

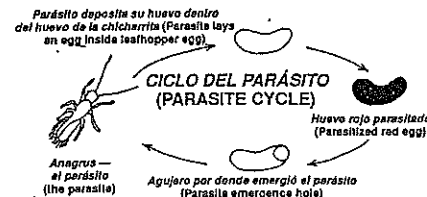
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## SOME COMMON NATURAL ENEMIES IN VINEYARDS

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### Parasites

*Anagrus epos*. This almost microscopic wasp attacks the eggs of the grape leafhopper, and to a lesser extent, the variegated leafhopper. Over 90% of grape leafhopper eggs can be parasitized in the late summer in some vineyards. Parasitized eggs turn red and the circular exit hole is evident in eggs from which parasites have emerged. Unparasitized eggs are clear. Populations are increased by native blackberries or French prune plantings.

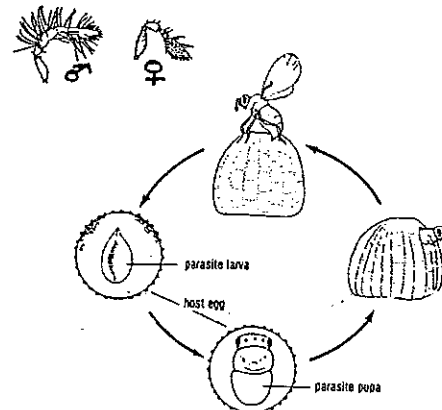


*Bracon cushmani*. This wasp attacks the caterpillar of the grape leaf folder, killing up to 40% or more of the population. Several eggs may be laid in a single caterpillar. Larvae of the wasp can be seen feeding externally on parasitized leaf folders. The wasps spin their white cottony cocoons next to the skin of the consumed leaf folder larva.



Larvae of *Bracon cushmani* on grape leaf folder larva.

*Trichogramma* sp. These tiny wasps attack eggs of many caterpillar species. They are available commercially but are also naturally abundant in many situations. For instance, naturally occurring populations parasitize grape leaf folder and omnivorous leafroller but rarely kill more than 10%. When purchasing for release, distinguish males and females by checking antennae; males have longer hairs.



*Aphid parasites*. A number of tiny wasps parasitize aphids, when they occur in vineyards. Parasitized aphids turn into crusty bronze mummies. A round exit hole on the top indicates the parasite adult has emerged.



Tachinid flies. Tachinid flies, especially *Nemorilla pyste* and *Erynnia tortricis*, attack caterpillars of the grape leaf folder, omnivorous leafroller and other moths in grapes. The tachinids are usually hairy and look similar to houseflies but lack hairs on their antennae. They lay their eggs on the outside of the caterpillars, usually the head or thorax, and the hatching larvae bore into the host. Pupation occurs within a misshapen host pupae. Most tachinid species attack only one or a few host species, however, as a group they may parasitize Lepidoptera, Coleoptera, Hemiptera, Orthoptera or Hymenoptera hosts. Sometimes their newly laid eggs can be seen deposited on the host surface. Drawing at left is *Paradexodes* sp.



## Hemipteran Predators

*Orius tristicolor*, minute pirate bug. These tiny predators are black and white as adults and an inconspicuous yellow-brown as nymphs. They are common predators many crops and are often among the first predators to appear in the spring. They feed on mites, small leafhoppers, insect and mite eggs, and any tiny insect—especially thrips—in both adult and nymph stages.

*Geocoris* sp., big-eyed bugs. These small predators feed on mites, leafhopper nymphs, aphids, small caterpillars, eggs, and other small insects. Their characteristic oversized eyes are present on both nymphs and adults and easily distinguish them from lygus bugs or false chinch bugs with which they are often confused.

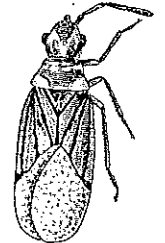
*Nabis americoferus*, the common damsel bug. These widely distributed predators feed on many mite and insect pests. Nymphs resemble adults except they lack wings. Damsel bugs often appear in the field later than other predators and are more common later in the summer.

*Zelus renardii*, leafhopper assassin bug; *Sinea diadema*, the spined assassin bug. Assassin bugs have long, often spiny bodies and long legs and antennae. They are found in almost any crop or landscape situation and prey on many insect species including caterpillars, lygus bugs, aphids and beneficial species as well. Eggs are barrelshaped and laid in groups.

## Lacewings

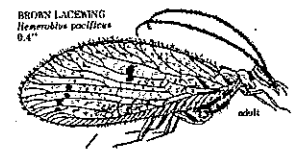
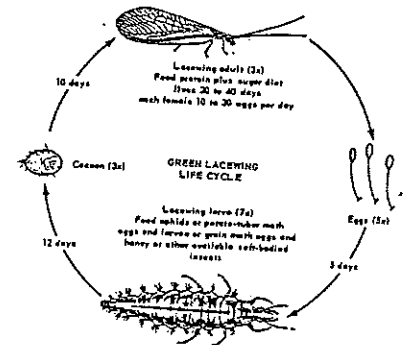
*Chrysoperla carnea*; *C. rufilabris*; green lacewings. Numerous green lacewing species occur in California. These two species are commercially available. *C. carnea* is suitable for low growing plants; *C. rufilabris* can be used in trees or fields. *C. rufilabris* is recommended for use in vineyards. These species are predaceous as larvae; adults feed on nectar. Other species of green lacewings are often abundant naturally in vineyards including *Chrysoperla comanche*. Look for their eggs laid on long stalks. Sold both as eggs and larvae; larvae are less likely to suffer high mortality from predators after release. Green lacewings are general predators, feeding on leafhoppers, aphids, mealybugs, whiteflies, insect eggs and small caterpillars.

