TWO EXAMPLES OF BIOLOGICAL PEST CONTROL

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INTRODUCTION

Weeds and insect pests are responsible for huge losses of crops and livestock throughout the world. There are five basic methods by which they are controlled.

1. Legislative control: Most countries attempt to stop foreign insect pests and weeds from entering their territory. This is done by inspection of vessels and cargo at all ports of entry. In Papua New Guinea, this inspection is handled by the Quarantine Service of the Department of Primary Industry. Sometimes a country will also try to stop the spread of pests within its territory for example from one island to another.

2. Cultural control: This is an attempt to plan agricultural operations in such a way as to prevent or lessen pest damage.

3. Chemical control. The modern and usually expensive method of controlling pests and weeds is by use of chemicals such as D.D.T. and 2,4-D. Experience has shown that this method can be dangerous especially with very poisonous chemicals and untrained labour.

4. Mechanical or physical control: This is the physical removal of plant or animal pests, for example by weeding or by hand removal of insects from a crop.

5. Biological control: This is the introduction of natural enemies of a pest into an area where they are not normally found in the hope that they will control it. The advantages of this method are that it is comparatively cheap, it does not pollute the environment, and the control agents are self perpetuating (do not have to be reintroduced every season).

The aim of this article is to illustrate the use of biological control by two examples from Papua New Guinea.

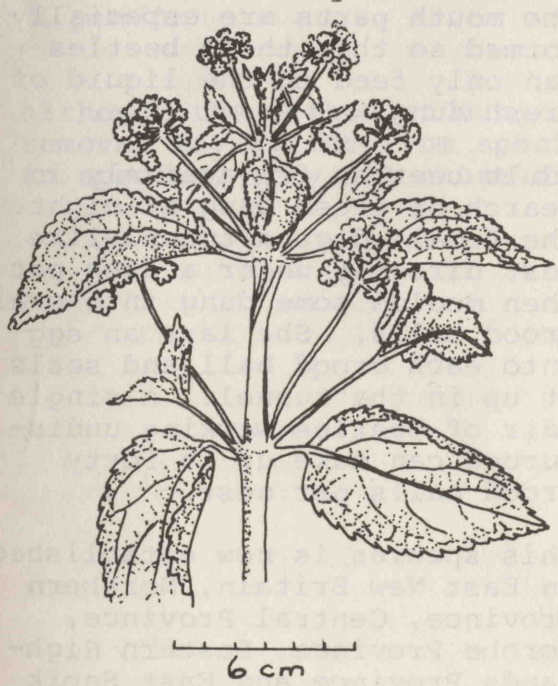
BIOLOGICAL CONTROL OF *LANTANA*

The plant *Lantana camara* comes from tropical America. It has been introduced to most tropical and sub-tropical countries and where the climate is suitable, it has become a serious weed. This is because the natural enemies (insects or diseases) which keep it under control in its native land are not present in these other countries. Without this check on their growth, the plants can spread very quickly, becoming serious pests in a relatively short time. Before the natural enemies can be brought into the new host country for biological control, tests have to be made to ensure that they do not feed on other species of plants.

The exact date of *Lantana* intro-

duction into Papua New Guinea is not known. The weed is now found in various forms and densities in some provinces while, in others, it either is not present or has not been reported.

The Hawaiian State Government attempted biological control of *Lantana* early this century using insects from Mexico and Central America. Recently, the Commonwealth Scientific and Industrial Research Organisation (C.S.I.R.O) Division of Entomology in Australia has made a concerted attempt to control the weed in this way, importing new insect enemies to supplement those already there.



This is what the leaves and flowers of Lantana *look like.*

At the Long Pocket Laboratories in Brisbane, C.S.I.R.O. has bred and tested a number of insects which eat *Lantana*. These include:-

1) In the bug family:

a) *Teleomia scrupulosa*

b) *Teleonomia elata*

c) *Leptobyrsa decora*

This group of insects causes damage to the plant by sucking the sap from young and tender growing points.

2) In the beetle family:

a) *Octotoma scabripennis*

b) *Uroplata girardi*

The damage these two beetles cause is due to the adults feeding on the leaf surface and to the larvae tunnelling into the leaves.

So far only one of these species is available in Papua New Guinea. *Teleonomia scrupulosa* is present in widely scattered areas and possibly came into the country with the original *Lantana* stock. The wild populations of this bug have been boosted with laboratory raised stock imported from Australia.

