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David A. Evans
Kalamazoo College

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DIURNAL AND SEASONAL ACTIVITY OF FEMALE MUTILLIDS ON A MICHIGAN SAND FLAT (HYMENOPTERA: MUTILLIDAE)

David A. Evans¹

ABSTRACT

Diurnal activity of mutillid females of a southwestern Michigan sand area was characterized in relation to sand surface temperature conditions. Seasonal abundance patterns were determined for four *Dasymutilla* species.

Female mutillids are conspicuous elements of the fauna of sandy areas in southwestern Michigan, yet little information has been gathered on diurnal or seasonal activity patterns of these insects. Periodic activity in arid habitats has long been recognized as a hygrothermal stress-reducing adaptation (Cloudsley-Thompson 1975), and a number of studies have been done on temperature-related activity patterns of insects inhabiting sand areas in the northern United States (Waldbauer et al. 1977, Maier and Waldauer 1979). Chapman et al. (1923) characterized female mutillids as the last insects to retreat from the sand as the temperature rose and the first to return when the temperature fell.

Observations were made on a single sand flat over the course of the summer season 1979 to determine the relationship of diurnal activity of female mutillids to temperature conditions, to characterize seasonal patterns of activity, and to detect differential activity patterns among the various mutillid species of the habitat.

MATERIALS AND METHODS

The site observed was a sand flat 2 km north of Alamo, Kalamazoo County, Michigan. The area measured approximately 75 by 200 m; the surface of the area varied from patchy vegetation to bare sand, and margins of the study site were sharply delimited by oak woods or old fields.

Observations were made at weekly intervals from 21 June until 6 September 1979. Temperature (air and sand surface), humidity, wind, and cloud cover data were taken hourly from 0700 through 1700 hours EST. The survey technique was similar to that used by Maier and Waldbauer (1979) in determining diurnal activity of syrphid flies. A set zig-zag path was walked over the sand flat at hourly intervals, each circuit taking roughly one-half hour. Female mutillids seen were captured, identified, and released at the point of capture.

RESULTS AND DISCUSSION

Females of eight species were collected at the site. In order of decreasing abundance, they were *Dasymutilla nigripes* (Fabr.), *D. lepeletierii* (Fox), *D. canella* (Blake), *D. asopus bexar* (Blake), *Timulla v. vagans* (Fabr.), *D. v. vesta* (Cresson), *Pseudomethoca f. frigida* (Smith), and *P. s. sanbornii* (Blake).

Overall diurnal activity patterns for all females (n = 304) are shown in Figure 1. A somewhat bimodal activity pattern is indicated from these data but is most strongly expressed when activity patterns are depicted for females (n = 98) captured on days when the

¹Department of Biology, Kalamazoo College, Kalamazoo, MI 49007.

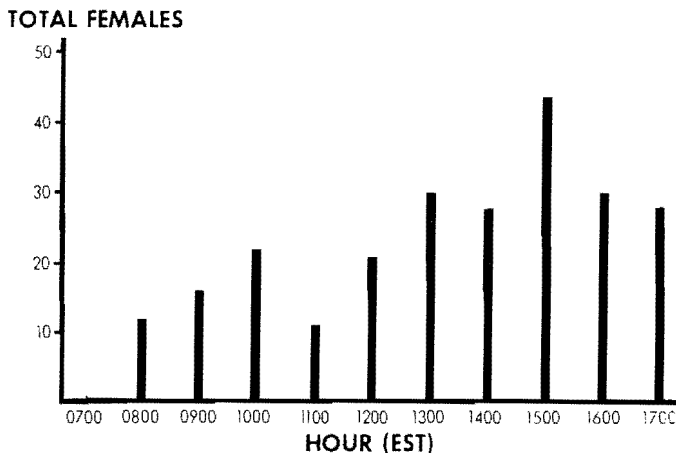


Fig. 1. Diurnal activity of female mutillids. Summer 1979, Alamo, Michigan (weekly observations).

