INTRODUCING A WEEVIL FROM AFRICA TO POLLINATE OIL PALM IN PAPUA NEW GUINEA

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INTRODUCTION

The oil palm was first introduced to Papua New Guinea from Africa about 50 years ago. Only in the last 15 years has the crop become the base of a large industry. Oil palm is now important in the West New Britain and Northern Provinces, where a total of over 30,000 ha of oil palm has been planted.

In Africa it was believed that oil palms were naturally pollinated by the wind. When poor pollination occurred, this was thought to be because of a shortage of pollen, or because rain had washed the pollen away. However, when scientists came to investigate pollination, they found that high yields were still obtained, even after very high rainfall. Because of this, scientists in Africa began to look for insects which might be involved in pollinating oil palms.

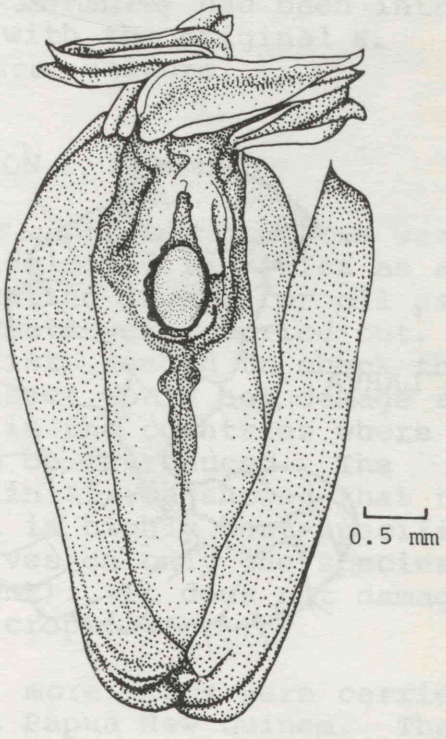
Several insects were found to be involved. After 3 years of studies one species of weevil was selected as being possibly suitable for introduction to Asia and the South Pacific. The weevil is *Elaeidobius kamerunicus*. It is one of the most important pollinators of wild oil palm in West Africa.

In Papua New Guinea, oil palms had always been hand pollinated. This takes a long time, and on large plantations requires a lot of labour. It was decided to introduce and to establish the West African pollinating weevil, *E. kamerunicus*, to see if it would improve oil palm pollination and fruit set in Papua New Guinea.

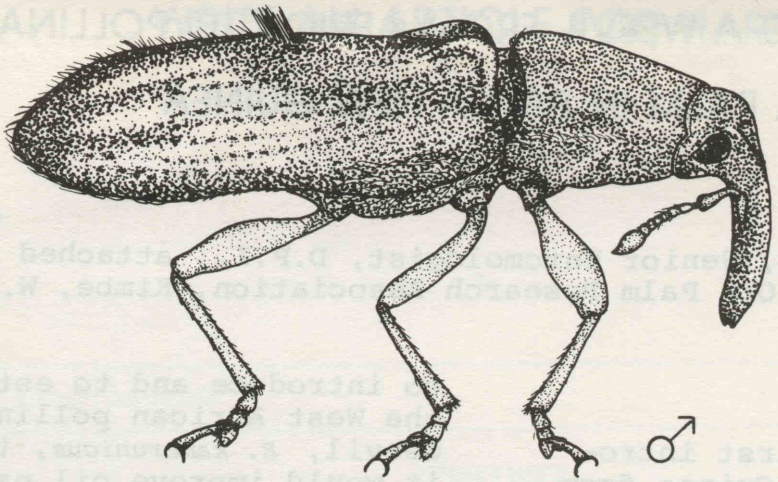
THE LIFE CYCLE OF *ELAEIDOBIUS KAMERUNICUS*

Adult weevils are 2-3.5 mm long and dark brown in colour. The male is usually slightly larger than the female. The male has a shorter rostrum (beak) and two projections on its wing covers (see diagram on page 54).

