

Survey for Soft Scale Parasitoids in Interior Southern California

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This project seeks to improve the biological control of black scale in southern California and of citricola scale in the San Joaquin Valley (SJV). To do so, we need to better understand which parasitoids attack black scale during the year in southern California and which species in the complex are responsible for the near elimination of citricola scale in this region. We will contrast this information with that from the SJV, where citricola scale remains a significant problem.

We are surveying ten citrus groves in southern California and place 2 to 3 brown soft scale-infested *Yucca* leaves at these locations every two weeks. We examine all the leaves collected from the field three times: (1) to aspirate adult wasps from the leaves after they are returned from the field; (2) 1-2 days later we inspect the leaves using a dissecting microscope and isolate each scale containing parasitoid larvae and/or pupae in a small vial and return the leaf to its rearing tube; and (3) we inspect the leaf one week later.

We keep all leaves with scale for 55 days in the lab to monitor and record wasp emergence. We collect, sort, and record these wasps by species, location, and date. We use the isolated scales to provide information on scale stages attacked and the parasitoid species, sex, and time of emergence. April through September is the period of time over which we encounter the most natural enemy activity (Figure 1).

The parasitoid complex is the most diverse in the Riverside area, having a higher number of parasitoid species when compared to those emerging from leaves placed in Hemet and Redlands. The most prevalent *Metaphycus* spp. collected was the newly identified *M. angustifrons* and *M. luteolus*.

To date, we have collected at least two species of *Coccophagus* that are common at all sites. Some researchers believe *Coccophagus* may interfere with biocontrol because immature male *Coccophagus* are hyperparasitoids that feed on immature female *Metaphycus* or *Coccophagus*. We have not found this to be the case. *Metaphycus* spp. continues to be the dominant parasitoid collected (Figure 2).

At two sites, we collected an uncommon *Diversinervus* sp. that attacks older scales, and at three sites we collected an uncommon *Microterys* sp. that attacks older, larger scales. Some of these species still need to be identified and have been preserved for subsequent genetic studies. The newly identified species, *Metaphycus angustifrons*, was originally imported from Taiwan (1952). It was reared (UCR) then release in southern California against Black scale but was never recovered from black scale (Figure 3). Moreover, for the past 43+ years this species has been present and is currently one of the dominant *Metaphycus* spp. against soft scales, but until this survey not known to exist in California.

This project continues to yield results that will identify the complex of natural enemies controlling *Coccus* spp. in Southern California. Results to date have been most encouraging, and we have initiated a colony of *M. angustifrons* for release against citricola scale in the San Joaquin Valley.

