INSECT FAUNA OF OIL PALM IN THE NORTHERN PROVINCE OF PAPUA NEW GUINEA

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ABSTRACT

Pyrethrum knockdowns were used to sample the insect faunas of two 3 ha plots of oil palm. Approximately 150 samples were taken in each plot at regular intervals throughout 1973. The ant Anoplolepis longipes *was the most abundant insect present. Five or more specimens of a further 25 species of insect were taken, and the distribution of some of these was found to vary between plots and between the edges and interior of the plots. The insect fauna of the Saiho plot changed substantially between 1968 and 1973; it is suggested that the changes were associated with the development of the palms, and that change was continuing during the study. Very little insect damage was present, in marked contrast to plantation situations elsewhere; in particular no Psychidae were found.* Scapanes australis *was the only species causing significant damage.*

INTRODUCTION

In 1967 the Department of Agriculture, Stock and Fisheries, planted two small plots of oil palm in the Northern Province of Papua New Guinea with a view to establishing the suitability of the soil and climate for palm oil production. During the late 1960s and early 1970s the major cash crop industry in the area, cocoa, went into a decline associated with insect pest problems. In 1972 it was suggested that areas of unproductive cocoa be cleared and replanted with oil palm to establish a production system similar to that on West New Britain (Anon. 1972).

This paper presents the results of a one-year survey of the more abundant insects found in the two small experimental plots of oil palm. The aims of the survey were to provide general information on the insect fauna present and to establish which species known as oil palm pests elsewhere were already present in the area.

SAMPLING SITES

One plot of oil palm was located at the Saiho Agricultural Field Station about 30 km SW of Popondetta. It was surrounded by food garden clearings and coffee plantings interspersed among patches of rainforest.

The second plot was in the grounds of the Popondetta Agricultural Training Institute (PATI) 3 km E of Popondetta. PATI contained extensive cocoa plantings, and the oil palm plot was adjacent to an area of rubber on one side and pasture dominated by *Imperata cylindrica* (L.) on another. PATI has an appreciably drier climate than Saiho. Haantjens (1964) gives details of the soils, climate and vegetation of the Northern District.

Both oil palm plots contained 19 × 17 palms on a triangular spacing of approximately 12 m. The palms at Saiho were 3-4 m tall at the crown and bearing fruit; the palms at PATI were only 1.5-2 m tall and bore no fruit.

METHODS

All sampling was by 'pyrethrum knock-down': a white sheet was placed on the ground and the foliage above it was sprayed to runoff with 0.2% bioresmethrin from a 'Solo' mistblower. All insects falling onto the sheet within 30 min of spraying were collected.

Each plot was mapped and divided into four quadrants. On each sampling occasion one sample was taken from each

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quadrant. Alternate samples were taken using intact 3 × 3 m sheets placed equidistant from surrounding palm trunks (canopy samples); the remaining samples were taken using 3.3 × 3.3 m sheets which had a slit from one side to a 1.5 m diameter central hole and were placed around the bases of palm trunks (trunk samples). On each sampling occasion, sampling sites were two palms away from the sites used on the previous occasion. Sampling was carried out between 08.00 and 11.00 hrs on the first three Wednesdays of all months between 1 January 1973 and 18 December 1973, except in July and August when sampling occurred on four occasions in each month.

In such small plots, edge effects were expected to be important. To enable preliminary analysis of these effects, all samples within two palms of the edge of a plot were recorded as 'edge samples', while the remainder were recorded as 'interior samples'

Table 1.—**Total numbers of individuals taken in each location/position (figures in parenthesis are individuals per sample)**

