

Trap comparison in the capture of flying Coleoptera

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Abstract

A comparison of malaise, light, sticky, and window traps for the capture of flying Coleoptera showed the malaise trap to be far superior to the other 3 types in variety and number of insects taken. However, consideration of individual species showed a number of exceptions to this general pattern. Data on the seasonal flight activity of 11 species are presented.

INTRODUCTION

The use of traps for the capture of flying insects has long been an essential part of many entomological field investigations. A lack of information on the relative merits of different types of traps has led to difficulty in the selection of the most appropriate type for particular studies. Johnson (1950) compared suction, sticky, and tow-net traps for sampling small airborne insects, and Juillett (1963) compared the captures of window, malaise, rotary, and sticky traps with special reference to Hymenoptera. Most other work has been confined to individual types of traps or their modifications.

The present study was designed to compare the effectiveness of malaise, light, sticky, and window traps in the capture of flying Coleoptera.

MATERIALS AND METHODS

The light trap was a Rothamsted type (Williams 1948) fitted with a 200-watt frosted bulb and a plaster-lined collecting jar impregnated with tetrachloroethylene. It was operated 24 hours a day throughout the sampling period.

The malaise trap was as described by Townes (1972). Isopropyl alcohol was used in the collecting jar.

The window traps (described by Hosking & Knight 1975) were mounted at 1.5 and 4.5 m above the ground and Tanglefoot® (Registered Trade Name, Tanglefoot Co., Grand Rapids, Mich. U.S.A.) was used on the glass collecting surface.

The 2 sticky traps were made by inverting plastic buckets on 1.5 m poles and attaching a plastic sheet spread with Tanglefoot around the outside, giving a collecting surface of 0.12 m².

The traps were sited in Whakarewarewa State Forest Park in a small stand of mature *Pinus ponderosa* Laws. The predominant understorey plants were *Pseudopanax arboreum* (Murr.) Philipson, *Coprosma lucida* J. R. et G. Forst., *Aristotelia serrata* (J. R. et G. Forst.) W. R. B. Oliver, *Coriaria sarmentosa* Forst. f., and *Dicksonia squarrosa* (Forst. f.) Swartz. The minor species included *Leptospermum scoparium* J. R. et G. Forst., *Coprosma robusta* Raoul, *Pittosporum tenuifolium* Sol. ex Gaertn., and *Hebe salicifolia* (Forst. f.) Pennell. All traps were located within a 15 m square and were serviced every 4 days from late November 1975 to early February 1976.

Coleoptera from all traps were, where possible, identified to species. The catches from the 2 window traps were combined, as were those from the 2 sticky traps.

Voucher specimens are deposited in the Forest Research Institute, NZFS collection at Rotorua.

RESULTS AND DISCUSSION

The distribution of individuals by species and trap type is shown in Table 1. Fifteen of the 69 species trapped are represented by only a single specimen and cannot be