It is anticipated that other species of insects feeding on *Lantana* will be introduced into Papua New Guinea as they become available. However, before this can be done, they must be very carefully tested to make sure that they do not eat any useful plants as well.

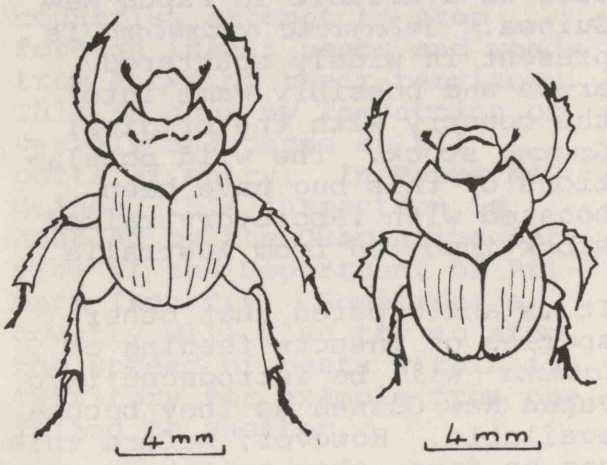
BIOLOGICAL CONTROL OF BUFFALO FLY

Dung beetles are useful insects which bury animal droppings in the soil and so help to improve its fertility and structure (see HARVEST 5(2):80-83).

The only large animals in Papua New Guinea before the introduction of cattle, were pigs and wallabies, and so the native dung beetles developed to make use of their small, fairly dry droppings. Cattle have large, wet droppings which the native beetles cannot use. Without

dung beetles to bury them, these droppings stay on top of the soil for several months before they are broken up by rain, ants or termites.

On heavily stocked pastures, quite a lot of the land becomes covered with dung. Grass will not grow on the dung patches and the cattle will not eat grass growing close to them. This means that a lot of good land is wasted. To overcome this problem, a number of foreign species of dung beetle, adapted to cattle dung, have been introduced into Papua New Guinea.



A native dung beetle

An introduced dung beetle

As well as increasing the area of productive pasture and improving soil fertility, the beetles have been found to help to control buffalo fly and other flies which are cattle pests.

This is because the flies can only breed in fresh cattle dung. They lay their eggs in the dung and when the maggots hatch out, they feed on it. If the dung is quickly buried by the beetles, then the flies will be prevented from breeding in it and so they will slowly die out.

This is biological control of the buffalo fly by the dung beetle through removal of the fly's breeding sites.

Papua New Guinea imports dung beetles from C.S.I.R.O. in Australia. Most of the C.S.I.R.O. stocks have been imported from Africa.

Four of the species of dung beetles which have been imported into Papua New Guinea are described below:

1. *Onthophagus gazella:* This has a broad, squat shape and strong digging forelegs. Male beetles have one or more ornamental horns sticking out of the head but females rarely have any. The mouth parts are especially formed so that these beetles can only feed on the liquid of fresh dung.

Adult beetles fly actively in search of fresh dung at night. The female digs a tunnel-like nest directly under a dung pat then moulds some dung into oval brood balls. She lays an egg into each brood ball and seals it up in the tunnel. A single pair of beetles working undisturbed can make up to forty brood balls per nest.

This species is now established in East New Britain, Northern Province, Central Province, Morobe Province, Eastern Highlands Province and East Sepik Province.

2. *Sisyphus spinipes:* This species moulds dung into a ball while at the dung pat and then rolls the ball a few feet away before laying an egg in it. The brood balls are left on the soil surface, not buried in tunnels. It has not been possible to breed this species in Papua New Guinea although it is successfully established in parts of tropical Australia.

3. *Onitis alexis:* This is a larger species than the first two with similar nesting habits to *O. gazella*. It was released in the Northern Province but did not become established there.

Plans are being made to import more stock from Australia for release in the Central and Morobe Provinces.

4. *Ontophagus obiquus:* This species is considered to be adapted to wetter areas. It has been released at Popondetta, Lae, Wau and Bulolo but it is not yet known if it has become established in these places. The nesting habits of this beetle are similar to those of *O. gazella*.

Although the method of dung removal may differ from species to species, they all cause disruption of the buffalo fly life cycle by starving the maggots of dung. The rate of removal of dung depends on the number of paired beetles present and their size, and is the most important factor in fly control

FURTHER WORK

Research is continuing on both of the examples of biological control given in this article and several other projects are underway. One of the most successful biological control programmes in Papua New Guinea at present was described in an earlier issue of HARVEST (5(2): 84-91) and concerns the use of a virus to control rhinoceros beetles.