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DISTRIBUTION, ABUNDANCE, AND SOME HABITS OF LARVAE OF CICINDELA HIRTICOLLIS (COLEOPTERA: CICINDELIDAE) ON A LAKE MICHIGAN BEACH

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INTRODUCTION

In August 1965, numerous burrows of tiger beetle larvae were found on a short expanse of beach along the shore of Lake Michigan in Emmet Co., Mich. Several adults associated with the larvae were captured and identified as *Cicindela hirticollis* Say. Blanchard (1921) collected *C. hirticollis* a few miles south of this area in 1917, and reported he had not found it in the interior of either Emmet or Cheboygan counties. In an extensive survey of Michigan Cicindelidae, Graves (1963) found *C. hirticollis* to be restricted to the sandy shores of three of the Great Lakes. Apparently this insect is widespread in North America, since several investigators have reported it from beaches along the Atlantic and Pacific coasts (Davis, 1903; Dunn, 1891; Fox, 1910; Gould, 1834).

Because of the high population of larvae on the Lake Michigan beach in 1965, the area was reexamined August 12, 1966 to measure the distribution and abundance of the larvae.

DESCRIPTION OF THE STUDY AREA

The study area was located along the east shore of the lake, approximately 3.5 miles south of Good Hart, Michigan. High steep bluffs dominated the back shore for many miles along this portion of the lake. Tiger beetle larvae were abundant on a small, gently rounded point (Fig. 1) that was about 250 ft. long. On this point the bluffs ended abruptly on a broad, flat storm beach, varying from 95 to 105 feet wide (Fig. 2) and which was separable into 3 distinct zones. The first zone or upper beach, at the base of the bluff (Figs.1, 2), was about 35-40 feet wide, dry, and temporarily stabilized with grasses. The middle beach was 50-55 feet wide and moist except for some patches of dry surface sand. The lower beach consisted of 8 or 10 feet of swash zone, wet and perpetually modified by wave action. A ragged, littoral drift line delineated the lower and middle beaches.

The shoreline north and south of the point differed from the point by having a very narrow, or nearly nonexistent middle storm beach.

DISTRIBUTION AND ABUNDANCE

A quadrat (1 square foot) was used to estimate larval distribution and abundance on the point. Five transects were made at regular intervals across the beach from the base of the bluffs to the swash

zone. Larval burrows were counted in each quadrat sampled at 4-foot intervals along each transect.

No larval burrows were found on the upper and lower beaches. The mean distribution of larvae on the middle storm beach is illustrated in Fig. 3. Density was very low adjacent to the upper beach, but it increased and reached maximum between 10 and 15 feet away. Density declined steadily from that point on and ended just before the swash

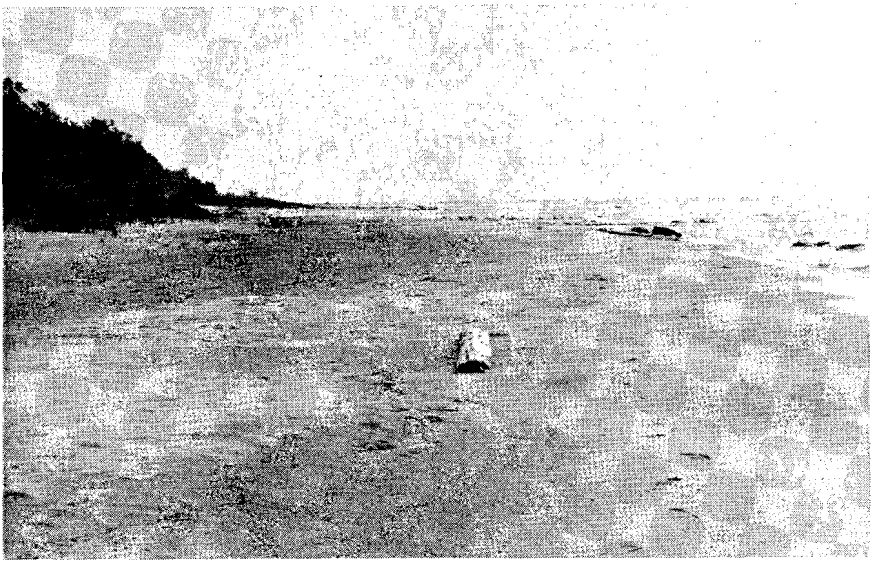

Fig. 1. Habitat of *C. hirticollis* larvae on a Lake Michigan beach, Emmet Co., Michigan.

