

## MACROBRACHIUM OHIONIS, THE LARGE FRESH-WATER SHRIMP

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*Macrobrachium ohionis* (Smith) is a relatively little-known fresh-water shrimp locally of economic importance. Sidney I. Smith (1874) described it under the name of *Palaemon ohionis*. He states that: "The only specimens which I have seen were obtained by Professor F. H. Bradley from the Ohio River at Cannelton, Indiana, where he tells me it is taken for food." Only diagnostic external features were mentioned. S. A. Forbes (1876) found it only in the Mississippi River. W. P. Hay (1891) reported it as being captured in large numbers from the Ohio River near Lawrenceburg. Waldo L. Schmitt (1926), after a study of the more abundant tropical *Palaemonidae*, has placed this species in the genus *Macrobrachium*.

W. L. Schmitt (1933) lists the accessions to the United States National Museum as mostly from the region of New Orleans. A single record was from the State of Mississippi, a few from near the city of Savannah, Georgia, and one from North Carolina. This last mentioned one, taken in 1878, measures 102 mm. from tip of sternum to the extremity of telson. Schmitt raises the question, "Is *M. ohionis* confined to the Mississippi below St. Louis and the lower Ohio to the exclusion of the other large tributaries of these rivers?" J. N. Gowanlick of the Louisiana Conservation Commission in littora, August 17, 1931, informed me that *Macrobrachium ohionis* is a staple market article here and has an extreme delicacy of flavor. No published figure of this native species is extant.

Specimens were obtained over a period of three years (1930-32) from the Mississippi River near Chester, Illinois, and from New Orleans, Louisiana. Beside the study of preserved material observations were made on a group at the John G. Shedd Aquarium, Chicago. Others at Chester were examined alive under a binocular microscope.

This species, the "river shrimp," is distinguished from the *Penaeus* group of marine species by having only the first two pereopods or thoracic legs, chelate, instead of three. The second one is the larger, figure 2.

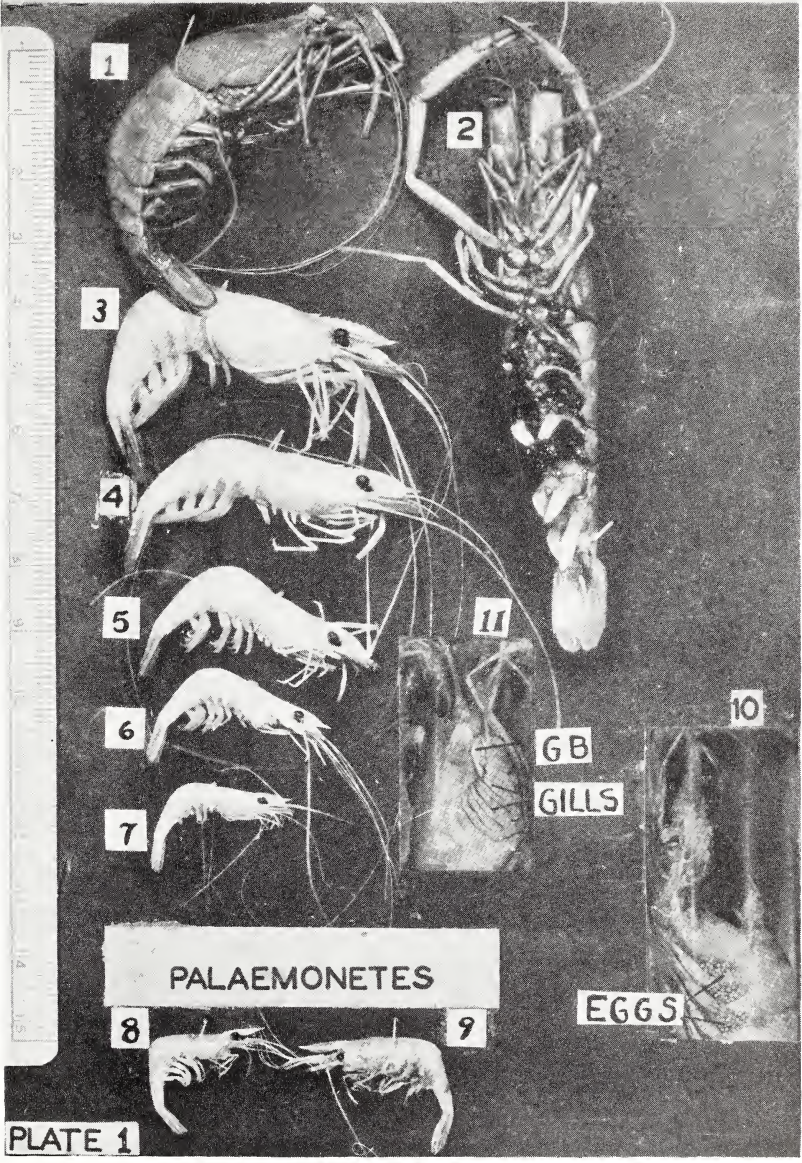
Plate 1 is a photograph, approximately natural size,<sup>1</sup> of the two species of fresh-water shrimps. Figures 1 and 2 show ovigerous adults

