Aphthona nigriscutis

Classification

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

General Life History

The biology and life history of *Aphthona nigriscutis* is similar to that of other univoltine *Aphthona* species (Maw, 1981; Rees and Spencer, 1993). *A. nigriscutis* 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. *A. nigriscutis* adults are about 3 mm long; they rarely fly under field conditions and instead 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).

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 a series of small groups every three to five days (Maw, 1981). Larvae hatch, burrow into the soil, and begin feeding on very small leafy spurge roots and root hairs. As they develop, *A. nigriscutis* 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 Tests

Aphthona nigriscutis appears to feed only on leafy spurge (*Euphorbia esula* L.) and several other closely-related *Euphorbia* spp. in its native Europe (Gassmann, 1985). To date, introduced United States populations of *A. nigriscutis* have been reported only from *E. esula* L.

Laboratory and controlled field studies showed at least limited feeding by *Aphthona nigriscutis* adults on the foliage of a number of European and North American *Euphorbia* spp. (Gassmann, 1985; Pemberton, 1989). However, only a few European *Euphorbia* spp. in the subgenus *Esula* supported larval development and thus could be considered likely hosts (Gassmann, 1985). Four North American *Euphorbia* spp. in the subgenus, including the rare species *E. purpurea* (Raf.) Fernald and *E. telephiodes* Chapm., did not support larval development (Pemberton,1989). Thus, the host plant range of *Aphthona nigriscutis* appears restricted below the subgeneric level, and may only include leafy spurge and other Eurasian *Euphorbia* species in the subgenus *Esula*.

List of Known Parasitoids or Predators of *Aphthona nigriscutis*

Consumption of *Aphthona* spp. larvae and adults by generalist predators, particularly ants, has been reported anecdotally. No native or introduced parasitoids have been reported among *A. nigriscutis* populations in the United States.

Impact of *Aphthona nigriscutis* on Leafy Spurge

Under optimal site conditions, *Aphthona nigriscutis* populations will, directly or indirectly, kill leafy spurge plants over large areas. As leafy spurge stem densities decline, the relative abundance of nontarget grasses and forbs will increase. For example, four years after the initial release, an *A. nigriscutis* population in central Montana has reduced spurge densities by more than 90% over a 0.53 ha (1.3 ac) area (Hansen, unpublished data). Leafy spurge control over much larger areas has been reported from many other locations in the western United States and Canada.

The host range of *Aphthona nigriscutis* is limited to a subset of plant species in the subgenus *Esula* of the genus *Euphorbia*, including the target weed (*Euphorbia esula* L.). 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. nigriscutis*. Four native spurges in the subgenus *Esula*, including *E. purpurea* (Raf.) and *E. telephiodes* Chapm., two rare species being considered for protection (Pemberton, 1985), were not suitable hosts for *A. nigriscutis* (Pemberton, 1989).

The potential host status of 17 other North American species (occurring north of Mexico) in the subgenus *Esula* (Pemberton, 1985) has not been evaluated. Of these, eight are annuals (Pemberton, 1985) that could possibly be utilized by *A. nigriscutis*, but would not permit completion of the life cycle and, hence, population establishment; flea beetle larvae require plant roots year-round. The nine perennial species in the subgenus could be considered possible *A. nigriscutis* hosts, though most occur in the southern United States and are not sympatric with leafy spurge populations (Pemberton, 1985).

