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Insect Pests
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Hawai'i Landscape Plant Pest Guide: Chewing Insects

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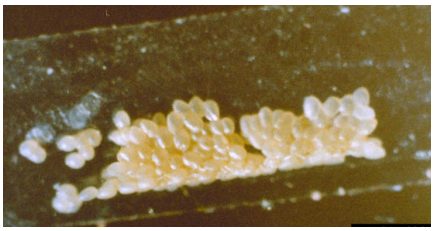
Banana Moth Caterpillar *(Opogona sacchari)*

Identification and Damage

- Mobile and voracious, banana moth larvae feed on detritus and decaying plant material then move on to adjacent healthy tissue, boring into the stem and feeding on the cortex and pith.
- Caterpillars avoid light within the holes they bore in plant tissue but can be detected by the accumulation of frass and debris bound with silky secretions.
- Host plants include tropical crops such as banana, eggplant, pineapple, bamboo, maize, peppers, sugarcane, and coffee, and ornamentals, including Alpinia, Begonia, Bougainvillea, bromeliads, cactus, Dracaena, Dieffenbachia, Ficus, Helicona, palms, Strelitzia, and ti.
- Pupation occurs in plant tissue or in soil beneath host plant. As the pupa matures, it works itself partially out to allow adult to emerge.
- Adult moths are nocturnal. At rest, their long antennae point forward.



Banana moth eggs. (Photo credit: Robert Hollingsworth, USDA-ARS-PBARC.)

Larval stage. (Photo credit: Walter Nagamine, HDOA.)

What to Do

- Remove decaying and dead plant tissue.
- Insecticides are not effective against the caterpillar once it bores into the plant stem. Contact insecticides such as pyrethroids may be used as a preventative treatment, controlling caterpillars prior to their entry into plant tissue.

Adult moth and pupal case.

More Information

- Sugano, J., and R.F.L. Mau. 2001. Crop Profile for Bananas in Hawai'i. University of Hawai'i IPM.
- EPPO Data Sheets on Quarantine Pests: *Opogona sacchari*. http://www.eppo.org/QUARANTINE/insects/Opogona_sacchari/OPOGSC_ds.pdf

Adult moths

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Beet Armyworm *(Spodoptera exigua)*

Identification and Damage

- Larvae coloring varies from bright green to purplish green to blackish.
- Mature caterpillar 1½ to 2 in.
- Young larvae spin loose webbing between leaves.
- Leaves may be skeletonized and almost completely consumed. Plant stems are seldom eaten clear through.
- Young seedlings may be completely destroyed, while older plants can recover.
- Host range: ornamentals (chrysanthemum, rose) andvegetable crops (beets, beans, crucifers, carrot, corn, cotton, lettuce, onion, peas, pepper, potato, sorghum, sweetpotato, and tomato).
- Adult moth is ½ in long, with 1½-in wingspan. Coloring ranges from silvery-gray to grayish-brown.
- Young larvae feed in terminal clusters of host crops, often going unnoticed until damage becomes apparent.
- They remain under the webbing they spin until the third or fourth larval stages, when they move out to other parts of the plant.
- Beet armyworm caterpillars seldom migrate in armies like other species of armyworms.

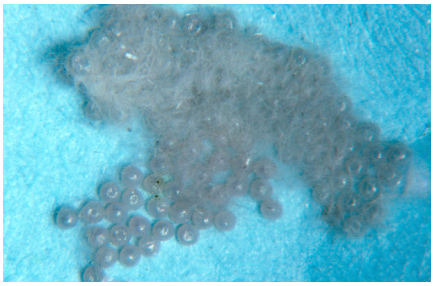
What to Do

- Control broadleaf weeds and rapidly dispose of crop residues after harvest to discourage beet armyworm infestations.
- Tachinid fly species (*Frontina archippivora* and *Chaetogodia monticola*) and a braconid wasp (*Meteorus laphygmae*) parasitize the beet armyworm.
- Bacterial insecticides (*Bacillus thuringiensis*, or *Bt*) are effective when applied to achieve good coverage of targeted plants. *Bt* does not kill on contact but is a stomach poison that must be fed upon to be effective; early larval stages are most susceptible.

