PSYCHE.

EARWIGS (*ANISOLABIA MARITIMA* BON.).

BY CHARLES BARROWS BENNETT, PROVIDENCE, R. I.

IN the summer of 1901 I found a place near Cold Spring Harbor, N. Y., where there were many earwigs. As these insects are rather rare in New England, I watched them as much as possible, and also captured several, from which others were reared.

THE EGGS AND YOUNG.

Eggs were laid mainly in the warmer months of July and August, and only a very few after the middle of September. When first laid the eggs were almost two millimeters (about one-sixteenth of an inch) in length, were cylindrical in form, and white, and covered with an almost transparent, glossy shell. (See Figure 1, e.) At first the color of each egg was uniform throughout, and its shape was regular. After some days the contents became separated into a clearly outlined embryo and a colorless liquid. The embryo was of a crescent shape and the side of the egg on which it was became a little larger and less regular than at first. After about seventeen days—although the time varied with varying conditions of temperature, humidity, etc.—the young emerged from the egg. Their length at that time was seven and a half millimeters (about five-sixteenths of an inch), not including the length of the antennae. (See Figure 1, d.) They had, even then, forceps, or nippers, shaped like those of the adult female, although, of course, much smaller in size. At this stage the antennae were longer in proportion to the length of the body than they were in the adult. In a few other points also the young differed slightly from the adult, but for the most part they resembled them in miniature. Their color when newly hatched was almost white, but soon became almost black above and brownish below, the same as that of their parents.

GROWTH AND DEVELOPMENT.

I was not able to ascertain positively how many times the young earwigs shed their skins; it was probably four times. The fact that the general characteristics remained the same until the last change, together with the fact that they speedily devoured their own cast-off skins, made it difficult to be sure, at times, whether or

not a change had been made. The last change, I think, was usually made in the spring following the year in which the eggs were hatched; that is to say, they usually winter in the nymph stage. In confinement, however, I have had them winter also in the adult stage.

All the young up to the last nymph stage have ten plates, or tergites, on the

dorsal surface between the last pair of legs and the terminal forceps. In the last part of the nymph stage, however, some of the females have only nine plates fully showing, with just the tip of a tenth. I found that this was due to the fact that the plate next to the last — that is, the ninth — gradually slid under the one anterior to it — or the eighth — until it was nearly lost to sight. No male earwig that I have ever seen had this peculiarity.

ADULTS.

The females, after they have shed their skins for the last time, have only eight plates on the upper side of the abdomen. The easiest way, therefore, to distinguish the adult female from the young is to count the number of its plates; for the general shape both of the body and of the forceps is essentially the same in both. The case of the males is different. Although until the last change of skin their forceps were not distinguishable from those of the adult females or the young of either sex, after that the forceps were much more curved. (See Figure 1, a, b, and c; a and c are adult males, and b is an adult female.) Their plates also, after this last moult, seemed to overlap each other along the sides of the abdomen to a greater extent than did those of either the females or the young. The posterior end of the abdomen seemed broader in proportion to the size in the male adults than in the other sex or in the younger earwigs. The abdominal plates also remained ten in number, as in the nymph stage. The legs of both male and female adults were of a uniform tan color, while those of the young were generally more or less dotted with black. Female adults are, as a rule, longer and otherwise larger than the males. The size of the full-grown insects which I have seen varied from almost sixteen millimeters (five-eighths of an inch) to nearly thirty-five millimeters (about one and three-eighths inches), not in either case including the length of the antennae. I have not been able to ascertain the length of life of earwigs when wild, but one which I still have in confinement has lived about twenty-one months. The females were three or four times as numerous as the males.

HARDINESS.

Earwigs seem to be capable of great endurance. They are accustomed to live near water, and when disturbed they frequently enter the water. One of them remained under water for an hour and five minutes or more when disturbed above water. It showed little sign of being weakened by its experience. They are capable of recovery from quite serious injuries. Once when an earwig was by accident nearly torn in two just below the last pair of legs, and was consequently paralyzed for a while in one leg and most of its abdomen, I pushed in all the viscera as far as possible with a wooden toothpick, and then closed the opening. In a short time it seemed to be as well and as able-bodied as ever. They easily succumb to lack of water; if kept in a dry place they soon die.

FOOD.

It is certain that these earwigs are at least partly carnivorous. Any dead insect not protected by too tough a covering will serve them as food. In captivity they also eat cooked fish, chicken, and mutton, and both raw and cooked beef. They probably would also eat raw fish, fowl, or flesh of any kind if given them. The fact of their eating their own cast-off skins has been already noted. Whether or not they eat any vegetable food is a question, despite the common belief that they do. Certainly I have never seen one that did. I caught and dissected three earwigs and found that the alimentary tract of two contained animal matter only — very small insects, etc. In the stomach of the third, it is true, there were a few particles of starch, but this may have been accidentally eaten together with animal matter. Those which I have freshly caught, and those which I have kept in confinement for some time, would readily eat animal matter, but refused vegetable matter.

SOME HABITS NOTICED.

I found that the earwigs were not at all afraid of entering the brackish water in the bay at Cold Spring Harbor, where they were found. Some voluntarily swam about from place to place. Perhaps they more properly floated than swam, for their movements were mainly on the surface of the water, and often their backs were perfectly dry. When frightened, however, they would often crawl to the under side of some floating object and hide themselves under water.

