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Some Notes on the Biology of the Larva of the Crab, Rhithropanopeus harrisii (Gould) subsp. tridentatus (Maitland)

by

Lucjan Lawiński & Fryderyk Pautsch

The larvae of the crab, Rhithropanopeus, occur in the river Martwa Wisla (Dead Vistula) during the second half of July and in August, i.e., after the period of intense egg-laying that takes place in the second half of June and in July (Lawiński and Weglarska, 1959). They can be found in shallow places and also in places where the water is deeper (about 5 m). Regarding their biological properties no details are known so far. We were, however, able to find that, like many other planktonic organisms, these larvae are subject to diurnal vertical migration. In respect of their quantitative composition the plankton samples collected at noon, from the layer close to the surface, differed considerably from those collected at midnight. Catches were made using a plankton net, 3o cm in diameter, drawn for about 3o minutes behind a rowboat. Midnight plankton, consisting mainly of plant life (with the blue-green algae predominating), of larval and adult forms of Copepoda, Branchiopoda and of Mysidacea, contained a considerable number of Rhithropanopeus larvae in various developmental stages: zoeas, metazoeas and megalops. Plankton samples collected at noon are qualitatively similar but very poor quantitatively, Rhithropanopeus larvae being found only exceptionally in them.

The Table 1 gives the numbers of larval forms of Rhithropanopeus found in individual day- and night-catches.

Table 1 Number of Rhithropanopeus larvae found in plankton catches from Dead Vistula

Date of catching	Number of larvae caught at noon			Number of larvae caught at midnight		
	zoeas	meta-zoeas	megalops	zoeas	meta-zoeas	megalops
17.VII.59	no catching was made			2	2	-
21.VII.59				-	-	21
26.VII.59				3o	-	5o
28.VII.59	-	-	-	35	3o	2o
3o.VII.59	-	-	-	16	21	21
31.VII.59	-	-	2	25	3o	2o
2.VIII.59	-	-	-	1	29	2o
4.VIII.59	-	-	-	-	4	8

As seen from Table 1, the largest numbers of larvae and specimens in their later developmental stages were collected between July 26 and August 2, which probably indicates that this is the hatching time of the majority of eggs. The migratory periodicity of the larvae (zoea) coincides with some diurnal internal rhythm, namely the chromatophore rhythm. There are two kinds of chromatophores:- dichromatic - containing black-brown and light-yellow pigments or monochromatic - containing only light-yellow pigment. The chromatophores are arranged in the body of a larva according to a regular constant pattern. Some of them are primary chromatohpores, others, fewer in number, constitute the prospective chromatophore system of the metamorphosed forms (secondary chromatophores). All the chromatophores can rapidly change their pigment concentration, which process results in physiological colour-change. The pigment is much more dispersed at noon than at midnight, i.e., the colour of the body is darker at daytime than at night. This holds true for both the black-brown and the yellow pigments. However, the former one invariably shows a slightly greater dispersion. So the contribution of the dark pigment to the overall pigmentation is greater than that of the light one.

This diurnal rhythm is repeated with much precision every day. The dispersion of the pigment gradually increases from sunrise till about noon, when the pigment begins to concentrate slowly with the decrease in the intensity of light, reaching maximum concentration at midnight. This phenomenon entirely depends on the light changes, a proof of which is the fact that the chromatophore rhythm disappears in larvae kept in a dark room. In this respect the Rhithropanopeus zoea differs from other crab larvae, for instance from the zoea of Carcinus maenas, in which the diurnal chromatophore rhythm is partly subject to internal control and does not disappear when the external stimuli, i.e., diurnal light changes, cease to act (Pautsch, 1961).

It is probable that the greater pigment dispersion observed at daytime protects the internal organs of the otherwise translucent larvae against harmful effects of light. This suggestion seems to be supported by the fact that the majority of chromatophores are arranged in such a way that during the phase of their pigment dispersion they form a kind of screen enveloping the most important organs and the nervous system in particular. However, it should be pointed out that similar chromatophore rhythm also exists in metamorphosed crabs (Pautsch et al., 1960). In these the pigment screen cannot have a similar function, since the considerable pigment deposits of the cuticle to a great extent reflect light rays, regardless of the state of the chromatophores which are invisible from outside.

The chromatophores of the Rhithropanopeus zoea, too, possess an ability, though limited, of background adaptation by which they differ from other decapod larvae, which have already been studied to this effect (Crangon crangon - Pautsch, 1951, Carcinus maenas - Pautsch, 1961). In a light of moderate intensity (40 lux) the black-brown pigment of the larvae kept in black vessels shows a slightly greater dispersion than that of the larvae placed in vessels with white walls. In white-adapted larvae transferred to black vessels an increase in the dark pigment dispersion occurs, whereas in black-background adapted larvae placed in a white vessel the dispersion of the dark pigment decreases. It is difficult to state whether this background adaptation is of any biological importance, for instance, as a concealment against the predator's eyes. It should again be emphasized that the chromatophores of metamorphosed crabs, too, are able to adapt themselves to the background, though in this case this process cannot play any protective role, since, as mentioned above, the chromatophores are hidden under the cuticle.

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