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FOOD HABITS OF CORIXIDS.

BY H. B. HUNGERFORD,

ITHACA, N. Y.

In the literature dealing with Aquatic Hemiptera, we are informed that there are some ten or eleven families of the higher Heteroptera¹ that dwell in or upon the water, where they maintain themselves by preying upon other living forms. An examination of the external structure of the majority of them substantiates this view. For whether we examine the slender Hydrometra that stalks its prey upon the water, or the Naucorid that lies in wait in the tangled vegetation of the pool, we find a sharp beak, and, in the latter case, rapacious forelegs. These are the two extremes to be sure. The foreleg of Hydrometra is but slightly modified if at all, but the beak is sharp and the stylets, though flexible, are strongly and retrorsely barbed²; while the foreleg of the Naucorid is greatly modified into a most efficient grasping device (Plate II, figs. 3 and 6).

There is, however, one large family of water bugs whose external equipment is strikingly peculiar and whose front legs, if used for

¹ See Bibliography references (7), (8) and (9).

² Mr. J. R. De la Torre Bueno has reared these upon flies and like forms which he dropped upon the surface of the water. I have observed them catching larvæ and pupæ of mosquitoes as they were taking air at the surface film. And I have also watched them capture young members of their own species, small midges, and plant lice, but in none of these operations were the forelegs involved in the retention of the prey, the barbed stylets being able to retain even large and active wrigglers.

catching and holding prey, have developed along a line quite remote from the usual form. The forelegs possessed by the Mantids and the Notonectids alike are suited to withstand the struggle, but the spoon-shaped scoops of the forelegs of Corixids, fringed as they are with bristles, might present a sorry sight after an encounter with some struggling victim (Plate II, figs. 1, 4 and 5). Perhaps Dr. Kirkaldy³ had this point in mind when he wrote regarding the Corixids:

"Although not so specially adapted to our eyes for such a life, the Corixidæ have gained a more complete mastery over the problems of aquatic existence than their relatives, the Notonectidæ and Naucoridæ, if we may judge by the much greater number of their species."

As we shall see, their equipment is more nicely adapted to the lives they lead than we have ever supposed.

When we began a study of the food habits of the boatmen, aside from the generalization cited at the beginning of this paper, there was but one specific clue as to their food habits. Dr. Abbott noted some of the larger nymphs of *Ramphocorixa balanodis* (Abbott)¹ feeding on ostracods. Our studies were started in the fall, and one Corixid, after a prolonged fast, was induced to attack a blood worm.

Though the adult Corixids were early noted to spend much time apparently scraping the sediment from the dead oak leaves that were in the aquarium, it was not until spring that the nature of their feeding habits was definitely determined. This was revealed in a delightful way by the newly hatched Corixids, which were confined in petrie dishes with a little pond water, and some of the brownish deposits, so characteristic of the bottom of quiet pools. These little fellows could be observed for hours under the binocular and were not easily disturbed.

The method of food getting by boatmen in all stages has been observed many, many times, but the account would not differ greatly from my first observation, recorded in my notes as follows:

"Petrie dish A: It is my good fortune this morning to watch under the binocular one of these little corixid nymphs search out his breakfast. It is on a bit of oak leaf covered over with brown sedimentary

³ Canadian Entomologist, Vol. XL, No. 4, 1908.

⁴ Now *acuminata* Uhler.

material containing threads of *Zygnema*, diatoms, spores, euglenæ, etc. Amongst this material plows the little Corixid, leaving in its wake a ridge of sediment bounded upon either side by a furrow. The body is supported upon the long middle legs. These legs are broadly spread. The femora go out at right angles to the body, the tibia turn down at a wide angle, thus providing a biped support upon which *Corixa* swings from the horizontal to a position with the face nearly parallel to the surface of the leaf, and the caudal end of the body elevated. This support suits *Corixa*'s purpose, for it moves forward in feeding rather slowly considering the rapidity of its other movements. When an advance position is desired, first one leg is brought forward and then another, rather stiffly, like a boy on stilts. The arc of this swing enables it to bring the face against any mass of this loose material and working the forelegs rapidly it gathers double arm loads of material and passes it across its face from front to rear. Arm load after arm load passes by its face, appressed there by the flat rakes of its forelegs (Plate II, fig. 5). The buccal opening is on the cephalic surface of the beak and thus this machine, doubtless working like a colander, sends into the mouth bits of food material, and that which passes by is crowded on under the body between the middle legs and soon appears from beneath it partly due to the Corixid's advance and partly to the force of the material crowded after it.

The hind legs are all the while out at an angle to the body after the fashion of the parent and now and again strike forth in one or a whole series of rapid strokes that propel it forward not at all, but doubtless drive a current of water with its newer air supply across the body.

So intent is *Corixa* upon its work of embracing this food-containing material that it pays slight attention to the cyclops that scurry by—to the little grayish spotted ostracods that glide in and out of the way, or to a baby snail that comes close.

Beginning with the third instar, the Corixids evince more concern regarding their air supply, and spend less time in continuous feeding. The adults also are nervous feeders, gathering up a little in one place, then suddenly darting to another, with no apparent reason.

If one examines the head parts of a Corixid, it will be soon discovered that the stylets, when exerted, are directed forward out of the opening which lies on the cephalic side of the beak a trifle above

its tip (Plate II, figs. 2 and 5). These stylets are roundly notched on their outer side, as shown in the drawing and the opening is capable of some enlargement—facts which enable us to understand how some surprising bits of material come to be found in the digestive tract. (We have found oscillatoria 9/10 mm. long and bits of *Zygnema* filaments consisting of as many as seven cells.)

We have spent many delightful hours watching the boatmen in their natural surroundings and in the aquarium and feel safe in saying that the customary food of Corixids consist of such matter as is to be found in the brownish deposits on the bottom of the pool and upon the dead leaves that have lodged in its shallow waters. These deposits consist of tiny bits of organic matter, diatoms, desmids, oscillatoria, sometimes threads of live, more often dead filaments of *Zygnema*, *Euglenæ*, paramecium, *Chlamydomonas*, spores of various algae and the cysts of *Euglenæ* and other unicellular plants and animals.

That these things form the daily fare of Corixids can be substantiated by any one who cares to examine the stomach contents of a few of them.¹ To be able to say just what, out of all the matter they take into their little bodies, nourishes them, is a more difficult matter, and involves feeding them on pure cultures. But for the purposes of this paper, it is enough to point out the source and nature of their food supply and call attention to the fact that here may be one reason for their dominance.

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¹ The reader might be interested to know that I have reared Corixids from egg to maturity in 11 cm. petrie dishes. As many as twelve have been reared in one petrie by giving them a few pipettes full of fresh sediment each day. In a few instances in the past have appeared accounts of Corixids feeding on animal organisms. After having watched them repeatedly strike out of their way, during their foraging, ostracods and similar organisms I am convinced the observations are exceptional or misinterpreted.



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