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NOTES ON THE BIOLOGY OF *'Oryctes monoceros'* (OLIV.) A PEST OF PALMS IN NIGERIA.

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ABSTRACT

Studies on the biology of the rhinoceros beetle, *Oryctes monoceros* Oliv. was conducted in the laboratory. *O. monoceros* has 3 larval instars. In the mean the egg stage lasted 11, the larval stages 75.6, the pupal stage 15.5 and the adults stage 51.6 days. The mean developmental period from egg to adult for *O. monoceros* was 145 days. The beetle lives for about 5 months of which between 2-3 months are spent as a larva.

KEY WORDS: *Oryctes monoceros,* Oviposition, Larvae, Pupation, Moulting.

INTRODUCTION

The cultivated oil palm (*Elaeis guineensis* Jacq.) is a monocotyledonous tree belonging to the family Palmaceae and the sub- family Cocoideae. Optimum performance of this popular economic crop has been observed to be affected by the menace of insect pests (Ria, 1977; Tiong, 1981; Jacquemard, 1998). In Nigeria, larvae and adults of *Oryctes monoceros* Oliv. are usually present all year round in palm plantations. Here, the beetles have been observed attacking the bases of the leaf stalks, borrow into trunks, and gnawing the young unopened leaves above the bud. Infestation has also been observed in coconut Palm (*Cocos nucifera*).

Information on the general biology of *Oryctes monoceros* is scanty as most reports have been on the nature of damage (Golding, 1946; Turner and Gillbanks, 1974; Young, 1975). There have been records of the presence of *O. monoceros* in other parts of the world. Beck (1942) reported that it is found not only in Africa but also in Arabia. Other related species which are known to infest either the Oil Palm or the Coconut Palm in Nigeria, Malaysia and Burma are *O. boas*, *O. erebus* and *O. owariensis* (Corbett, 1927;Hartley, 1988). This paper is a report on the general biology of *Oryctes monoceros* based on laboratory and field studies in the Ibiae Oil Palm Plantations of the Cross River Oil Palm Estate, Nigeria.

MATERIALS AND METHODS

Larvae of *O. monoceros* collected in February, 2000 from Ibiae Oil Palm Estate were reared in the laboratory at the University of Calabar, Calabar at 24.0°C-32.0°C (mean 26.8°C) and 60-80% relative humidities. They were reared in open glass troughs on pieces of dead oil palm trunks. Adults from the pupae were sexed and a pair (male and female) placed in glass containers. Checks were made twice daily for eggs. Eggs laid (and some collected from the field) were placed singly in the frass of the palm in 27x10.5cm specimen tubes. A total of 36 specimen tubes were used for the study, half of which contained eggs collected from the field and the rest laboratory laid eggs. Records were kept of the development of the insect at the different stages from the egg to the adult. These included the number of eggs laid per female, number of eggs hatched with respect to the laboratory laid eggs and those collected from the field, number of instars and their duration, the

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head capsule measurements and the age of the beetles at the time of egg laying. The study was repeated in February 2001.

RESULTS AND DISCUSSION

Egg and Oviposition

The results of the biological study of *Oryctes monoceros* reared under laboratory conditions is shown in Table 1. Copulation and oviposition of eggs were not observed since these took place within the frass of oil palm trunk. However, eggs were laid singly within the frass. The number of eggs laid varied from 1-8 eggs per female. But, in the field 18 eggs were collected from one dead palm trunk and a search revealed a single female. This confirms the observation that *O. monoceros* in captivity does not lay many eggs (Dry, 1922; Ukeh, 2002). The age of the beetles at the time of laying varied between 35-40 days.

The egg when freshly laid was milky white, spherical or oval in shape, and had a diameter of 2.5-3.5mm. The eggs obtained from the field were similar in size and colour to those laid in the laboratory. The larva ate its way out of the egg chorion after about 10-13 days. Out of the 18 eggs obtained from the field, 15 (83.3%) hatched into larvae, while 11 (61.1%) of the 18 laboratory laid eggs hatched giving a total of 26 larvae. Older larvae were observed to prey upon the young ones as they emerge from the eggs. As a result of this predation, 21 larvae were left for pupation.

LARVAL GROWTH

O. monoceros larvae measured between 8-10mm on hatching. The head capsule and body were translucent white. The head capsule, however, turned brown after 2 hours. The emerged larva fed on the fibrous materials of the oil palm. Growth was rapid and there were only 3 larval instars. The first larval instar lasted between 9-20 days, the second larval instar

Table 1: Biology of *Oryctes monoceros* under Laboratory Conditions.

