

Two Italian Imports Tackle Musk Thistle

Biological controls zero in on a thorny problem.

Two weed-eating Italian insects may be reunited in the United States this spring to help throttle musk thistle, one of our most nettlesome exotic weeds.

Entomologists at the Agricultural Research Service have planned the first U.S. release of a tiny Italian flea beetle, *Psylliodes chalconera*. It would join another, larger, Italian immigrant, the syrphid fly, *Cheilisia corydon*. ARS entomologist Paul Boldt plans to release hundreds of



Musk thistle, *Carduus nutans*, of the aster family, is a noxious weed that has spread to about 35 states.

syrphids and flea beetles this month on rangeland near Comfort, Texas.

In Italy, the insects were studied and collected for U.S. shipments by entomologist Gaetano Campobasso at the Rome substation of ARS' European Biological Control Laboratory. Scientists at the laboratory, headquartered in Montpellier, France, are USDA's primary European sources of foreign insects and micro-

organisms that may have a future here as natural pest controls.

Musk thistle, *Carduus nutans*, is a member of the aster family and also related to artichoke and chicory. But you wouldn't want it in your garden, despite showy purple flowers and stalks that are edible while young and tender. Nor would you enjoy wading through musk thistle on a hike through a meadow.

The weed chokes out forage plants on range and pasture and also displaces desirable species on streambanks and roadsides and in forests, parks, and hay and grain fields.

The seed of musk thistle sprouts in fall to form a low, leafy rosette or crown atop a fleshy taproot. By early spring, the plant sends up a 2- to 6-foot stalk with many leafy branches. Sharp spines protrude from branches, leaves, and flower heads, turning the plant into a botanical porcupine. The spines discourage most animals—including cattle, which won't graze anywhere near the weed. And one plant may produce up to 2,000 seeds.

Musk thistle was first reported in the United States in 1853, says Campobasso. Free from its European natural enemies, it adapted and has spread to about 35 states from Maryland to California.

In Texas, musk thistle moved into 28 counties in 20 years.

"It's tough to stop," says Boldt, who is at the Grassland, Soil, and Water Laboratory in Temple, Texas. "Chemical herbicides are expensive and must be applied at the right time. On rangeland, the benefit from herbicides isn't worth the expense. And they can't be used near areas such as beaches and parks."

ARS scientists believe biological control is the best long-term strategy.

Since the 1970's, Campobasso and Boldt have been searching for, studying, testing, and shipping

thistle-loving insects to the United States for studies and releases.

"We need a diverse team of insects to attack different parts of the plant at different times of year and in different climates," Boldt says. Already on the job in several states are two weevils that Boldt, Campobasso, and colleagues imported. Larvae of the flower head weevil, *Rhinocyllus conicus*, feed on seeds in the flower head. The other weevil, *Trichosiromus horridus*, feeds on the rosette.



Adult *Psylliodes chalconera*, a flea beetle that feeds on musk thistle.

The Biocontrols' Modus Operandi

Adults of the *Psylliodes* flea beetles feed on young rosette leaves, Campobasso says. On older thistle plants, larvae of *Psylliodes* attack the inner part, or meristem, of axillary buds that form on the stalks. In tests in Italy, "the beetle's feeding on meristematic tissue was devastating," says Campobasso. In other tests, he

determined the insect will not harm U.S. native or crop plants, including artichokes.

Cheilosia syrphid fly larvae feed in rosettes and large flower-bearing stems, says Boldt. "I've seen as many as 25 larvae on one stem."

The adult syrphid, about two-thirds of an inch long, has a hairy "chest," or thorax, and big black eyes. "The insects use their excellent vision, along with their buzzing, to locate mates while flying up to 25 feet in the air," says Boldt. "People often mistake them for bees, but they don't pack a stinger and threaten only musk thistle."

Campobasso and Boldt first found the syrphid on musk thistle in southern Italy in 1975. They thoroughly studied its biology and ecology and showed it would not feed on valuable U.S. plants. ARS then obtained a permit to import and release it in this country. Shipments from Campobasso to Boldt began in 1994.

Campobasso travels to the Calabria region, about 475 miles south of Rome, to collect thistle roots infested with white *Cheilosia* larvae. The region's climate—wet, mild winters and dry, hot summers—resembles that of the southwestern United States. He thinks the syrphids will find Texas more to their liking than some of the other states where they've been released, such as Montana and Maryland.

In February 1995, Boldt made the largest U.S. release of the syrphid to date. He freed 385 adult flies in the same area where he plans this year's release of *Psylliodes*.

"The site mimics what *Cheilosia* likes in Europe—the border zone between woods and pasture, where water and lots of spring flowers are available," Boldt says. "This gives the insects a good opportunity to establish and spread."

In the spring of 1996, he found syrphid larvae at the site. "I didn't find many, but the important thing is that the released insects reproduced, and their larval offspring began feeding on musk thistle." Finding the

James Nechols of Kansas State University in Manhattan to coordinate U.S. distribution of *Psylliodes* for releases in several states this year. Cooperators include USDA's Animal and Plant Health Inspection Service, the Bureau of Land Management of the U.S. Department of the Interior, and the U.S. Army.

Insects aren't the only organisms scientists want to deploy against musk thistle. Extensive lab trials and limited field tests have shown that a

rust fungus from Turkey can greatly reduce musk thistle's growth and seed production. The tests were led by William Bruckart at ARS' Foreign Disease-Weed Science Research Laboratory in Frederick, Maryland.

"We've also determined that the rust, *Puccinia carduorum*, won't damage valuable plants including—most recently—an endangered thistle that is native to the Southwest," he says. This finding increases the likelihood of the rust gaining approval for wide-scale release.—By **Jim De Quattro**, ARS.

Gaetano Campobasso is at the USDA-ARS European Biological Control Laboratory, Rome Substation, Via Colle Trugli N. 9, 00132

Rome, Italy; phone 011-39-620-609-346, fax 011-39-620-790-86, e-mail ebcl.RomeSubstation@agora.stm.it

Paul Boldt is with the USDA-ARS Grassland, Soil, and Water Research Laboratory, 808 East Blackland Rd., Temple, TX 76502-6530; phone (817) 770-6530, fax (817) 770-6561, e-mail boldt@brcsun0.tamu.edu ♦

PAUL BOLDT



The larval stage of this syrphid fly, *Cheilosia corydon*, feeds on musk thistle rosettes and large flower-bearing stems.

insects again this spring could confirm their establishment in the United States. *Cheilosia* may also have taken up residence in other states where it has been released.

Boldt, Campobasso, and Montpellier lab director Lloyd Knutson are working closely with entomologist