

# FURTHER STUDIES ON DISTRIBUTION AND TAXONOMY OF OHIO CRAYFISHES, AND THE DESCRIPTION OF A NEW SUBSPECIES

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The first reference to Ohio crayfishes of which I am aware was made by Girard (1852: 88). Other references followed until by 1870 Hagen was able to include in his monograph several records from southeastern and central Ohio. About 1880 Faxon collected material from the Little Miami River during his visit to Antioch College, Yellow Springs, Ohio. Near the turn of the century, Osburn and Williamson (1898: 21) and Williamson (1899: 47-48) collected crayfishes in many Ohio localities, and in recording their collections laid the foundation of the study of Ohio crayfishes. During 1920-1921 the Ohio Survey Party collected widely in Ohio and from the collections Turner (1926) published a well annotated list of thirteen species and subspecies. This is the most complete publication on Ohio crayfishes to date.

The present paper is intended as a supplement to Turner's work. In it are described a new subspecies from Ohio, *Cambarus bartoni sciotensis*; a species and a subspecies are added to the state list; and the distribution of several other species more clearly defined through the addition of about fifteen hundred new records. In this paper only the counties from which Turner has not recorded a species are given. The total number of crayfishes now known to occur in Ohio is seventeen.

## DISCUSSION OF SPECIES

### ***Procambarus blandingi acutus* (Girard) (1852)** ***Cambarus (Cambarus) blandingii acutus* Girard**

Additional county records: Allen, Auglaize, Delaware, Hardin, Huron, Marion.

The species has been reported to me from Richland and Ashland counties by Mr. Fred Locke who gave an unmistakable description. However, the Ashland College Biology Department survey under the direction of Mrs. Mary Auten Trautman failed to disclose the presence of the species in that county.

### ***Orconectes sloani* (Bundy) (1876)**

There have been no significant additions to the distribution of this species since my paper (Rhoades, 1941: 93-98), except that it has been found common in Clear Creek and its spring-fed tributaries east of the Great Miami River in Warren County.

### ***Orconectes propinquus sanborni* (Faxon) (1884)** ***Cambarus (Faxonius) proquiquus sanborni* Faxon**

Additional county records: Adams, Ashtabula (U. S. N. M.), (Carnegie Mus.), Carroll (Carnegie Mus.), Clermont, Hamilton, Highland, Holmes, Jackson, Meigs, Ottawa, Pike, Richland, Ross, Starke (Carnegie Mus.), (U. S. N. M.), Trumbull (Mus. Zool., Univ. Mich.), Washington.

The species is present in the Ohio River as far west as the mouth of the Little Miami River and it has become established in certain tributary streams on the unglaciated Cumberland Plateau west to Clermont County. Its western limit conforms more closely with the western edge of the exposed Devonian shales and sandstones than it does to drainage areas.

**Orconectes rusticus rusticus** (Girard) (1852)  
**Cambarus (Faxonius) rusticus** Girard

Additional county records: Brown, Champaign, Clark, Clermont, Clinton, Crawford, Darke, Geauga, Hancock (Mus. Zool., Univ. Mich.), Hardin, Highland, Jackson, Lawrence, Miami, Ottawa (U. S. N. M.), Pike, Preble, Sandusky, Van Wert, Washington, Wyandot (U. S. N. M.).

The range of this species in the southern counties is overlapped by *O. p. sanborni* from the east, *O. juvenilis* from the south and *O. sloani* from the west. With the investigation of the northeastern counties the *rusticus* distribution becomes more widespread, extending into the western end of Lake Erie. It is logical, in light of its preference for a limestone habitat, that it should occur there. Records east of the western limit of the Devonian shale and sandstone formations in Ohio may be the result of introductions from our western Ohio state fish farms to "islands" of limestone in an area of silicious rock. Incidentally, successful introductions are apparently rather rare.

**Orconectes juvenilis** (Hagen) (1870)  
**Cambarus (Faxonius) juvenilis** Hagen

Additional county records: Adams, Brown, Clermont, Hamilton.

This species is more widespread and abundant than Turner's two records indicate. It seldom occurs associated with other stream species, except in the Ohio River from the mouth of the Big Sandy River to the Falls of the Ohio.

