

# IMPORTED SEED WEEVILS ITALIAN AND MILK THISTLES SOUTHERN CALIFORNIA

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**I**TALIAN THISTLE, *Carduus pycnocephalus* L., and milk thistle, *Silybum marianum* (L.) Gaertn., alien weeds of Eurasian origin, have been studied since 1966 as targets of biological control in southern California. Found mainly in the coastal counties, these thistles are common weeds on grazing and pasture lands, open woodlands, fallow cropland, and wastelands such as roadsides, railroad rights-of-way, field margins, and ditch-banks. Field surveys from 1966 to 1971

established that both weeds were relatively free of deleterious insect injury. Most insects found associated with these weeds were sap- or foliage-feeding species which apparently had little influence on the vigor and reproductive capacity of these thistles in southern California.

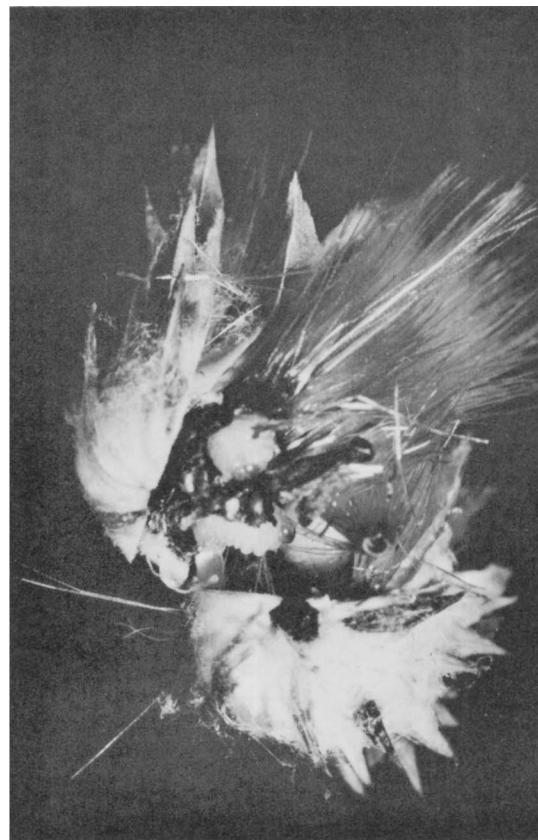
During the 1960s, under contract to the Canada Department of Agriculture, entomologists at the European Station of the Commonwealth Institute of Biological Control (CIBC) at Delmont, Switzerland extensively surveyed the insects attacking European thistles. The weevil, *Rhinocyllus conicus* Froelich (photo 1), was

found to attack thistles in the genera *Carduus*, *Onopordum*, *Silybum*, and *Cirsium* in central and southern Europe. Intensive studies by the CIBC demonstrated the weevil's noneconomic status, restricted host range, and potential effectiveness as a biological control agent. It was first imported into Canada and liberated in mid-1968 in Saskatchewan for biological control of musk thistle (*Carduus nutans* L.) and in Ontario for control of plumeless thistle (*Carduus acanthoides* L.). Supplemental studies of this weevil attacking musk and milk thistles in Italy were conducted by USDA-

Photo 1. Adult of *Rhinocyllus conicus*.



Photo 2. Flowerhead of Italian thistle containing three seed-destroying larvae of *Rhinocyllus conicus*.



# ATTACK IN

ARS entomologists in Italy and in California. Permission was subsequently received from appropriate authorities to introduce *R. conicus* into the United States for biological weed control. This report covers only those importations and liberations made since 1971 in southern California. Concurrent liberations in northern California by cooperating federal entomologists were reported about a year ago.

On June 5, 1971, 316 weevils collected as overwintered adults near Rome, Italy, were colonized on milk thistle at a site near Santa Barbara. Later in the same year, an additional consignment was im-

Photo 3. Cross-section of empty pupal cell of *Rhinocyllus conicus* in flowerhead of Italian thistle.



ported, consisting of 800 weevils dissected from mature flowerheads of milk thistle in Italy. Of these, 388 were liberated at the same Santa Barbara site on July 15, and 382 on milk thistle on Santa Cruz Island on July 20.