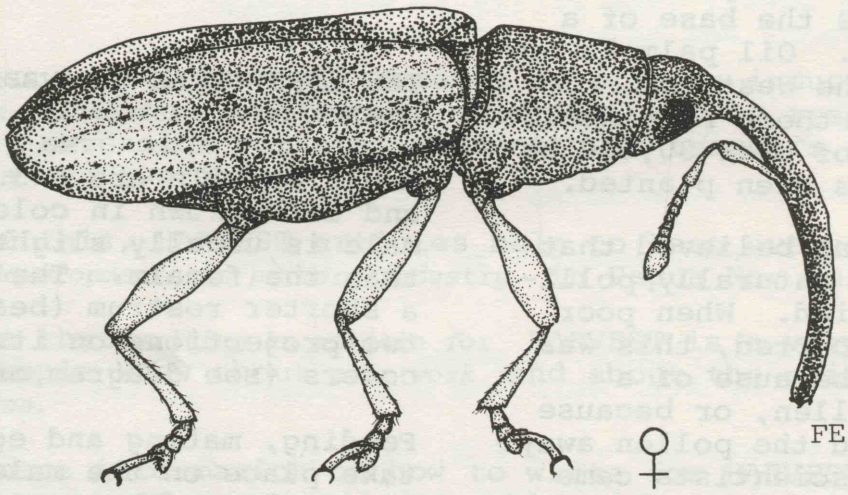
Feeding, mating and egg laying take place on the male flower.



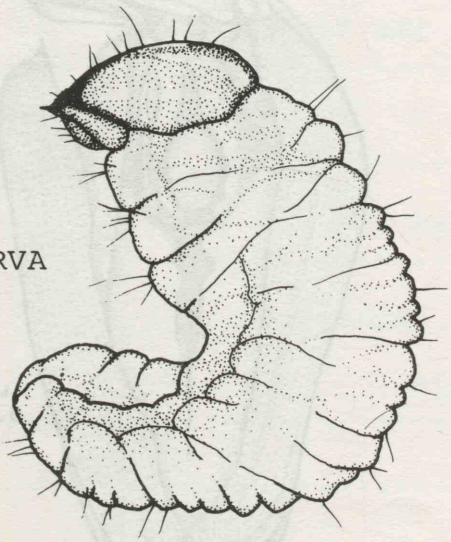
A single male flower of the oil plam showing an egg of Elaeidobius *inside*



MALE ♂

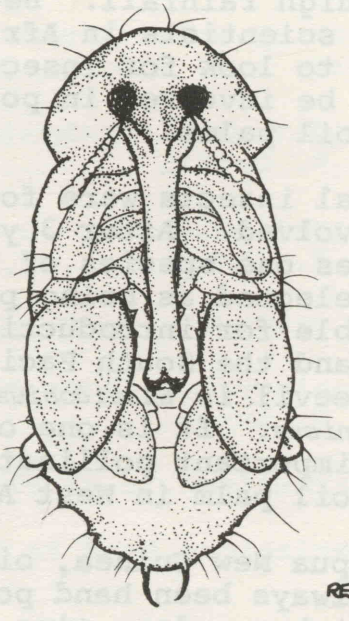


FEMALE ♀



LARVA

PUPA



0.33 mm

The West African pollinating weevil, Elaeidobius kamerunicus

Eggs are laid singly in small holes chewed in the anther filaments. The eggs hatch in about 24 hours. The small, pale yellow larvae eat the soft tissues beneath the anthers. The larvae grow and change their skins 3 times. They are fully grown in about 8 days.

Pupation (the resting stage) is also inside the flower. The pupal stage lasts about 3 days.

Adult weevils begin to emerge at about 10 days after egg laying. Females usually emerge first, with the males following a day or so later.

The life cycle in Papua New Guinea takes 10-15 days. In the field, females live about 50 days and males about 30 days. The female lays eggs usually during the first 25 days after emergence at a rate of 1 to 2 per day.

