

Connolly, C. 1925

CARDED 1945

The Larval Stages and Megalops of *Rhithropanopeus Harrisi*
(Gould)

BY
C. J. CONNOLLY, PH.D.

INVERTEBRATE
ZOOLOGY
Crustacea

Reprinted from *Contributions to Canadian Biology, being Studies from the Biological Stations of Canada, N.S., Vol. II, part 2, 1925*

No. 15

THE LARVAL STAGES AND MEGALOPS OF RHITHROPANOPEUS
HARRISI (GOULD)

BY

C. J. CONNOLLY

The Larval Stages and Megalops of *Rhithropanopeus Harrisi* (Gould)

BY C. J. CONNOLLY, PH.D.

St. Francis Xavier's College, Antigonish, N.S.

The identification of the larval stages to be described below as the zoëae of *Rhithropanopeus harrisi*, was based solely on a study of the plankton hauls. This method, under usual conditions, would be very uncertain, but considering the distribution of the adult as distinguished from other crabs occurring in the Miramichi river where these hauls were made, and that frequent tows were taken at many stations from Northumberland Strait (Station 80) where the salinity is relatively high, up to the upper reaches of the river where the water is brackish to fresh, the identification of the larvae becomes quite feasible.

It was observed in examining the various zoëae from the stations on this river, that there was an increasing frequency in the occurrence of one particular larva from the outer stations where it was rarely found, through stations where this larva and the larvae of other crabs were found together, until at the stations farther inland only this particular kind was found, and where *Rhithropanopeus harrisi* alone of the crabs occurred. Following closely upon the appearance of the advanced zoëae stages, there was found the megalops stage, whose structure identifies it as being the post-larval stage of *Rhithropanopeus*.

THE LARVAL STAGES

No protozoëa or post-embryonic stage was found in the plankton hauls, but it is quite possible that it occurs in this species as was found to be the case with *Cancer amoenus* which was hatched out in the laboratory. As in the latter species, there are four zoëa stages followed by a post-larval or megalops stage. As the development is very similar in the two species, it will be unnecessary to describe and figure in detail the various appendages.

The most striking feature of the zoëa of *Rhithropanopeus* is the presence of very long rostral and second antennal spines. The dorsal spine is of moderate size, while the lateral spine is quite small. Another structural character distinguishing it from all other zoëae examined, is the presence of very long lateral spines on the distal ends of the fifth abdominal segments. The fourth segment bears much shorter lateral spines, while the first three abdominal segments are smooth and rounded at the lower edge. A slender curved tooth-like process is present on each side and at about the middle of the second abdominal segment. The distal dorsal margin of the second to fifth abdominal segments bear each a pair of small hairs.

The telson is comparatively long and slender with ends of the telson fork curving backwards and upwards. There are three long spines on the mesial side of the furca on each side, such as are found to be typical of most zoëae. These have double rows of fine serrations. Each telson fork bears dorsally a single spine which arises about the middle of the fork.

The appendages are functional as far back as the second maxillipeds, but the "anlagen" of the following thoracic appendages are present.

On examining a large number of zoëae (several hundred were picked out of the tow-nettings), it was found that four groups or classes differing in size could be distinguished, and correlated with size a definite advance in structure.

STAGE I (FIG. 1)

The length of the dorsal spine measured from the posterior angle where it meets the carapace is 0.52 mm. The length of the rostral spine measured from the anterior border of the eye is 1.2 mm. The perpendicular distance from end of rostral to end of dorsal spine is 2.2 mm. The lateral spine measured 0.09 mm. The second antenna extends 1.1 mm. in front of the eye. The carapace measured 0.49 mm.

The first antenna consists of a single segment and bears two large sensory hairs or aesthetascs and three much smaller hairs. A small needle-like spine is present at the base of the second antenna on its dorsal side in this and the following stages.

The appendages are functional to the second maxillipeds inclusive, but the buds of the third maxillipeds and the pereopods may be seen in the angle between the second maxillipeds and the first abdominal segments.

The exopodite of the first and second maxillipeds bear each four plumose setae in this stage.

The abdomen consists of five segments and a telson. The spine on the lower lateral margin of the fifth segment is 0.22 mm. long. The fourth segment bears a small lateral spine at this stage.

The telson (Fig. 2) is 0.52 mm. long.

STAGE II (FIG. 3)

The length of the dorsal spine is 0.60 mm.; that of the rostral spine is 1.4 mm. The distance from end of rostral to end of dorsal spine is 2.5 mm. The sensory hairs of the first antenna have increased in size.

The second antenna extends 1.3 mm. in front of the eye, and in some specimens the bud of an endopodite branch is barely perceptible near its base.

The exopodite of the first maxilliped bears six plumose setae, while that of the second maxilliped bears seven, the outer posterior seta arising somewhat proximally to the others. The first pereopod may be distinguished by its large size.

