Pacific Pests, Pathogens & Weeds - Fact Sheets

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Coconut rhinoceros beetle - Oryctes (108)

Photo 1. Characteristic damage done by the coconut rhinoceros beetle, *Oryctes rhinoceros*, showing V or wedge-shaped sections missing from the fronds eaten by the adults as they tunnel into the crowns of mature palms. (Solomon Islands)

Photo 2. Severe damage to young fronds by adult coconut rhinoceros beetle, *Orytes rhinoceros*. (Palau)

Photo 3. The damage from *Orytes rhinoceros* in Solomon Islands is so severe that palms are dying from the attack.

Photo 4. Close up of characteristic shape of fronds eaten by adult coconut rhinoceros beetle, *Oryctes rhinoceros*. (Palau)

Photo 5. Holes made by adult coconut rhinoceros beetle, *Oryctes rhinoceros*, in the base of fronds. Presumably, the holes were made when the leaves were much younger as the beetle tunnelled into the crown of the palm. (Palau)

Photo 6. Larvae of coconut rhinoceros beetle, *Orytes rhinoceros*, in a rotten coconut trunk. A favourite breeding site, especially in still standing but decaying palms (Fiji).

Photo 7. Larvae of coconut rhinoceros beetle, *Orytes rhinoceros*, under a log of unknown tree species.

Photo 8. Close-up of the larva of a coconut rhinoceros beetle, *Orytes rhinoceros*. Note that the C-shape grubs or larvae grow up to 100 mm.

Photo 9. The adult is jet-black, up to 40 mm long with a prominent horn. Both male and female beetles vary in size, and size cannot be used to distinguish the sexes.

Photo 10. Close-up of the head end of the coconut rhinoceros beetle, *Oryctes rhinoceros*. Male (right), female (left).

Photo 11. Underside of adult coconut rhinoceros beetle, *Oryctes rhinoceros*, to show the fuzzy group of hairs at the rear end of the female (left) compared to the male (right).

Photo 12. Close-up of the hind end of the coconut rhinoceros beetle, *Oryctes rhinoceros*. Female, with abundant hairs at the tip (left); male (right).

Photo 13. The grub or larva of a coconut rhinoceros beetle, *Oryctes rhinoceros*, infected by the fungus *Metarhizium* (Guam). The green areas are where the fungus is sporulating.

Photo 14. Trapping coconut rhinoceros beetle, *Oryctes rhinoceros*. Breeding sites are heaps of old fronds or other organic matter; they are covered by a gill net, and the beetles get caught in the mesh when entering or leaving the heaps.

Photo 15. Bucket traps for coconut rhinoceros beetles, *Oyctes rhinoceros*, with checken-wire covers and pheromone (Fiji).

Photo 16. Bucket traps for coconut rhinoceros beetles, *Oyctes rhinoceros,* placed above ground. About 2 m above ground is ideal.

Photo 17. Bucket trap with catch of coconut rhioceros beetles, *Oryctes rhinoceros.*

Photo 18. An artifical breeding site inoculated with spores of *Metarhizium anisopliae*, in order to infect larvae of the rhinoceros beetle, *Oryctes rhinoceros* (Fiji).

Common Name

Coconut rhinoceros beetle, rhinoceros beetle

Scientific Name

Oryctes rhinoceros. Several strains are recognised. In Pacific islands

Distribution

Widespread. South and Southeast Asia, Oceania. American Samoa, Fiji, Hawaii, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, and Wallis & Futuna. Recently, the beetle has spread to Guam, Hawaii, mainland Papua New Guinea, Solomon Islands, and Vanuatu (under eradicatiion).

Hosts

Coconut is the most important host, but other palm species are attacked, including betel nut, sago palm and oil palm. Banana, *Pandanus*, sugarcane and tree fern are also hosts.

Symptoms & Life Cycle

The adult beetle does the damage, boring into the crown of coconut palms, cutting across young fronds and flowers. When the leaves unfold the damage is seen as V or wedge-shaped areas missing from the leaflets (Photos 1-4). Holes in the base of the fronds may be obvious when beetle populations are high (Photo 5).

Oval eggs (3.5 x 4 mm) are laid one at a time, 5-15 cm, below the surface of moist organic materials, such as sawdust, manure, compost and garbage heaps, or above ground in tunnels, debris in axils of coconut fronds, in still-standing but dead and rotten coconut palms, and in the rotten ends of fallen coconut trunks (Photo 6). Logs and stumps of many other kinds of trees are also hosts (Photo 7). The eggs hatch in 8-12 days. The C-shaped larvae or grubs are white then creamy with brown heads (Photo 8). There are three stages lasting 80 to 200 days (depending on quality of the diet), with the third stage up to 100 mm long and 20 mm diameter. The last stage makes a hollow where it feeds, lining it with liquid faecal material, and then pupates. The two pupal stages last 25-40 days.

Adults remain in the ground for 2-3 weeks and then chew their way out. They are black with horns - those of the female often shorter than the male (Photos 9-12). Females live about 9 months, and lay about 50 eggs; males live about 5 months. The beetles are nocturnal, flying to the tops of coconuts where they use their mandibles, horn and strong forelegs to tunnel into the crowns. They do not eat the frass from

the tunnels; instead, they drink the sap that comes from tunneling.