	Egg (days)	Larva (days)	Pre-pupa (days)	Pupa (days)	Adult (days)
Max. No. of days	13	98	16	16	54
Min. No. of days	10	59	5	15	44
Mean No. of days	11	75.6	8	15.5	51.6

Table 2: Head Capsule Measurements and Duration of Larval Stages

	Mean head capsule Measurement (mm) Width	Length	Mean duration of each larval stage (Days)	Range (days)
1st Instar	3.50	3.50	13.4	9-20
2nd Instar	6.02	6.02	18.9	16-24
3rd Instar	11.00	12.44	43.3	34-54

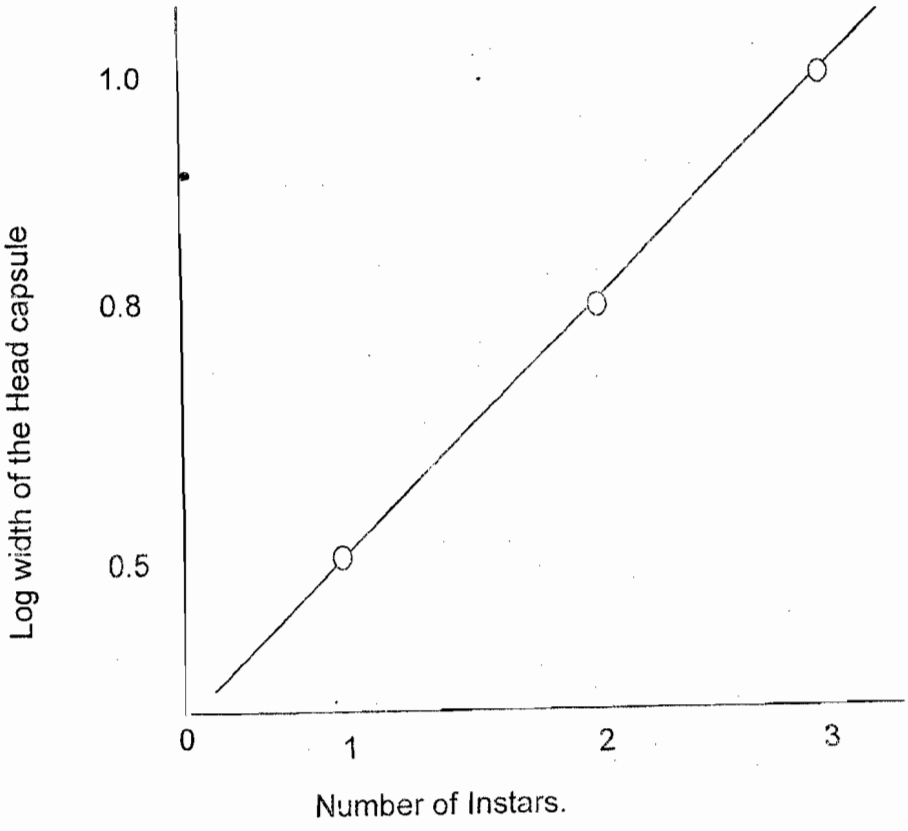

Fig. 1. Growth rate of *O. Monoceros* – after Dyar

lasted between 16-24 days, while the third larval instar lasted between 34-54 days. In general, the larval stage lasted between 59-98 days. Moulting was preceded by the preparation of moulting space as if the larva was about to pupate. The head capsule widths, lengths and duration of each larval instar are shown in Table 2.

The width of the head capsule *of O. monoceros* increased from 3.5mm in the first instar to 11.0mm in the third instar. Wigglesworth (1939) reported the observations of Dyar that the head capsule of caterpillars grows in a geometrical progression, increasing in width at each moult by a ratio which is constant for a given species. When the number of instars was plotted against the logarithm of the width of the head capsule, a straight line was obtained (Figure 1). The growth ratio was 0.3 for the first 2 instars but diminished in the third instar to 0.2. This may be explained by the variation which occur as a result of fact that pupation occurred at the third instar thereby terminating larval growth.

PUPATION

The third instar larva or grub measured 8-11cm in length (dorsal surface) and 1.6-1.8cm in width. In the laboratory the grub when fully grown formed its cocoon. It became quiescent, wriggled from side to side thus creating a large concavity to accommodate itself. It exuded a fluid which bound the fibrous materials of the oil palm trunk and the excrement from the larva into a cocoon around itself. Within a cocoon it voided out most of its gut contents, assumed a milky or translucent white colour and shortened up. It remained in this state (pre-pupa) for an average of 8 days. On pupation a split occurred along the coronal, adfrontal and frontal sutures of the head

capsule and also along the mid-dorsal line of the thorax to about the mid-half of the abdomen. The last bits of food in the digestive tract were voided with the last larval skin. The pupa was exarate, brown and measured 4.0-4.5cm in length, 1.7-2.0cm in width. Towards the end of the pupal period it turned slightly dark brown.

Adult

The adult beetles emerged in the mornings between 6-11a.m. On emergence, the elytra were yellowish brown. The head capsule, the sternum and the pronotum darkened first. Adult beetles have a mean life span of 51.6 days in the laboratory. In the field damage to oil palm trees was observed to be caused by the adults and not the grubs.

For the egg, larva, pre-pupa and pupal period, except for little differences, there is some measure of agreement in the life cycle of *O. monoceros*. However, in the adult stage, Dry (1922) found that they lived for over 100 days, twice as much as was recorded in Calabar. While Beckett and Usua (1979) observed that the adult beetle could live as long as 6 months. This wide difference may be partly due to differences in nutritive value of host plants, or to differences in altitude and environmental conditions.

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