Table 1. Coleoptera, by species, taken in 4 trap types

Family and Species	Number of individuals			
	Malaise	Light	Window	Sticky
Anthribidae				
<i>Anthribus hetaera</i> Sharp	7			
Anthicidae				
Species A	1			
Cerambycidae				
<i>Hybolasius pedator</i> Bates	5		1	16
<i>Hybolasius vegetus</i> Broun	14			6
<i>Navomorpha lineata</i> Fabricius	1			
<i>Stenopotes pallidus</i> Pascoe	1	2		
<i>Tetroraea cilipes</i> White		2		
<i>Prionoplus reticularis</i> White		270		
<i>Xylotoles nudus</i> Bates	2			
Chrysomelidae				
<i>Adoxia vulgaris</i> Broun	20	2	3	2
<i>Alema paradoxa</i> Sharp			1	
<i>Eucolaspis puncticollis</i> (Broun)	4		3	
Cistelidae				
<i>Tanychilus sophorae</i> Broun		1		
Cleridae				
<i>Balcius niger</i> Sharp	1			
<i>Phymatophaea atrata</i> Broun	16			
<i>Phymatophaea electa</i> Pascoe	1			
<i>Phymatophaea nigricornis</i> Broun	1		2	3
<i>Phymatophaea opiloides</i> Pascoe	5		1	
Colydiidae				
<i>Bitoma insularis</i> White		18	19	18
<i>Pycnomerus minor</i> Sharp			15	13
<i>Tarphiomimus indentatus</i> Wollaston	1	2	1	2
Cryptophagidae				
? <i>Antarticotectus</i> sp.	2			
Curculionidae				
<i>Acalles</i> sp.	2			
<i>Hoplocneme hookeri</i> White	41	1		2
<i>Mecistostylus douei</i> Lacordaire	25	2	2	1
<i>Irenimus compressus</i> (Broun)	1			
<i>Praolepra infusca</i> Broun	1			
<i>Psepholax simplex</i> Pascoe	1	1		
<i>Rhopalomerus maurus</i> (Broun)	8	1		
<i>Rhopalomerus picipennis</i> (Pascoe)	8	1	1	
<i>Rhopalomerus tenuicornis</i> Blanchard	677	3	5	4
<i>Scolopterus penicillatus</i> White	12		1	
<i>Sericostrogus subaenescens</i> Wollaston	2		2	8
<i>Stephanorrhynchus lawsoni</i> Sharp	41	1		5
Elateridae				
<i>Corymbites megops</i> White	1	1	4	4
<i>Corymbites olivascens</i> White	54	5	7	4
<i>Lomemus elegans</i> Sharp	12		14	7
<i>Ochosternus zealandicus</i> (White)	1	139		6
<i>Panspoeus tenebrosus</i> Broun			3	
<i>Parinus villosus</i> Sharp	2	1		
<i>Protelater elongatus</i> Sharp	28		61	26
<i>Protelater guttatus</i> Sharp	2			
<i>Protelater vitticollis</i> Broun	30		16	11
<i>Sphaenelater fulvus</i> (Sharp)	17			1
? <i>Talerax</i> sp.	1			

Table 1 (cont.)

Family and Species	Number of individuals			
	Malaise	Light	Window	Sticky
Eucinetidae				
<i>Apeosina stewarti</i> Broun	3			
Helodidae				
<i>Veronatus tricostellus</i> (White)	1			
<i>Cyphon viridipennis</i> Broun	2	2		
<i>Cyphon</i> sp. aff. <i>genalis</i> Broun				2
<i>Cyphon</i> sp.	218	14	14	7
<i>Cyphon amplus</i> Broun	9			
Lampyridae				
<i>Metriorrhynchus rufipennis</i> (Fabricius)	1			
Melandryidae				
<i>Axylita sericophora</i> Broun			2	1
<i>Ctenoplectron maculatum</i> Broun			1	
Mordellidae				
<i>Mordella detracta</i> Pascoe	5		4	
<i>Mordellistena neglecta</i> Broun	2			
Oedemeridae				
<i>Thelyphassa strigipennis</i> (White)	20			1
Platypodidae				
<i>Platyplus apicalis</i> White	1		1	
Scarabaeidae				
<i>Odontria sylvatica</i> Broun	3	26		
Scolytidae				
<i>Dendrotrupes vestitus</i> Broun	313	241	647	1852
<i>Pachycotes peregrinus</i> (Chapuis)		8		
<i>Xyleborus saxeseni</i> (Ratzburg)				1
Silphidae				
<i>Necrophilus prolongatus</i> Sharp		2		
Staphylinidae				
<i>Neoxantholinus rufulus</i> (Broun)			2	
<i>Ocalea socialis</i> (Broun)	21	3	2	1
<i>Phanophilus comptus</i> (Broun)	6	2		
<i>Sepedophilus acerbus</i> (Broun)	1			
<i>Sepedophilus nubilus</i> (Broun)	8		2	1
<i>Tramiathaea cornigera</i> (Broun)		1		
Total number of species	54	27	29	27

considered as indicative of trap performance. The malaise trap was equal or superior to the other 3 types in the number of individuals caught for 36 of the other 54 species. The light trap excelled for 10 species, the window traps for 9, and the sticky traps for 7.

The malaise trap was clearly superior in numbers of families (18) and species (54) caught, and was surpassed in individuals (1663) only by the sticky traps which captured 1852 *Dendrotrupes vestitus* Broun. The malaise trap was found particularly good for the capture of Curculionidae and Elateridae, with Cleridae, Helodidae, and Staphylinidae also being well represented. However, it was particularly poor in the capture of Colydiidae and Scolytidae.

The light trap took 11 families, 27 species, and 752 individuals. Only 7 species were clearly attracted to light; all others were taken in equal or greater numbers by one or more of the other traps. The 3 most notable species showing strong attraction to light were the cerambycid *Prionoplus reticularis* White, the elaterid *Ochosternus zealandicus* (White), and the scarabaeid *Odontria sylvatica* Broun.

