

NEUROCOLPUS AND CALOCORIS

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The California buckeye bug, *Neurocolpus longirostris* Knight (Miridae), is a native insect common throughout the Sierra Nevada and coast range foothills of California. In its native habitat, *Neurocolpus* has been found primarily on California buckeye, *Aesculus californica*, and has been collected from Kern County north to Butte and Glenn counties. Adults and eggs have also been collected from coffeeberry, *Rhamnus* sp.

Another mirid commonly associated with pistachios, *Calocoris norvegicus* (Gmelin), is known as the potato mirid in Europe and New Zealand. *Calocoris* is not a native insect as is *Neurocolpus* or other mirid pests in pistachios, but is a relatively recent introduction to North America. It first appeared in collections from California during the 1940s and has since spread through most of northern and central California. Field surveys have shown it to be much more numerous in northern California and the Sacramento Valley than in the southern San Joaquin Valley. However, high populations of *Calocoris* have been found as far south as the San Joaquin River.

NEUROCOLPUS LONGIROSTRUS

Adults of the buckeye bug are approximately 3/8 inch long and are mottled light to dark brown in color. The most distinguishing characteristic of *Neurocolpus* adults and nymphs is the enlarged first antennal segment that appears fuzzy or hairy under magnification (Plate 21A). Nymphs of *Neurocolpus* are gray-green with gray to reddish-brown wing pads and alternating white and brown bands on the legs and antennae.

Neurocolpus overwinters in the egg stage on both buckeye and pistachios. The females lay their eggs at the base of new growth leaf petioles or terminal buds. Egg hatch coincides with buckeye flowering at various elevations or with pistachio bloom in April. Adults begin to

appear in beating tray samples from pistachios by early May and are present in the orchard only until late May or early June. *Neurocolpus* has only one generation per year in California.

Because this insect has been found only in pistachio orchards that are near its native hosts, epicarp lesion and crop losses caused by this pest are not widespread through all pistachio growing districts. Damage from *Neurocolpus*, however, can be severe in certain orchards in foothill areas of California. Damage to soft shell pistachio nuts is typical of mirid epicarp lesion symptoms. These symptoms appear inside the shell as distinct cavities or pits in the soft shell tissue and externally as darkening, concentric (zonate) rings or stains. Crop loss estimates in impacted orchards have ranged as high as 30-35% from *Neurocolpus*, in a few instances even higher.

The nymphs are relatively easy to detect with beating tray samples early in the season at about the time that pistachio bloom is complete and small nuts begin to form in clusters. First or second instar nymphs are easily seen on beating trays, and population evaluations can be made at this time. Small nuts exposed to *Neurocolpus* nymphs in late April developed epicarp lesion symptoms in 36-48 hours after feeding, with severe internal shell pitting most often found at the base of the funiculus. Because nymphal development and nut cluster formation coincide, damage often appears as small blackened nutlets in the cluster (Plate 21B).

Neurocolpus adults move from nearby buckeye trees or other hosts into pistachio orchards and may lay overwintering eggs in May and June. The adults have been observed to migrate distances over 1/4 mile from native buckeye to commercial pistachio plantings. Once established, *Neurocolpus* can maintain itself as an endemic pest in pistachios.

At least four parasites are known to attack *Neurocolpus* eggs on buckeye throughout its

native host range. These parasites have not been found in *Neurocolpus* eggs in pistachio orchards, however, and it is not known whether they would be able to exert any effective biological control on *Neurocolpus* in commercial plantings.

At the present time (treatment threshold levels for *Neurocolpus* in pistachio orchards have not been established. It has been observed, however, that once *Neurocolpus* invades pistachio orchards, chemical control will eventually be required, due to the potentially severe impact of this pest on soft shelled nuts.

CALOCORIS NORVEGICUS

Adult *Calocoris* are small, yellow-green bugs, about 1/4 to 5/16 of an inch long with two prominent black spots on the thorax just behind the head. The outer tips of the wings appear dark when folded over the body.

Preferred hosts of *Calocoris* are native or cultivated legumes such as purple vetch, clovers and alfalfa; broad-leaved weeds such as mustard, fireweed, London rocket and curly dock; and occasionally grasses. *Calocoris* does not appear to have a strong affinity or continual association with pistachios, as does *Neurocolpus*. Instead, they seem to build to high populations on weeds in and around pistachios. As the native hosts dry down or are cultivated, adult *Calocoris* migrate into pistachio trees and cause early season epicarp lesion similar to that caused by *Neurocolpus*, *Phytocoris* and other mirids prior to shell hardening. A strong direct correlation has been shown between populations of *Calocoris* in weeds and alfalfa and epicarp lesion damage in adjacent pistachios. Studies in northern California showed that *Calocoris* adults could cause yield losses up to 48% from uncontrolled populations. *Calocoris* generally appears to prefer moist, cooler environments, perhaps because its preferred hosts are more prevalent in these situations. It has only one generation per year and overwinters in the egg stage in stems of weed hosts. Nymphs appear in early to

mid-March in the Central Valley and in late March in the Sacramento Valley. Adults are present from mid-April through June. Adults are usually found 3-9 weeks after the first nymphs are collected in sweep net samples from the orchard ground cover.

Caged *Calocoris* females have been observed laying eggs in the rachis of nut clusters. However, these eggs do not hatch, thus *Calocoris* does not overwinter in pistachio trees as does *Neurocolpus*. *Calocoris* populations decline and disappear with the maturing and drying of native weed hosts in late spring and early summer. Cover crops and weeds within pistachio orchards could sustain adult populations of *Calocoris* for extended periods. The adults will migrate during the day between orchard ground covers and nut clusters in the trees.

Control of *Calocoris* and concurrent reduction of epicarp lesion by migrating adult bugs is best achieved through reduction of weed hosts in and around pistachio orchards prior to the maturing of *Calocoris* nymphs on the native hosts. Weed hosts should be cultivated or treated when fourth or fifth instar nymphs are first detected in sweep samples. Effective weed control should reduce or eliminate the need for most insecticide sprays for *Calocoris* in pistachio orchards. Migrating adult populations of *Calocoris* usually do not go more than 300 feet into pistachio orchards from outside sources. Therefore, if chemical controls are under consideration, border treatments on the perimeter of orchards should reduce damage from *Calocoris* to negligible levels. To date, there are no known predators or parasites that might contribute to biological control of this pest species.

Recently, sex pheromones for both *Neurocolpus* and *Calocoris* have been identified and synthesized. These pheromones are highly specific for adult male bugs. To date however, field recommendations for their use in detection and monitoring of adult bugs have not been developed.