Earwigs easily dig holes in the sand. Those which I have observed used only their mouth-parts in digging. They never kicked or pushed the earth out with their feet.

Earwigs do not seem to be nearly as much afraid of the light as are our common centipedes (*Lithobius americanus*). They are said to be nocturnal in their habits, and to hide themselves by day "in any dark cranny that they can find," but those which I studied often apparently preferred the light to the darkness, although as a rule they chose the darkness.

I have observed that whenever the ground was wet an earwig walking over it would so twist its heavy abdomen that the narrow side rather than the flat bottom would come in contact with the ground and thus serve as a runner to support its weight.

EGG LAYING AND CARE OF THE YOUNG.

When about to lay her eggs the female would make a little chamber for herself in the ground about half an inch deep, and one, or one and one-quarter, inches

wide. This was hollowed out beneath a log or some other object that rested on the ground. In making this chamber she carried the earth out in her mouth-parts, as already suggested, a little at a time, just as an ant would do. She never seemed to use her forceps for either digging or carrying the earth. The chamber is made perfectly clean; no sticks or bits of wood or pebbles are allowed by the more careful females to remain inside. Here she deposits her eggs. In the chamber of one wild earwig I counted about ninety eggs, but none of those I have had in captivity laid quite so many at one time, some laying only twenty-five or less. Immediately after the eggs were laid the female picked them up in her mouth-parts, one at a time, and wiped them all over. It looked, indeed, as if she rolled them in her mouth. However that may be, when the process is over the eggs are all clean and glossy. Then she places them in a neat pile and stands guard over them. Whether or not it be true with the wild insect, some of the females I have kept for observation have, before their eggs were hatched, moved them all several times from place to place, carrying them one at a time. Some of my earwigs refused to touch food of any kind, so far as I could see, from the time they laid their eggs until the young were hatched, while others would leave their eggs at times to get something to eat. Several times the females, after caring for their eggs a while, have eaten them. I have reason to think, however, that in nearly every case the eggs had already spoiled or dried up before this occurred. The females continued to guard their young for a few days after they were hatched. When, however, they had once left her to seek for food for themselves, they could not safely return lest she should endeavor to eat them.

One earwig which I kept in confinement deposited four fairly large batches of eggs in one summer.

USES OF THE FORCEPS.

The opinion has been advanced that the main use of the forceps is to furnish the earwig with an instrument with which it may fold away its delicate wings. That this is certainly not the only use I was assured by observing those which I kept in captivity. In the first place these were wingless,—the *Anisolabia maritima*, Bon.,—yet had thoroughly developed forceps. In the second place I detected at least three uses to which the forceps were put without regard to wings. These were (a) for defense, (b) for offense, and (c) as feelers in mating.

(a) That the earwigs used their forceps defensively was apparent. When one was picked up, it always tried to pinch its captor; when touched or molested by another insect in any way, it always used its forceps; in fact these forceps were the chief, and seemed to be almost the only, weapon of self-defense which they

had. (b) The use of the forceps offensively may have been less important, but was scarcely less evident. I have often seen large earwigs in confinement chase and catch with their forceps crickets, sand-fleas, and even smaller earwigs, which they then proceeded to eat. When a victim was once caught, generally no amount of struggling freed it again from the powerful grasp of the forceps. When the victim continued to struggle for some time, the earwig which had caught it would, as I have often noticed, curve its own body sidewise until it took the shape of the letter U and its mouth could be brought into contact with its prey. Then the earwig would proceed to eat the living food it was holding. I have also seen earwigs clutch their victims in their forceps and drag them about from place to place. The deliberate manner in which some earwigs in confinement have chased

Figure 2.

and caught their prey, while I was observing them, convinces me that in their native state also they must at times use their forceps offensively, yet their progress seemed to be too slow to allow them to catch uninjured crickets or sand-fleas in the open. The earwigs which I watched would, when hunting, walk forward until their antennae touched a desirable object; then, with wonderful speed, they would swing the abdomen sidewise at a very sharp angle until the forceps were where the antennae had been, when they would instantaneously snap the prey if it had not escaped. If it had, the earwig, with scarcely a moment's delay, would continue its expedition. (c) Earwigs also use their forceps in mating. Although these forceps are so strong, they are yet very sensitive. One earwig can hardly touch with its antennae the forceps of another without the second one immediately knowing it. When mating, the two earwigs, after having located each other, approach each other

back to back until the forceps touch. Then the male completely inverts the end of his abdomen and, of course with inverted forceps, proceeds to back under the female until the required position is reached. (See Figure 2.)

The forceps of the male and of the female differ, as we have already noticed, those of the male being the more rounded and irregular. (The original type seems to have been that of the female, for both sexes have this type until the last stage.) The shape of the male forceps also varies greatly, male differing from male (see Figure 1, a and c) in a marked manner, while that of the female is always the same. I wondered at first why the forceps of the male should be curved as they are. I noticed that the right one frequently laps a little over the left when they are closed, and that it is usually a little more bent than the left. When I saw that the male in mating inverts his forceps and that therefore the right is the one to touch the ground, I could readily see at least one advantage in the present shape. The right is the more bent of the two, often with the point at right angles to his body, or sometimes even pointing a little forward. It would, therefore, not offer the obstruction to his backward movement that it would if his forceps were shaped like those of his mate. This applies certainly to the earwigs which I had in confinement. Still so great is the difference both in shape and dimensions of other species of earwigs that I dare not state it as a rule applicable to all.