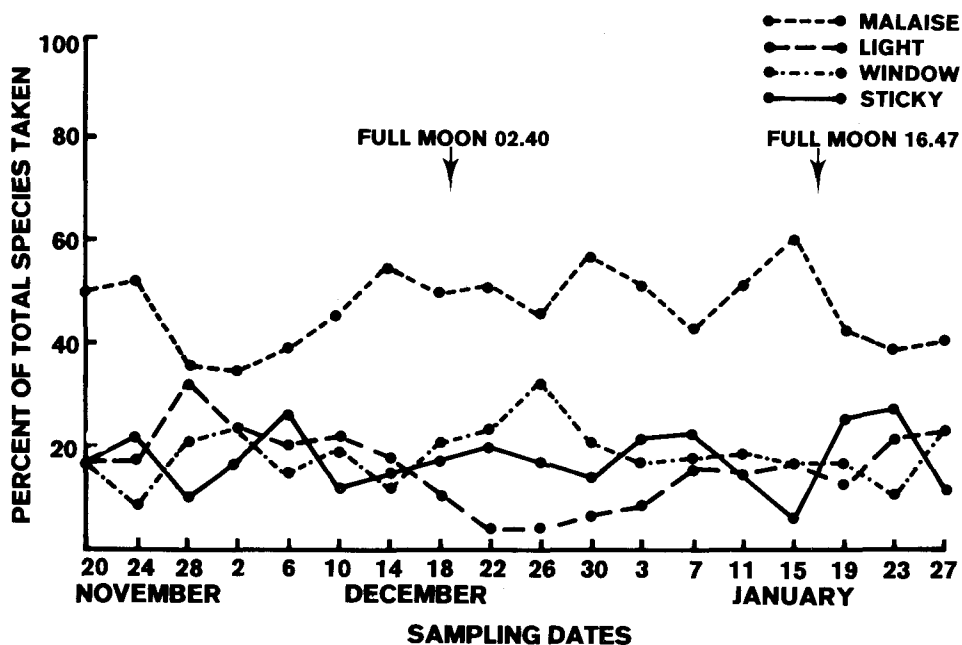


Fig. 1. Catch variation between traps on each sample date.

The window traps collected 13 families, 29 species, and 837 individuals. They were most effective for Colydiidae but also performed well for Elateridae.

The sticky traps took 11 families, 27 species, and 2005 individuals, most of which were accounted for by the single scolytid species *D. vestitus*. The Colydiidae were well represented and the cerambycid *Hybolasius pedator* Bates was taken in fair numbers.

The greatest variation in number of species taken at each sample date was shown by the light trap, and the malaise trap was the most consistent of the 4 types over the whole period (Fig. 1). The full moon on 19 December 1975 probably accounts for the sharp decline in light trap catches around that time.

The seasonal flight patterns for 11 of the commonest species are presented in Figure 2. Each graph represents the total catch for all traps on each sampling date.

Clearly the mode of action of each trap will have a strong influence on the variety and composition of the catches. This is seen most strikingly in a comparison of the interception type (malaise and window) and the attraction type (light), the latter being also limited to nocturnal fliers. The sticky trap, falling somewhere in between, can be classed as an attraction type if coloured surfaces are used. In this study yellow and red surfaces were compared with inconclusive results and only the data from yellow surfaces are presented in this paper.

Unlike the work of Johnson (1950), the present study does not compare traps on the basis of volume of air sampled but merely compares the captures of 4 types of traps under uniform conditions. Juillet's (1963) paper purports to relate captures to volume of air sampled but gives no indication as to how cubic yards sampled per hour was calculated for glass barrier, sticky, or malaise traps. Indeed, it is difficult to see how this could be done. His results for Coleoptera are very different from those found during the present study. He rates the sticky trap 4 times as effective as the malaise, with the window trap almost as good. It is possible his calculation of the amount of air sampled is a significant factor in the disparity of results.

