

RESEARCH ABSTRACT

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Study Title:

1. Ecological factors determining population size of *Aphis varians*.
2. Factors causing pattern of *Altica tombacina* population on fireweed.

Key Words:

terrestrial plant animal invertebrate insect
herbivory predation competition population dynamics archives

Abstract: 1. Research is intended to assess the ecological factor(s) of greatest importance in determining the population size of an aphid (*Aphis varians*) feeding on fireweed (*Epilobium angustifolium*). We manipulated the host plant (by shading, watering, and fertilizing), the size of fireweed patches, the density of a leaf-feeding beetle (*Altica tombacina*) which also utilizes fireweed, and the presence of predators of the aphid (primarily ladybird beetles and syrphid flies) by means of cages.

Preliminary results:

Predation is overwhelmingly important in limiting aphid population growth. We found that in the presence of large natural enemy populations, aphids attained their highest densities on small isolated clusters of fireweed. Only in the absence of predators (i.e. in cages) do host plant quality and competing herbivores play a role in aphid population dynamics; aphids were either not affected by fireweed patch size, or were less abundant on small patches of their host plant in the absence of natural enemies. This result points out that the relationship between a herbivore and the geography of host plant islands depends on a larger embedding web of interactions.

2. The leaf-feeding beetle (*Altica tombacina*) tends to be found in large numbers on selected plants of fireweed and absent from nearby fireweed plants. This is largely the result of the habit of several females to lay eggs on one plant and of the general adult population to congregate on one or a few plants. The consequence of this community structure is that as density increases, survivorship decreases due to competition for food. The effect of beetle populations on fireweed is the stripping of foliage from densely inhabited plants.

Type of Measurement(s): Density of all insects associated with fireweed measured on a per stem basis for 200 marked plants, some within experimental cages and others undisturbed; direct observation of movement rates for aphids and ladybugs; rate of growth of aphid colonies.

Frequency of Measurement(s): Populations censused every 2 weeks during growing seasons of 1985-1989.

Data Storage: ASCII and SYSTAT computer files (5 1/4 in. floppy disks formatted for use by an IBM-compatible P.C. using D.O.S.).

Long-term plans: Data available for collaborative efforts: Part of this project was completed in 1989. Manuscripts concerning completed studies will be published in 1991. Our long-term plans are to return to our original study sites and repeat our experiments in 1992-1995. The point of this will be to evaluate the effects of fireweed patch size as the succession further enriches the community. We hypothesize that pairwise biotic interactions will be weaker because the enriched biota will dilute particular interactions.

We will be glad to cooperate with anyone, especially individuals who could broaden our taxonomic base. Part of our long-term goals include developing mathematical models of invasions and reconstruction of communities. We would be particularly interested in cooperating with other researchers who have spatially structured data.