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SPIDER PREDATORS OF MOSQUITO LARVAE

Spiders have been largely overlooked as predators of mosquito larvae in aquatic ecosystems. Bishop and Hart (1931) were the first to report a spider (*Pardosa sternalis* (Thorell)) consuming mosquito larvae in a small gravel pit pool in Colorado. Garcia and Schlinger (1972) also reported consumption of mosquito larvae by *P. sternalis*. The mosquitos involved in the latter instance were *Aedes dorsalis* (Meigen) breeding in a California salt marsh. Similarly, Greenstone (1979, 1983) reported evidence of predation of *Ae. dorsalis* by *Pardosa ramulosa* (McCook). *Dolomedes* sp. was found to prey upon ^{32}P-labeled *Culex pipiens pipiens* L. larvae in a Southeast Texas ricefield (Breene, unpubl. data). Finally, Service (1973) found a species of *Lycosa* and one of *Pardosa* testing positive for *Anopheles gambiae* Giles in a precipitin analysis, but implied they probably attacked only emerging mosquito adults.

In the current study, a pisaurid, *Dolomedes triton* (Walckenaer), and two lycosids, *Pirata sedentarius* Montgomery and *Pardosa delicatula* Gertsch & Wallace, were evaluated as predators of *C. p. pipiens*, the northern house mosquito. *Dolomedes triton* and *P. sedentarius* were chosen for their close association with mosquito larvae habitats in East Texas, while *P. delicatula* was chosen due to its common presence in grassy areas that border much of the mosquito larvae habitat in the College Station, Texas area. The results of these evaluations are reported within.

METHODS

Fourth instar *C. p. pipiens* larvae from laboratory cultures were irradiated with 0.1 to 0.4 μCi/ml ^{32}P for 24 h in a 500 ml container, and then were removed and washed thoroughly to remove residual radioactivity from the integument. A mean DPM (disintegrations per minute) for the mosquito larvae (n=50) was determined from a random sample of larvae before each experiment.

Approximately 1000 radioactive larvae were placed into each of two simulated grass bank ponds, each measuring 110 cm by 70 cm and filled with water to a depth of 8 cm. These ponds were set up in aquarium tanks lined with black plastic tarp to facilitate rapid removal of any radioactive residues between experiments. Approximately 25% of the surface of the water in each pond was covered with duckweed (*Wolffia papulifera* Thomps. and *Spirodela ologorhiza* (Kurtz) Hegelm) and grass debris (*Cynodon dactylon* (L.)) to simulate natural pond conditions. An additional 1000 non-radioactive mosquito larvae were placed in an identical control tank.

The first simulated pond contained only spiders captured on or near local ponds. The second pond contained both spiders and several of the 30 species of aquatic insect predators also found in local ponds that were used over the course of the experiments. In the case of the control, 1000 non-radiated mosquito larvae were placed in a simulated pond containing both spiders and insects. Otherwise, the control pond was similar in all aspects to the test ponds. After 48 h, all spiders and insects were removed from the test and control ponds and subjected individually to liquid scintillation counting procedures. Seventeen replications were performed.

A simple linear algorithm was used to estimate quantitative ingestion of larvae by the three species of spiders. Observation of predation of a known number of mosquito larvae with a known radioactive mean by each species of spider was used to derive the quantifying algorithm. A complete and detailed account of ^{32}P quantitative methods can be found in Breene & Sterling (1988).

RESULTS AND DISCUSSION

A total of 56 of 73 (76.7%) *D. triton* exposed to ^{32}P- labeled mosquito larvae were found labeled with ^{32}P. An average of 12 mosquito larvae per 24 h were consumed by these labeled spiders. Only six *D. triton* used in the study were adult, of which half were radioactive, indicating larval consumption.

In the case of *P. sedentarius*, 118 of 160 (73.8%) of the spiders consumed an average of two mosquito larvae per 24 h. However, only 17 of 56 (30.4%) *P. delicatula* tested positive for radioactivity. Of the *Pirata* and *Pardosa* utilized, 106 of 160, and 51 of 56 were adults, respectively.

No significant differences were found in predation rates between any of the spider species in either the tank with spiders only or in the tank where the spiders were given a wider choice of prey in the form of other insects. Both *Dolomedes* and *Pirata* were observed preying upon the mosquito larvae by grasping individual larvae from beneath the surface of the water, pulling their bodies through the surface tension and consuming them.

Dolomedes triton and *P. sedentarius* share habitat preferences in common with mosquito larvae (Carico 1973; Wallace and Exline 1978; Heiss and Meisch 1985). In Texas, these spiders most notably associate with riceland populations of *Psorophora columbiae* (Dyar and Knab) and a salt marsh mosquito, *Aedes solicitans* (Walker). *Pardosa delicatula* is often found along the banks of ponds and streams but has not been closely tied with the aquatic habitat. However, other species of *Pardosa* have been found in such habitats (Bishop and Hart 1931; Garcia and Schlinger 1972; Greenstone 1979, 1980; Heiss and Meisch 1985). *Dolomedes triton* and many species of *Pirata* are found commonly associated with mosquito larva habitats except during reproductive or migrational cycles. In salt marshes, hunting spiders such as *Pirata* (LaSalle and Cruz 1985) and *Dolomedes* (pers. obs.) may be highly important invertebrate predators of mosquito larvae due to the paucity of freshwater aquatic insect predators known to prey upon mosquito larvae.

This study furnishes laboratory evidence that the three species of spiders tested will prey readily upon mosquito larvae. If a complete picture of the predation ecology of culicine larvae is to be ascertained, field work that includes entire groups of potentially important taxa, such as the Araneae, will be required.

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