	Saiho	PATI	Trunk	Canopy	Edge	Interior
Number of samples:	152	148	150	150	63	237
Blattodea						
indeterminate sp.6	676	674	432	918	156(2.5)	1194(5.0)
indeterminate sp.21	6	93	57	42	22(0.4)	77(0.3)
Dermaptera						
Chelisoches morio (F.)	2365	522	2 760	127	891(14.1)	1196(8.4)
indeterminate sp.16	106	0	48	58	21(0.3)	85(0.4)
indeterminate sp.26	10	12	21	1	9(0.1)	13(0.1)
indeterminate sp.30	3	2	5	0	0	5
Orthoptera						
Segestidea princeps Bolivar	211	0	83	128	39(0.6)	172(0.7)
Tettigoniidae sp.2	37	140	33	144	13(0.2)	164(0.7)
Mecopoda elongata (L.)	296	2	133	165	24(0.4)	274(1.2)
Cardiodactylus novaeguineae Haan	333	7	284	56	44(0.7)	296(1.3)
Phasmatodea						
indeterminate sp.18	117	0	79	38	8(0.1)	109(0.5)
Coleoptera						
Scarabaeidae						
Dermolepida noxium Britton	26	35	15	46	7(0.1)	54(0.2)
Curculionidae						
Rhabdoscelus obscurus (Boisd.)	83	78	153	8	25(0.4)	136(0.6)
Oribius sp.15	16	14	19	11	9(0.1)	21(0.1)
Elateridae						
Simodactylus sp.23	36	1	35	2	5(0.1)	32(0.1)
Chrysomelidae						
Rhyparida coriacea Joic	29	8	23	14	20(0.3)	17(0.1)
Rhyparida sp.27	23	4	20	7	18(0.3)	9(0.0)
indeterminate sp.22	21	53	6	68	45(0.7)	29(0.1)
Cerambycidae						
Mulciber linnaei Thoms	13	23	33	3	20(0.3)	16(0.1)
Alleculidae						
indeterminate sp.12	24	8	10	22	5(0.1)	27(0.1)
Anthribidae						
indeterminate sp.13	5	7	10	2	9(0.1)	3(0.0)
Galerucidae						
Cassena papuana Jac.	24	8	14	18	18(0.3)	14(0.1)
Diptera						
Chrysosoma sp.17	29	205	122	112	77(1.2)	157(0.7)
Lepidoptera						
larva sp.19	4	23	13	14	5(0.1)	22(0.1)
larva sp.28	3	4	2	5	1	6

RESULTS

Table 1 shows the abundance of all species (except ants) of which more than four individuals were taken classified with respect to plot, trunk/canopy and edge/interior. Species reference numbers refer to specimens deposited in the Department of Agriculture, Stock and Fisheries central insect collection, Port Moresby.

Table 2 shows the numbers of individuals of each species taken in each of the 12 sampling months. With the exception of the Coleoptera and Diptera for which no larvae were taken, and the Lepidoptera for which no adults were taken, both tables show total numbers of adults plus immatures for each species.

In terms of numbers of individuals, ants were the most abundant insects present. *Anoplolepis longipes* (Jerdon) dominated the canopy both at Saiho and PATI. *Paratrechina ? stigmatica* Mann and *Polyrhachis* (*Chariomyrma*) spp. were also present in the canopy, while *Odontomachus simillimus* F.Sm. was occasionally taken on trunks.

One specimen was also taken of each of the following two beetles known as pests of palms elsewhere (Lamb 1974):

Table 2.—**Total numbers of individuals taken in each month**

	J	F	M	A	M	J	J	A	S	O	N	D
Number of samples:	20	24	24	24	24	24	32	32	24	24	24	24
Blattodea sp.6	66	93	77	79	95	90	83	140	147	237	115	128
Blattodea sp.21	4	14	14	18	9	10	11	5	2	5	7	0
Chelisoches morio	345	289	116	362	158	269	228	164	103	227	316	312
Dermaptera sp.16	3	4	27	9	11	5	5	11	2	17	10	2
Dermaptera sp.26	0	0	3	2	4	8	1	3	1	0	0	0
Dermaptera sp.30	0	0	0	0	0	0	0	1	1	2	1	0
Segestidea princeps	11	22	14	16	9	11	14	13	11	25	36	28
Tettigoniidae sp.2	4	9	5	13	13	19	34	15	9	29	4	15
Mecopoda elongata	0	3	15	20	15	40	44	35	54	22	32	18
Cardiodactylus novaeguineae	17	20	14	23	9	18	19	29	47	46	49	47
Phasmatodea sp. 18	1	7	7	6	11	5	19	11	6	8	11	25
Dermolepida noxium	2	2	3	2	1	4	4	7	13	14	3	6
Rhabdoscelus obscurus	10	14	4	19	9	8	17	5	13	27	14	21
Oribius sp. 15	1	1	1	1	0	1	2	0	3	14	4	2
Simodactylus sp.23	0	2	1	3	3	2	1	7	5	5	5	4
Rhyparida coriacea	8	1	5	4	0	6	0	5	6	1	1	0
Rhyparida sp.27	0	0	2	2	0	2	6	0	0	12	1	2
Chrysomelidae sp.22	1	3	4	2	5	3	0	6	37	0	11	2
Mulciber linnaei	0	8	8	4	5	1	1	1	3	1	4	0
Alleculidae sp.12	3	2	4	0	1	6	11	0	1	0	2	2
Anthribidae sp.13	5	0	0	0	0	1	2	1	0	2	0	1
Cassena papuana	13	2	5	0	3	3	1	2	0	0	1	1
Chrysosoma sp.17	21	25	23	26	19	25	22	12	11	13	18	4
Lepidoptera sp.19	1	3	1	4	3	6	2	3	0	2	1	1
Lepidoptera sp.28	0	0	0	0	0	0	2	4	0	0	1	0

Scapanes australis (Boisd.) (Dynastidae) at Saiho in August, *Rhynchophorus bilineatus* Mont. (Curculionidae) at PATI in July.