The carapace is 0.64 mm. in length and bears two setae on each side of the posterior lateral border.

The abdomen consists as in Stage I of five segments.

The spine on the lower border of the fourth abdominal segment is now quite conspicuous.

There is no change in the telson apart from increase in size, being now 0.63 mm. in length.

STAGE III (FIG. 4)

The dorsal spine is 0.78 mm. in length; the rostral 1.8 mm. The distance from the end of rostral to end of dorsal spine is 3.4 mm. On the first antenna in most specimens, the mere trace of a bud may be seen arising from the middle of the antenna. The second antenna extends 1.6 mm. in front of eye. At its base a bud of the endopodite arises and extends slightly beyond the tip of the first antenna. This becomes the permanent flagellum.

The carapace is 0.78 mm. in length. Four or five setae, sparsely plumose, are now present on lower margin of carapace.

The exopodite of the first maxilliped bears eight plumose setae while that of the second maxilliped usually bears nine, a short seta on the posterior side arising farther back.

The third maxillipeds and the pereopods with their gills have increased greatly in size, the first pereopod being chelate.

The abdomen now consists of six segments, a new segment somewhat smaller than the others, having been cut off from the proximal end of the telson. The second to fifth segments bear buds of the pereopods. A pair of hairs appear about the middle of the first abdominal segment. The lateral spine on the fourth segment now extends almost half way down the fifth segment.

The telson has additional spines on either side of the furcal angle. It is 0.67 in length, being comparatively short due to the new segment cut off.

STAGE IV (FIG. 5)

The length of the dorsal spine is 0.87 mm.; of the rostral spine 2.1 mm. The distance from the end of rostral to end of dorsal spine 3.8 mm. The second antenna extends 1.9 mm. in front of eye.

The carapace is 1.0 mm. in length and is provided with eight plumose setae on each side, on the lower margin.

The first antenna is now partially segmented. Its base is somewhat globular in outline. The endopodite bud is now quite prominent and just above point of origin a joint is present. At level of tip of this bud, additional sensory hairs arise, more distal ones also being present as in previous stages.

The endopodite of second antenna now reaches to about end of first antenna.

The mandible is in this stage provided with a palp of one segment.

The first maxillipeds have on their exopodites ten plumose setae, while the exopodites of the second maxillipeds usually bear eleven plumose setae, the one on the outer posterior side arising proximally to the others.

The pereiopods with their gills are now quite prominent and segmented.

The pleopods are spatulate in form, and constricted off from the abdominal wall. All except those of the sixth segment have small endopodites. The pleopods of the sixth segment which first appear in this stage, arise at some distance from one another.

The telson is similar to previous stage. It is now 0.78 mm. in length.

The table below shows the typical comparative measurements in millimetres of the four zoëa stages.

	I	II	III	IV
Distance between tips of rostral and dorsal spines	2.2	2.5	3.4	3.8
Distance of rostral tip from anterior border of eye	1.2	1.4	1.8	2.1
Distance of tip of second antenna from anterior border of eye	1.1	1.3	1.6	1.7
Length of dorsal spine	0.52	0.60	0.78	0.87
Length of carapace	0.49	0.64	0.78	1.0
Length of telson	0.52	0.63	0.67	0.78
Number of plumose setae on exopodites of first maxillipeds	4	6	8	10
Number of plumose setae on exopodites of second maxillipeds	4	7	9	11

There is, of course, a slight variation in size in specimens of the same zoëa stage according as they have just moulted from the stage below or are about to moult into the next stage. The conventional measurement for length of zoëae is the distance from tip of rostral to tip of dorsal spine. On account of the very long rostral spine, this measurement gives an idea of larger size than the other measurements indicate. Williamson (1915) has pointed out that there is no correlation between size of larvae and size of post-larval stage.

THE MEGALOPS (FIG. 6)

The megalops or post-larval stage is somewhat quadrilateral in outline and has no rostral or dorsal spine. The anterior border of the rostrum is slightly oblique, but being usually deflexed it has a truncate appearance. The rostrum has a median triangular notch, the borders of which coalesce to form a median ventral ridge.

The surface of the carapace is very uneven. An elevation is present on each side just posterior to the eye and in line with the lateral surface of the rostrum. Posterior to this and more laterally another elevation occurs, and on the posterior median surface there is also an elevation. These are all beset with short spines as is also the dorsal surface of the rostrum. The carapace is very convex forming a median ridge between the anterior elevations. Its length is 1.1 mm. and its breadth 1.0. The lower margin of the carapace is provided with spines having very fine hairs.

The pereiopods are heavily armed with spines, especially on the last seg-

ment. The fifth pair are directed dorsally and extend over the upper surface of the carapace. The ventral surface of the thorax is deeply arched.

