multiplication has not so far been reported. But we found from cell counts that there is cell multiplication (at least a doubling of number in preovulatory follicle) during the formation of corpus luteum from the collapsed follicle. Corpus luteum, though brief in existence, appears from its cell structure to play some role in the ovarian cycle of the insect. Measurements of different parts of the ovariole in *Phenacopsophus* are as follows:

- Length of ovariole excluding filament: 2.1 mm.
- Length of filament: 0.75 mm.
- Diameter of germarium: 0.03 mm.
- Length of ripe oocyte: 0.55 mm.
- Breadth of ripe oocyte: 0.22 mm.
- Diameter of germinal vesicle: 0.13 mm.
- Diameter of follicle cell: 0.01 mm.
- Diameter of cell in corpus luteum: 0.01 mm.
- Diameter of nucleus in corpus luteum: 0.005 mm.

Our thanks are due to Prof. R. V. Seshaiya and the Zoological Survey of India for identification of the beetle and to the authorities of Pachaiyappa's College, Madras, for facilities.

Post-Graduate Dept. of N. P. KALYANAM.
Zoology. K. SHANMUGHAM.
Pachaiyappa's College,
Madras, November 30, 1967.

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1. Andrews, H. E. *Fauna of British India* (Coleoptera: Carabidae), 1929, 1, 81.

**PSEUDOEMBATA ACUTIPODA GEN. ET SP. NOV. (ROTIFERA: BDELLOIDAE), AN EPIZOIC ROTIFER**

During investigations on the biology of a caridean shrimp, Caridina sp., one of the problems was to rear the larvae to adults. These larvae invariably succumbed a few days after hatching as they were found heavily infested with an epizoic rotifer belonging to the order Bdelloidea. Later, it was observed that the adults too carried these rotifers from whom probably the larvae receive their infection. Among the Bdelloid rotifers, members of the genus *Embata* are known to lead an epizoic life on the gill plates and gill chambers of amphipods, isopods, crayfish and insect larvae.

Detailed examination of the present material shows that these rotifers combine most of the features characteristic of the genus *Embata* and a few characters of the closely related genus *Philodina*, both belonging to the family *Philodinidae*. Therefore, it is proposed to describe these rotifers as belonging to a separate genus *Pseudoembata* due to the preponderance of *Embata* characters.


**Structure of the individual.**—The clearly transparent animal has a total length of about 350 μ (Fig. 1, A). The digestive tube is light or dark yellowish-brown. The cuticle is thin and smooth with a few longitudinal folds. The trochal disc or the wheel-organ is wider than the neck. Eye spots are located just above the mastax and are light red in colour. Rostrum is long and broad (Fig. 1, B). Dorsal antenna narrows towards the tip with a notch on one side (Fig. 1, C). The mastax is of the ramate type, typical of *Bdelloidea* (Fig. 1, D). Fulcrum is absent, and each ramus having two of their teeth thickened in the middle region. The trunk region is distinctly broader than the neck and passes gradually into the foot. Foot is less than half of the total length and consists of four segments. Four toes are present which are almost of equal size (Fig. 1, E). Spurs are not very long and are closely situated parallel to each other, tapering towards their tips. The interspace between them is one-fourth of the diameter of the spur at its base (Fig. 1, F). These rotifers are oviparous and the eggs have a mean size of 166 μ (length) and 77 μ (width) (Fig. 1, G).

