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A Study of the Species of Small Mammals in Mixed Coconut - Cacao Gardens in Kerala

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The species composition of small mammals in coconut-cacao mixed habitat was analysed in five gardens by setting wooden (30x12x11.5 cm.) and Sherman (23x7.5x9 cm.) 'live' traps on the branches as well as on the ground. Altogether, representatives of six species of rodents and one insectivore were trapped. Rattus rattus wroughtoni was the most predominant species followed by Mus booduga. They were followed by Vandeleuria oleracea, Funambulus tristriatus, Rattus rattus rufescens, Suncus murinus and Tatera indica in the order of frequency of trapping. R.r. wroughtoni was more common on the branches (65%) and M. booduga on the ground (70%). V. oleracea was purely arboreal, whereas M. booduga and S. murinus were ground dwellers. F. tristriatus, R.r. wroughtoni and R.r. rufescens were primarily arboreal but were also active on the ground.

In India, cacao (*Theobroma cacao* L.) is grown either as a mixed-crop along with coconut or arecanut or as a pure crop under forest along the west coast in Karnataka and Kerala and in some tracts of Tamil Nadu (George, 1977). Among the mammalian pests that infest this crop in South India, rats and squirrels are of primary importance (Abraham & Padmanabhan, 1967; Bhat, 1978; Abraham & Remamony, 1979; Bhat, *et al.*, 1981). Their depredation is confined mainly to the pods and as such these pests are responsible for heavy loss in yield (Bhat, 1978; Bhat, *et al.*, 1981). When different groups of animals co-exist in a given habitat, the competition for food and shelter is minimised by each species exhibiting different behavioural patterns and occupying separate micro-habitats (Rosenzweig, *et al.*, 1975). In such cases where coexistence in the same environment is common, correct identification of the target animal and knowledge on its habits, habitat selection and

association with other species is necessary for adoption of successful control operations (Prakash, 1976).

No information was hitherto available on the species composition and spatial distribution of small mammals in coconut-cacao mixed habitat. In order to fill in this gap, a detailed study was undertaken on these aspects, and the results are discussed here.

MATERIALS AND METHODS

Small mammals were regularly live-trapped for twelve months from January to December 1985 in five coconut-cacao mixed gardens (0.5 - 1.0 ha) around Kasaragod (12°30' NL, 75°EL), Kerala. In order to collect representatives of bigger as well as smaller animals equally, we randomly set twenty each of wooden 'live' traps (30 x 12 x 11.5 cm) and Sherman traps (23 x 7.5 x 9 cm) in the field. Ten traps in each type were set on the branches of cacao trees and

another ten on their bases so as to collect both arboreal and ground-dwelling rodents in equal proportion. The traps were set simultaneously in the morning hours using coconut kernel as bait and examined on the following day. The trapped animals were collected, brought to the laboratory and identified. Specimens of *Rattus rattus* and *Suncus murinus* were identified by the Zoological survey of India, Calcutta. After removing the trapped animals, the traps were reset at the same point. Trapping was continued for fifteen consecutive days in each plot at bimonthly intervals.

RESULTS

Species composition

A total of 480 small mammals comprising six species of rodents and one species of an insectivore (Figure 1) were trapped from coconut-cacao mixed habitat (Table 1). Out of this, rodents alone formed nearly 97 per cent of the total catch. The black rat, *Rattus rattus wroughtoni* Hinton was the

commonest species followed by the field mouse *Mus booduga* Gray. The former comprised nearly 45 per cent of the population and the latter 30 per cent. The preponderance of *R.r. wroughtoni* was evident in four of the five gardens surveyed (Table 2) and except in one, *M. booduga* occurred in about equal proportion with *R.r. wroughtoni*. The tree mouse, *Vandeleuria oleracea* Bennett was third in abundance, but markedly less in number than the black rat and the field mouse and absent in two gardens. However, in one garden the number of tree mice was almost equal to the population of the black rat and the field mouse (Table 2). The Western Ghats squirrel (*Funambulus tristriatus* Waterhouse), the house rat (*Rattus rattus rufescens* Gray) and the musk shrew (*Suncus murinus* Anderson) were much less in abundance than the black rat and the field mouse but represented in all the gardens surveyed. The Indian gerbil *Tatera indica* Hardwicke was insignificant with only two representations altogether.

