

OBSERVATIONS ON INSECT FLIGHT IN A TROPICAL FOREST PLANTATION

VI. Flight activity of Elateridae, Eucnemidae, Throscidae and Languriidae (Coleoptera)¹

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Abstract: Over a 25-day period of sticky trap captures in a Hoop Pine (*Araucaria cunninghamii* D. Don) plantation near Bulolo in Papua New Guinea, a total of 187 specimens of Elateridae, Eucnemidae, Throscidae and Languriidae were collected, most (41.2%) of which belonged to the Elateridae. The sex ratio of the 2 most common species showed a preponderance of females. More of the specimens (57.7%) were captured in the traps during the night than during the day, though collections of 6 of the 14 species were greater, or only, during the day. The relative abundance of beetles captured in flight appeared to be related in part to weather conditions. There were no marked differences shown in the number of beetles captured in the sticky traps around each of the 5 trees. There was also no marked flight direction response, but fewer beetles were captured when flying east, both during the day and night.

The families Elateridae, Eucnemidae and Throscidae (=Trixagidae) (superfamily Elateroidea) and the Languriidae (superfamily Cucujoidea) are treated in this paper, the 6th of a series to be presented on the diurnal flight activity of insects over a 25-day period in a Hoop Pine (*Araucaria cunninghamii* D. Don) plantation. Specimens belonging to these families were captured in sticky traps during a study of flight activity of insects.

There are few accounts, other than recorded collections, given in the literature on the flight activity of Elateridae, Eucnemidae, Throscidae and Languriidae. Doane (1963), in a study of dispersal of 2 elaterid species in Canada, trapped only small numbers of 1 species, *Hypnoidus bicolor* (Eschscholtz) (= *Hypolithus*), in flight; its flight activity was related to the oviposition period. In another Canadian study, Lafrance (1963) collected 2310 beetles belonging to 11 elaterid species in flight traps over a 6-year period; most of these beetles were captured when flying south, and all were captured at heights below 2 m.

MATERIALS AND METHODS

Details of the layout of the sticky traps and times of collection are given by Gray (1973a). Identification of the captured species was carried out by Miss C. M. F. von Hayek, Mr R. Madge and Dr J. N. L. Stibick. For determination of the sex ratio, the genitalia were examined. The families are considered separately in the results and discussion, except in relation to observations on numbers captured in the sticky traps around the 5 trees and on flight direction.