DISCUSSION

Anon. (1971) lists seven species found in the Saiho plot in 1968 which were not found in 1973. Only *Cardiodactylus novaeguineae, Scapanes australis, Rhinoscapha thomsoni* Waterh, and *Acanthotyla* sp. were present in both years. This suggests that a change in the composition of the insect fauna has occurred with development of the palms from seedlings to maturity.

Table 1 shows that in 1973 11 species were more abundant at Saiho than PATI, eight species were equally abundant in both plots, and six species were more abundant at PATI than Saiho. To some extent the different stage of palm growth in each plot might be responsible for the differences. It also seems likely that the factors promoting faster palm growth at Saiho, possibly higher rainfall, and the surroundings of each plot might be important.

The following species were found to be more abundant on the edges rather than in the interior of plots: *Chelisoches morio,* Chrysomelidae sp. 22, *Rhyparida* sp. 27 and *Chrysosoma* sp. 17. Under large scale plantation conditions these species would be expected to be much less prominent than in the study plots. Other species were more abundant in the interior of plots and would be expected to be common inhabitants of large scale plantations: Blattodea sp. 6, Tettigoniidae sp. 2, *Mecopoda elongata, Cardiodactylus novaeguineae,* Phasmatodea sp. 18 and *Dermolepida noxium.*

Insect damage to palms was minimal in both plots, with the exception of three palms killed and two severely damaged at Saiho by rhinoceros beetles, *Scapanes australis.* Palms could not be felled and dissected, but external examination suggested that the weevils *Rhabdoscelus obscurus* and *Oribius* sp. 15 caused little damage. Leaf damage was negligible in both plots, though a little greater at Saiho than PATI. The very abundant Blattodea sp. 6 and *Chelisoches morio* appeared to cause no damage.

The lack of damage contrasts strongly with the situations on the Malaysian mainland reported by Wood (1968) and in Sabah reported by Conway and Tay (undated). Larvae of Psychidae and Limacodidae in particular underwent devastating outbreaks in both areas. However, Conway (1969) suggested that insecticide applications released the species involved from effective control by natural enemies. No insecticides were used in the study plots in 1973 (with the exception of bioresmethrin for sampling). In 1968 Psychidae of the genera *Clania* and *Plutorectis* severely defoliated young and seedling oil palms on West New Britain, whereas an unidentified Psychid was present in the Saiho plot but caused no damage (Anon. 1971).

Wood (1968) describes *Rhynchophorus schach* Oliv. as a secondary pest whose adults gather to feed on exudations from fresh trunk wounds and subsequently lay eggs. During the present work, numbers of adult *Rhabdoscelus obscurus* were seen gathered on fresh cuts after old leaves had been pruned. If this species becomes troublesome a change in pruning policy might be sufficient to reduce its numbers.

Plotting the data in *Table 2* in the form of number of individuals per sample against month showed little in the way of universal phenological trends. However, the more common species can be grouped into six categories according to abundance:

1. Decreasing from January to December: Blattodea sp. 21 and *Chrysosoma* sp. 17.

2. Increasing from January to December: *Cardiodactylus novaeguineae* and Phasmatodea sp. 18.

3. Minima between June and September: *Segestidea princeps, Chelisoches morio* and *Rhabdoscelus obscurus.*

4. Maxima between June and September: *Mecopoda elongata.*
5. Maxima in September/October: Blattodea sp. 6, *Dermolepida noxium* and Chrysomelidae sp. 22.
6. Fluctuations irregular.

Data from several years are required before conclusions could be drawn from the above groupings, but tentative suggestions as to the meaning of the groups are as follows.

Groups 1 and 2 might represent a continuation of the successional changes which appear to have occurred between 1968 and 1973 at Saiho. As the palms get older, the canopy becomes thicker and intercepts more light, making conditions below the canopy more humid and temperature stable. Species in group 1 might find such changes deleterious, while species in group 2 might find them beneficial. Additional evidence for this suggestion is present in *Table 1* where *Chrysosoma* sp. 17 is shown as an 'edge species', while members of group 2 are 'interior species'.

Mean monthly rainfall and sunshine figures for Popondetta in Room and Smith (1975) show that there is a dull/wet season between December and March, and a sunny/dry season between June and August. Groups 3 and 4 might have population extremes associated with the sunny/dry season, while group 5 species might have population maxima associated with the return of wet conditions after the sunny/dry season.

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