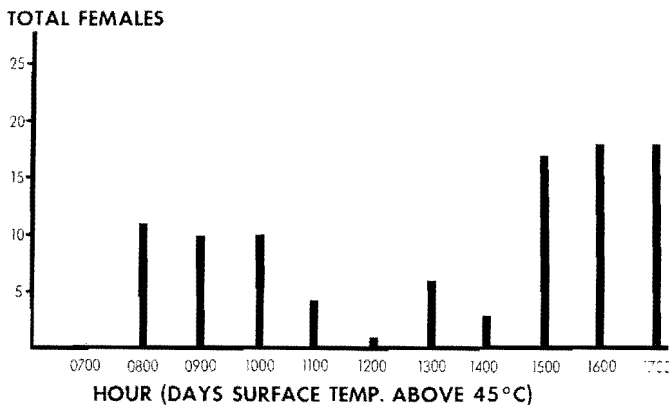


Fig. 2. Diurnal activity of female mutillids on days when sand surface temperature exceeded 45°C. Summer 1979, Alamo, Michigan (weekly observations).

sand surface temperature exceeded 45°C (Fig. 2). Figure 3 shows little female activity below a sand surface temperature of 34°C or above 46°C with most females active at 40°C. As temperatures exceeded 45°C, females were noted walking on leaves of plants, particularly *Asclepias* sp., that were growing on the sand flat. Observations were also made of females apparently seeking refuge from high temperatures by crawling under protective objects on the sand surface or burying themselves under loose sand. A typical day of observation during the summer season showed commencement of female activity at 0800, a decreasing number of females on the open sand as the surface temperature rose, and an activity increase to a peak in late afternoon until about 1700, after which few females could be seen.

No species differences were detected among diurnal activity patterns of those females observed.

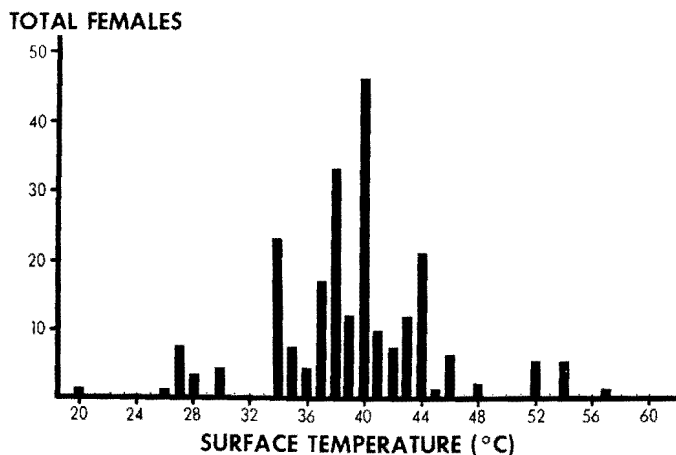


Fig. 3. Activity of female mutillids in relation to sand surface temperature. Summer 1979, Alamo, Michigan.

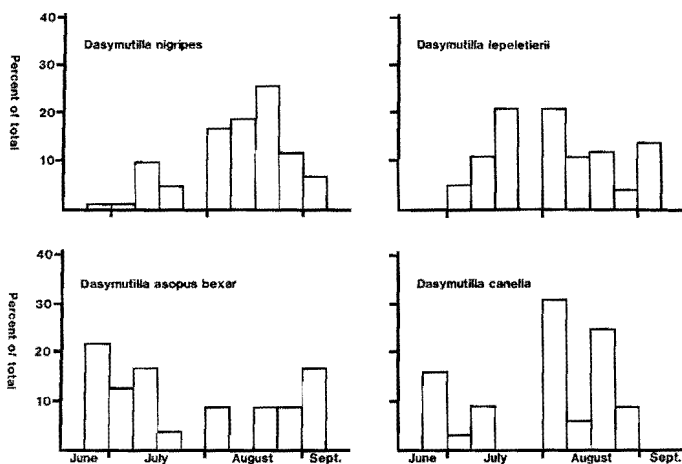


Fig. 4. Seasonal abundance of four *Dasymutilla* species. Summer 1979, Alamo, Michigan (weekly observations).

A seasonal progression of activity for females of the four most abundant species is shown in Figure 4. *D. nigripes* activity occurred throughout the summer, increasing to a peak in mid-August; peak activity for *D. lepeletieri* extended from mid-July to early August; *D. a. bexar* was prominent early in the season and again at the beginning of September; *D. canella* was active in late June and declined in numbers until a resurgence in early August.

Although diurnal activity patterns are probably related to sand surface conditions, seasonal activity for each species is more likely determined by presence and abundance of hymenopterous hosts of these insects. As at least one mutillid species, *D. nigripes*, is capable of adult overwintering in Michigan (Evans and Miller 1970), and a small number of

females were seen on the sand flat in early June, it would be desirable to begin data collection several weeks sooner than the beginning of this study. Additional information is needed on life cycles, host associations, and degrees of specificity of the Mutillidae in order to determine factors producing a characteristic seasonal progression of species.

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