

Zoologischer Anzeiger

herausgegeben

von Prof. **Eugen Korschelt** in Marburg.

Zugleich

Organ der Deutschen Zoologischen Gesellschaft.

Bibliographia zoologica

bearbeitet von Dr. **H. H. Field** (Concilium bibliographicum) in Zürich.

Verlag von Wilhelm Engelmann in Leipzig.

XXXII. Band.

17. März 1908.

Nr. 23.

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I. Wissenschaftliche Mitteilungen.

1. Notes on *Cambarus montezumae*.

By E. A. Andrews, Johns Hopkins University, Baltimore.

eingeg. 18. Dezember 1907.

Nothing being known of the life histories of Mexican crayfishes and Ortmann having given reasons for deriving all Cambari from ancestors once living in the Mexican region, the following meager facts seem worthy of record.

Late in July, 179 of the small crayfish, *Cambarus montezumae*, cooked for food, were purchased, in the market of the City of Mexico: of these 91 were males and 88 were females, so that the sexes may well be about equal in numbers.

The dimorphism in the females which we have elsewhere described in some other Cambari is very marked in connection with the peculiar form of annulus, a detailed account of which will appear in the Biological Bulletin: 44 of the females were dextral, that is had the seminal receptacle on the right side of the body and, as it happened, 44 were sinistral. This dimorphism being thus found in representatives of four out of the six sub-genera recognized by Ortmann is probably to be found in many

if not in all Cambari and is probably a real dimorphism and not an alternate phase in the life of each individual, as is the apparent dimorphism of the males in this genus.

Most of the males were about 25 mm long: one was 32, one 33, two 17 and one 14. Many of the females were about 28 mm long: many 28: three sinistral forms were 31, one 17, one 16: of the right handed females one was 36, two 35, one 32, one 31, one 21, two 20.

That the breeding season is a somewhat extended one, or at least not punctually observed by all females alike, is shown by the various phases present in this small collection. In some males the sperm was found in the tip of the stylet of the first abdominal somite, which indicates a recent union with the female and this usually takes place some weeks or months before the eggs are laid, in *Cambarus*, yet females were found bearing eggs. Again while some of the females bore eggs that were evidently but recently laid, since they had short flat stalks and no visible embryo, other females bore eggs that must have been laid much sooner since the embryos had advanced far enough to show nine pairs of appendages as in Reichenbach's stage H, and in another case the appendages were as in stage J, long and crowded. On a few females larvae were found and this means, probably, that their eggs had been laid some weeks before. However, the majority of these specimens had not yet entered their breeding period, to judge from their smaller size and from the large ovarian eggs still present in some of them. Only six females bore eggs; three sinistral, 31 mm long and three dextral, 31, 32, 35 mm long. Only two females, both dextral, bore young, and these females were 35 and 36 mm long.

Hence it may be that the breeding seasons begins before July, for some larger females and continues after July for others, possibly much longer, but one of the males had recently cast its shell and some of the females had the new shell well formed under the old, which would indicate an approach to the end of the breeding season, for these specimens at least.

The eggs were about $1\frac{1}{2}$ mm in diameter, which is not actually large for crayfish eggs, but relatively large for such small adults, for the width of the abdomen between the pleural plates was but 9 mm and the length of the body 35 mm. More than 120 eggs were fastened onto the eight pleopods, about 15 on each, and while this is not a large number of eggs for one female as compared with what is found in some of our Northern crayfish it filled out the abdominal basket as completely, since the eggs were so relatively large.

None of the eggs were found attached to the first abdominal somite, either by hairs or by pleopods and a search for the expected first pleo-

pods proved that they were absent. This absence of the first pleopods in the females of *Cambarus montexumae* had not been previously noticed and raised the question whether other Mexican crayfish show this point of resemblance to the American *Astacus*. Dr. Ortmann has been good enough to examine his collection with reference to the occurrence of these appendages and finds that while his specimens of *C. montexumae* lack the first female pleopods, specimens of the other two sub-genera of the Mexican and Central American regions do not lack them. The appendages are found in 5 other species, of the subgenus *Cambarus*, in 10 of the sub-genus *Faxonius*, in 9 of the sub-genus *Bartonius*, which he has examined; and probably a further search will but strengthen the common belief that these appendages are generally present throughout the genus *Cambarus*. Strange to state, however, Dr. Ortmann finds these appendages absent in his one specimen of *C. pellucidus*, from Indiana.

The facts regarding the first abdominal somite and its appendages in crayfishes seem to be as follows: In all crayfishes in the Southern Hemisphere the appendages are absent in both males and females, as far as is known: In all crayfishes in the Northern Hemisphere the appendages are present in the males, and used as necessary reproductive organs, and are present as small and apparently almost useless organs in the females in most crayfishes of America, Asia and Europe. They are absent in the following few cases: In the crayfishes of eastern Asia; western coast of America; in the Mexican form, *Cambarus montexumae*; in the blind cave form, *C. pellucidus*, of Kentucky and Indiana and also, according to Huxley in some specimens of an English crayfish, though other specimens have the appendages present and some have only one. In our present understanding of the history of the crayfishes we can only conclude that these appendages have been independently lost in all of the above cases of crayfishes in the northern hemisphere, but further knowledge of the crayfishes of the southern hemisphere may put the matter in a different light.

