Aphthona flava

Classification

Phylum: Arthropoda
Class: Insecta
Subclass: Pterygota
Division: Endopterygota
Order: Coleoptera
Suborder: Polyphaga
Superfamily: Chrysomeloidae
Family: Chrysomelidae
Subfamily: Halticinae
Tribe: Aphthonini
Genus: *Aphthona*
Species: *Aphthona flava* Guillebeau

General Life History

There is little published information available on *Aphthona flava* biology, but its life history is similar to that of other univoltine *Aphthona* species (Maw, 1981; Rees and Spencer, 1993; Sommer and Maw, 1982). *Aphthona flava* overwinters as a diapausing larva, in the soil and on or near a leafy spurge root. Overwintered larvae resume development in the spring, and pupation occurs within a soil cell from late spring to early summer. Adult beetles emerge from the soil throughout the summer and begin feeding on leafy spurge leaves and flowering structures. *Aphthona flava* adults are about 3 mm long. They have been observed to fly under field conditions, but most often move about by hopping in typical flea beetle fashion. Adults are relatively long-lived beetles, capable of surviving several weeks to several months, depending on field conditions (Maw, 1981). At a given location, *A. flava* adults begin to emerge and reach their peak abundance later than do other introduced *Aphthona* spp. (Hansen, unpublished data).

Mating occurs on leafy spurge shoots, after which adult females lay eggs at the soil surface or in the soil, on or near the base of a leafy spurge stem. Generally, *Aphthona* spp. females lay a total of 100-300 eggs during their lifetime, in clusters of 20-30 every three to five days (Maw, 1982). Larvae hatch, burrow into the soil, and begin feeding on very small leafy spurge roots and root hairs. As they develop, *A. flava* larvae utilize progressively larger spurge roots; mature larvae may also be found burrowing within large lateral roots and root buds. Larval root feeding continues through the summer and into the fall, until cold temperatures and the onset of dormancy. There are a total of three larval stadia.

Host Range in the Field and Greenhouse Testing

Aphthona flava appears to feed only on leafy spurge (*Euphorbia esula* L.), cypress spurge (*E. cyparissias* L.), and several other closely related *Euphorbia* spp. in its native Europe (Sommer and Maw, 1982). To date, introduced United States populations of *A. flava* have been reported only from *E. esula* L. Laboratory and controlled field studies showed at least limited feeding by *Aphthona flava* adults on the foliage of a number of European and North American *Euphorbia* spp. in several subgenera (Pemberton and Rees, 1990; Sommer and Maw, 1982). Under laboratory conditions, larval development was completed only on European and North American plants in the subgenus *Esula*, including the North American species *Euphorbia incisa* Engelm., *E. palmeri* Engelm., *E. robusta* (Engelm.) Small, and *E. spatulata* Lam. (Pemberton and Rees, 1990; Sommer and Maw, 1982). Thus, these species may be considered potential hosts, though *Euphorbia spatulata* Lam. is an annual and could not support *Aphthona flava* development under field conditions (Pemberton and Rees, 1990). The rare United States species *Euphorbia purpurea* (Raf.) Fernald and *E. telephoides* Chapm., though included in the subgenus *Esula*, were not utilized by *A. flava*. Thus, the host plant range of *Aphthona flava* appears restricted below the subgeneric level, and may only include leafy spurge and other *Euphorbia* species in the subgenus *Esula*.

List of Known Parasitoids or Predators of *Aphthona flava*

Consumption of *Aphthona* spp. larvae and adults by generalist predators, particularly ants, has been reported anecdotally. Parasitoids are reported to be rare among European *A. flava* populations (Sommer and Maw, 1982). No native or introduced parasitoids have been reported among *A. flava* populations in the United States.

Impact of *Aphthona flava* on Leafy Spurge

Under optimal site conditions, *Aphthona flava* populations will, directly or indirectly, kill leafy spurge plants over large areas. As leafy spurge stems densities decline, the relative abundance of nontarget grasses and forbs will increase. Leafy spurge control over at least several acres has been reported from several locations in the western United States and Canada where *A. flava* has been released.

The host range of *Aphthona flava* is limited to plant species in the subgenus *Esula* of the genus *Euphorbia*, including the target weed (*Euphorbia esula* L.) and cypress spurge (*E. cyparissias* L.), an introduced weed in eastern North America. The two federally protected native spurges (*Euphorbia garberi* Engelm. and *E. deltiodes* Engelm. ex Chapm.) are in the subgenus *Chamaesyce* (Pemberton 1985) and are not potential host plants for *A. flava*. The host status of six native spurges in the subgenus *Esula* has been evaluated (Pemberton and Rees 1990); four species were considered potential *A. flava* hosts, while two (the rare species *Euphorbia purpurea* (Raf.) Fernald and *E. telephoides* Chapm.) were not.