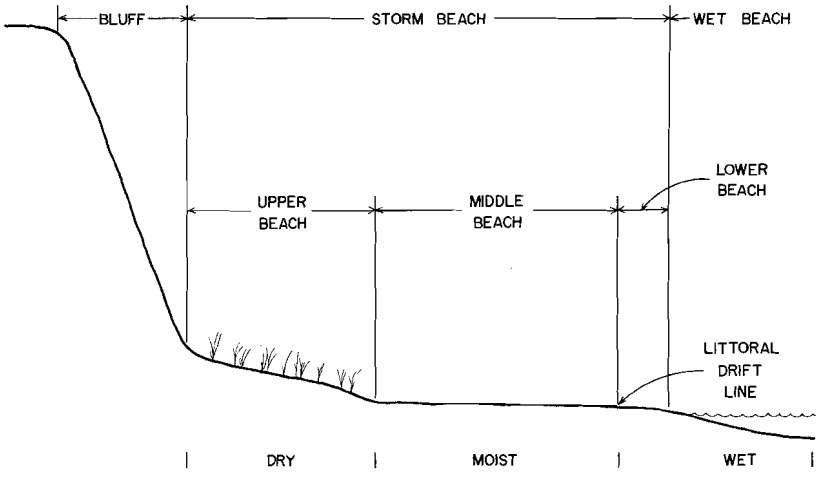

Fig. 2. Profile of *C. hirticollis* habitat on a Lake Michigan beach.

zone. Interestingly a few burrows were within inches of the littoral drift line suggesting a high probability of flooding under conditions of slightly higher waves.

The mean number of larval burrows per square foot (61 quadrats) was 5.31 $\pm$ 7.24 S.D. Macnamara (1922) reported a mean tiger beetle larval density of about one larva per square foot for a different species on a sandy farm road. I calculated that the population on the middle beach on the point might have been at least 50 thousand larvae--perhaps even more, considering that some could have had their burrows closed temporarily for ecdysis. Frick (1957) reported that burrows of some species are closed for two days during ecdysis.

Fourteen extra quadrats were taken along the high density band (between 10 and 15 feet from the upper beach). Only high density clusters of burrows were selected. The counts averaged 39.2 burrows per square foot--the highest density recorded was 67 per square foot (Fig. 4).

BEHAVIOR AND HABITS

The high density of tiger beetle larvae was first noted when the sand "suddenly became full of holes" while walking along the beach. Typical of most cicindelids, *C. hirticollis* is very wary and drops to the bottom of its shallow burrow at the slightest alarm, but soon returns. All burrows examined were vertical shafts varying from 5 to 8 in. deep; some went nearly to the shallow water table. Shelford (1909) and Hamilton (1925) also noted burrows 5 to 8 in. deep for *C. hirticollis*. The size of the burrow openings (Fig. 4) and the size of the larvae

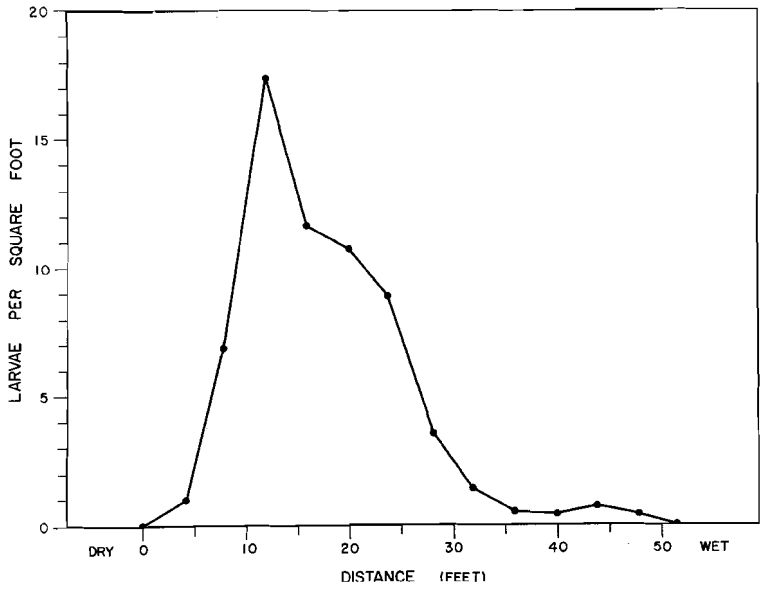

Fig. 3. Distribution of *C. hirticollis* larvae across the moist middle storm beach.

