

SIGMA XI GRANT—EXAMPLE OF FUNDED PROPOSAL

Egg clustering and subsequent gregarious behavior of larvae is common among insect species. Numerous proposed hypotheses have been advanced to explain this phenomenon (4). The hypothesis, that gregarious feeding by larvae overwhelms plant defenses (facilitation) and the hypothesis that group defense decreases predation/parasitism (natural enemies), have received notable attention (1,3,5). Variation in group size has been shown to affect larval performance (1,3,5). A wide range of insects exhibit behavioral adaptations for dealing with secretory compounds of plants (2).

I plan to test the feeding facilitation and natural enemies hypotheses using larvae of *Doa ampla* Dyar (Lepidoptera:Doidae). Female *D. ampla* oviposit in variable size clutches on the leaves of *Stillingia texana* (Euphorbiaceae), a common perennial found in calcareous soils in central Texas. *S. texana*, like many euphorbs, "bleeds" a white, milky substance when injured. Multiple wounds, from group feeding, may decrease the flow of this substance and hence decrease the amount of plant toxin ingested by individual larvae. To test the hypothesis that group feeding gives the larvae of *D. ampla* an advantage in dealing with plant defenses, I will experimentally wound potted *S. texana* plants and place variable size groups (1,5,10 larvae/group) of first instar larvae on wounded and unwounded plants. By measuring growth rate, development time, pupal weight, and percent mortality weekly I can determine the effect of plant defenses on the performance of various size larval groups.

When disturbed, larvae of *D. ampla* exhibit a defensive behavior in which they writhe and excrete a liquid (noxious?). The combined exhibition of defensive behavior may be a successful deterrent to potential predators or parasitoids. Also, the display of small groups may not be equal to that of large groups. Lawrence (3) has shown that large groups have fewer predators per larva than do small groups. To test the hypothesis that group behavior gives the larvae of *D. ampla* an advantage in defense, I will use a plastic "fence" coated in TangleFoot to encircle individual plants and place larva in variable size cohorts on plants. Through a weekly census of all cohorts, I will be able to determine the effect of predation on variable size cohorts. The use of this "fence" and fluorescent powder (for marking individual larva) will enable me to determine whether individual larva left the host plant in an attempt to disperse or were removed by predators.

The study proposed here will differentiate between these hypotheses. I will be able to determine whether these hypotheses individually or simultaneously explain gregarious behavior. Detailed studies of this type are required to understand the evolution of this complex behavior.

References:

- (1) Crowe, M.L. 1995. *Ecological Entomology* 20, 27-32.
- (2) Dussourd, D.E., and R.F. Denno. 1991. *Ecology* 72(4), 1383-1396.
- (3) Lawrence, W.S. 1990. *Ecological Entomology* 15, 53-62.
- (4) Stamp, N.E. 1980. *American Naturalist* 115, 367-380.
- (5) Tsubaki, Y. 1981. *Researches on Population Ecology* 23, 156-167.