POLLINATION

Both the male and female flowers of oil palm have a strong smell of aniseed. It is this smell which attracts the weevils. They visit both male and female flowers in search of breeding sites. The weevils become covered in pollen after visiting the male flowers. If they then visit a female flower, some of the pollen is rubbed off their bodies onto the female flower parts. Pollination then takes place. Because there is a large number of weevils and they are very active, this process is very efficient.

Stages in pollination are shown in the diagram on page 56.

QUARANTINE AND REARING

Before *Elaeidobius kamerunicus* was released into the main oil palm areas in Papua New Guinea, it was held in quarantine. A site was chosen at D.P.I. Bubia, just outside Lae. A small trial plot of oil palm had been planted there in 1968. A special laboratory where the insects could be reared and tested under strict quarantine was built by the Papua New Guinea Oil Palm Research Association.

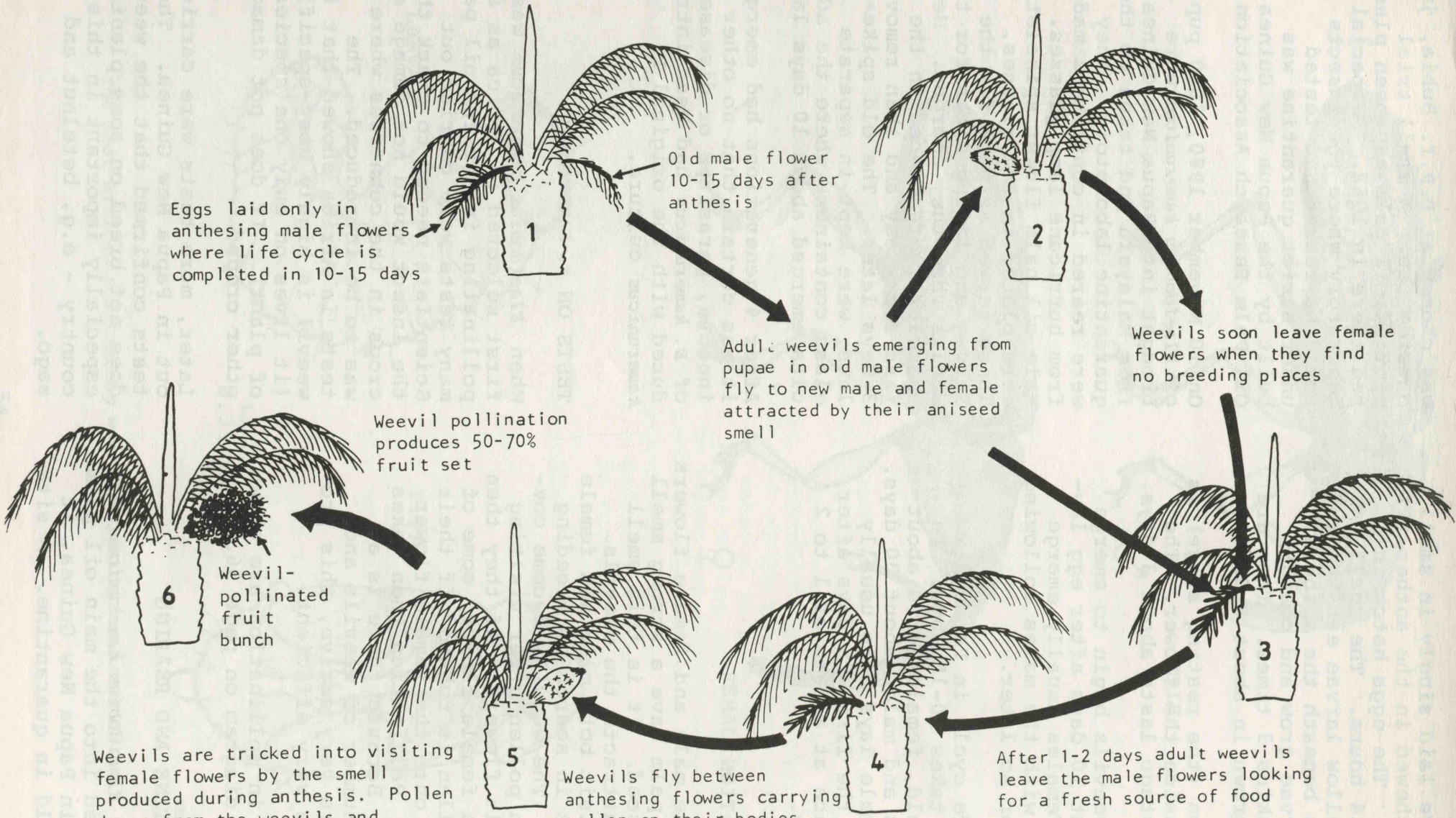
On 10 November 1980, 1000 pupae of *Elaeidobius kamerunicus* were brought into Papua New Guinea from Malaysia and taken to the quarantine laboratory. They were reared in containers made from hurricane lamp glasses. Male oil palm flower spikelets were placed in the glasses. These served as food for the larvae and laying sites for the adults when they emerged. New spikelets were placed in the jars every day and then removed 3 days later. The old spikelets, were kept in separate glass containers where the adults emerged about 10 days later.