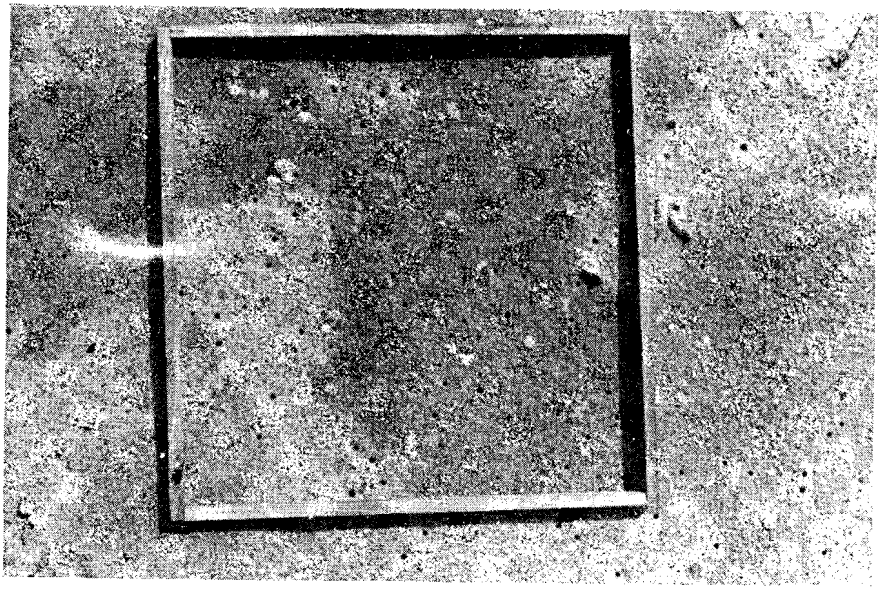

Fig. 4. A quadrat (1 square ft.) showing 67 larval burrows--4 of them "plugged" by larvae. This was the highest density recorded on the middle storm beach. Note the hole sizes indicating two larval instars, and the small piles of dry sand made during burrow construction and maintenance.

within indicated that the last two instars were present when the study was made.

Macnamara (1922) reported that tiger beetle larvae fling the sand away from their burrows. This appears to be true for *C. hirticollis*, because the burrow openings are clean and small piles of sand can be found nearby (Fig. 4).

C. hirticollis adults were common on the point too; they were present but less common all along the shoreline north and south of the point. The adult population was not censused on the point but 15-20 could be raised easily while walking five or six steps. Adults were common on both the upper and middle beach zones. They were very difficult to approach and capture. Hamilton (1885) noted that this species was wary, active, and not easily taken.

DISCUSSION

The limited location of *C. hirticollis* larval burrows indicate that the larvae occupy a very restricted habitat on the beach. The conditions favorable for larval development and survival occurred only on the middle beach area of the point. One of these conditions appeared to be sand moisture. Except for the swash zone, the middle beach on the

point was the only area that had moist sand from the surface to the water table 8-12 inches below. The surface sand on the rest of the beach was dry. Shelford (1909) stated that the larvae of this species could not burrow if the surface sand was dry. Also, Hamilton (1925) and Graves (1963) noted that moisture appeared to be important for larval development and survival.

The reasons for the high density zone of larval burrows ten to fifteen feet from the edge of the upper beach were not apparent at the time the data were collected. The depth of the water table under the middle beach did not appear to be correlated to larval density, but the data gathered were insufficient for detailed analysis. On the other hand, the high density zone could have been caused in part by variation in the width of the swash zone during the summer. The pattern of litter and debris on the middle beach suggested that it had been partially inundated sometime during the season. If larvae were on the front of the beach when this occurred they would have had to retreat in order to survive. In support of this, Shelford (1909) noted that *C. hirticollis* larvae left their burrows and even moved up dunes after rains and storms. After a storm, once the water on the beach receded, some larvae might again move to the front of the middle beach. This would still leave a high density band of larvae at a particular place on the beach--as occurred in this study.

There are certainly other factors which might have been wholly or partially responsible for the pattern of larval density and distribution on the middle beach. For instance, the adult females could have oviposited in a particular zone with little subsequent larval movement. Also, food organisms may have been more plentiful in certain localities or sand particle size and texture might have been optimum in one zone, causing the larvae to congregate in order to better their chances of survival.

One reason for the large number of larvae on this particular beach was probably due to its relative inaccessibility to people. The steep bluffs, limited number of private homes, and distance from towns kept this beach fairly isolated. Only occasionally was it used for swimming, so it was seldom disturbed.

ACKNOWLEDGMENTS

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LITERATURE CITED

Blanchard, F.N. 1921. The tiger beetles (Cicindelidae) of Cheboygan and Emmet Counties, Michigan. Papers Mich. Acad. Sci., Arts, and Letters 1:396-417.

Davis, C. A. 1903. The Cicindelidae of Rhode Island. Entomol. News 14:270-273.

Dunn, G.W. 1891. The tiger beetles of California. Zoe 2:152-154.

Fox, H. 1910. Observations on Cicindelidae in northern Cape May County, N.J., during the summers of 1908-09. Entomol. News 21: 75-82.

Frick, K.E. 1957. Biology and control of tiger beetles in alkali bee nesting sites. J. Econ. Entomol. 50:503-504.

Gould, A.A. 1834. Art. IV. On the Cicindelidae of Massachusetts. Boston J. Nat. Hist. 1:41-55.

Graves, R.C. 1963. The Cicindelidae of Michigan (Coleoptera). Amer. Midland Nat. 69:492-507.

Hamilton, C.C. 1925. Studies on the morphology, taxonomy, and ecology of the larvae of holarctic tiger beetles (family Cicindelidae). U.S. Nat. Mus., Proc. 65:1-87.

Hamilton, J. 1885. Entomology of Brigantine Beach, N.J. in September. Canad. Entomol. 17:201-206.

Macnamara, C. 1922. Popular and practical entomology. Tiger beetle larvae. Canad. Entomol. 54:241-246.

Shelford, V.E. 1909. Life-histories and larval habits of the tiger beetles (Cicindelidae). J. Linn. Soc. London, Zool. 30:157-184.

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