

SOUTH PACIFIC COMMISSION PAPUANA BEETLES



Left: *Taro corm with a hole caused by Papuana beetle. Note the beetle resting on the corm.*

Right: *Damaged corm of taro showing numerous holes and tunnels.*



PAPUANA BEETLES attack many crops in the Region but they are especially serious on taro (*Colocasia esculenta*).

As their name suggests they are important in Papua New Guinea where eighteen species have been recorded, eleven of which damage taro. The most important are *Papuana woodlarkiana*, *P. biroi*, *P. trinodosa*, *P. szentivanyi* and *P. huebneri*. Of the six species which occur in Solomon Islands, *P. uninodis*, *P. inermis* and *P. huebneri* are pests of taro. In Vanuatu, *P. inermis* and *P. huebneri* attack taro, while on the atoll of Tarawa in Kiribati *P. huebneri* is a serious pest of the giant swamp taro (*Cyrtosperma chamissonis*). In 1984 *P. uninodis* was found for the first time in Fiji. *Papuana* species also occur in Indonesia (Irian Jaya and the Moluccas Islands).

BIOLOGY

The following description is based on studies on *P. huebneri* which is the most widespread species.

The adult beetle (Fig. 1) is black and shiny, and 15-20 mm long. The size and number of head horns varies between species and sexes but generally the male horn is more prominent than that of the female. In *P. huebneri*, there is only one small horn; that of the male is larger.

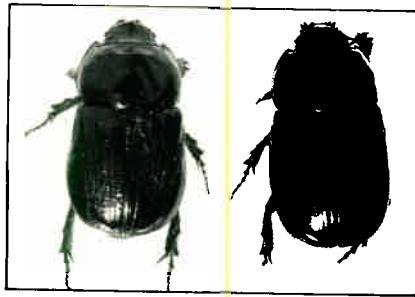


Fig 1: Male (left) and female (right) adults of *Papuana uninodis* (x 1).

The life-cycle (egg to adult) is completed in about twenty weeks. Longer life-cycles have been recorded for *P. woodlarkiana*

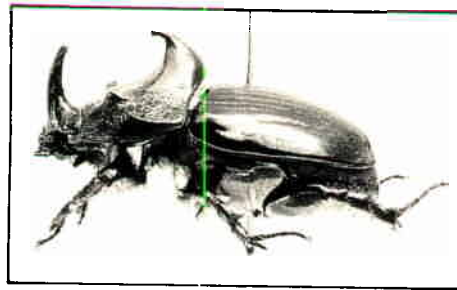


Fig. 2: Male *Papuana woodlarkiana* (x 1.5).

(Fig. 2) and for this and other species living in the highlands of Papua New Guinea.

Egg-laying begins seven weeks after adult emergence and on average 70 eggs are produced. They are laid singly under rotting logs, in decaying vegetation, or 100-150 mm below the soil surface. Initially they are oval, 2-3 mm long, white and soft with a tough flexible skin (Fig. 3). When dropped on a hard surface they bounce. During their development they enlarge to up to three times their original size. The larvae (grubs) emerge after 11-16 days.

The newly hatched larva is white and 4-5 mm long. At rest it lies in a "C" shape (Fig. 3), typical for this type of beetle. It is not known what it eats but most probably it feeds on rotting vegetation, humus and soil. Larvae have been found in taro gardens but only rarely have they been found feeding on corms. In Papua New Guinea there are reports of large numbers being present among the roots of pitpit (*Saccharum edule*) and sugarcane. The larva moults three times and when fully grown is 34-40mm long. At this stage it makes a chamber in the soil, in which it pupates (Fig 4). The adult emerges after three weeks.

DAMAGE

The adult feeds on taro corms and in the process forms smooth-sided tunnels of regular diameter (see front cover). The amount of damage to any crop depends upon the age of the plants when attacked and the number of beetles present. Newly

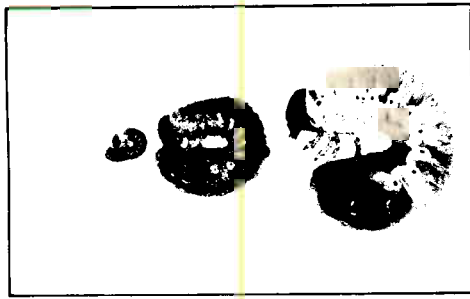


Fig. 3: Egg and first, second and third instars of *Papuana uninodis* (x 1).