Location where *Aphthona nigriscuts* was originally collected

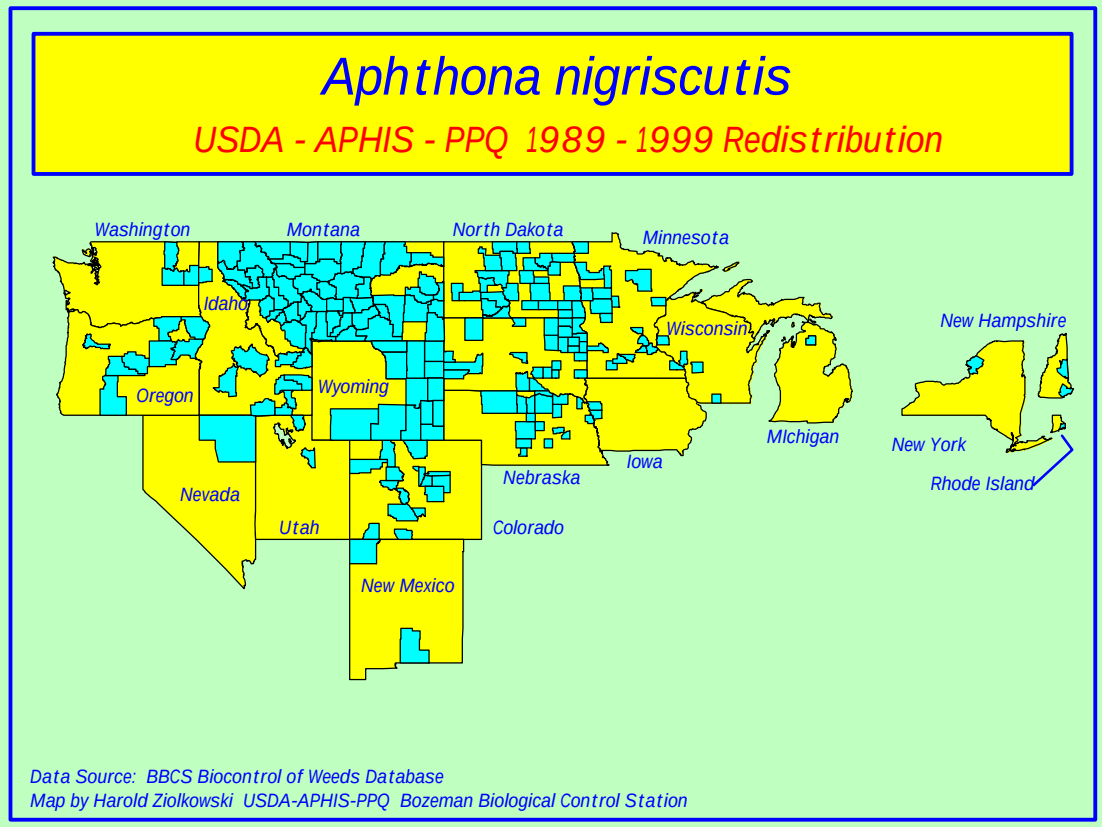
Insects initially released in the United States were collected near Baja, in southern Hungary or from several Canadian locations (Alberta and Manitoba).

Current North American Distribution

Aphthona nigriscutis was approved for release in the United States in May of 1989. From 1989 to 1999, *A. nigriscutis* has been released in 19 states and over 200 counties. Established populations of *Aphthona nigriscutis* are present in all states where it has been released. 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 nigriscutis* in most or all of the spurge infested areas of the United States and Canada. However, *A. nigriscutis* appears best adapted to comparatively dry sites, which support leafy spurge infestations of relatively low weed density. The largest *A. nigriscutis* populations should be expected where precipitation patterns and/or soil properties favor these site conditions. The ultimate North American range of this insect will reflect the extent of human redistribution activities.



Specific References on *Aphthona nigriscutis*

Gassmann, A. 1985. *Aphthona nigriscutis* Foudras (Coleoptera:Chrysomelidae): a candidate for the biological control of cypress spurge and leafy spurge in North America. Intl. Inst. Of Biol. Contr., Delémont, Switzerland. Final Screening Report: 19.

Pemberton, R.W. 1989. Petition to introduce *Aphthona nigriscutis* Foudras (Chrysomelidae) to the United States for leafy spurge (*Euphorbia esula* L.) control. USDA-ARS Unpubl. Report: 9.