species of the higher genera.

The species included in this list, with the exception of those found only in the great lakes, were all taken within the comparatively limited area included in the counties of Racine, Jefferson, Dodge, Fond du Lac, Outagamie, Dane, Sauk and Richland. I have received specimens from but a single locality each, in the greater number of these.

The following list embraces all the species of the higher orders known to inhabit the waters of the state:

Order: Decapoda.

Family: Astacidæ.

Cambarus acutus. Girard.

C. stygius. Bundy.

C. virilis. Hagen.
C. propinquus. Girard.
C. placidus. Hagen.
C. rusticus. Girard.
C. wisconsinensis. Bundy.
C. debilis. Bundy.
C. gracilis. Bundy.
C. bartonii. Erichson.
C. obesus. Hagen.

Family: Mysidæ.

Mysis relicta. Loven.

ORDER: AMPHIPODA.

Family: Orchestidæ.

Orchestes dentatus. Smith.

Family: Lysianassidæ.

Pontoporeia hoyi. Smith.
P. filicornis. Smith.

Family: Gammaridæ.

Gammarus limnæus. Smith.
G. fasciatus. Say.
Crangonyx gracilis. Smith.

ORDER: ISOPODA.

Family: Assellidæ.

Asellus intermedius. Forbes.
Asellopsis tenax. Hagen.

ORDER: PHYLLOPIDÆ.

Family: Branchipodidæ.

Eubranchipus bundyi. Forbes.

Family: Estheriadæ.

Limnetis sp.?

The genus Cambarus is the only representative of the family Astacidæ in the fresh waters of the United States east of the Rocky Mountains. These animals, popularly known as "crawfish" or "crabs," are our largest crustaceans. The great number of species, separated by characters generally obscure and difficult of definition, many of them remarkably inconstant, with an undoubted dimorphism of males and the not infrequent occurrence of abnormal individuals, render the study of this genus particularly perplexing.

The following key will assist in separating the species herein mentioned:

A.—Rostrum toothed near apex, at least when young.

B.—Rostrum long, pointed; first abdominal legs of male truncate; third joint of third and fourth thoracic legs hooked.

C.—Hands long and slender; fingers curved; cephalothorax densely tuberculate. C. *acutus.*

CC.—Hands short; cephalothorax smooth or nearly so. C. *stygius.*

BB.—Rostrum subquadrangular; first abdominal legs of male bifid; hooks on third joint only, of thoracic legs.

D.—Tips of first abdominal legs of male nearly equal, straight or slightly curved; two rows of teeth on lower border of brachium *very indistinct* or *absent.*

E.—Rostrum carinated above. C. *propinquus.*

EE.—Rostrum not carinated above; hands large; fingers gaping at base. C. *placidus.*

DD.—Tips of first abdominal legs of male unequal and recurved.

F.—Margins of rostrum converging in front; first abdominal legs of male long, thick, inner ramus swollen near apex. C. *wisconsinensis.*

AA.—Rostrum toothless.

H.—First abdominal legs of male truncate; three slender teeth at apex. C. *gracilis.*

HH.—First abdominal legs of male ending in two short, thick, recurved teeth.

I.—Dorsal areola wide. C. *bartonii.*

II.— Dorsal areola none. C. *obesus.*

Cambarus acutus (Girard) has been found in Racine county by Dr. Hoy. It occurs also in marsh ditches near Sauk City in company with C. obesus.