<sup>1</sup> Reduced 20 per cent in making the cut.—Ed.

### Plate 1. Fresh-Water Shrimps. Figure Titles

1. Lateral view of ovigerous *Macrobrachium ohionis*.
2. Ventral view of ovigerous adult *M. ohionis*.
- 3 to 7. Different sizes (and ages) *M. ohionis*.
- 8, 9. Lateral view of ovigerous adults of *Palaemonetes exilipes* for comparison with *M. ohionis*.  
(Above figures approximately X1. See mm. ruler)
- 10, 11. Lateral views of *M. ohionis*, dissected. GB, gill-bailer.  
(Figures 10 and 11 slightly more enlarged than 1-9)

MACROBRACHIUM OHIONIS



of *Macrobrachium*. Figures 8 and 9 are of similar egg-bearing *Palaemonetes*. Figures 3 and 7 show *M. ohionis* of various ages, while 10 and 11 are dissected *Macrobrachium*. In a representative group the ovigerous *Macrobrachium ohionis* averaged almost 80 mm. and the similarly egg-bearing *Palaemonetes* averaged 38 mm. in length. The definite flexure in the middle of the abdomen of the smaller species, figures 8 and 9, is not present in *Macrobrachium*. My observation is in accord with Forbes (1876) that *P. exilipes* has a "nearly straight rostrum with seven or eight teeth above and one or two below." The range for *Macrobrachium*, as determined from the material here studied, is from 9 to 12 dorsal rostral teeth and from one to three ventral teeth. This variation is not in favor of either sex. No marked difference in dental formula or in size appears between the upper and lower Mississippi River specimens.

The outer surface of the carapace is relatively smooth and clear. Instead of the two lateral spines being "of nearly equal size," as described by Smith (1874), the antennal spine is one-half larger than the outer and lower hepatic spine. The scattered body chromatophores and deeply pigmented eyes are striking in appearance.

The triflagellate first antenna is attached ventral to the eye. The larger flagellum of each side pointing ahead of the animal and the two flagellae arched backward over the abdomen are characteristic of the living animal and evidently are used as "feelers." The tuft of setae in the depression on the dorsal surface of the proximal joint of the peduncle marks the opening of the statocyst. Apparent exploratory movements are also made by the larger singly flagellated second antenna. On the ventral surface of the coxa is the opening of the "green gland." Injured antennae are not reflexly shed.

The mouth is bounded anteriorly by the fleshy labrum, figure 12, plate 2, and posteriorly by the two thin paragnatha, neither of which is a true appendage. Right and left are the heavy tridentrate cutting edges of the mandibles. Within the mouth and slightly dorsal to these on each mandible is a broader, tuberculated crushing and molar surface. The mandibles are connected to each other by a short heavy transverse tendon and are operated by a complex set of muscles. A three-jointed palp on each mandible is a characteristic not found in *Palaemonetes*. In order, following the mandible, are the two pairs of maxillae and three of maxillipeds. There are on the maxillae and maxillipeds integumentary configurations here designated "combs" and "brushes," figures 13 and 15.