After 4 generations had emerged, it was certain that no other insects, parasites or diseases of *E. kamerunicus* had been introduced with the original *E. kamerunicus* culture.

TESTS ON *E. KAMERUNICUS*

When *Elaeidobius kamerunicus* was first selected in Africa as a pollinating insect for oil palm, many tests were carried out. Scientists needed to check that the insect would not damage any crops in the countries where it was to be introduced. The tests in Africa showed that the weevil is highly host-specific (it lives on only one species of plant). It does not damage other crops.

Later, more tests were carried out in Papua New Guinea. These tests confirmed that the weevil does not breed on some plants especially important in this country - e.g. betelnut and sago.



Pollination of oil palm by the introduced African weevil

THE RELEASE OF THE WEEVIL IN PAPUA NEW GUINEA

The quarantine requirements for pest and disease freedom, and host specificity had now been demonstrated in Papua New Guinea. It was considered safe to release the weevil.

The first release in Papua New Guinea was at Bubia in April 1981. In less than 50 days the weevil was well established throughout the 4 ha block of oil palm. It was then decided to release the weevil in the commercial areas of oil palm as soon as possible.

Large numbers of weevils were reared in plastic dustbins. The insects were then brought to Dami, West New Britain Province.

At first the insect was released at one site only. This was done by placing male spikelets containing pupae, into the crown of a palm. From there the weevils spread outwards to the palms over 4-5 ha. Male spikelets were taken from this area and distributed over the whole oil palm development in West New Britain, an area of 12,000 ha. The distribution was finished by the end of August 1981.

The weevil was also established at the oil palm development in Popondetta by December 1981.

THE EFFECTS OF INTRODUCING *ELAEIDOBIUS KAMERUNICUS*

1. There is now no need to hand pollinate.

2. Insect pollination is more efficient than hand pollination. The improvement depends on how well hand pollination was being carried out. As the palms grow taller, hand pollination becomes more difficult. Therefore the biggest improvement in the amount of fruit produced is seen on the older palms.

After 8 months under full weevil pollination, some areas reported a doubling of the yield of oil compared with the last 3 years. Production lost because of bunch failure (rotten bunches) caused by poor pollination was reduced. Also, better pollination increased the percentage of oil extracted from 18.5% to 21%.

The weevil has now been introduced successfully to all the oil palm areas in Papua New Guinea. As a result, the production of palm oil has increased considerably. The introduction of a foreign insect was therefore justified by the increased production of palm oil, and the removal of the need to hand-pollinate the palms.

(Illustrations on pages 53 and 54: R.E. Sutherland)