



Redhumped Caterpillar

The redhumped caterpillar, *Schizura concinna* (Notodontidae) (Figure 1), is found throughout much of the United States. In California, high populations are usually limited to the Central Valley.

This pest most commonly chews leaves of liquidambar (sweet gum), plum, and walnut. It also feeds on almond, apple, apricot, birch, cherry, cottonwood, pear, prune, redbud, willow, and other deciduous trees and shrubs.



Figure 1. The redhumped caterpillar, *Schizura concinna*.

IDENTIFICATION

Adult females lay eggs (Figure 2) in groups of 25 to 100 on the underside of leaves. The eggs are spherical, cream-colored to yellow, and about 1/16 inch in diameter. After hatching, the empty egg shells are translucent to white with an irregular, ragged hole. First-generation eggs are laid on lower leaves, nearest the ground. Later in the season, egg clusters can occur throughout the tree.

Newly hatched (first-instar) caterpillars are approximately 1/8 inch long and often feed in groups (Figure 3). Young larvae have dark brown to black heads, yellowish-orange bodies with faint dark, lengthwise stripes, and rows of dark bumps (tubercles) with bristles along the body.

Older caterpillars reach 1 to 1-1/2 inches long and have yellowish-orange bodies with lengthwise black and white stripes (Figure 4). Second through fourth instars have blackish or red heads, and the fifth (last) instar has a red head. In late instars, the fourth segment behind the head (the first abdominal segment) has a reddish hump with two prominent black spines. The dark tubercles and bristles along the length of the body are more striking in larger (later-instar) caterpillars. Larger caterpillars commonly hold their rear end raised above the plant surface.

The pupa (Figure 5) is brown to red and about 1/2 inch long. Pupae occur in a thin, silk cocoon in topsoil or organic debris on the ground at the base of the tree, or sometimes on leaves.

Adult moths (Figure 6) are about 7/10 inch long and have a wingspan of 1 to 1-3/8 inches. The forewings are a mix of reddish to gray and brown. The hind wings are whitish to gray or pale brown.



Figure 2. Redhumped caterpillar egg cluster.



Figure 3. Young redhumped caterpillars and hatched eggs.

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LIFE CYCLE

The redhumped caterpillar has four stages of development (Figure 7)—egg, larva (caterpillar), pupa, and adult (moth). Moths emerge from pupae in April to May and mate. Each female lays several groups of eggs on host foliage.

The eggs hatch into caterpillars that feed on and chew leaves. Caterpillars grow through five increasingly larger instars (immature stages) by shedding and regrowing their outer cuticle (skin), then pupate.

In the autumn, full-grown caterpillars move to the ground, spin a silk cocoon, and remain inside over the winter as inactive, mature larvae (pre-pupae). During spring, they undergo metamorphosis into pupae, then become adult moths that emerge and seek mates. The redhumped caterpillar has two or more generations per year in California’s Central Valley.

DAMAGE

Young caterpillars commonly feed side-by-side in groups, chewing on the lower leaf surface (Figure 3). As the larvae grow, they tend to disperse and feed in smaller groups or individually. Skeletonized leaves are a common result, as the older cater-



Figure 5. Redhumped caterpillar pupa.



Figure 6. Redhumped caterpillar moth.



Figure 4. Older redhumped caterpillar larvae.