C. stygius (Bundy). Bulletin No. 1, Ill. Mus. Nat. Hist., 1876.

A number of small crawfish were sent me by Dr. P. R. Hoy, by whom they were found on the shore of Lake Michigan at Racine, having been washed ashore during a storm. Proving to be a new species, they were described under the above name. The rostrum is long and pointed, smooth above, foveolate at base; cephalothorax slightly compressed, smooth or slightly punctate above and finely granulate on sides. The dorsal area is narrow and the lateral spines acute, antennal plates wide, truncate, with short apical teeth; epistoma rounded in front, twice as wide as long; third maxillipedes hairy on inner and lower sides; hands short, smooth, serrate on inner margins, fingers short, nearly straight, ribbed and punctate above, with contiguous margins tuberculate, outer one hairy; third segment of third (and probably fourth) thoracic legs of male hooked. (The specimens were so badly mutilated during the transfer through the mail that I could not determine this point, not one of the three males sent me having the fourth legs remaining.) The first abdominal legs of male are short, truncate, with three short obtuse teeth directed outward from posterior margins of apex, leaving a smooth groove passing up on outer surface between these teeth and the anterior margin. The ventral ring of female is flat, transversely elliptical, with posterior margin slightly elevated. This species resembles C. acutus, but can be instantly separated by the short hands and non-tuberculate annulus of female. The color of these specimens when caught was a dark cream, darker along sutures. In alcohol they changed to a purplish black, not confined to the exoskeleton, but extending to the adjacent soft tissues.

C. *viriles* (Hagen) is our most abundant species. It will doubtless be found in all the streams of the state.

A male in my collection, taken on a fisherman's net at Jefferson, belongs to Hagen's variety A. It is the largest crawfish I have seen, measuring 6¾ inches from tip of telson to that of ros-

trum. The specimen has peculiar hooks on third segment of second pair of thoracic legs.

C. *propinquus* (Girard) is also a very abundant species, generally found in company with C. *virilis*. It is our smallest species. Of hundreds in my collection from various parts of the state, the largest measures only two and one-fourth inches from tip of telson to tip of rostrum.

C. *placidus* (Hagen) occurs sparingly in Fox river, from which stream I have received a single individual.

C. *rusticus* (Girard) has been found in Lake Superior.

C. *wisconsinenis* (Bundy). Bul. No. 1, Ill. Mus. Nat. Hist., 1876. Rostrum wide at base, much narrower in front, not depressed, slightly concave above and nearly smooth, margins not elevated above eyes, acumen short; cephalothorax oval, punctate above and granulate on sides; lateral teeth but slightly developed; areola narrow, wider behind; antennæ slender, shorter than body; epistoma variable, wider than long, lateral angles prominent; third maxillipedes bearded within, and below at base only; carpus with a group of small sharp teeth on inner margin; two rows of teeth on lower aspect of brachium; third segment of third thoracic legs hooked; first abdominal legs of male long, thick, bifid, nearly straight, reaching when folded under thorax to base of first pair of legs; external ramus longer, with recurved tip, inner ramus swollen near short, acute, obliquely incurved apex.

Racine and Normal, Ill.:

C. *debilis* (Bundy). Bulletin No. 1, Ill. Mus. Nat. Hist., 1876. This crawfish was found in the Little Baraboo river at Ironton, in company with C. *propinquus*. A single individual was also found in the Wisconsin river at Sauk City.

Rostrum wide, quadrangular, slightly concave above, teeth prominent, margins nearly parallel, acumen short and flat; cephalothorax slightly depressed, punctate above, granulate on sides; lateral teeth acute; dorsal area narrow, widest behind; antennal plates somewhat longer than rostrum; antennæ slender, reaching to base of telson; epistoma wider than long, truncate; third maxillipedes barbate on inner and lower sides; hands with two rows of teeth on inner margins; contiguous margins of fingers tuber-

culate; costate and punctate above, outer one hairy at base; third segment of third thoracic legs hooked; first abdominal legs of male long, bifid, nearly straight, outer ramus longer, recurved, inner ramus more abruptly curved near apex, not enlarged near apex as in C. wisconsinensis; tubercle or inner basal angle small.

C. *gracillis* (Bundy). Bulletin No. 1, Ill. Mus. Nat. Hist., 1876. Rostrum short, wide, depressed, toothless, concave above, nearly right-angled in front; cephalothorax laterally compressed, smooth above, granulate on sides; areola wanting; cephalic carinæ prominent, ending behind in callosities; antennal plates very small and narrow; eyes small; antennæ short and slender; epistoma rounded in front; third maxillipedes hairy on inner and lower aspects; hands large, smooth below, punctate above, strongly toothed on inner margins; fingers slender, gaping at base, depressed, contiguous margins irregularly tuberculate, outer one incurved, wide at base, movable one longer, tuberculate on outer margin near base; carpus with one large and several small teeth on inner margin; brachium with two rows of sharp teeth on lower margin; third joint of third thoracic legs of male hooked; first abdominal legs of male truncate, with several small apical teeth, the inner one longest, slender and directed obliquely outward; bases of these legs narrow and inserted into deep sinuses in the first abdominal segment; interpedal space long, narrow, reaching half way from small basal tubercle to apex of legs.