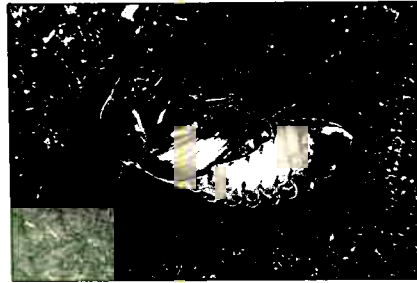


Fig. 4: Pupa of *Papuana uninodis* in its soil chamber (x 1).

planted setts will be killed if the beetles bore into the growing points. Such attack is uncommon and if it occurs suggests that there are many adults in the area, the offspring of which may cause severe damage late in the life of the crop. High infestations of the beetle can completely destroy the corm, while low infestations can reduce marketability through the presence of a single hole. Damaged corms may be more susceptible to rots.

Other plants attacked include *Xanthosoma sagittifolium*, bananas (*Musa* spp.), Canna lily (*Canna indica*), sweet potato (*Ipomoea batatas*), potato (*Solanum tuberosum*), pandanus (*Pandanus odoratissimus*), the bark of tea, coffee and cocoa and, in Fiji, the fern *Angiopteris evecta*.

P. woodlarkiana attacks coconut and oil palm seedlings in Solomon Islands.

CONTROL

Biological control

Two larval parasites of *Papuana* have been recorded, a scolitud wasp (*Scolia nitida*) in Solomon Islands and a tachinid fly (*Formosa* sp.) in Papua New Guinea. Neither of these is effective in controlling populations of the beetle. The fungus, *Metarhizium anisopliae*, kills larvae and adults, but very high levels of inoculum in the soil are necessary and this makes its use impractical at present. In Fiji, a strain of baculovirus from the rhinoceros beetle (*Oryctes rhinoceros*) has been shown to kill adult beetles in the laboratory, but field trials with the virus have yet to be completed.

Cultural control and varietal resistance

Reports of reduced attack have been made following the use of specific cultural techniques, e.g., the use of bananas or pitpit as trap and barrier crops around taro plots, regular and thorough weeding of the crop, and the application of wood ash into the planting hole.

Mulching of taro has been shown to increase beetle attack in Solomon Islands and should be avoided.

In Kiribati, *P. huebneri* apparently prefers the giant swamp taro variety "ikaroi" rather than "katutu". In Papua New Guinea and Solomon Islands varietal differences in susceptibility have been reported, but no useful resistance has been found.

Chemical control

In Papua New Guinea one application of 6 per cent lindane (Gamma BHC) granules is recommended at a rate of 1 kg active ingredient per hectare, mixed into the soil where a planting hole is to be made. In Solomon Islands this method has not been tried. Instead, two applications of lindane granules, each at 1 kg active ingredient per hectare, are recommended. The first is applied into the hole at planting and the second is added to the soil surface three months later. In Kiribati the application of persistent pesticides cannot be recommended for fear of contaminating the fresh water lens.

QUARANTINE PRECAUTIONS

Because of the risk of transferring *Papuana* beetles and other pests and diseases, the unrestricted movement of taro between countries of the Region should not be permitted. If it is essential to import corms they should be washed free of soil, the tops cut off and scraped to remove the buds (devitalised). If holes caused by *Papuana* beetles are seen then the corms should also be fumigated with methyl bromide at normal atmospheric pressure as indicated below:

g/m ³	Time (hours)	Temperature (°C)
40	3	16-20
32	3	21-26
24	3	27-32

Care must be taken to monitor the temperature and gas concentration during fumigation.

The movement of taro-propagating material between countries should be limited to small quantities for scientific purposes under the supervision of the specialist officers of the agricultural services. Preferably these introductions should be as sterile pathogen-tested plantlets growing in tissue culture. (For more information see SPC *Quarantine Advisory leaflet* No. 9. □

This leaflet was prepared by Bob Macfarlane, Plant Protection Officer, South Pacific Commission, Suva, Fiji. The photographs were taken by Bob Macfarlane (Cover and Fig. 4), Detlef Blumel, Graphic Arts Officer, South Pacific Commission, Suva, Fiji (Figs. 1 and 3) and Dr Brian Thistleton, Entomologist, Department of Primary Industries, Papua New Guinea (Fig. 2).

Further information may be obtained from the Plant Protection Officer, South Pacific Commission, Private Mail Bag, Suva, Fiji.

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