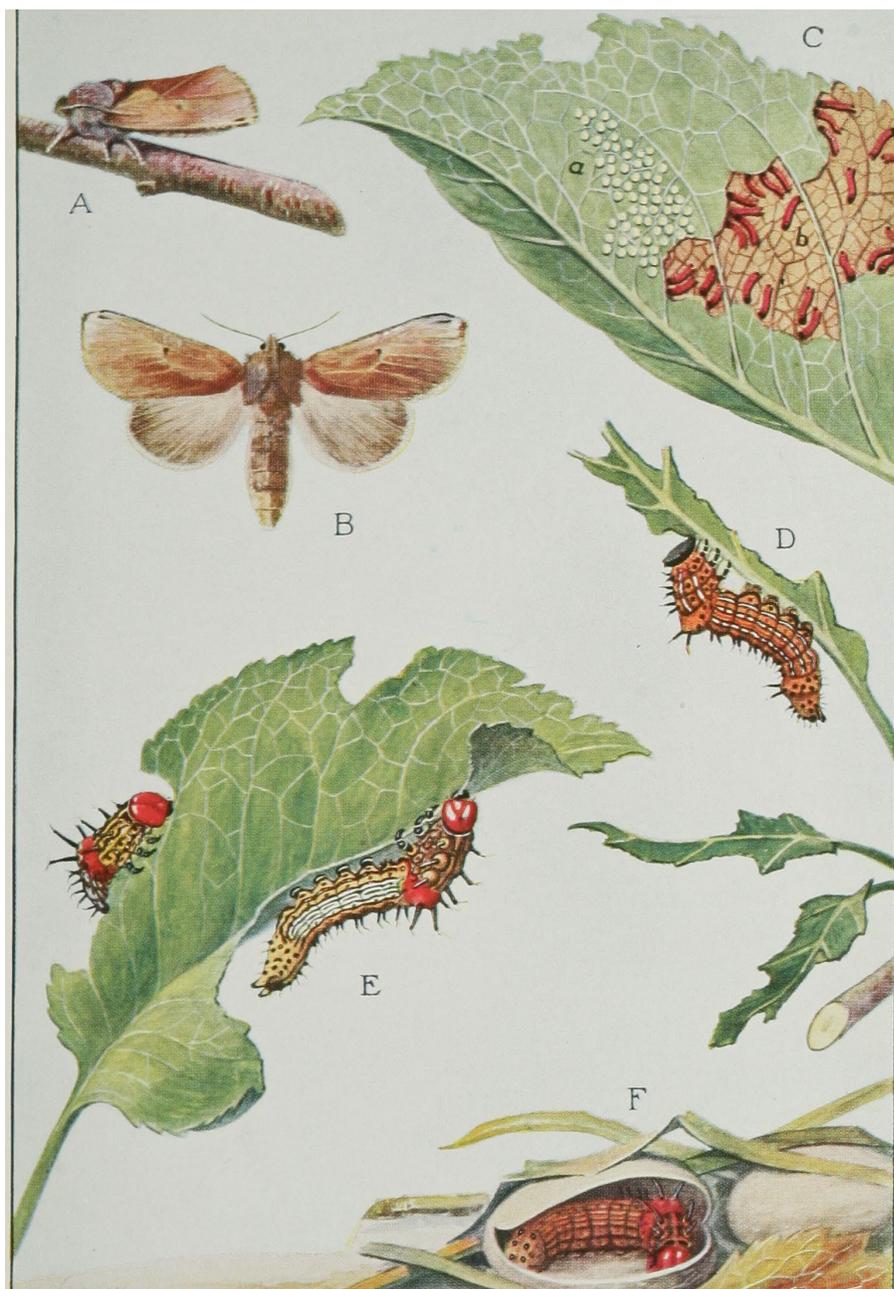


Figure 7. Life stages of the redhumped caterpillar. A, B. Adults; C. Eggs and first instars; D. Fourth instar; E. Fifth (last) instar; F. Cocoons on the ground, one cut open revealing the prepupa inside.



Figure 8. Redhumped caterpillar feeding, skeletonized walnut leaves.

pillars chew all the way through and consume leaves, leaving only the larger, tough veins (Figure 8). Unlike certain other caterpillars that may feed on the same hosts, redhumped caterpillars do not tie leaves with webbing or leave silk strands on foliage; the exception is when silk-covered pupae occur on leaves.

When their abundance is low, larvae eat leaves on only a few branch terminals. Occasionally, heavy infestations develop and defoliate entire trees during the summer. Usually only scattered individual and young trees are severely defoliated. If severely defoliated, trees that are otherwise healthy usually recover.

Redhumped caterpillars do not feed on fruit or nuts, but these may become sunburned and drop prematurely if defoliation is severe. Yield quantity may be reduced the season after fruit or nut trees are defoliated.

MANAGEMENT

Biological control and spot-pruning of infested shoots are sufficient to manage this pest in most situations. Insecticide application can be warranted if caterpillars are abundant and their feeding damage is intolerable, especially when trees are small,

already stressed, or unhealthy from other causes.