More Information

- UH CTAHR Crop Knowledge Master http://www.extento.hawaii.edu/kbase/crop/crop.htm
- Ruberson, J.R., G.A. Herzog, W.R. Lambert, and W.J. Lewis. 1994. Management of the beet armyworm (Lepidoptera: Noctuidae) in cotton: role of natural enemies. *Florida Entomologist* 77: 440–453.
- Zimmerman, E.C. 1958. *Spodoptera exigua* (Hubner), new combination. pp. 339–344. In Insects of Hawaii: A Manual of the Insects of the Hawaiian Islands, etc. Vol. 7: Macrolepidoptera. U of Hawai'i P, Honolulu. 542 pages.

Damage caused by beet armyworm caterpillar.



Eggs are protected under a layer of fine hairs and scales from the adult moth.

Older beet armyworm larva.

Pupa and prepupa.

Adult moth ranges from silvery-gray to grayish-brown.

Black Twig (Coffee) Borer *(Xylosandrus compactus)*

Identification and Damage

- Female beetles tunnel into woody twigs, leaving pin-sized entry holes, then excavate galleries, lay eggs, and spread fungal spores.
- This excavation, along with the introduction of pathogens, is the cause of damage to the host plant. Adults and larvae do not feed directly on live plant tissue but on ambrosia fungus introduced into galleries by the female.
- Hosts include anthurium, avocado, brushbox (*Tristania conferta*), cacao, Christmasberry (*Schinus terebinthifolia*), citrus, coffee, eucalyptus (*E. sideroxylon, E. pilularis, E. robusta*), guava, hibiscus, koa haole (*Leucaena leucocephala*), kukui, lychee, macadamia, mahogany, mango, orchids (cattleya, dendrobium, epidendrum, vanda), paper-bark (*Melaleuca leucadendron*), periwinkle, pikake, floral red ginger, star jasmine, Surinam cherry, turpentine tree (*Syncarpia glomulifers*), and vervain (*Stachytarpheta jamaicensis*).
- BTB is one of many "ambrosia beetles" that feed on ambrosia fungus, but unlike the others, it prefers living to dead/dying plants.
- Male beetles have no wings and spend their entire lives inside twig galleries.Female beetles mate there, then exit through the parents' entry pinhole.
- Females can reproduce without mating, though all offspring will be male.

What to Do

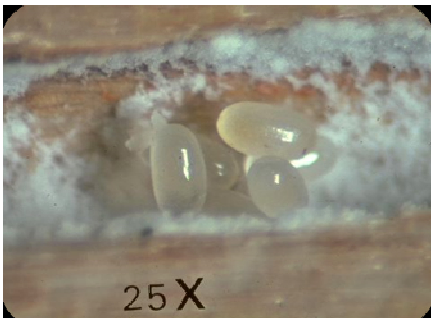
- Pruning and destruction of beetle-infested plant material is essential. Good tree care to promote tree vigor and health will help in resisting or recovering from infestation.
- A eulophid wasp (*Tetrastichus* sp.) was unsuccessfully introduced to Hawai'i to control BTB.
- The restricted-use pesticide chlorpyrifos controls adult female beetles (100% mortality), while pyrethroids are less effective.

More Information

- UH CTAHR Crop Knowledge Master http://www.extento.hawaii.edu/kbase/crop/crop.htm

Infestation becomes apparent when dieback of stem occurs at borer entry point.

Pinhole entry to gallery in twig.



BTB eggs. (Photo credit: A.H. Hara, UH-CTAHR.)

Adult BTB. (Photo credit: A.H. Hara, UH-CTAHR.)

BTB larvae. (Photo credit: A.H. Hara, UH-CTAHR.)

Chinese Rose Beetle *(Adoretus sinicus)*

Identification and Damage

- Chinese rose beetle adults are ½ in long, reddish brown, and covered with fine white hairs.
- The adult beetle is nocturnal, remaining under leaf litter during the day and emerging at dusk. Peak feeding and mating activity occurs about 30 minutes after sunset. They are also attracted to lights at night.
- Rose beetles are drawn to feed on stressed or already damaged leaves, which release ethylene gas that attracts the beetles.
- Beetles feed on plant tissue between leaf veins, creating a lace-like appearance on leaves. In severe cases, most leaves are "skeletonized."
- Major ornamental and cultivated crop hosts include asparagus, beans, cacao, chiso, corn, cotton, crucifers, cucurbits, eggplant, ginger, grape, okra, rose, strawberry, and sweetpotato.

