areas offering refugia for these terrestrial forms are the islands that have been investigated in this study. Although no information is available on species composition or abundance immediately after flooding, one would expect the islands to all possess a full complement of the local vertebrate forms. If this is so, then several species have been lost in the approximate 20 years that the islands have been in existence. It has been argued (MacArthur and Wilson, 1967) that the paucity of species on some islands is due to the inability of numerous species to reach and colonize these areas. Findings of this study suggest that even when islands begin with a full complement of species, not all of the species can maintain viable island populations. The islands in this study, while appearing to offer a variety of suitable habitats and ranging in size from 1.2 to 299 ares, could not support anywhere near the number of vertebrate species trapped there by the rising floodwaters.

Three of the study islands did not have small mammal populations during the study period. Two of these three islands show connection with the mainland during periods of low water levels. Sheppe (1965) found that close proximity to the mainland facilitated small mammal emigration as well as immigration. Both of the islands periodically connected with the mainland showed characteristic sign of past small mammal activity. No factor was found which would account for the absence of small mammals on these two islands except for the possibility that emigration of the population had occurred during a period of connection with the mainland. The third uninhabited island had relatively sparse vegetative ground cover and was completely devoid of other forms of cover, such as rocks or logs. Lack of cover alone may explain the absence of small mammal populations as predation by avian predators is doubtless made easier by the absence of dense ground cover. In this regard, Bendell (1961) notes that habitat selection in the white-footed mouse (*Peromyscus leucopus noveboracensis*) on the islands of Lake Opincon was primarily for protective cover.

Cameron (1962) and Ozoga and Phillips (1964) point out that the habitats selected by *Peromyscus maniculatus* and other small rodents on islands was different from that of relatives on the mainland. We found *P. maniculatus* in greater abundance than *P. leucopus* in the more open type woods but Conaway and Howell (1953) working in Johnson County Tennessee, found *P. leucopus* to be more abundant in open type woods than *P. maniculatus*. These changes in habitat selection may represent either a temporary reversal of habitat selection or an adaptive change in the ecology of these two island-inhabiting rodents.

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PREFERRED TEMPERATURE RANGES OF *CICINDELA REPANDA* DEJEAN AND *CICINDELA RUFIVENTRIS RUFIVENTRIS* DEJEAN (COLEOPTERA: CICINDELIDAE)

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Abstract

The tiger beetles *Cicindela repanda* and *Cicindela rufiventris rufiventris* were exposed to a temperature gradient to determine their preferred temperature ranges. *C. r. rufiventris*, a summer species, selected a range of 27.4 to 33.5° C; the range selected by *C. repanda*, a common spring and fall species, was 26.7 to 30.9° C. Statistical comparison indicated a significant difference between the preferred temperature means.

Introduction

Temperature gradient studies were conducted on the tiger bettles *Cicindela repanda* and *C. rufiventris rufiventris* collected at two sites in Shelby County, Tennessee. *C. repanda*, a common fluvial species, is a spring and fall form; *C. r. rufiventris* is a summer species which inhabits bare open clearings adjacent to forested areas. Seasonal distribution of these species in Shelby County is shown in Fig. 1. The purpose of this investigation was twofold: to define the preferred temperature ranges for each species; and to determine if detectable differences between these ranges existed.

Material and Methods

After capture, beetles were returned to the laboratory and placed in a temperature gradient apparatus patterned after the Herter temperature organ (Roeder, 1953) used by Fulton (1928) and Ferguson and Land (1961). This device consisted of a plexiglass (methyl-methacrylate) tube, 12 cm in diameter by 122 cm long, sealed at one end with a removable plate at the other end. This tube extended through a 30 cm² plexiglass box, then through a semicircular, galvanized metal trough. The space between the metal trough and plexiglass tube was filled with moist sand which provided continuous contact between trough and tube along the entire lower length of the tube. The upper curvature of the tube remained above the sand allowing complete visibility into the test chamber.

A temperature gradient was established within the apparatus by filling the plexiglass box with crushed ice and placing a 150 watt bulb as a heat source beneath the trough at the opposite end of the tube. After equilibration, the device established a temperature range of 20 - 48° C. Temperature at any position along the tube was read by angular insertion of a Shultheis rapid recording thermometer (0 - 50° C) into the sand adjacent to the tube. A thermocouple (iron constantan) placed onto the inner surface of the tube indicated inside temperatures averaged 3° C lower than those at adjacent sites in the sand; all experimental readings were therefore reduced by 3° C.