*C. juvenilis* is indicative of a Cumberland River influence in southern Ohio. The degree of difference in specimens from the Cumberland River and the Big Sandy River is slight. The Big Sandy and the southern Ohio *juvenilis* are remarkably close in the length and width of the areola, the shape of the rostrum, the prominent median carina, and the markings of the chela. This has probably resulted from a direct path of migration northward from the Cumberland Mountains by way of the Big Sandy River and the Ohio. The life history is similar to that of other species of the southern Appalachians but unique among the Ohio crayfishes.

**Orconectes virilis** (Hagen) (1870)  
**Cambarus (Faxonius) virilis** Hagen

Turner stated (1926: 176-177) that *O. virilis* occurs in the Great Miami drainage near Dayton and in Scioto County but thus far no specimens have been discovered to substantiate these records. The species is probably not present in southern Ohio since it requires an ecological situation more commonly found in northern streams. Undoubtedly, *virilis* will be found to occur in the extreme northeastern counties of the state as Turner has indicated.

**Orconectes immnis immnis** (Hagen) (1870)  
**Cambarus (Faxonius) immnis** Hagen

Additional county records: Darke, Miami, Preble, Putnam, Van Wert.

Several specimens have been received from "Forty Acre Pond, Sec. 27, Noble Twp., Auglaize County" which have been tentatively assigned to the subspecies, *O. immnis spinirostris*, until the status of the species and subspecies is determined.

**Cambarus bartoni sciotensis** n. subsp.

Type Locality: Limestone Cliffs below O'Shaughnessy Dam, Scioto River, Sec. 3, Liberty Twp., Delaware County, Ohio. (3 m. I; 4 f., September 27, 1937, R. Rhoades, coll.).

The holotype, male, form I, the allotype, male, form II, and the allotype, female, are deposited in the United States National Museum. Paratypes, a male, form I, and a female, are deposited in the Ohio State Museum. Paratypes from the same locality are retained in my collection. Paratypes from "Leatherlips Riffle," Scioto River, Sec. 4, Concord Twp. and Scioto Twp., Delaware County, Ohio, are deposited in the Museum of Comparative Zoology.

Additional specimens have been examined from Fairfield, Franklin, Delaware, Pickaway, Ross, Scioto, and Union counties. Turner's records for *C. bartoni robustus* from the Scioto River should be included in this subspecies.

Differential Characters: *Cambarus bartoni sciotensis*, here described, is unlike *C. bartoni bartoni* by having more converging margins of the rostrum and a wider, longer areola. It is unlike *C. bartoni robustus* in lacking the prominent contraction above and below at the base of the immovable finger. The tip of the inner ramus of the male, form I, gonopod is bulbous and constricted into a minute rounded tip. *C. b. sciotensis* differs from *Cambarus montanus montanus* by having a much longer and slightly narrower areola and the chela and fingers are rather smooth.

This subspecies is intermediate between *C. m. montanus* of the Appalachians and the *C. b. robustus* of the St. Lawrence drainage. It is doubtful if its presence in the Scioto River indicates a path of migration.

Distribution and Ecology: This subspecies occurs in the larger streams of the Scioto River drainage where its habitat is the large, fast riffles and where it spends its entire life. In this respect it is unlike *C. b. bartoni* which inhabits small and medium sized streams, and the adults of which burrow when the stream becomes intermittent.

***Cambarus bartoni bartoni* (Fabricius) (1798)**

***Cambarus* (*Cambarus*) *bartoni* (Fabricius)**

Additional county records: Adams, Brown, Champaign, Clark, Clermont, Clinton, Columbiana, Darke, Fairfield (O. S. M.), Fayette, Gallia, Hamilton,<sup>1</sup> Highland, Hocking, Lawrence, Licking, Logan, Madison, Miami, Montgomery, Muskingum, Perry, Pickaway, Pike, Ross, Scioto, Vinton, Wayne.

This species is probably distributed throughout the counties of the Ohio River drainage and many of the counties of the Lake Erie drainage near the watershed. Ohio is on the northern limit of the distribution of this species and most Ohio specimens are not typical with specimens from the type locality in the vicinity of Philadelphia or from the accepted center of origin of the species in the southern Appalachians. The areola becomes progressively longer and narrower toward the northeast. The length of the areola of Scioto County specimens is from 34 to 36 per cent of the total length of the carapace, and its width is from 11 to 20 per cent of its own length. Specimens from the Mad River drainage measure from 37 to 41 per cent and 9 to 15 per cent respectively. This variation is accompanied by a loss of acuteness of the armature of the chelipeds.