Chinese rose beetle adults prefer to feed on plants high in starches and sugars.

1st to 3rd instars of larvae. Immature grubs do not attack live plant tissue and prefer to live in loose, rich soil; leaf litter; or compost.

What to Do

- A fungus found in soil, *Metarrhizium anisoplia*, infects and destroys many beetles (grubs and adults), particularly during the wet season.
- Use shadecloth to surround and protect plants from feeding damage.
- Chinese rose beetles emerge from daylight shelter approximately 30 minutes after sunset and fly to plants where they will feed until pre-sunrise hours. Illumination of target plants (fluorescent, LED spotlight, etc.) at dusk deters beetles from feeding.
- As yet, no introduced natural enemy has been found effective against the Chinese rose beetle.

Pupation occurs in soil. Pupae are ¼ x ½ in.

More Information

- UH CTAHR Crop Knowledge Master http://www.extento.hawaii.edu/kbase/crop/crop.htm"
- McQuate, G.T. and M.L. Jameson. 2011. Control of Chinese rose beetle through the use of solar-powered nighttime illumination. *Entomologia Experimentalis et Applicata* 141:187–196.

Chinese rose beetles and feeding damage.

Feeding damage by adult rose beetles.

Citrus Leafminer *(Phyllocnistis citrella)*

Identification and Damage

- Larvae create leaf mines most often on the undersides of young terminal leaves by tunneling just under the surface layer.
- Leaf mining causes leaf deformity, chlorosis, necrosis, and some leaf drop, decreasing the tree's photosynthetic ability.
- Severe damage to young trees can delay maturity and fruit bearing by 1–2 years.
- Citrus leafminers feed primarily on citrus and related plants.
- Citrus leafminer leaf mines can be distinguished from others by the presence of a thin, reddish-brown fecal line along the length of the mines.
- Adult moths are active during early morning and early evening hours.

What to Do

- Biological control: A tiny parasitic wasp (Ageniaspis citricola) (adult and pupae shown below) is established on all islands and has kept citrus leafminer under control.

More Information

- Kerns, D. G. Wright, and J. Loghry. 2005. Citrus leafminer (*Phyllocnistis citrella*). In Citrus Arthropod Pest Management in Arizona. University of Arizona College of Agriculture, Cooperative Extension. Tucson, AZ.
- Nagamine W.T., and R.A. Heu. 2003 (rev). Citrus leafminer *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae) State of Hawai'i, Department of Agriculture. New Pest Advisory No. 00-01. Honolulu, HI.

Leaf mine with larva at left.

Leafminer larva.

Leafminer pupa.

Leaf mine damage.

Leaf mine damage.
(Photo credit: Walter Nagamine, HDOA.)

Leafminer adult.

Coconut Leafroller *(Omiodes blackburni)*

Identification and Damage

- Young larvae feed on the underside of the leaves beneath a thin, protective web of silk.
- Older larvae feed on epidermis of upper and undersides of leaves down to leaf ribs.
- Older caterpillars attach the edges of the coconut leaves together with silken threads to form a protective chamber.
- This pest is more prevalent in windy areas, possibly due to wind interference with its natural parasitoids.
- The coconut leafroller is believed to be endemic to Hawai'i and originated on either native bananas or endemic Pritchardia species. Later it fed on coconut as an alternate host after the palm's introduction. Host plants today also include other introduced palms and all varieties of banana.

What to Do

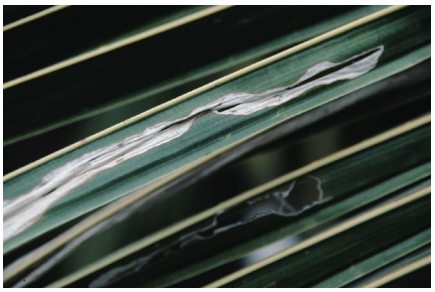
- There are a number of very effective parasites of the coconut leafroller in Hawai'i that are credited with the low incidence of injury from this pest:
  - Egg: *Trichogramma minutum*
  - Larvae: *Lespesia archippivora, Bracon omiodivorum, Casinaria infesta, Chaetogaedia monticola*, and *Diadegma blackburni*.
  - Pupae: *Brachymeria lasus, Pimpla punicipes*, and *Echthromorpha agrestoria fuscator.*
  - Caterpillars: Native ichneumonid wasp *Trathala flavoorbitalis* is probably most effective, parasitizing up to 90%.
- All these tiny wasps are hampered by strong winds and therefore less effective in windswept areas.
- Other predators include wasps *Odynerus nigripennis* and *Polistes* sp., which prey on caterpillars.
- Chemical control of this pest is usually not needed because of the effectiveness of its natural enemies.