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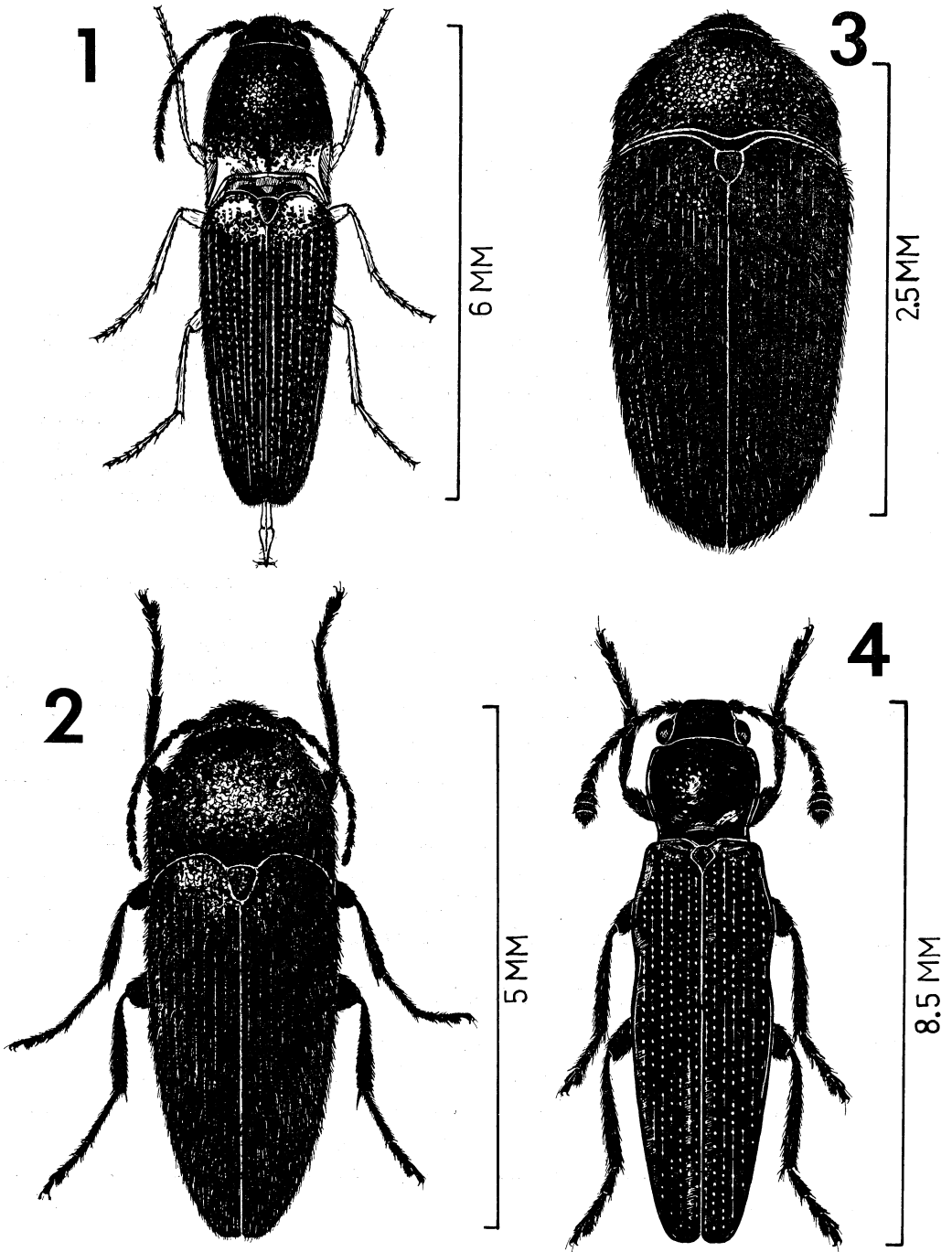


FIG. 1-4. 1, ♀ adult of *Melanoxanthus* sp. (Elateridae); 2, adult of *Fornax* sp. C (Eucnemidae); 3, adult of *Throscus* sp. (Throscidae); 4, adult of *Caenolanguria* sp. (Languriidae).

RESULTS AND DISCUSSION

More specimens (77) and species (7) of Elateridae were captured over the 25-day period as compared with the Eucnemidae (43 and 5), Throscidae (25 and 1), and Languriidae (15 and 1) (TABLE 1). All except 1 of the 14 species collected are probably new to science. Various problems prevent the early description of the new species.

A greater number of females were captured in flight. The sex ratios of the more abundant species, *Melanoxanthus* sp. (FIG. 1) and *Fornax* sp. A, showed a marked preponderance of females, the ratios being 1 ♂: 4 ♀♀ and 1 ♂: 28 ♀♀, respectively. In the case of the less common species, 4 showed a greater number of males, 2 a greater number of females, 4 were represented by females only and 2 were represented by males only (TABLE 1).

A feature of the collections was the greater number of specimens, 108 out of 187 (57.7%), captured in the sticky traps during the night than during the day (TABLE 2). This is in contrast with the results previously recorded for other families, Platypodidae (Gray 1973b), Scolytidae (Gray 1974a), Buprestidae and Othniidae (Gray 1974b), wherein most specimens were captured diurnally. An exception was the greater number of Eucnemidae captured during the day. The results, in general, appear to be typical for the Elateridae and Throscidae. Dr Stibick (pers. commun., 1973) has also observed these families to be chiefly nocturnal with greatest activity near 11:00 pm.

Of the 14 species collected, only 1, the eucnemid *Fornax* sp. C (FIG. 2), was captured in

TABLE 1. Species of Elateridae, Eucnemidae, Throscidae and Languriidae collected in the sticky trap study, with numbers and sexes of adults caught during the day and night.