In addition, the Mad River specimens possess a plane, broad, quadrangular rostrum which sharply contracts into an abbreviated acumen. Occasional specimens appear to have a carinated rostrum. The chelae, having the spines and tubercles in normal positions, are broadly triangular and the fingers are widely gaping in old males. If we apply Ortmann's criteria for determining specialization among crayfishes, the Mad River drainage race seems to be the most specialized of the Ohio *C. b. bartoni*.

***Cambarus bartoni laevis* Faxon (1914)**

This subspecies constitutes an addition to the list of crayfishes of Ohio. It has been collected recently in Brown, Butler, Clinton, Hamilton, Miami, Montgomery, Preble, and Warren counties.

*C. bartoni laevis* is found under a variety of conditions. It inhabits small intermittent streams where it burrows under pieces of stone for a short distance, and during drought may extend its burrows considerably to reach the water level. Toward the northern limit of its range it often burrows along the swampy margins of streams in calamus beds. It avoids cold brooks which compose the common habitat of *C. b. bartoni*.

*C. b. laevis*, which is usually lighter in color than *C. b. bartoni*, can be easily distinguished by the long, linear areola. The rostrum is somewhat shorter than in *bartoni* and the margins gently converge into a rather long acumen. The carapace is slightly depressed and nearly smooth with only a few large granules on the sides of the hepatic region. The inner tip of the male, form I, gonopod is more strongly recurved and distinctly separated from the outer tip. The annulus ventralis is not distinctly different from *C. b. bartoni* except that it is more circular in outline.

<sup>1</sup>Turner included one record from Hamilton County on Map 5 (p. 184), but failed to include the locality in his list of Ohio records (p. 185).

**Cambarus ortmanni** Williamson (1907)

In the collections of the Museum of Comparative Zoology there is a specimen (M. C. Z., No. 243) from "Cincinnati, Ohio," which Hagen (1870: 78-79) called *C. bartoni*. Faxon (1885: 64) referred to this specimen and attempted to establish its affinity with *Cambarus latimanus*. He later (1914: 394-395) assigned the specimen to *C. ortmanni*. The doubt concerning the validity of the label and the detail with which Williamson discussed the limited range of his species caused subsequent authors to disregard this record.

Recent collections of this species have been taken in Auglaize, Butler, Clinton, Hamilton, Preble, and Warren counties.

The species is a burrower like *Cambarus diogenes*, but unlike that species builds a low wide chimney. Williamson found his Wells County, Indiana, specimens on stream margins and this is its usual habitat niche in Ohio. It is found on the old canal beds which have become swampy and often occurs associated with *C. b. laevis*. In the metropolitan area of Cincinnati *C. ortmanni* persists commonly where the water table is close to the surface.

*C. ortmanni* is readily distinguished from the other cambarids of Ohio by the very high, subquadrangular cephalothorax and the depressed, reduced rostrum. The areola is slightly longer and narrower than in *C. b. laevis*. The gonopods of the male, form I, resemble more closely the members of the diogenes section. The annulus ventralis has a high posterior wall and is circular in outline. The abdomen is noticeably shorter than the cephalothorax.

**Cambarus fodiens** (Cottle) (1863)**Cambarus argillicola** Faxon (1884)

Additional county records: Auglaize, Fulton, Mercer, Van Wert.

Turner's records for this species were mostly from the north-central counties. Mr. Clark has provided me with records from the four counties mentioned above. He has obtained the specimens from woodland pools in early spring.

**Cambarus diogenes** Girard (1852)**Cambarus (Cambarus) diogenes** Girard

Additional county records: Brown, Butler, Champaign, Clark, Clinton, Clermont, Darke, Defiance (O. S. M.), Hamilton, Greene, Highland, Logan, Lucas (Mus. Zool., Univ. Mich.), Mercer, Miami, Pike, Preble, Shelby, Warren.

This species probably occurs in every county of Ohio as indicated by the widespread records now existing. Specimens from southwestern Ohio have a more lanceolate rostrum, characteristic of the western race of *C. diogenes*.

I can mention but a few of the many who have contributed to the collection which forms the basis of this paper. Mr. Clarence F. Clark, Fish Management Agent, Ohio Division of Conservation and Natural Resources, has provided me with many records from his own collections from northwestern Ohio. Mr. John Z. Pelton and Mr. Lee S. Roach, Fish Management Agents, Ohio Division of Conservation and Natural Resources, have permitted me to examine their numerous collections from southern Ohio.

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