**Habitat.**—These rotifers are distributed mostly on the extremities of the animal, especially at their joints (Fig. 1, H). Occasionally, a few of them were lodged on the gill lamellae within the gill chamber. The eggs were also attached to the body of the host. It was almost always the anterior region which contained the maximum number of individuals while the posterior half of the host had very little or none of these rotifers. Evidently, these rotifers being filter-feeders like their hosts, may be benefited by remaining in the anterior region where the water currents are set up for respiration and feeding, by the shrimps. The larvae reared in the laboratory were found heavily infested and were incapable of any movement. Further, it is thought likely that these rotifers also
compete with the food available for the larvae as seen in a simple experiment. When these larvae were fed with yeast, the attached rotifers too, actively collect the yeast particles for their own nutrition, thereby depleting the available food for the larvae. It will be of interest to study whether these epibionts do compete for the food of their hosts in natural environments also.

placed, and in the foot being less than half of total length, which are characters of the genus Philodina. Further, this genus differs from Embata in being oviparous yet possessing eye-spots. Thus, the present genus, while combining both the generic characters, has a closer affinity to genus Embata and hence the name Pseudoembata. The specific name refers to the structure of the spurs.


Remarks.—These rotifers resemble the members of the genus Embata in the possession of a broad wheel-organ, stout foot, four toes, in gross internal structure and in their mode of life. However, they differ from the above genus in the spur being short and closely

The authors are grateful to Professor S. Krishnaswamy, for suggesting this problem and for the encouragement and help in the preparation of this paper. Our thanks are due to Dr. W. T. Edmondson, University of Washington, Seattle, U.S.A., for the supply of relevant
literature. This work was done during the
grant of a U.G.C. Scholarship to one of us
(M. J. W.).

Dept. of Zoology. M. JOHN WYCLIFFE.
Madurai University. R. GEORGE MICHAEL.


OBSERVATIONS ON THE RATE OF
HEART-BEAT IN THE VARIOUS
STAGES OF THE TIGER BEETLE,
CICINDELA CANCELLATA DEJ.

The rate of contraction of the dorsal blood vessel in insects is known to be dependent on many factors such as general metabolism, activity, temperature, stage of development and the presence of various agents.\(^1\) The rate of contraction of the dorsal vessel in the various stages has been observed by Newport\(^2\) in *Sphinx ligustri* and by Masera\(^3\) in *Bombyx mori*.

This investigation was designed to record observations on the rate of heart-beat in *Cicindela cancellata*, in the various stages, viz., the three instars, the inactive stage just before molting, in the pupa and in the adult. The observations were made in the laboratory at a temperature of \(27 \pm 2^\circ\) C. and 66 \pm 5\% relative humidity.

*Cicindela cancellata* was collected from the Malabar Christian College compound and was reared in the laboratory in special rearing cages designed by Soans.\(^4\) The various immature stages of the insect were collected from the cages and observations were made under a binocular dissecting microscope. The contractions of the dorsal vessel could be easily observed through the integument of the larva and through the intersegmental membranes in the pupa and adult. The immature stages under observation were kept in an open petri dish containing some moist sand taken from the rearing cages. The rates of heart-beat were measured with the help of a stop-watch. For each stage, twenty replications were made. The statistical data relating to these observations are contained in Table I.

It is noted from the results that the rate of heart-beat in *Cicindela cancellata* is highest during the first instar and that it progressively decreases during development, through successive stages. The average rates for the three instars are, 68, 56 and 29 beats per minute respectively. The rate drops to the lowest and apparently to a common level at the inactive phase just before molting and during the pupal stage both of which show a rate of 19 beats per minute. The rate rises again to 63 beats per minute in the adult.

Grateful acknowledgement is made of the grant from the University Grants Commission.

Dept. of Zoology. A. B. SOANS.
Malabar Christian College, J. S. SOANS.
Calicut-1, November 24, 1967.

<table>
<thead>
<tr>
<th>Stage</th>
<th>I instar</th>
<th>II instar</th>
<th>III instar</th>
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A STUDY OF THE BIOCHEMICAL COMPOSITION OF THE SEA STAR
OREASTER HEDEMANNI

Very few investigators have analysed the biochemical composition of the echinoderms\(^2\) of the east coast of India. The present note deals with the biochemical composition of different tissues of the sea star *Oreaster hedemanni*. This investigation was started in order to understand the distribution of organic food materials in major subdivisions of the body.