To avoid acclimitization to laboratory temperatures, beetles were tested immediately after return from the field. Specimens were introduced singly into the open end of the test chamber. After sealing the chamber, temperatures were recorded at 15 minute intervals for the location occupied by the insect within the tube. A test run lasted 3 hours and 15 minutes; 13 preferred temperature measurements were made for each test specimen. For each species 390 observations of preferred temperature were recorded from 30 test individuals. As a control, five beetles of each species were introduced into the test chamber without a gradient established.

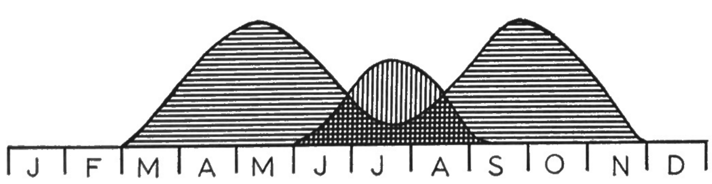

Figure 1. Relative seasonal abundance of *Cicindela repanda* (horizonal lines) and *Cicindela rufiventris rufiventris* (vertical lines) in Shelby County, Tennessee.

Results and Discussion

Temperature preference ranges for both species are indicated in Fig. 2; *C. r. rufiventris* selected a higher temperature range than did *C. repanda.* The preferred temperature mean for *C. r. rufiventris* was 30.5° C; that for *C. repanda* was 28.8° C. A significant difference between the preferred temperature means was indicated by Student's *t* test ($t = 2.45^*$). The preferred ranges are expressed, following methods of Ferguson and Land (1961), as approximately 68% of the total selected temperatures (mean ± one standard deviation). This method showed the preferred range of *C. repanda* as 26.7 - 30.9° C while that of *C. r. rufiventris* was 27.4 - 33.5° C (Fig. 2). These figures lie within the 20 - 37° C range of activity noted by Willis (1967) for adults of certain saline habitat tiger beetles; Willis also reported *C. repanda* to be inactive at 38 - 39° C.

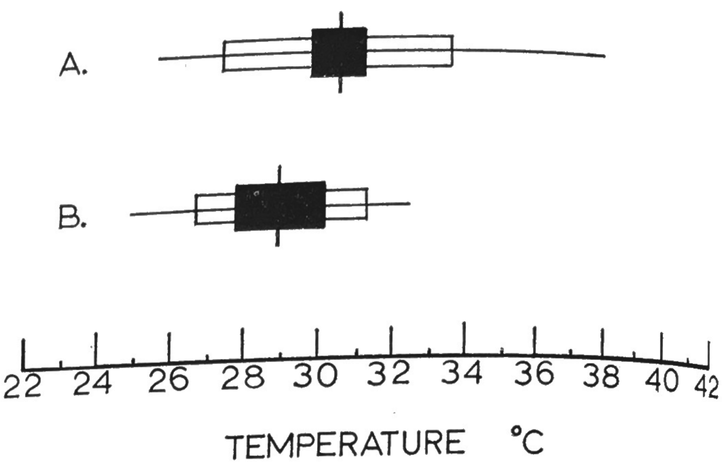

Figure 2. Selected temperature ranges for *Cicindela rufiventris rufiventris* (A) and *Cicindela repanda* (B). Vertical line represents the mean; horizontal line, the range. Black bar represents mean ± 2 standard errors; open bar, mean ± 1 standard deviation.

During certain tests beetles progressively selected lower temperatures throughout the observation period. This decrease in preferred temperature was interpreted as a positive response to the cooler, more humid portion of the test chamber. Shelford (1913) found *C. scutellaris* Dejean responded positively to cooler moist air; Gunn and Cosway (1938) observed a similar phenomenon in the cockroach. Ferguson and Land (1961) reported that the beetle, *Popilius disjuctus* (Illiger), selected lower temperatures as time of exposure increased.

Control specimens dispersed randomly and showed no affinity for any one area of the sealed tube. This suggested that behavior of test specimens was actually in response to the heat gradient since all congregated near the middle of the test chamber.

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