More Information

- UH CTAHR Crop Knowledge Master: http://www.extento.hawaii.edu/kbase/crop/crop.htm.

Leafroller's silk threads on Pritchardia leaf. (Photo credit: A.H. Hara, UH-CTAHR.)

Older instars attach edges of leaves together with silk to create a protective chamber. (Photo credit: A.H. Hara, UH-CTAHR.)



Feeding damage to coconut leaf. (Photo credit: Ronald Heu, HDOA.)

Adult coconut leafroller moth.

Cypress Roach, Pacific Beetle Cockroach *(Diploptera punctata)*

Identification and Damage

- This roach gnaws and girdles the bark of branches, causing branch dieback distal to the girdling. Multiple branch dieback observed along the height of cypress trees indicates cypress roach infestation.
- In addition to *Cupressus* species, host plants include kiawe (*Prosopis pallida*), ironwood, and citrus.
- This viviparous roach does not lay eggs or egg cases but gives birth to live young every 2 to 3 weeks.

Damage to cypress.
(Photo credit: Brian Bushe, UH-CTAHR.)

What to Do

- Remove as much of the leaf litter within the tree as possible and spray with a pyrethroid insecticide approved for landscape use, such as cyfluthrin or bifenthrin. Assure complete spray coverage to branches where girdling occurs.

Beetle cockroach beneath cypress. (Photo credit: Brian Bushe, UH-CTAHR.)

More Information

- Fullaway, D.T. 1972. Norfolk Island Pine Culture. University of Hawai'i, Cooperative Extension Service. Circular 453.
- Fullaway, D.T., and N.L.H. Krauss. 1945. Common Insects of Hawaii. Tongg Publishing Company, Honolulu, HI.

Cypress roach. (Photo credit: A.H. Hara, UH-CTAHR.)

Cypress roach.(Photo credit: A.H. Hara, UH-CTAHR.)

Damage to cypress. (Photo credit: Brian Bushe, UH-CTAHR.)

Damage to cypress. (Photo credit: Scot Nelson, UH-CTAHR.)

Damage to cypress. (Photo credit: A.H. Hara, UH-CTAHR.)

Eucalyptus Longhorned Borer *(Phoracantha semipunctata)*

Identification and Damage

- Upon hatching, larvae begin to bore into tree bark and feed on the phloem, creating larval galleries in the cambium where pupation eventually occurs.
- Extensive larval feeding can girdle a tree. Early signs of infestation include branch dieback, while heavy infestations may cause sudden tree death, with discolored leaves remaining on the tree for up to a month.
- The scraping sounds of larvae chewing through the cambium can be heard several feet from heavily infested trees. Adult beetles emerge through the galleries created by larvae.
- Holes may appear in the bark of limbs or trunk, oozing liquid or a dark brown stain.
- Host plants for this beetle extend to several *Eucalyptus* species.
- Freshly chopped logs and branches drying for firewood are primary breeding sites for beetles seeking a moisture level conducive to egg laying.
- Moisture-stressed trees (under drought conditions) are the most susceptible, but healthy trees may also be infested.

Eucalyptus longhorned borer damage

Larvae

Adult and larva

What to Do

- Reduce moisture stress to trees by avoiding planting in poor soil or drought.
- Plant less susceptible *Eucalyptus* species.
- Protect trees from stress of injuries and extensive pruning.
- Avoid accumulating wood that is not dried and can serve as a breeding site for the borers: split logs and remove bark from felled branches to accelerate drying.
- Burn, bury, or chip infested wood, or solar-treat it: thoroughly seal small amounts of wood in UV-resistant plastic (10 mil) and store in direct sun for several months to kill borers.