Spread is on the wing, they are stronger flyers, and aboard ships and aircraft. They are attracted to lights.

Impact

The damage caused by the beetle results in loss of leaf area, flowers dying, early nut fall and, ultimately, lower yields. Occasionally, the beetles bore through the midribs of fronds, which snap in the wind.

It is difficult to relate damage to lost production. One way is to prune leaves to simulate beetle attack and compare nut yields on healthy palms. Using the relationship between damage and yield calculated elsewhere, work in Samoa showed that a 25% reduction in leaf area resulted in a 25% reduction in nut yield.

Indirect damage also occurs. In Asia and parts of Papua New Guinea, *Oryctes* attack encourages invasion by *Rhynchophorus* sp. palm weevils (**see Fact Sheet no. 180**).

Detection & inspection

Look for large jet-black beetles up to 40 mm long with prominent horns. Look for tunnels in the crown of coconut palms with frass - often more than one per palm. Look for the V-shape damaged fronds. Use a hooked wire inserted into the tunnel to remove the beetle. Differences between the strains depends on molecular tests.

Management

Research into management of *Oryctes* started in the Pacific islands in the 1960s. Today, the key agent is a virus (*Oryctes rhinoceros nudivirus* - OrNV) originally from Malaysia. A fungus, *Metarhizium anisopliae,* from the Philippines is also used. Apply control measures if 3-5 beetles occur per ha up to 2 years after planting, and 15-20 beetles per ha thereafter.

BIOSECURITY

Vigilance is needed at seaports and airports against hitchhiking beetles. Establish pheromone traps and regularly inspect coconut palms growing nearby for frass and leaf symptoms. This is particularly important as new strains of the beetle have been found in Pacific islands in recent years, in addition to the original strain, CRB-S (also known as CRB-P), that has been present for more than 100 years. CRB-G is now present in Guam, Palau, Papua New Guinea, and Solomon Islands, and CRB-PNG in the islands of Papua New Guinea and Solomon Islands. The damage of all the strains is similar, but there has been speculation that CRB-G is tolerant to OrNV, and that it is more aggressive.

The FAO/IBPGR *Technical Guidelines for the Safe Movement of Coconut Germplasm* should be followed when coconut germplasm is transferred between countries (http://www.bioversityinternational.org/e-library/publications/detail/coconut/).

NATURAL ENEMIES

There are many general predators (pigs, rats, ants and other insects) and scoliid wasp parasites (e.g., *Scolia ruficornis*). The nudivirus infects larvae and adults. It was released in Fiji, Samoa and Tonga in the late '60s and early '70s. Adult beetles are dipped in a suspension of ground, infected grubs, and then released to infect grubs in breeding sites, and adults in feeding tunnels. In Guam, spores of *Metarhizium anisopliae* (imported from the Philippines) are dusted onto beetles, which then contaminate larvae (Photo 13), and other beetles in breeding sites.

CULTURAL CONTROL

- Destroy fallen dead palms (split, allow to dry and burn); compost dead leaves and grass; and turn manure and sawdust heaps regularly and remove the grubs. Treat compost and manure with *Metarhizium* or insecticides. Note, in Samoa, the cutting of recently dead trunks has been questioned as a policy: the standing dead palms are (i) a valuable source of *Oryctes rhinoceros nudivirus*, and (ii) can be processed for fence posts, and other uses.
- Catch adults by covering breeding sites - heaps of fronds or other organic matter - with gill nets (Photo 14); the beetles get caught in the gill net when entering or leaving the breeding site. A method developed at the University of Guam.
- Catch adults with pheromone (ethyl 4-methyloctanoate) attached to bucket traps (15-17) spaced at 1-2 km (at beetle 'hot-spots'). Traps should be inspected at about every 3 month, beetles removed, and reloaded with pheromone.
- Make artifical breeding sites coconut logs containing organic material (chicken manure, sawdust, rotting coconut fibre, oil palm bunches) and laced with spores of *Metarrhizium anisopliae*.
- Grow a legume ground cover (e.g., *Pueraria phaseoloides*) over logs or stumps, and other potential breeding sites that cannot be

destroyed easily.

- Use a hooked wire to extract and destroy adult beetles feeding in the crowns of palms.

CHEMICAL CONTROL

Chemical control is uneconomical because of the low value of coconuts per unit area; additionally, it is impractical to apply insecticides except to young palms. If insecticides are needed, use synthetic pyrethroids. Traps with the attractant ethyl 4-methyloctanoate have been used to monitor populations and to give economic control in some countries. Use one trap per 2 ha.

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Information from Waterhouse DF, Norris KR (1987) *Biological Control Pacific Prospects.* Inkata Press, Melbourne; and from Mark Schmaedick (2005). Cococnut rhinoceros beetle. Pests and diseases of American Samoa, Number 8. American Samoa College Community & Natural Resources Cooperative Research & Extension. Photos 7-10&12 Mark Schmaedick, Land Grant Program, American Samoa Community College. Photos 2,4,5,9&11 Joel Miles, Bureau of Agriculture, Republic of Palau. Photos 9,19&12 **Mark Schmaedick, Entomologist, Land Grant Program, American Samoa Community College.** Photo 13 Fred Brooks, University of Hawaii at Manoa. Photo 14 Aubrey Moore University of Guam. Photos 6&15-18 Nitya Singh, Ministry of Agriculture, Fiji.

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