University of Florida Book of Insect Records
Chapter 2 *Greatest Host Range*

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The fall webworm, Hyphantria cunea *(Drury), (Lepidoptera:Arctiidae), probably has the widest host range for any insect. The larvae feed on an estimated 636 species of plants worldwide. This number appears to be higher than the records for gypsy moth and for Japanese beetle. The gypsy moth seems to be limited by secondary plant metabolites but feeds on plants containing tannins. This factor does not appear to restrict the fall webworm.*

Polyphagy is well known in the animal kingdom, and though many insects are specialists, some exploit the generalist way of life. Being a generalist has at least two advantages in terms of survival: 1) a female may have an easier time finding a suitable host for oviposition using chemical cues if more hosts are acceptable, and 2) an insect that finds a suitable food source easily can spend more time eating and growing and less time searching.

Insect consumers can be grouped into four types: predators and parasitoids, parasites, detritivores, and herbivores. Each consumer has some potential for being a generalist in its category.

Herbivores are apparently the best group to search for host records. Predators and parasitoids contain many specialists, but also some generalists which have poorly studied host preferences. Few insects are themselves parasites but they vector diseases. Detritus feeders feed on dead or organic matter but these are hard to classify as to specific hosts. Also, information on these is limited. Herbivores are more studied relative to their hosts due to the high number of agricultural pests. Also, a plant species is a well documented single unit. Thus I consider herbivores as the insects most likely to have the greatest host range.

Defining what makes a host is difficult. Herbivores may be tested against plants to show willingness to feed, ability to feed, ability to develop fully, or the ability to develop partially. Some insects need more than one host to complete full development. In this chapter observed feeding will constitute a host record regardless of the effect on development of the insect and whether or not it was a lab or field observation. One host will equal one species of plant fed upon.

Methods

Professors and graduate students were asked to nominate candidates. Standard library techniques were used to investigate candidates, but the best results came from literature volunteered by a professor.

Results

Promising candidates were the gypsy moth, *Lymantria dispar* (L), and the Japanese beetle, *Popillia japonica* Newman, but the most polyphagous insect appears to be the fall webworm moth, *Hyphantria cunea* (Drury) (Lepidoptera: Arctiidae).

A native of North America, *H. cunea* had spread to Hungary by 1940, to Japan by 1947 and soon after into Korea (Warren & Tadic 1970). It is now a resident of most of the holarctic region.

The number of plant species that are hosts for

the fall webworm is staggering. An early report by Doane (1936) says that it "feeds on almost any tree except conifers. . . when almost full grown they scatter, feeding upon anything green." It has been collected from over 200 host species in the United States (Coulson & Witter 1984). In Europe, Warren & Tadic (1970) noted that it feeds on 219 species with 103 hosts in Hungary, 85 hosts in Yugoslavia, as well as 48 species in the former Soviet Union. In Japan more than 300 species of plants are hosts including trees, shrubs, weeds, and vegetables (Masaki & Umeya 1977), and in Korea 65 hosts are recorded (Woo 1961). The total number of observed hosts is 636 species (Warren & Tadic 1970).

Discussion

It is unlikely that 636 is the exact number of hosts as this is based on different reports from different parts of the world. Warren and Tadic (1970) compiled the data of others and stated that their list is not considered final or complete and no distinction was made between food preferences for the black-headed and red-headed races.

The Japanese beetle, *Popillia japonica*, was dismissed as a candidate for the most polyphagous because Fleming (1972) stated that it feeds on just under 300 species.

The gypsy moth, *Lymantria dispar*, the other close candidate, is known for its damage in the United States and Canada to a wide number of hosts including some conifers. Millller & Hanson (1989) combined previous studies on host preference by *L. dispar* and reported that a total of 658 species had been tested and/or observed for suitability as hosts. The tests revealed that gypsy moth rejected many plants due to the presence of secondary plant metabolites, apparently toxic to it. It generally accepted plants containing tannins but lacking alkaloids, terpenoids, and glucosinolates. These plant compounds may partly restrict the host range of gypsy moth as compared to fall webworm.

Some arctiid moths are known to sequester highly toxic chemical (Krasnoff & Dussourd 1989). *H. cunea* is by no means a specialist on poisonous plants, but considering its relationship to other Arctiidae, it may have mechanisms for handling plant toxins that the gypsy moth just cannot keep up with.

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