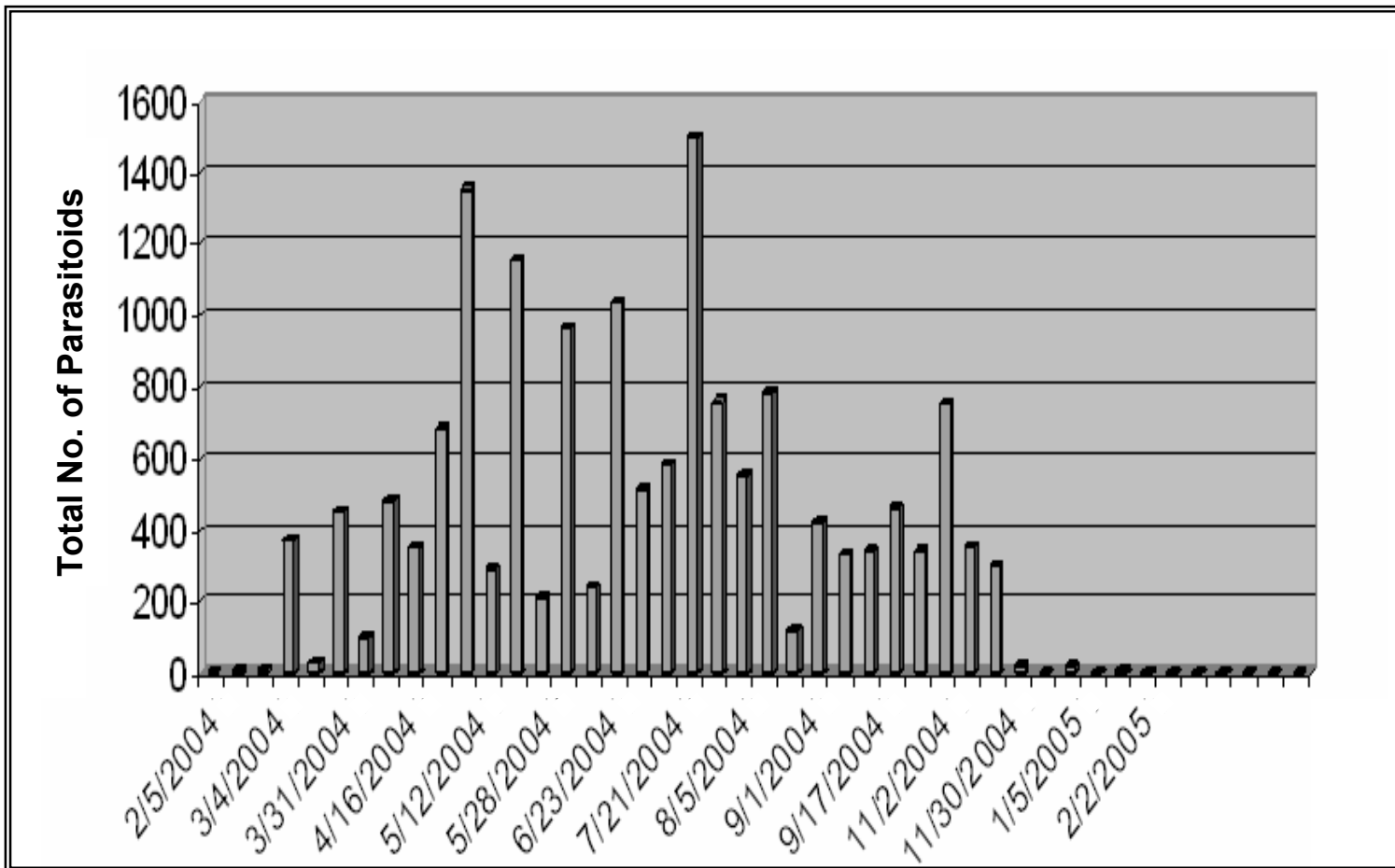


Figure 1. Seasonal pattern of parasitoids collected across all locations.

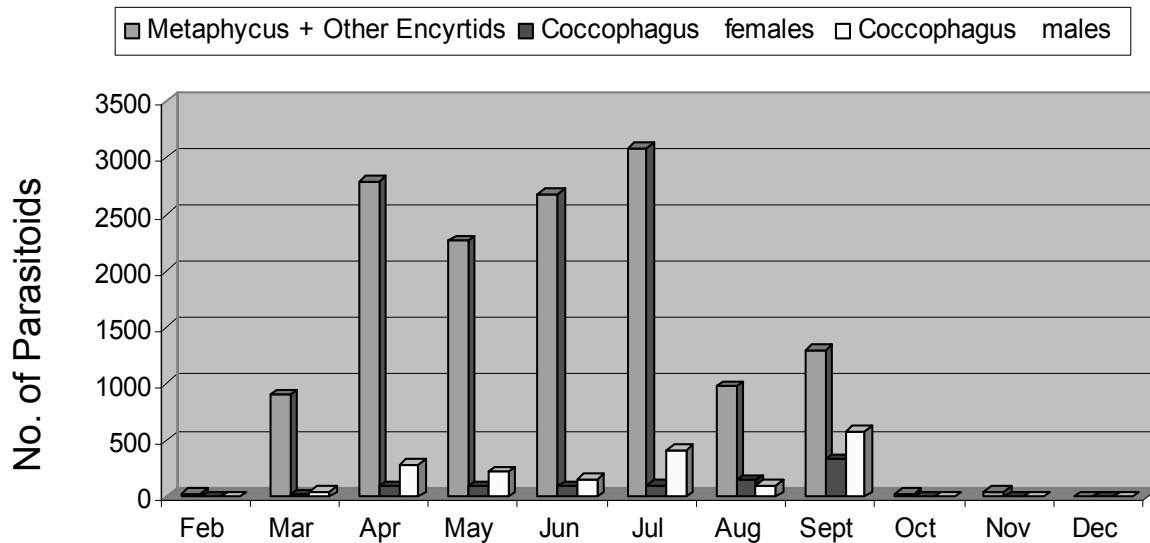


Figure 2. Coccophagus spp. Collected versus Metaphycus spp. and other parasitoids.

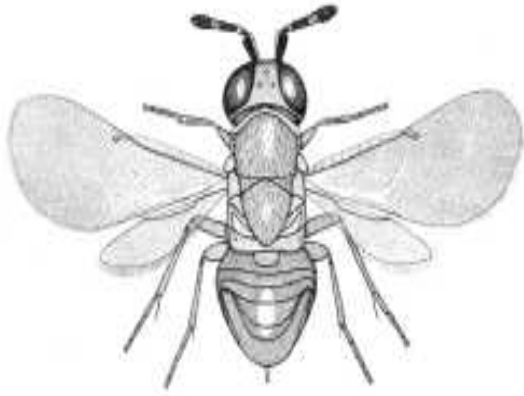


Figure 3. New identification: Metaphycus angustifrons.