The first antenna is segmented and the endopodite branch is now provided with terminal spines. About a dozen sensory hairs arise in series from the distal segments. The second antenna has nine segments.

The first four pleopods have endopodites bearing at their extremities three small hook-like spines. The last pair of pleopods are small and have no endopodites.

The megalops just described must be that of *Rhithropanopeus harrisi*. Thirty-three specimens of this stage were taken in tows at Stations 82, 93, 94 and 100, together with many zoëae of stages III and IV described above, but no other kind of megalops was found with them. Considering, moreover, the normal distribution of the adult, and the frequent occurrence of this megalops at the upper stations on the Miramichi river where the salinity is low, and finally the structure of the megalops which approaches that of the adult, it is quite certain that it is the post-larval stage of *Rhithropanopeus harrisi*.

DISTRIBUTION OF THE ADULT AND LARVAE

Several specimens of *Rhithropanopeus harrisi* were found in the Miramichi river in 1918. Its occurrence so far north would seem to be a remarkable case of discontinuous distribution, for its range as hitherto known has been assigned to the region between Long Island Sound and Florida (Hay and Shore, 1918). It is probable, however, that it will yet be found in the intervening coastal regions.

Professor A. G. Huntsman, Director of the Biological Station, St. Andrew's, who identified the adult specimens, has kindly given me the records of its capture in the Miramichi river during the summer of 1918.

At Marsh point, below Newcastle bridge (near Station 93) on south bank of river, one male 15 mm. long was taken with a large seine on September 9th.

At Portage island (near Station 75) one male 15 mm. was taken with a small seine on June 13th.

Near Station 94, one male 14 mm. and two females 12 mm. and 13 mm. were taken with a large seine on July 2nd.

At Station 81, one male 14 mm. was dredged on mud-bottom, 11 to 12 metres, on June 10th.

At Station 100, on mud-bottom, 5 metres, one large and one small specimen were dredged on July 1st.

Off Loggieville, in cunner (*Tautogolabrus*) taken with hook and line on August 18th, one specimen was found in the stomach and two in the intestine.

At Middle island, (near Station 100), all the specimens of this species were obtained in the brackish portion of the Miramichi river between a point near the mouth at Sheldrake island (Station 81), where it broadens, to Beaubère island, just above Station 94, where it forks into its south-west and north-west branches. Much more collecting was done in the outer salter water, and yet only

one specimen was obtained, which had doubtless been carried out by the spring freshets.

The distribution of the larvae conforms to that of the adult. Its centre of distribution appears to be at Station 100 near Middle island, for here the larvae were most abundant (during August) though they were also very abundant at Station 82 near Chatham. Tows taken below Station 100 (e.g., at Stations 81, 76, 78) contained this larva together with other crab larvae. Outside of Station 78 it did not occur. At Station 100 and above, namely, at Station 93 just below Newcastle, at 94 just above Newcastle and at 95 above bridge across north-west branch of river, only this crab larva was found.

Likewise in the case of the megalops. A few specimens in this stage were found in tows taken at Station 82 on September 7th, but larger numbers were observed in tows taken above this station, namely, at Stations 93, 94 and 100, while below it none were found.

LITERATURE

- HAY, W. P. and SHORE, C. A. The Decapod Crustaceans of Beaufort, N.C., and the surrounding region. *Bull. Bur. Fisheries*. Vol. 35, 1915-16, pp. 441-442, pl. XXXV, fig. 5. Document No. 859, Washington, 1918.
- WILLIAMSON, H. C. Decapoden, I Teil (Larven) in *Nordisches Plankton*. Achtzehnte Lieferung VI. p. 324. Kiel und Leipzig, 1915.
-

EXPLANATION OF PLATES

PLATE I

- Fig. 1. First zoëa stage.
 Fig. 2. First zoëa stage: telson.

PLATE II

- Fig. 3. Second zoëa stage.
 Fig. 4. Third zoëa stage.

PLATE III

- Fig. 5. Fourth zoëa stage.
 Fig. 6. Megalops stage.

PLATE I.

