

***HOMALOTYLUS CALIFORNICUS* (HYMENOPTERA:
ENCYRTIDAE), A PARASITE OF *COCCINELLA CALIFORNICA*
(COLEOPTERA: COCCINELLIDAE) IN BRITISH COLUMBIA**

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ABSTRACT

We record the first occurrence in British Columbia of *Homalotylus californicus* Girault, a parasite of *Coccinella californica* larvae. Parasitized larvae are mummified and hardened with an abnormal bluish tint so they are easily recognized in the field. The rate of parasitization in the field was 13%. The significance of this and related parasites of Coccinellids is discussed.

In our study of the population dynamics of aphids on oats and alfalfa, we made daily estimates of the abundance of coccinellids of all stages in our field plots. The procedure for estimating adult numbers will be reported elsewhere. When a pupa was encountered its species was recorded and a spot of paint was placed beside it to avoid confusion later.

In 1975, first generation pupae of *Coccinella californica* Mannerheim began to appear in mid-July. On July 30 an unusual larva was seen. It was moribund, hard, and mummified, but attached to a leaf at its caudal end. It looked like a larva about to pupate except for its dull bluish colour. Such 'blue' larvae were also identified with paint, and recorded separately. The last blue larva was found on August 19 at the end of production of pupae in the field.

In all, 30 blue larvae were taken. From six of these, emerged 5, 5, 5, 4, 3 and 3 adult *Homalotylus californicus* Girault, but the remaining 24 mummified larvae failed to develop further. When they were dissected, all contained dead parasite larvae oriented longitudinally more or less two abreast. Cocoons inside those larvae from which *H. californicus* had emerged were positioned similarly.

We recorded 201 normal pupae during the time when the 30 parasitized larvae were found. The rate of parasitization by *H. californicus* was therefore estimated at 30/(201+30) or 13%. This value cannot easily be compared to parasitization rates in the literature because of apparent inconsistencies in the use of names. The situation is similar to the confusion in use of two species names of *Homalotylus* in Europe (Hodek 1973); one species being solitary and the other gregarious. Muesbeck *et al.* (1951) and Peck (1963) refer to *H. californicus* as a

subspecies of *H. terminalis* following Timberlake (1919) who did not find a constant diagnostic character to separate the two. But Leonard (1933) records that each pupa of *Cycloneda sanguinea* L. had a single emergence hole caused by *H. terminalis*, whereas our specimens had many holes, one for each adult parasite. Leonard recorded a parasitization rate for *C. sanguinea* as 90%; Kulman (1971) found that 26% of the *Anatis quindecimpunctata* larvae he observed were parasitized, each producing from 1 to 21 *H. terminalis*; and Kapur (1942), and Miller and Thompson (1926, 1927), recorded parasitization by *H. t. californicus* as high as 42%, and by *H. terminalis* up to 50%, respectively.

Yet in spite of the apparently low rate of parasitization we observed, we believe the *H. californicus* is potentially important. Preliminary field experiments on the survival of larval coccinellids show that less than 1% of newly hatched, first instar larvae survive to the fourth instar even when supplied with an abundance of prey, the 13% mortality caused by *H. californicus* is applied to those few surviving fourth instar larvae. Since the parasite is gregarious, the potential for increase and detrimental impact on *C. californica* is great, as shown by the high rates of parasitization reported for other gregarious species.

Homalotylus spp. have been considered by Hodek (1973) to be a very significant mortality factor which may limit the entomophagous efficiency of certain coccinellids in Europe, India, the U.S.S.R. and Israel. However, most species of *Homalotylus* are known to have parasites of their own; perhaps this accounts for their lack of more general and consistent impact.

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PREDATION BY CARPENTER ANTS: A DETERRENT TO THE SPREAD OF CINNABAR MOTH

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ABSTRACT

Cinnabar moth, an introduced biological control agent for tansy ragwort, suffers heavy predation by carpenter ants in recently logged areas of Oregon. We suggest that this mortality factor will reduce the spread of Cinnabar moth, thus preventing it from attacking a major seed source of tansy ragwort and reducing its potential as a biological control agent. Single larvae escape predation by ants more often than those in groups which suggests that carpenter ant predation may select for larval dispersal.

The Cinnabar moth, *Tyria jacobaeae* L. (Arctiidae), has been widely spread from its native Europe because of its potential as a biological control agent against the weed Tansy ragwort, *Senecio jacobaea* L. The success of these introductions has ranged from "never seen again" to "abundant and thriving" after 15 years. At Abbotsford, B.C. the failure of the first releases was attributed to heavy predation by ground beetles (Wilkinson, 1965). In the Gippsland vicinity of Victoria, Australia a mecopteran, *Harpobittacus nigriceps*, heavily predated a newly introduced Cinnabar population and a nuclear polyhedral virus assured the failure of the attempted introduction (Borne-missza, 1966). The causes for the lack of success of other introductions are not known (Hawkes, 1968, Harris *et al.* 1975, Isaacson 1973).

Van der Meijden (1971) records an almost perfect correlation between the log % mortality of Cinnabar larvae and log density of *Lasius*

alienus, a predaceous ant. Further studies of *Lasius* predation led Van der Meijden (1973) to conclude that this ant may limit Cinnabar numbers in some sand dune areas of the Netherlands.

The following observations on predation by ants were made as a by-product of experiments designed to investigate larval dispersal in the Cinnabar moth.

Study Area and Methods

The study was carried out in Linn County, Oregon which lies between the western slope of the Cascade Mountains and the eastern edge of the Willamette Valley. Larvae were collected from the Silbernagel population which was studied by Isaacson (1973), and were transported to an area about 10 miles to the south on Neal Creek Road. This area was logged within the last 10 years so that stumps and fallen logs were abundant on the steep hillsides. Tansy ragwort is a common component of the herb-