Monitoring

On hosts where this insect has been a problem, look for redhumped caterpillars in April and May. This is when the first-generation caterpillars may be present. Inspect the underside of terminal leaves for egg masses and groups of small caterpillars at least once a week.

From a distance, look for green shoots with ragged (chewed) or few leaves, or leaves that turn brown, which may indicate the presence of redhumped caterpillars. Leaves can turn brown from many other causes, so inspect the underside of leaves for the insects themselves and their chewing damage. If you find eggs or larvae of the first generation, prune out and destroy the infested shoots.

Monitor again in late June and July for second-generation eggs and caterpillars. If you find these, look for evidence of parasitism as described below. If caterpillar parasitism is abundant, no further control action is needed. If parasitization is low, prune out and destroy infestations if they are limited, or consider applying an insecticide if caterpillars are abundant.

Biological Control

Parasitic wasps (parasitoids) are important natural enemies of the redhumped caterpillar and often appear to prevent this pest from becoming abundant. Female wasps of several species lay eggs in caterpillars, which hatch into larvae that feed inside the host.

Cotesia (Apanteles) schizurae (Braconidae) feeds as multiple larvae inside each caterpillar; they emerge and pupate in white, silken cocoons in a group near the caterpillar they killed (Figure 9). *Hyposoter fugitivus* larvae feed singly and pupate inside the skin of the caterpillar (Figure 10), which becomes swollen and mottled gray with black.

Because these parasites do not change their host appearance until shortly before the caterpillar is killed, when obviously parasitized caterpillars are observed, other nearby caterpillars may also contain parasites too immature to have affected caterpillar appearance. When a caterpillar appears lethargic or not actively feeding, especially when others nearby appear parasitized, grasping the caterpillar at each end and pulling it apart may expose one or more pale, maggotlike, parasite larvae inside.

Trichogramma spp. wasps feed as larvae inside moth eggs, causing



Figure 9. White cocoons of *Cotesia (Apanteles) schizurae*.

the normally pale-colored eggs to darken. When a *Trichogramma* adult emerges, the egg has a smooth-edged, roundish hole instead of the irregular, ragged hole chewed when a caterpillar emerged.

Predators of caterpillar eggs and young larvae include bigeyed bugs, damsel bugs, green lacewings, and spiders.

Conserve parasites and predators by avoiding the use of long-residual (long-lasting), broad-spectrum insecticides such as carbamates, organophosphates, and pyrethroids. Plant flowering species as insectary plants near commonly infested trees, because parasites of redhumped caterpillar live longer, lay more eggs, and can parasitize and kill more caterpillars when the adult parasites are provided with flower nectar, as discussed by Pinnock and others (see References).

Cultural Control

Clip off shoots that contain caterpillars while the insects are young and feeding in groups. At this stage, you'll need to prune off only the infested shoot terminals to destroy a large group of caterpillars (Figures 3 and 8). Crush the caterpillars, or dispose of them in a plastic bag in the trash.



Figure 10. Redhumped caterpillars parasitized by *Hyposoter fugitivus*.

Provide trees and shrubs with a good growing environment and proper cultural care to encourage their healthy regrowth and increase plants' tolerance to redhumped caterpillar chewing and damage by certain other pests. See the management recommendations online at ipm.ucanr.edu for more information.

Chemical Control

If applying insecticides, select active

ingredients that are the least toxic to the caterpillar's natural enemies and other nontarget organisms. These insecticides include *Bacillus thuringiensis* and spinosad, which can be sprayed on foliage alone, in combination, or mixed with horticultural oil (petroleum or narrow-range oil, e.g., All Seasons Horticultural & Dormant Spray Oil). Because redhumped caterpillar infestations tend to be very localized, spot treatment (e.g., spraying only the outer

Insectary Plants

Insectary plants are those grown to attract, feed, and shelter insect parasites (parasitoids) and predators to enhance biological control.

For recommended annual insectary plants, see *Flower Flies (Syrphidae) and Other Biological Control Agents for Aphids in Vegetable Crops*: anrcatalog.ucanr.edu/pdf/8285.pdf. For perennial insectary plant species and their management, consult *Establishing Hedgerows on Farms in California*: anrcatalog.ucanr.edu/pdf/8390.pdf.

