

FURTHER OBSERVATIONS ON THE FUNCTION OF
THE EARWIG FORCEPS.

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In a former paper¹ the writer gave the results of observations and experiments which seemed to show conclusively that the earwig forceps are used primarily as organs of combat. Since several writers, especially in text-books, have referred to them as being used as claspers in mating, it seemed advisable to extend the observations with reference to the use of the forceps during the mating process. Of the few contributions dealing with the function of the earwig forceps only two papers² were found that dealt with this subject in detail. These authors expressed their doubt as to the use of the forceps as claspers in mating but did not give the basis for their doubt³. The following observations were made during the past summer at the Indiana University Biological Station with earwigs¹ collected in Florida, Louisiana and California. The large brown Florida earwig (*Labidura bidens* Oliv.)¹ used in former experiments was the most favorable for observation.

The insects under observation were kept in uncovered tin containers partially filled with sand and plant debris and placed in subdued light, conditions which very nearly resemble their normal habitat. Both sexes would seek hiding places in crevices and under objects. When left undisturbed for a few minutes those females not already hidden would begin burrowing in a manner that might be described as "dog fashion". The front legs were used alternately in starting the digging and as several grains of sand were scraped back this was moved further by the second and third legs. The real digging was accomplished by the front legs that moved much more rapidly than the others; however, the mandibles were used at times in dragging out large objects. Occasionally the males would burrow similar to the females. Although several individuals burrowed entirely below the surface, the females, especially before mating, often remained with only their forceps protruding from the burrow. It was in this situation the males usually found the females, thus offering excellent opportunity for the observation of the mating habits.

The males, after finding the females, would turn quickly in the opposite direction and then move backward toward the female. Here

¹ Notes on the function of the Forceps of Earwigs. Proc. Ind. Acad. Sci., Vol. 33, 1923 (1924). (Figure 1 of this paper is *Labidura bidens* Oliv. and figure 2 *Anisolabis maritima* Bon., Caudell det.)

² Sopp, E. J. B. Calipers of Earwigs. 28th Proc. Lancashire & Cheshire Entomological Soc. 1905.

³ de Kerville, Henri Gadeau. Notes Sur Les Fonctions De La Pince Des Insectes Orthopteres De La Famille Des Forficulides.

⁴ The writer is indebted to A. N. Caudell, U. S. National Museum, Washington, D. C., for the identifications of the earwigs referred to in this paper.

the mobility of the abdomen, described in connection with the use of the forceps during combat, was seen to place the male opposite the female. Throughout the whole process the male would hold his forceps so that the tips were nearly together and at no time were they used in the grasping or scissor-like actions seen in fighting. The female when thus approached by a male would curve her abdomen upward and keep her forceps open but they were never used in any scissor-like movement during the mating process. The female often rotated her abdomen from the horizontal plane while the male placed the posterior portion of his abdomen in a plane parallel to that of the female. Usually the ventral surfaces of both sexes were opposite. The genitalia of the earwigs are not brought in contact by any clasping structures but copulation is effected by the penis which is in part chitinous and quite protrusible. Its length in forms dissected was about half the length of the male forceps but, under certain conditions, it was seen in the living insect to extend to a length equal to that of the forceps.

Several cases were observed where two males were attracted by the same female. This invariably resulted in a combat between the males. They would rush toward each other with the abdomen raised above the head and forceps opened wide, in scorpion-like posture, and with the scissor-like strokes either frighten their adversary away or lock him in a death grip. Several such encounters were seen to end in fatalities and in some instances the vanquished male was eaten by the winner and the female.

The writer observed in the dissection of several individuals of different species that the length of the penis varied directly with the length of the forceps. This condition seemed to hold in the species having short curved forceps as well as those having the long straight ones. Due to this relationship existing between the length of the penis and the length of the male forceps it seemed probable that the forceps act as an actual obstruction in the mating process which has been structurally offset by the length of the copulatory organ.

In conclusion the writer is convinced that the earwig forceps do not act as claspers during mating.