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Plate 2. *Macrobrachium ohionis*. Figure Titles

12. Mouth, lips and mandible, ventral view. (Enlarged twice as much as figures 13-18.)
13. Right first maxilla, ventral view.
14. Second right maxilla, ventral view.
15. Second maxilliped, ventral view. First gill.
16. Second thoracic leg, pereopod, ventral view.
17. Fifth pereopod, partly regenerated.
18. Fifth pleopod, ventral view. Typical abdominal appendage.



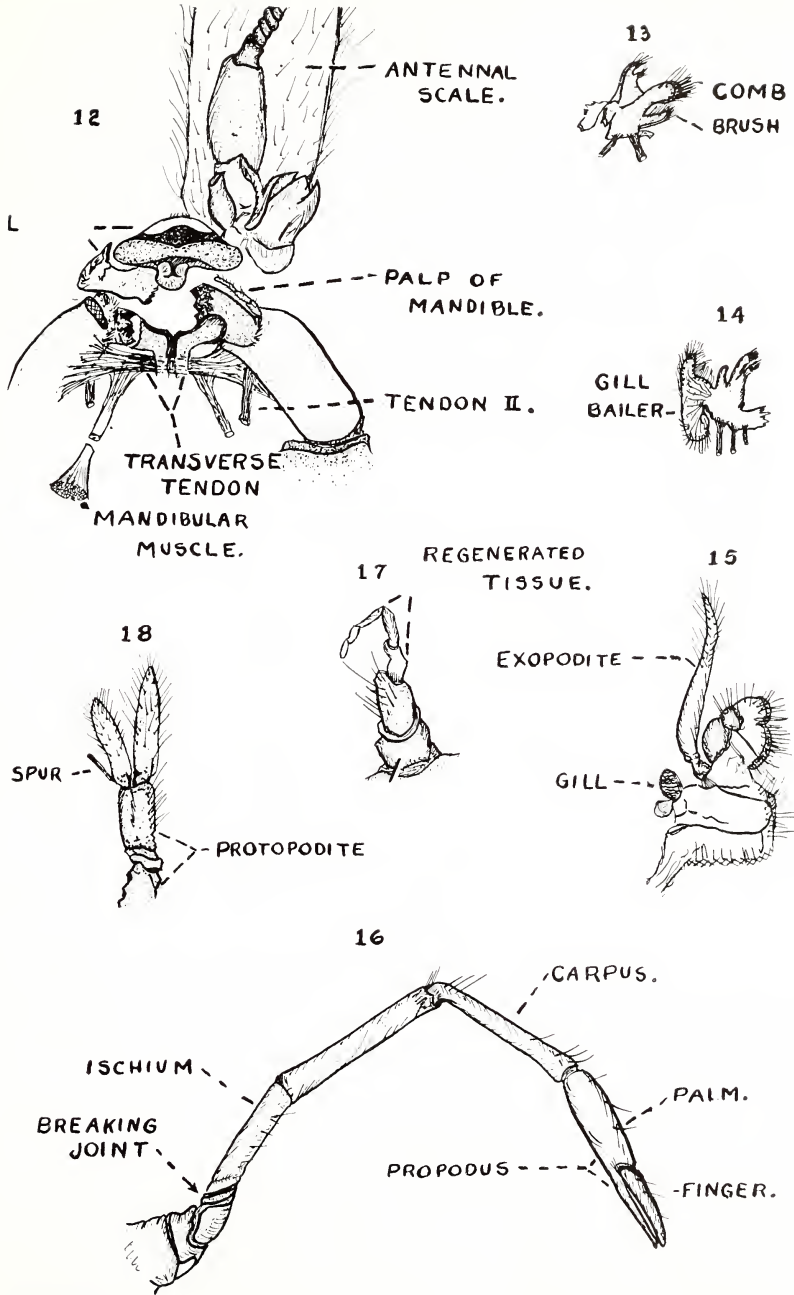


PLATE 2.