More Information

- Bain, J. 1976. *Phoracantha semipunctata* (Fabricius) (Coleoptera: Cerambycidae). New Zealand Forest Service, Forest and Timber Insects in New Zealand No. 4: http://www.nzffa.org.nz/farm-forestry-model/the-essentials/forest-health-pests-and-diseases/Pests/Phoracantha-semipunctata
- Kliejunas, J.T, B.M. Tkacz, H. Bursdall Jr., G.A. DeNitto, A. Eglitis, D.A. Haugen, and W.E. Wallner. 2001. Pest risk assessment of the importation into the United States of unprocessed eucalyptus logs and chips from South America. Gen. Tech. Rep. FPL-GTR-124. Madison, WI: U.S. Dept. of Agric., Forest Service, Forest Products Laboratory. p. 49.
- Paine, T.D., S.H. Dreistadt, and J.G. Millar. 2009. Eucalyptus longhorned beetle. Pest Notes Publication 7425. University of California, Statewide Integrated Pest Management Program, University of California, Davis, CA.

Green Garden Looper *(Chrysodeixis eriosoma)*

Identification and Damage

- The green garden looper crawls in a "looping" fashion, arching the middle portion of its body to bring its hind legs towards its head, then extending its front legs to inch forward.
- Adult moths emerge from the pupae at dusk and are nocturnal, avoiding strong sunlight inside flowers, on vegetation, or on structure walls.
- Adults feed on flower nectar and honeydew.
- Adult males are ready to mate soon after emergence; however, females usually wait 1 to 4 days.
- The youngest instars consume only one side of the leaf, causing a windowpane effect. As larvae develop, they chew holes through the leaf.
- Older instars feed from the leaf margin.
- Green garden loopers are general feeders and have been reported on ornamental flowers and foliage (Aglaonema, chrysanthemum, Diffenbachia, Ficus, orchid, Syngonium, ti) as well as fruit and vegetable crops (basil, cabbage, celery, Chinese pea, corn, eggplant, green beans, lettuce, mint, parsley, peas, potato, spinach, sweetpotato, and tomato).

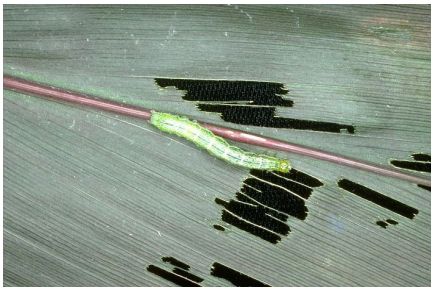
What to Do

- Non-chemical control: Several parasites present in Hawai'i contribute to controlling populations of the green garden looper, including tachinid flies (*Chaetogaedia monticola* and *Eucelatoria armigera*) and an encyrtid wasp (*Copidosoma truncatellum*), which has as high as 85% parasitization rate).
- Bacterial insecticides (*Bacillus thuringiensis*, or *Bt*) are effective when applied to achieve good coverage of targeted plants. *Bt* does not kill on contact but is a stomach poison that must be fed upon to be effective; early larval stages are most susceptible.
- Several viruses, including a nuclear polyhedrosis virus, infect the larvae.

More Information

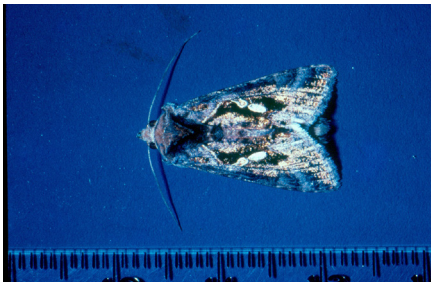
- UH CTAHR Crop Knowledge Master http://www.extento.hawaii.edu/kbase/crop/crop.htm Laboratory. p. 49.

Feeding damage caused by earlier larval stage. (Photo credit: A.H. Hara, UH-CTAHR.)



As larvae develop, they chew holes through leaves. (Photo credit: A.H. Hara, UH-CTAHR.)

Pupal stage of green garden looper. (Photo credit: Ronald Mau, UH-CTAHR.)



Adult garden looper moth has 1½-inch wingspan and is brown or bronze with silvery white marks. (Photo credit: Ronald Mau, UH-CTAHR.)