	PERIOD OF FLIGHT		SEX*	
	Day	Night	♂	♀
Superfamily: Elateroidea				
Elateridae				
<i>Agrypnus</i> sp. A	7	6	6	3
<i>Agrypnus</i> sp. B	7	12	3	4
<i>Agrypnus</i> sp. C	1			1
<i>Conoderus vuilleti</i> Fleutiaux		2		2
<i>Conoderus</i> sp.	3	2	3	2
<i>Melanoxanthus</i> sp.	13	32	4	16
<i>Propsephus</i> sp.		1		1
Eucnemidae				
<i>Fornax</i> sp. A	14	15	1	28
<i>Fornax</i> sp. B		1		
<i>Fornax</i> sp. C	9	2	4	5
<i>Microrrhagus</i> sp.	1			
? Gen. et sp.		1		
Throscidae				
<i>Throscus</i> sp.	9	16	6	4
Superfamily: Cucujoidea				
Languriidae				
<i>Caenolanguria</i> sp.	6	9	8	2
Total specimens	70	99	35	68

*To preserve whole specimens for further study, limited numbers were dissected of the more common species.

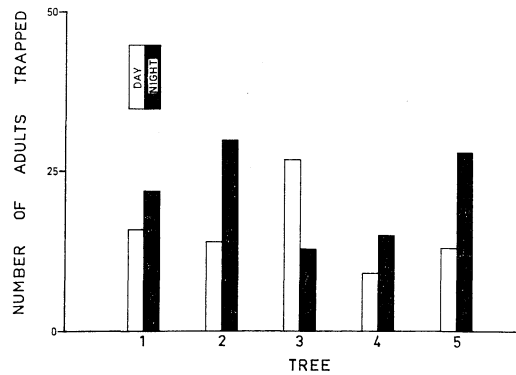


FIG. 5. Number of adult Elateridae, Eucnemidae, Throscidae and Languriidae collected during the day and night in the sticky traps around each of the 5 trees over the period April 26 to May 24, 1972. Tree numbers are given in Roman numerals in text.

flight mainly during the day (TABLE 1). Two of the species represented by a single specimen, *Agrypnus* sp. C and *Microrrhagus* sp., were captured diurnally; and in the case of the elaterids *Agrypnus* sp. A and *Conoderus* sp., a slightly greater number were collected during the day, but their numbers were low.

Another feature of the collections was the high frequency of multiple captures of certain species during the same period on several occasions. As example: 5 *Throscus* sp. (FIG. 1) were captured nocturnally on 19 May 1972 and 4 during the day on 15 May 1972; 5 *Melanoxanthus* sp. were collected during the night on 12 May 1972; 4 *Fornax* sp. A were captured on 3 occasions—twice during the day, on 26 and 27 April 1972, and during the night on 18 May 1972. Such trends suggest a tendency among several species of Elateroidea to take to flight in relatively large numbers on certain days. However, the trend was not evident with the languriid *Caenolanguria* sp. (TABLE 2 and FIG. 4).

Slightly greater numbers of beetles, 44 and 58, were captured during the day and night in those traps facing toward the 5 trees than in those traps facing away, 35 and 50, respectively. The numbers of beetles caught in the sticky traps around each of the 5 trees (FIG. 5) showed relatively less variation in comparison with those previously recorded for other families: Platypodidae (Gray 1973b), Scolytidae (Gray 1974a), Buprestidae and Othniidae (Gray 1974b). In the latter 4 families, noticeably more beetles were obtained in the sticky traps around tree number V, but in the case of the Elateridae, Eucnemidae, Throscidae and Languriidae the greatest number were captured around tree number III during the day and around tree number II during the night. The reason for this difference is not clear. One explanation may be the presence of largely local populations of these beetles, whose flight is less influenced by wind, in the vicinity of the study area, especially near trees number II and III.

There appeared to be some relationship between weather conditions and numbers of

TABLE 2. Number of adults of Elateridae, Eucnemidae, Throscidae and Languriidae collected in sticky traps during the day and night over the period April 26 to May 24, 1972, as related to temperature and rainfall.