Following the maxillipeds, in serial order, are five pairs of pereopods or legs on the thorax. The chelate legs 1 and 2 differ from the others in having the immobile finger on a distal outgrowth of the palm of the propodus, figures 2 and 16. The means used to determine the sex is the location of the external genital pore on each side. In the female this aperture is in a setae-covered papilla on the median surface of the coxal joint of the third pereopod. The opening of the sperm duct is



Plate 3. Shrimp Set at Chester, Illinois

in a corresponding position on the base of the fifth pereopod. Over the ventral aperture of each of these last is a chitinous flap or valve. All five of these legs, as well as the third maxilliped, are reflexly shed and regenerated from a definite "breaking-joint," the basi-ischial suture, figure 16. The order of frequency of this appears to be: the second pereopod (cheliped), most frequent; any one or more of the other four pairs of pereopods; and least frequently the maxillipeds. New tissue arises from the small blood vessel canal in the middle of the diaphragm left on the basos. Figure 17 shows a later stage of growth and spe-

cialization. These observations supplement those of Florence and H. E. Wood (1932), who restudied autotomy and related phenomena in other Decapoda.

The swimmerets are alike in the two sexes. The first abdominal appendage has a reduced endopodite. A small fleshy median spur occurs on each swimmeret, figure 18, except the first and the last or uropod. The effective area of each blade is increased by a fringe of setae on each ramus. Live individuals characteristically keep up a rhythmical motion of all of these paddle-like appendages. In ovigerous females this also serves to aerate the eggs. A quick backward progression is possible as well as forward swimming, crawling or climbing.

The gill-bailer (scaphognathite) is a part of the second maxilla, figures 11 and 14. It is supported within itself by chitinous thickenings and bordered by closely set setae. Ventral to this, under the gill-cover on each side of a shrimp, is the set of seven plate-gills. They increase in size posteriorly. Gills numbers 1 and 2 are attached to the coxa of the second and third maxilliped respectively (podobranchiae). The third gill is partly attached to the anterior and dorsal part of the leg where it joins the body wall. Gill number 4 is attached somewhat higher (arthrobranchiae). The remainder are attached dorsal to the leg bases (pleurobranchiae). They appear to be very similar in pattern and position to Perrier's (1925) representation of *Palaeomon*.

There is a variation in the size of the ovigerous females. There often is a considerable difference in the degree of development of the eggs and embryos from adult females captured at the same time. In a lot of 100 females examined the smallest (60 mm.) bore embryos having deeply pigmented eyes and the largest (96 mm.) had no evidence of external eggs. Eight thousand eggs were counted on the swimmerets of a representative female 84 mm. long. Specimens "in berry" have been found by the writer to have at the same time an apparently full complement of immature eggs in the ovary. As an example of the variation in size and age of those caught at a given time those taken at Chester, Illinois, on September 3 and 4, 1931, measured from 34 mm. to 90 mm. in length.

These Crustaceans are hardy and voracious. They eat both plant and animal material. "Shrimp sets" are made use of by the Chester, Illinois, fishermen. These consist of rows of green willows or cottonwood branches which are set out in shallow water and broken over so as to be partly submerged. Later, dipnets are used to catch the animals clinging to and chewing the green leaves.

In habitat and structure *Macrobrachium ohionis* is distinct from any other North American Crustacean. This report has placed on record representative morphological features and may suggest additional studies of this large fresh-water shrimp.

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## THE EFFECT OF ULTRAVIOLET IRRADIATION UPON FECUNDITY OF *DROSOPHILA MELANOGASTER*

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The effect of ultraviolet rays upon *Drosophila* was studied as early as 1914 by Guyénot, whose work showed, first, that eggs subjected to ultraviolet irradiation failed to develop; second, that larvae were not affected by exposures of 15 minutes' duration, but were by exposures of 30 to 45 minutes' duration; third, that adult females irradiated after copulation laid eggs during the first three days which developed normally, but after the third day the number of non-developing eggs increased until the fifth day, after which non-development was the rule. He noted that most irradiated individuals died within fifteen days after treatment. However, he centered his attention on certain melanic forms which appeared in his irradiated strains, which he believed arose as a result of the ultraviolet irradiations. That this was true, however, he did not conclusively demonstrate.

Guyénot's work was deficient in these respects. He failed to report the age of the flies at the time of irradiation, the distance of the flies from the source of irradiation, or the temperature to which the flies were subjected at the time of irradiation. All or any of these factors would have influenced the results obtained.

Although much experimental work has been done testing the effect of ultraviolet rays on various types of animals, little has been reported in recent years relative to the effect of ultraviolet rays on *Drosophila*. To see if ultraviolet rays would have any pronounced effect on *Drosophila* the following experiments were performed.