Monkeypod Caterpillars
(Polydesma umbricola, Melipotis indomita, Ascalapha odorata)

Identification and Damage

- Three species of caterpillars exist in Hawai'i: the monkeypod moth, monkeypod-kiawe caterpillar, and black witch (see above for their respective scientific names).
- Caterpillars feed in such large numbers they can defoliate tree canopies.
- Continued nightly feeding by larvae on sprouting leaves of the host plant causes "galling" on stems and prevents new growth.
- Defoliated trees can eventually die due to lack of nutrients. Stressed trees are also vulnerable to attack by other insects.
- The preferred host of these species is monkeypod, but they will attack related leguminous plants such as koa hoale (Leucaena) and kiawe (Albizzia).
- At dusk, caterpillars migrate up into the host tree's canopy to feed on foliage all night. At dawn, they hide in crevices in the bark or beneath leaf litter at the base of trees.

What to Do

- Do not prune the defoliated branches, which would further inhibit photosynthesis.
- Encircle the affected tree trunk with a band of carpet or burlap (approx. 12-inch width) to create a retreat site for caterpillars. Check under the covered area after sunrise and manually collect and destroy the caterpillars.
- Apply insecticide to the tree trunk (not the canopy or foliage) where the caterpillars retreat during the day.

More Information

- Oda, C.S., and R.F.L. Mau. 1974. Description and life cycle of the monkeypod-kiawe caterpillar *Melipotis indomita* Walker (Lepidoptera: Noctuidae). *Proc. Hawaiian Entomol. Soc.* 21: 435-441.
- Tamashiro, M., and W.C. Mitchell. 1976. Control of three species of caterpillars that attack monkeypod trees. University of Hawai'i Agricultural Experiment Station. Misc. Publication 123. Honolulu, HI. 4 pp.

Monkeypod caterpillar pupae.

Monkeypod caterpillar.

Larval feeding creates galls on stems.

Adult monkeypod moth.

Tree canopies may be defoliated.

New Guinea Sugarcane Weevil (NGSW) *(Rhabdoscelus obscurus)*

Identification and Damage

- The adult female weevil chews through plant tissue and deposits its eggs into the cavity. After hatching, the larvae (grubs) tunnel through the host plant's stem and pupate within.
- Host plants include sugarcane, palms (including betel nut, coconut, and pritchardia), dracaena, anthurium, and, to a lesser degree, papaya.
- NGSW prefers sick, decaying, or mechanically injured plant parts but will also bore into healthy, soft stems.
- The extent of an infestation may not be readily apparent since the adults hide within leaf sheaths or in bored stems and prefer to fly at night, though they may also fly in the late afternoon.
- Damage depends on the plant tissue affected. Boring into the base of coconut tree trunks weakens the tree, which is then susceptible to toppling by high winds. Boring into midribs can cause the leaves to break off, while boring into growing tips or crown of palm will kill the tree.

Adult weevil. (Photo credit: Walter Nagamine, HDOA.)

Pupa in fibrous cocoon surrounded by frass. (Photo credit: Walter Nagamine, HDOA.)

What to Do

- A parasitic fly (*Lixophaga spenophori*) introduced in Hawai'i has lessened weevil populations. The fly's maggots feed on the weevil's grubs, eventually pupating within the grub and emerging through the hole created by the adult weevil.
- Remove dead leaves and clear away trash to allow the parasitic fly to reach its prey.
- Keep palms healthy with optimal water, nutrient, and pest management.
- Traps baited with an aggregation pheromone combined with fresh-cut sugarcane and ethyl acetate lures can be used to monitor for the presence of NGSW but have not been tested for mass trapping to significantly reduce populations.

Larval feeding on coconut palm. (Photo credit: Aubrey Moore and George Wall, University of Guam.)

More Information

- Bianchi, F.A., and R.P. Owen. 1965. Observations on *Rhabdoscelus obscurus* (Boisduval) and *Rhabdoscelus asperipennis* (Fairmaire) in Micronesia (Coleoptera: Curculionidae). *Proc. Hawaiian Entomol. Soc.* 19:77–81.
- Davis, C.J. 1970. Recent introductions for biological control in Hawaii – XV. *Proc. Hawaiian Entomol. Soc.* 20:521–525.
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