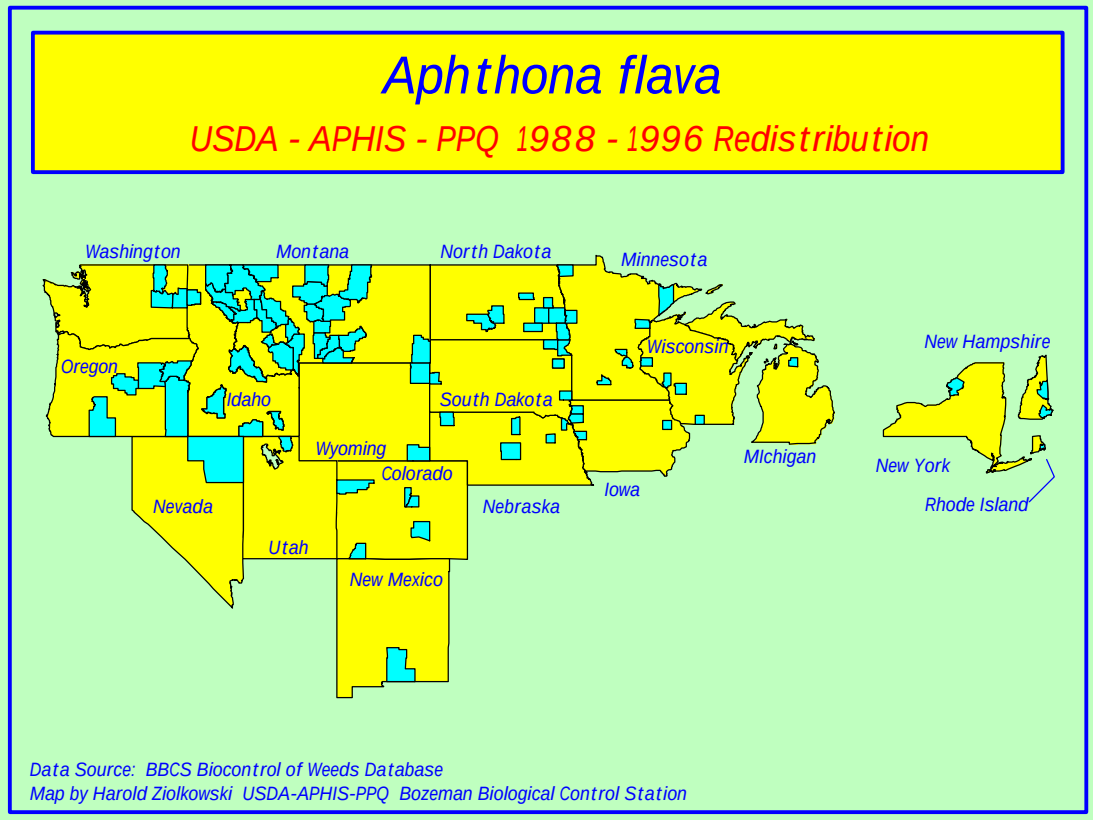
The potential host status of 15 other native *Euphorbia* spp. in the subgenus *Esula* (occurring north of Mexico) has not been examined. Of these, eight species are annuals (Pemberton, 1985) that could possibly be utilized by *A. flava*, but would not permit completion of the life cycle and, hence, population establishment; flea beetle larvae require plant roots year-round. The seven perennial species in the subgenus could be considered possible *A. flava* hosts, though most occur in the southern US and are not sympatric with leafy spurge populations (Pemberton, 1985).

Current North American Distribution

Aphthona flava was approved for United States release in June of 1985. Through 1996, *A. flava* had been released in 19 states and 91 counties. In several of these states, *Aphthona flava* has been widely distributed throughout spurge infested counties. The insect is also widely established throughout central and western Canada.

Expected North American Range

There are no obvious climatic or ecological barriers to survival and establishment of *Aphthona flava* in most or all of the spurge infested areas of the United States and Canada, though Sommer and Maw (1982) suggest that *A. flava* may exhibit less cold-hardiness in extreme northern habitats than other *Aphthona* spp. *A. flava* seems adapted to sites that are somewhat more mesic than those best suited to *A.cyparissiae* or *A. nigriscutis*. Thus, the largest *A. flava* populations could be expected where precipitation patterns and/or soil properties favor these site conditions. Of course, the ultimate North American range of this insect will reflect the extent of human redistribution activities.



Specific References on *Aphthona flava*

Pemberton, R.W. and N.E. Rees. 1990. Host specificity and establishment of *Aphthona flava* Guill. (Chrysomelidae), a biological control agent for leafy spurge, (*Euphorbia esula* L.) in the United States. Proc. Entomol. Soc. Wash. 92: 351-357.

Sommer, G. and E. Maw. 1982. *Aphthona cyparissiae* (Koch) and *A. flava* Guill. (Coleoptera: Chrysomelidae): Two candidates for the biological control of cypress and leafy spurge in North America. Intl. Inst. of Biol. Contr., Delémont, Switzerland. Final report: 42.