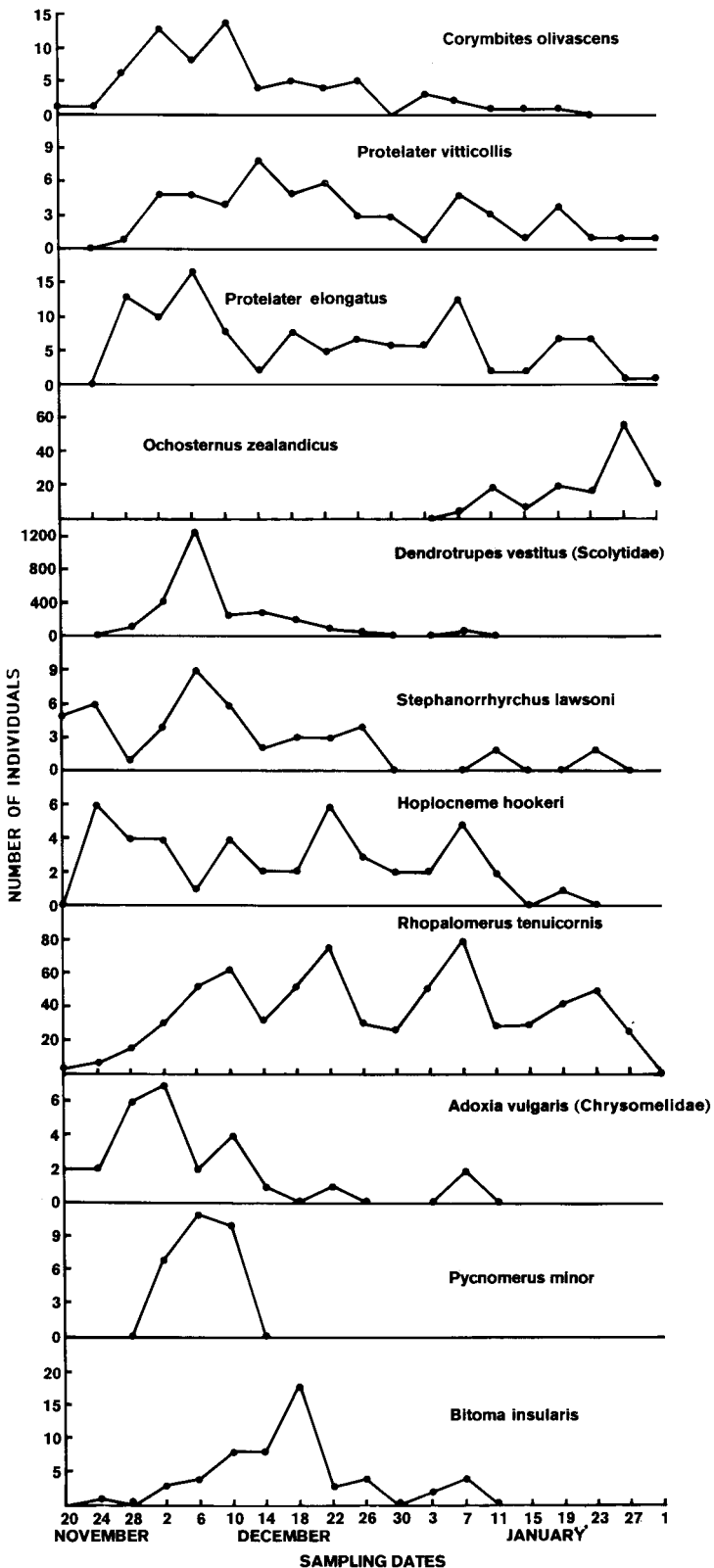


Fig. 2. Seasonal flight patterns of (top to bottom): 4 elaterids, 1 scolytid, 3 curculionids, 1 chrysomelid, and 2 colydiid species

The ease of sorting and cleaning catches is a major factor in the usefulness of each type of trap. The malaise and light catches required no cleaning but, due to the volume of the catch especially in orders other than the Coleoptera, sorting was time consuming. Both sticky and window traps required a cleaning operation. Tanglefoot contains vegetable waxes which are not easily dissolved without damage to the specimens. The use of a similar preparation, Tack Trap[®], (Registered Trade Name, Animal Repellents Inc. Griffin, Ga., U.S.A.), which is soluble in mineral turpentine, eliminates most of this problem. Catches on the window and sticky traps were very easy to sort and count because there were fewer individuals and poor catches of most Lepidoptera.

In studies of specific groups, such as Hosking & Knight's (1975) work with scolytids, the ease of sorting and counting may well offset the poor captures of the window and sticky types. However, for general Coleoptera collecting there is no doubt the malaise trap is the best of the 4 examined.

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