In September 1971, dissection of 154 mature flowerheads from the Santa Barbara site indicated that 9% had been attacked by *R. conicus*. The larvae feed upon and destroy the immature seeds (photo 2) and pupate in cells constructed among seed fragments (photo 3). Adults emerge from these cells after the mature flowerheads open to shed their seeds. During May of the following year, eggs were commonly found at the original release site at Santa Barbara, indicating that the weevils had survived the relatively cool and dry winter of 1971-72. Eggs glued to the inner and outer sides of the receptacular bracts of younger flowerheads also indicate weevil activity (photo 4).

During 1972, about 3500 additional weevils were collected and shipped from Italy. From 350 to 800 weevils were colonized during April and May on milk thistle at sites in San Luis Obispo, Ventura, Los Angeles, Orange, and San Diego counties. Eggs of *R. conicus* were recovered at all but the Santa Cruz Island release site during 1972. Dissection of 200 flowerheads of milk thistle from the Santa Barbara location indicated that 46% were infested, but only 1% of 200 flowerheads of Italian thistle from this location were attacked.

In March 1973, overwintered weevils were collected from Italian thistle in southern Italy. On April 2, more than a thousand of these weevils were colonized on this thistle at a single location in San Luis Obispo County. As anticipated, the weevils essentially ignored milk thistle and confined their oviposition to Italian thistle, though both species of thistle grew intermingled at this location. As many as three larvae were recovered from individual flowerheads of Italian thistle, more than sufficient to destroy all seeds (photo 2).

Despite heavy winter rains, the weevils survived and reproduced on milk thistle during 1973 at most sites. One colony in San Luis Obispo County was destroyed by floodwaters. *Rhinocyllus conicus* not only survived for a second year at Santa Barbara, but also increased its infestation rate to 94% of 208 flowerheads examined in May. As many as 94 eggs were found on a single flowerhead. Weevils were so abundant that 651 adults were collected in one hour for transfer to a new location

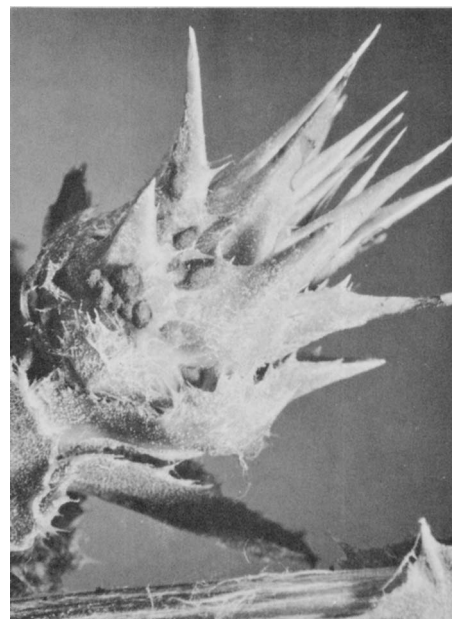


Photo 4. Eggs of *Rhinocyllus conicus* (also cover photo) glued to young flowerhead of milk thistle.

in Orange County. This transfer also was made to reduce the chance that this colony of obviously well-acclimated weevils might accidentally be destroyed, since it is located in a high fire-hazard area.

Parasitization of eggs, larvae, or pupae of *R. conicus* by indigenous insects has not yet been detected. Predation by spiders and snakeflies on adults has occasionally been noted. Rodents relish the seeds of milk thistle and appear responsible for incidental mortality of *R. conicus* at some locations. Cattle apparently destroyed one colony in Ventura County during 1972 by consuming flowerheads infested with *R. conicus* when forage was scarce.

Eventually these weevils, freed from their European enemies, might attain densities sufficient to destroy the seeds of the thistles in amounts necessary for effective biological control. Both thistles and this weevil produce only a single annual generation in southern California. It is encouraging that *R. conicus* has survived and reproduced under various conditions at different California locations, and in two years' time has attained localized densities in Santa Barbara far exceeding those observed in Europe.

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