DATE (1972)	ELATERIDAE		EUCNEMIDAE		THROSCIDAE		LANGURIIDAE		TOTAL*		TEMPERATURE °C**		RAINFALL IN MM	
	D***	N	D	N	D	N	D	N	D	N	D	N	D	N
26.IV.	4	1	4				1		1	8	22.2	18.3	0.1	0
27.IV.	4	4	4				1	1	9	6	26.1	19.2	0	0
28.IV.	1	2	1	3	1		1		4	5	26.1	19.1	0	0.5
29.IV.		2		3					3	4	29.8	19.6	0	2.1
30.IV.	2					1			2	1	28.5	19.9	5.0	0.9
1. V.	1								1		29.6	19.0	4.0	13.2
2. V.								1		1	27.2	19.6	0.1	0.4
3. V.		2		1						2	30.1	18.9	0	25.5
4. V.		2		1				1	1	3	25.7	18.3	8.2	1.3
5. V.		4				1			1	5	29.1	19.4	0	0
6. V.	4	2		1				1	6	4	29.9	18.8	4.0	0.2
7. V.		2		1	2				2	5	31.1	19.8	0	0.4
No collections during interim period														
11. V.	1	1		1	1				3	2	24.7	19.6	3.5	18.0
12. V.	2	5			2			1	2	8	27.5	19.3	0.6	1.5
13. V.	2	2		1				2	3	4	28.4	20.3	0.1	0.4
14. V.	4	3			1			2	4	6	29.0	20.1	0	0
15. V.	2	1		1		4	1	2	10	2	29.9	20.1	0.5	0.1
16. V.	4	1			1		1		5	4	26.6	17.3	0	0
17. V.		3		1	1		1		2	6	28.2	17.5	0	0
18. V.	2	3		2	4			1	4	9	30.9	19.8	0	0
19. V.		1			3		1	5	1	9	29.2	18.2	0	0
20. V.		2				1	1		4	3	29.6	18.2	10.1	0.2
21. V.		2		2			1			3	27.4	19.8	0	9.1
22. V.		3				1	2		1	6	24.9	19.3	0	30.5
23. V.	3	2						1	10	2	26.1	18.3	16.7	7.1
Total	36	50	24	19	9	16	6	9	79	108			52.9	111.4

*Due to the later loss of 16 specimens, the combined number of identified specimens in the 4 family columns does not agree with the total number captured daily, as the latter were recorded in the field.

**In calculating the temperature, the average was taken of the hourly temperature recorded over a period of 4 hr during the middle of the day and night.

***D = day, N = night.

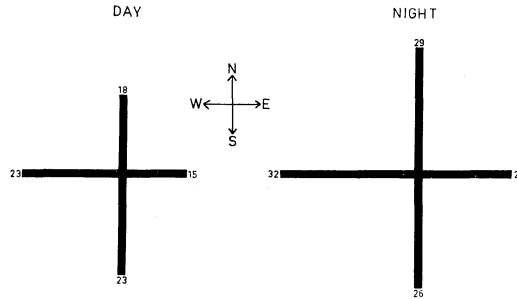


FIG. 6. Direction of flight of adult Elateridae, Eucnemidae, Throscidae and Languriidae captured in the sticky traps.

beetles (TABLE 1). Markedly fewer beetles were captured in the sticky traps over the period 30 April to 4 May 1972, when rain fell on several occasions and higher daytime temperatures were recorded than in the preceding period. However, the capture of 10 beetles on 23 May 1973, a day of fairly heavy rainfall, indicates a more complex relationship; the rain fell during a storm on this day between 4:05 and 4:45 pm, and later, at 7:00 pm and 7:05 pm, 2 elaterids were observed to fly into sticky traps numbered 20 and 23, respectively. Because these were the only Elateroidea observed in flight during inspection of the sticky traps, the event warrants further consideration. It is suggested that more Elateroidea tend to fly in the tropics in the cooling off period following rainstorms.

There was no evidence of a marked flight direction response, though slightly fewer beetles were captured when flying east, during either the day or night (FIG. 6). There were no especially large collections of the beetles off certain sticky traps as were reported in previous papers (Gray 1973a, 1973b, 1974a, 1974b); the maximum collected, day or night, was 7 beetles from trap number 36 during the night. No beetles were captured in 6 of the sticky traps during the day and in 4 traps at night.

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