Brown lacewings, *Hemerobius spp.* Brown lacewings resemble green lacewings in both adult and immature stages, but are slightly smaller. Adults are brown. Brown lacewings are often found in vineyards feeding on leafhoppers and other insects and insect eggs.



big-eyed bug

false chinch bug



## Predaceous Beetles

*Hippodamia convergens*, the convergent ladybeetle. This red and black ladybeetle is probably the most well known predator of all. The converging white spots on its pronotum are generally diagnostic; don't count the spots—they may range in number from zero to twelve. The alligator-shaped larva is black with orange spots. Its yellow eggs are laid on end in groups. When aphid populations drop in the valley in summer, much of the convergent ladybeetle population migrates to the mountains to overwinter. This ladybeetle is primarily an aphid feeder but has also been reported feeding on leafhopper nymphs in vineyards.



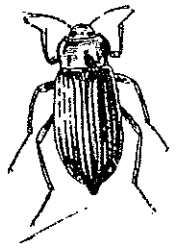
*Chilocorus orbus*, two stabbed ladybeetle. One of the most common scale feeding predators in California. Minute dense punctures; abdomen red. Clypeus expanded under eyes so mouth parts are less visible. Larvae are black with a median yellow transverse band and numerous spines.



*Cryptolaemus montrouzieri*, the mealybug destroyer. This ladybeetle is commercially available for control of mealybugs and is most effective in greenhouse situations. It has a difficult time surviving winters in most of California, although has been reported in vineyards in the Napa area. It is slightly hairy, mostly black with brownish pronotum. Larvae is white and waxy, superficially resembling a mealybug.



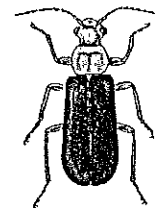
Carabid Beetles or Ground beetles. These soil dwelling beetles are believed to be important predators in many situations. They feed on soil dwelling or sequestered insects such as cutworms and borers. Usually black and shiny, flattened with a prominent thorax that is narrower than the abdomen, they have long legs and run rapidly. Their antennae are long and not clubbed like those of most plant-damaging darkling beetles.



Carabid

darkling beetle

Cantharids or soldier beetles. These moderate to large sized beetles have leatherlike dark wings and orange or red heads and thorax. All species are predaceous as larvae and many as adults, feeding on aphids and other insects. Larvae are soil dwelling.



## Thrips

*Scolothrips sexmaculatus*, the sixspotted thrips. This tiny insect can be a significant predator when spidermite populations are high. It gets its name from the six dots on the wings of the adult form. It prefers Pacific mite to the unwebbed colonies of Willamette mite.



### Predatory wasps

*Polistes spp.* These large predatory wasps capture caterpillars to provision their nests, but are not numerous under ordinary vineyard conditions. Other predatory wasps attack spiders or other insect groups.



### Predatory Mites

*Galendromus (Metasieulus) occidentalis.* western predatory mite. This predatory mite is common in spidermite infested fields and orchards in the warmer valleys of California. It is commercially available, but many fields have sufficient native populations if unsprayed. It can be distinguished from two spotted mites by the absence of the two spots on its sides. Its eggs are oval versus the spherical eggs of spider mites.

*Anystis agilis* is generalist predator which feeds on first instar leafhopper nymphs, mites, spiders and insects. It is a relatively large red mite with long legs. It moves rapidly and is sometimes called the whirligig. It is especially common in the Napa/Sonoma growing regions.



### Spiders

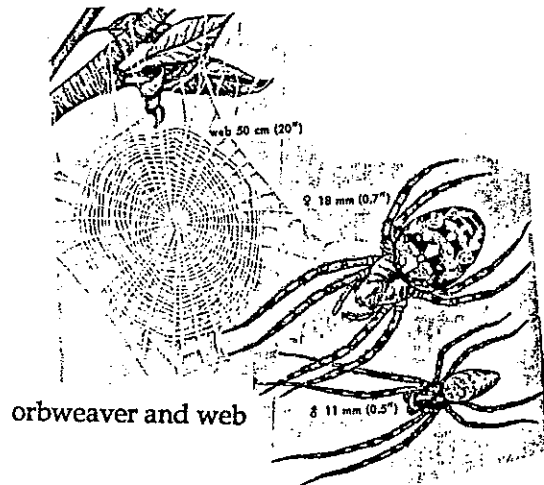
Spiders are often abundant in vineyards and are believed to contribute significantly to biological control. Among the most common groups in vineyards are the Therididae or cobweb spiders, usually found within their irregularly woven webs (these include the black widows); the orbweavers, which rest in or beside their symmetrical webs; and the crab spiders, which spin no webs at all.



cobweb spider  
(black widow)



crab spider



orbweaver and web