The Flight Capacity of Dispersing Milkweed Beetles, *Tetraopes tetraopthalmus*[1,2]

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ABSTRACT

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The flight capacity of dispersing milkweed beetles, *Tetraopes tetraopthalmus* (Forster) (Cerambycidae), was measured by using a still-air tethering technique and compared with the flight capacity of beetles randomly collected from source populations (milkweed patches). The mean flight duration of the dispersing group was 80 to 325% greater than that for any source population. These data attest to the validity of the tethered flight procedure.

The flight capacity of insects is often measured as the flight duration of insects flown on tether in the laboratory (Weis-Fogh 1952, Cockbain 1961, Dingle 1965, Caldwell and Hegmann 1969, Karuhize 1972, Roff 1977, Davis 1980a, Rankin and Rankin 1980). The insect is attached to a stick or probe and suspended in th air. The release of tarsal contact evokes flight in some species (Davis 1980a), but in others air must be blown on the insects (Roff 1977). Tethering is obviously an unnatural form of flight. However, it is a valid technique, providing field and tethered-flight performances are positively correlated. Dingle et. a. (1980) and Rankin and Rankin (1980) found an increase in the tethered-flight performances of insects presumed to be migrants. In an ongoing study of the red milkweed beetle, *Tetraopes tetraopthalmus* (Forster), I compared the flight performances of insects captured while dispersing with those collected from source populations.

Materials and Methods

T. tetraopthalmus is a comparatively short-flying species (Davis 1980a). As prepupae, beetles overwinter in the ground at the base of their host plant, *Asclepias syriaca*, and the species is presumably nonmigratory. Individuals do disperse locally, however, making flights between patches of its host plant. Since *T. tetraopthalmus* feeds only on milkweed, *Asclepias spp.*, (Chemsak 1963), any individual captured in flight between milkweed patches can be positively identified as a disperser.

During the period from 24 July to 8 August 1980, I captured 10 dispersing beetles in Hanover, N.H. I found the best capture areas to be large grassy areas, e.g., golf courses and athletic fields, which provided no prominent landing places for the beetles. When captured, the beetles were flying at a height of 1 to 3 m and at 2 m/sec. Within 1 h of capture, the beetles were taken to the laboratory where they were flight-tested for 30 min by a still-air tethering procedure (Davis 1980a). I compared these results with the flight durations of beetles sampled randomly from milkweed patches during 1978, 1979, and 1980.

Results and Discussion

Of the 10 dispersing beetles 8 were females. The mean flight duration for all 10 beetles was 6 min 56 sec, with a standard error of 1 min 53 sec. This is 80 to 325% greater than the mean flight level measured for any *Tetraopes* population within 20 km of Hanover. The flight duration (min:sec) of 14 such populations are given here (numbers of beetles in parentheses): 2:09 (24); 3:25 (18); 3:09 (36); 3:40 (108); 3:45 (35); 2:42 (50); 2:51 (23); 2:13 (18); 3:53 (17); 2:37 (18); 1:49 (18); 3:10 (18); 1:38 (18); 3:10 (36). The last population was 700 m from the golf course and an important source population for the dispersers captured in this study. Its flight duration and that of the dispersing beetles are significantly different ($P < 0.05$, Wilcoxon two-sample test).

If one defines a "long flight" to be one greater than 6 min (i.e., a flight of 0.75 km), then 60% (6 of 10) of the dispersing beetles exhibited long flights, compared with 22% (8 of 36) from the large source population. The proportion of beetles exhibiting long flights varies throughout the season (Davis 1980b). During late July and early August only 15 to 20% of the beetles collected from milkweed patches around Hanover exhibit long flights (Davis 1980b). The probability that a random sample of 10 beetles would yield six or more long fliers at this time of the season is very small ($P < 0.005$, calculated using the binomial probabilities, $P = 0.17$).

T. tetraopthalmus (Davis 1980a) and other species (Dingle 1966, Rose 1972) consist of two flight classes: short fliers that never exhibit a long flight, and individuals that exhibit long flights at some time. Presumably, dispersing insects consist only of class 2 individuals, whereas insects collected in the source population consist of both classes. If flight duration measured in the laboratory is actually correlated in some positive way with dispersal tendency, then one would expect dispersing individuals to fly longer on tether, on the average, than individuals randomly collected from a source population. This is precisely what I found.

If anything, the flight capacity of the dispersing beetles was underestimated. Individuals were in flight when captured were at least 500 m from the nearest milkweed patch. Thus they already had flown for at least 4 min before they were tested in the laboratory. This may partly explain why not all the dispersing beetles exhibited long tethered flights.

In summary, these data indicate that confidence in the tethered-flight procedure is warranted and suggest that the skewed flight distributions usually obtained by using the procedure may have a real ecological basis (Davis 1980c).

[1] Coleoptera: Cerambycidae.

[2] Received for publication 2 October 1980.

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[1] Coleoptera: Cerambycida
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