Avoid insectary-plant species that host arthropod pests or plant pathogens that can move to damage nearby crops or ornamentals. Consult the UC IPM publications on the plants you are considering for insectaries. Compare their pest species to those listed for your crops or other desirable plants grown:

Commercial crops—UC IPM Pest Management Guidelines: ipm.ucanr.edu/PMG/crops-agriculture.html

Gardens and landscapes—UC IPM guide for

Flowers: ipm.ucanr.edu/PMG/GARDEN/flowermenu.html

Fruit trees, nuts, berries, and grapevines: ipm.ucanr.edu/PMG/GARDEN/fruit.html

Trees and shrubs: ipm.ucanr.edu/PMG/GARDEN/plantmenu.html

Vegetables and melons: ipm.ucanr.edu/PMG/GARDEN/veggies.html

shoots on infested hosts) is usually sufficient.

Bacillus thuringiensis (Bt) is a group of naturally occurring bacteria that kill certain insects. To be effective, Bt must be eaten by the caterpillars, and it is most effective on younger caterpillars. Caterpillars stop eating within one day after feeding on a leaf sprayed with Bt; then they darken and die within a couple of days.

Thoroughly spray the underside of infested leaves with Bt when caterpillars and their chewing first appear. A second application 7 to 10 days after the first is recommended, because Bt degrades quickly and not all the moth eggs hatch at the same time. Bt has little or no toxicity to humans, bees, and most other animals, including the natural enemies of redhumped caterpillars.

Bts are produced commercially by fermentation and sold for pest control. The caterpillar-killing Bt subspecies *aizawai* and Bt subspecies *kurstaki* are available in a variety of products, including Garden Safe Brand Bt Worm & Caterpillar Killer, Monterey B.t., and Thuricide *Bacillus thuringiensis*.

Agree WG Biological Insecticide, Jackpot WP, and certain other

products containing Bt subspecies *aizawai* are available only to professional applicators. If caterpillar-infested trees are large or tall, hiring a pest control company with the equipment and experience to effectively spray trees can be a good idea. Discuss in advance with the company how they plan to control your pest problem. Request they apply caterpillar-selective Bt, or spinosad as discussed below if the plants to be sprayed are not blossoming.

The active ingredient spinosad is a mixture of spinosyns, which are fermentation products from the bacterium *Saccharopolyspora spinosa*. Spinosad quickly kills insects that contact or eat it, including most caterpillars, flies, thrips, and certain species of beetles and wasps. It can kill a larger percentage of the caterpillars than Bt, especially when spraying older caterpillars.

Spinosad (e.g., Captain Jack's Deadbug Brew, Monterey Garden Insect Spray, Ortho Insect Killer Tree and Shrub Concentrate) remains effective for about 1 week after application. Adding horticultural oil to the spray mix and using water with a pH of 6 to 8 may increase the persistence of spinosad.

Spinosad has relatively low toxicity to people but can be toxic to pollinators and natural enemies, including parasites of caterpillars. Applying Bt instead of spinosad where natural enemies are active may provide better long-term control by conserving natural enemies. It is toxic to bees for several hours after the spray has dried, so do not apply or allow it to drift to plants that are flowering. To minimize its adverse effects on honey bees, apply spinosad in the late evening if permitted by the label and regulations.

Insecticides to Avoid. Avoid foliar sprays of carbamate insecticides (carbaryl), organophosphates (e.g., malathion), or pyrethroids (e.g., bifenthrin, cyfluthrin, fluvalinate, and permethrin). These materials are highly toxic to natural enemies and pollinators and can cause spider mite outbreaks.

Because their use in landscapes and gardens can run or wash off into storm drains and contaminate municipal wastewater, these insecticides are being found in surface water, and are adversely affecting nontarget aquatic organisms.



REFERENCES

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WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original, labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Pesticides applied in your home and landscape can move and contaminate creeks, rivers, and oceans. Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash or pour pesticides down the sink or toilet. Either use the pesticide according to the label, or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your [county agricultural commissioner](#) for additional information on safe container disposal and for the location of the Household Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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This and other Pest Notes are available at ipm.ucanr.edu.

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