The second form male has shorter, less gaping fingers, smaller hooks on third thoracic legs and articulated first abdominal legs.

The annulus of the female is movable, small and round. It consists of two half-rings, each of which embraces one end of the other. Two tubercules on the anterior border are separated by a slight furrow that widens behind, covering the posterior border.

It occurs on the prairies in the vicinity of Racine, where it was found by Dr. P. R. Hoy, to whose kindness I am indebted for specimens.

It is also found abundantly along water courses in early spring at Normal, Ill. (Prof. Forbes).

Dr. Hoy found it burrowing in low grounds on the prairies, emerging from its holes at nightfall and after rains.

C. *obesus* (Hagen).

This is one of our largest and most abundant crawfish. Unlike most other species, it prefers stagnant water, frequenting ponds and meadow ditches, often wandering far from bodies of surface water, burrowing in wet fields and swales.

It is pre-eminently our burrowing species, sometimes extending its hole to considerable depths. I once followed a burrow twelve feet without unearthing its occupant or reaching the bottom of the hole.

This species is easily identified. The rostrum is short, toothless, depressed, concave above; areola wanting; first abdominal legs of male bifid, with two short, thick, abruptly recurved teeth.

The annulus of female is transversely elliptical, symmetrical, anterior and posterior margins bituberculate; fossa 8 shaped, constricted in middle by anterior and posterier tubercles; lateral angles rounded.

C. *bartonii.* (Erichson.)

I do not think this species has been found in the interior of the state. It occurs in Lake Superior.

It is similar to C. obesus. The rostrum is not so much depressed, is less excavated above and the areola is very wide.

The female annulus has the posterior border elevated and the lateral angles acute.

Mysas relicta. (Loven.)

This occurs in the Great Lakes. It has not been found in the interior waters of the state.

Orchestes dentatus. (Smith.)

With the exception of *Gammarus fasciatus* this is the most abundant species in the interior waters of the state.

Pontoporeia hoyi. (Smith.)

P. filicornas. (Smith.)

Both of these species inhabit the deep waters of Lake Michigan. They have never been found in the interior waters of the state, but their occurrence in the deeper lakes is probable.

Gammarus limnæus. (Smith.)

Found in the Great Lakes. Dr. P. R. Hoy has found it in a clear spring brook near Racine.

G. *fasciatus.* (Say.)

This is doubtless the most abundant of our crustacea. I have not failed to find it, in greater or less abundance, in every stream or pool that I have examined. It is particularly numerous in small brooklets whose beds are covered with deposits of finely divided vegetable debris.

Crangonyx gracilis. (Smith.)

This species has not been found in the interior waters of the state. It occurs in Lake Superior, and Professor Forbes finds it in abundance in central Illinois.

Asellus intermedius. (Forbes.)

Abundant in stagnant sloughs and slow running brooks about Sauk City. These Wisconsin specimens differ from the types of Professor Forbes in several unimportant details, especially in the shape of the ramus of the first genital plate, and the size of the second joint of the inner ramus of the second plate.

Assellopsis tenax. (Hagen.)

This species I have not seen. It is reported from Lake Superior.

Eubranchipus bundyi. (Forbes.) Bulletin No. 1, Ill. Mus. Nat. Hist., 1876.

This, our largest phyllopod, was discovered in small ponds of surface water at Jefferson. It was found in abundance in April, but after a few weeks entirely disappeared. Specimens found in two neighboring ponds, while indistinguishable in other respects, differed markedly in size and coloring. In one of these ponds in a densely timbered lot they were small, and pale in color, while in a pond exposed to the sun they were much larger and brilliantly colored.

Limnetis (sp.?)

In company with the smaller Eubranchipides above mentioned was found an apparently undescribed species of Limnetis. have met with it in no other locality.

Dioptomus sanguineus. (Forbes.)

This beautiful little creature is an abundant inhabitant of the marshy pools and ditches near Sauk City.