In these boiled and preserved specimens, young were still fastened to the pleopods of the female in two cases, 16 in one and 30 in the other. All these young were alike and were fastened by their large claws, which were much recurved so that the young could not be easily detached.

The young were $3\frac{1}{2}$ mm long and still well supplied with yolk though not so obese as is the case with the recently hatched young of *C. affinis* and *C. clarkii*. The eyes were very heavily pigmented and long, while the rostrum was not much bent down though rather blunt and without the lateral spines, which, however, as well as a more mucronate tip, were already formed within the exoskeleton, to be set free

at a near approaching moult. This change in the form of the rostrum is of interest in connection with a case of regeneration in one of the adult females. Here the rostrum had been broken off across between the anterior parts of the eyes and replaced by a piece of full size but as yet movable upon the old part. This new rostrum was simple and without the lateral spines of the other adults, so that the regenerated part was like the rostrum of the larva and would need to be perfected at a subsequent moult, and then the course of regeneration would run parallel to that of ontogeny. Possibly some of the apparent varieties of this very variable species may prove but imperfect, regenerating specimens.

Whether these young were in the first or the second stage of larval life was not easy to determine, as they showed characters of each stage. Crayfishes remain upon the mother both in the first and the second larval stages and differ not only in size but in the perfection of the external organs.

The larvae of these *C. montezumae* have the smooth, hairless bodies of first stage crayfishes, but they are long and have the spinules on the mouthparts unusually well developed.

In the first antenna there are four joints in the endopodite and five in the exopodite. The sense clubs are longer than in any other larval crayfish yet studied, three stand on the ultimate segment and two on the distal end of the antepenultimate segment. The ear pit is open, naked and full of dirt. The second antenna has 30 segments in the flagellum and about 15 teeth on the scale. The mandibles have three or four blunt teeth, but will have six or seven at the next moult. The exopodites of the maxillipedes are very long. And, as above stated, the tips of the chelae are very much recurved, while the rostrum is but little bent, though not provided with lateral teeth till the next moult.

The long, simple telson bears 16 very small triangular spines, or papillae, eight on each side, and these show no grouping such as to suggest the glandular function observed in the first stage of other crayfish, but as the larva is about to throw off its shell the appearance of the spines may have changed since they were first made. Inside the telson the last pair of pleopods is remarkably far developed and it is obvious that the larva will have a fringe of long setae, which will perhaps be plumose as in *C. clarkii*.

Upon tabulating the like characters in the other larval crayfish, in which they have been as yet described, namely *C. affinis*, *C. clarkii*, *C. diogenes*, and *Astacus leniusculus*, it appeared that these young of *C. montezumae* were more like the first stage in some respects but more like the second in others.

The chief resemblances to the first stage are: the absence of hairs;

the recurved tips of the chelae; the simple telson; the ratio of the length of the larva to the diameter of the egg, which is about two to one for the first and three to one for the second stage; the nakedness of the ear pit and the small number of the segments in the second antenna.

The chief resemblances to the second stage are: the greater development of the first antenna in having five segments in the exopodite in place of four and in having five sense hairs while in the first stage the other *Cambari* have none and the *Astacus* but one, though in the second stage the four crayfish above mentioned have 5. 5. 7. 8., in the order above given; the dentation of the mandibles, which, however in a second stage should have six or seven, in place of three or four teeth; the size and straightness of the rostrum; the great perfection of the last pair of pleopods.

In brief the larvae found on these Mexican crayfish would be regarded as of the first stage from the chelae and external appearance of the telson, but as in the second stage from the first antennae and the advanced condition of the last pleopods inside the telson.

Having shown that the recurved chelae and the simplicity of the telson are intimately connected in other crayfish, in all as far as known, with the peculiar dependence of the first stage upon the mother, and not knowing the value of the development of the sense clubs as distinguishing first and second stages, we will conclude that these larvae are in the first stage.

However as first stage larvae they differ from other species known, in the perfection of sensory clubs, size of spinules, dentation of mandibles, and the perfection of the last pleopods.

In these respects they support the view, elsewhere maintained, that the early larvae of *Cambari* have degenerated from more active forms in connection with a life of dependence upon the mother for in the Mexican region where *Cambari* are supposed to have departed from *Astacus*-like ancestors we might expect to find more of an original larval life remaining and, at all events, less of the more extreme adjustment which the most specialized northern larvae have developed in their more complete parasitism upon the mother.

Baltimore, December 9.

2. *Limnocodium im Jantsekiang*, eine neue Süßwassarmeduse aus China.

Von Dr. Asajiro Oka, Tokio.

eingeg. 23. Dezember 1907.

Vor einiger Zeit erhielt ich aus China unter andern zehn Exemplare einer Süßwassarmeduse, die von Herrn M. Kawai, Kapitän eines

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Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Zoologischer Anzeiger](#)

Jahr/Year: 1907

Band/Volume: [32](#)

Autor(en)/Author(s): Andrews E.A.

Artikel/Article: [Notes on Cambarus montezumae. 665-669](#)