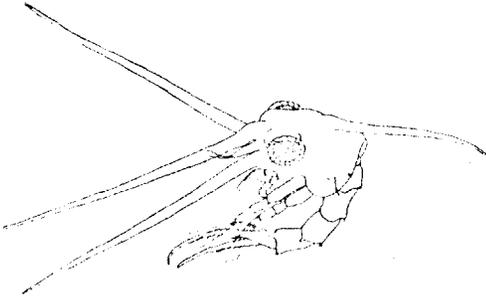


FIG. 1

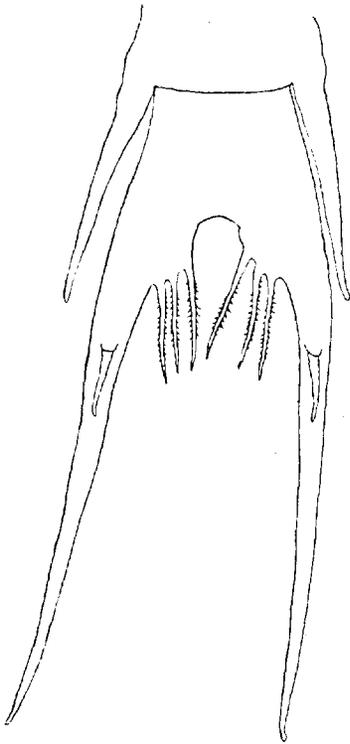


FIG. 2

PLATE II.

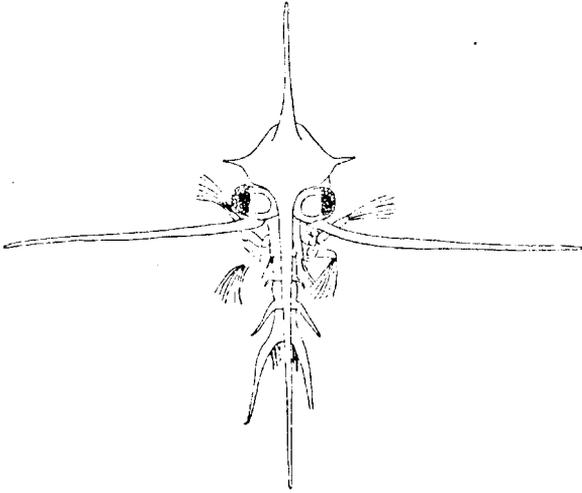


FIG. 3

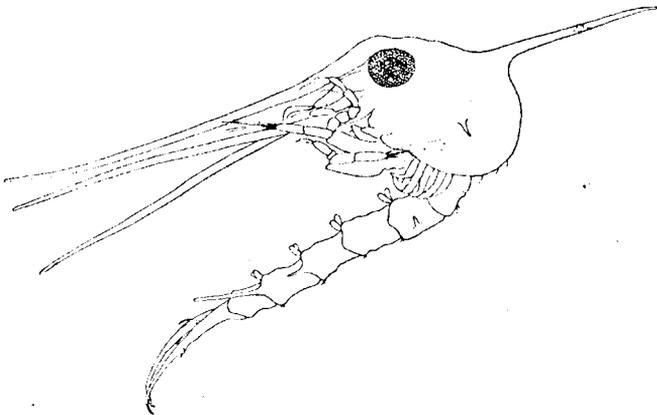


FIG. 4

PLATE III.

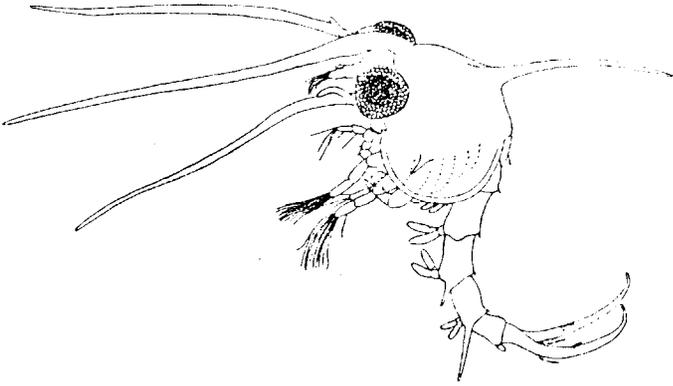


FIG. 5

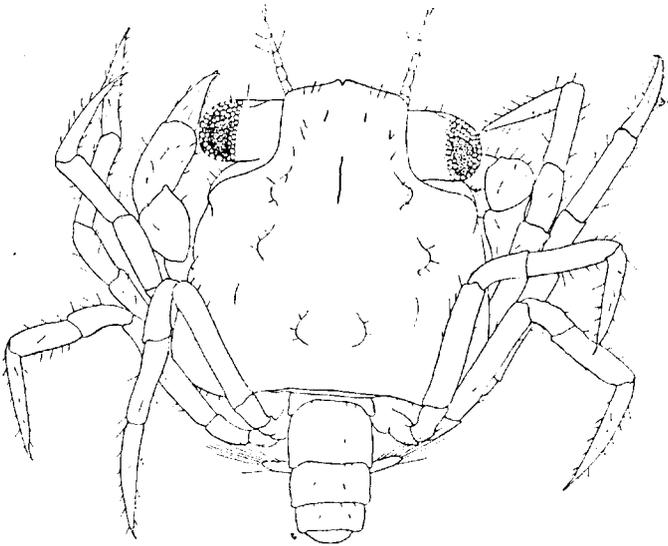


FIG. 6