A NOTE ON THE ZOÆA OF A LAND-CRAB CARDISOMA ARMATUM.

By H. GRAHAM CANNON, B.A., F.Z.S.

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A Note on the Zoæa of a Land-Crab, *Cardisoma armatum*.

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(Text-figures 1–6.)

Among the Land-Crabs it is known that the females of the genera *Gecarcoidea* and *Gecarcinus* resort to the sea in order that the young aquatic larvæ, on hatching from the eggs, may swim away into the water. According to Moreira [1912] ripe females of *Cardisoma guanhumi* also resort to salt or brackish water for this purpose, whereas, according to Calman [1909], neither Ortmann nor Andrews observed any specimens of the *Cardisoma hirtipes* in the neighbourhood of the sea.

During September 1922 a female land-crab of the species *C. armatum* Herklots, kept in captivity in the Society's Gardens, was noticed to be carrying a large mass of eggs underneath the abdomen. The eggs proved, on examination, to be fertile, and in a late stage of development. It was obviously of interest to find out whether the eggs of this species would hatch in fresh or in salt water.

Some eggs were removed from the female and placed in pure artificial sea-water, while others were placed in tap-water. A third lot were put into brackish water made of equal parts of sea-water and tap-water. The next day all the eggs appeared healthy, and the embryos in most showed a fairly regular heart-beat. After two days those eggs in the tap-water had become opaque, more especially in the central part of the egg, while those in brackish water and sea-water appeared to be developing normally. After three days many of the sea-water eggs hatched out and the young appeared quite vigorous. In the brackish water only a few hatched out, but these also appeared quite healthy. In the fresh water some of the eggs had burst the shell, but the young had disintegrated. It appears very probable from this that *C. armatum* also resorts to the sea, or at least to brackish water for spawning-purposes.

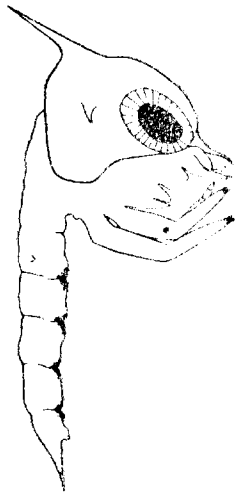
The larvæ only survived a few days after hatching and did not develop further, although they were being offered the diatom *Nitzschia* as food. It could not be seen whether the larvæ were actually taking the diatoms into their stomachs.

The larvæ were typical Brachyuran zoææ. The frontal spine slopes downwards and then curves upwards, and ends by recurving down again (text-fig. 1). There is a pair of lateral spines projecting outwards and slightly forwards (text-fig. 2). All the spines of the carapace are simple. The antennæ are very simple

(text-figs. 3 & 4) and the second antenna does not bear a lateral spinous process (text-fig. 4). The 1st abdominal segment bears at each side a short forwardly directed spine, the other segments being unarmed (text-fig. 2). The endopodite of the 1st maxilliped is five-jointed, the second joint being the longest (text-fig. 5). The exopodites of the 1st and 2nd maxillipeds end in a group of four short-pointed setæ arranged side by side (text-fig. 5). There is a large branched pigment-spot on the ventral side of the abdomen between each pair of segments and a small circular patch of pigment on the distal end of the protopodite of the 1st maxilliped (text-figs. 1 & 2).

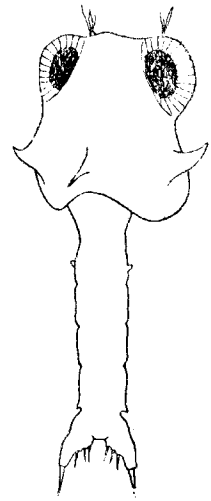
Comparison with the description given by Moreira [1912] for

Text-figure 1.



Lateral aspect of 1st zoæa of *Cardisoma armatum*. × 88.

Text-figure 2.



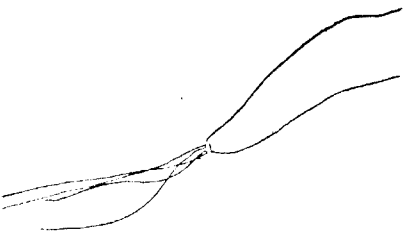
Dorsal aspect of 1st zoæa of *Cardisoma armatum*. × 88.

the zoæa of *C. guanhumi* shows only one marked difference. In *C. guanhumi* it is stated that the cephalothorax is provided solely with a dorsal spine, the anterior and lateral spines being absent. Between two such nearly related forms as *C. guanhumi* and *C. armatum* it would not be expected that such a difference would occur. However, the figures illustrating Moreira's paper suggest that a re-examination of the South-American form might be desirable.

An account of the 1st zoæa of *Gelasimus* by Hyman [1920] indicates a close similarity with the zoæa of *C. armatum*. In this form, however, there are no lateral spines on the cephalothorax, although the anterior spine is present.

Among twenty or thirty larvæ preserved for examination it was noticed that two specimens differed from the rest in the form of the 1st and 2nd maxillipeds. In these two specimens the exopodites, instead of ending in four short spines as in all other specimens, ended in a brush of four plumed hairs, each about the length of the remainder of the endopodite. In both *C. guanhumi*

Text-figure 3.

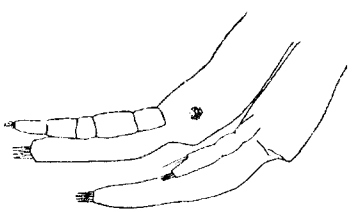


1st antenna.

Text-figure 4.

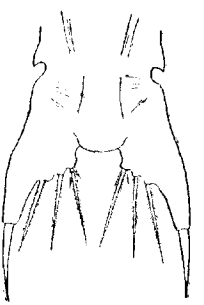
2nd antenna.

Text-figure 5.



1st and 2nd maxillipeds, seen from inside.

Text-figure 6.



Telson.

and in *Gelasimus* the exopodites of the maxillipeds normally end in a similar structure. It cannot be said with any degree of certainty what this represents. It may be that in these two specimens the 1st zoæa has already developed characters that would normally appear on a later instar, but, as no specimen was

reared to the second larval stage, this cannot be verified. It is interesting to note in this connection that Miss Webb [1919], in the larvæ of *Upogebia*, found two distinct forms. The difference in this case concerned the number of exopodites furnished with swimming setæ occurring on the thoracic legs, and became first evident at the commencement of the 2nd larval stage. Possibly the case recorded here is an analogous case of polymorphism.

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