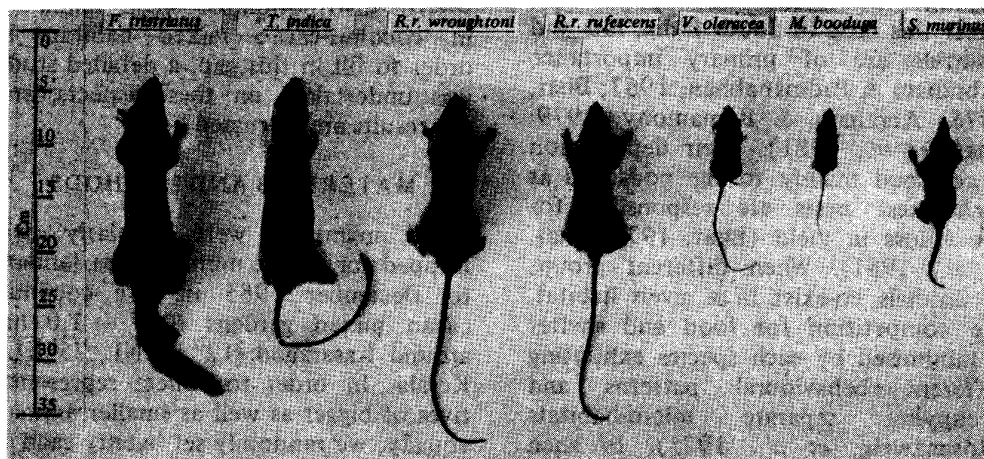


Figure 1. Small mammals trapped from coconut-cacao mixed habitat.

TABLE 1. RELATIVE ABUNDANCE OF SMALL MAMMALS IN COCONUT-CACAO MIXED HABITAT

Species	Total animals trapped on different levels			Relative abundance (%) [*] on different levels		
	Total	Branches	Ground	Total	Branches	Ground
Rodentia:						
<i>R.r. wroughtoni</i>	214	177	37	44.6	64.8	17.9
<i>M. Booduga</i>	145	0	145	30.2	0	70.1
<i>R.r. rufescens</i>	17	13	4	3.5	4.8	1.9
<i>F. tristriatus</i>	32	29	3	6.7	10.6	1.4
<i>V. oleracea</i>	55	54	1	11.5	19.8	0.5
<i>T indica</i>	2	0	2	0.4	0	1.0
Insectivora:						
<i>S. murinus</i>	15	0	15	3.1	0	7.2
Total	480	273	207	100.0	100.0	100.0

* in 20 wooden and 20 Sherman traps set for 15 consecutive days; each two months period from January - December, 1985.

TABLE 2. FREQUENCY OF COLLECTION (%) OF SMALL MAMMALS IN DIFFERENT PLOTS

Species	Plot number					Mean
	1	2	3	4	5	
<i>R.r. wroughtoni</i>	43.1	55.4	51.2	41.6	38.2	42.8* ± 7.73
<i>M. booduga</i>	17.6	33.7	27.9	28.9	34.6	29.0* ± 7.03
<i>R.r. rufescens</i>	13.7	4.0	4.6	0.7	2.2	3.4 ± 0.92
<i>F. tristriatus</i>	19.6	4.9	7.0	2.7	7.3	6.4 ± 1.34
<i>V. oleracea</i>	0	0	7.0	24.2	11.8	11.0 ± 6.18
<i>T. indica</i>	0	0	0	1.3	0	0.4 ± 0.36
<i>S. murinus</i>	5.9	2.0	2.3	0.7	5.9	3.0 ± 1.17

* Significantly more than all others at P = 0.05

‡ Significantly less than *R.r.w.* but more than others at P = 0.05

Out of 214 *R.r. wroughtoni* collected, nearly 67 per cent (145 Nos) of them were trapped in wooden traps. Contrary, out of 145 *M. booduga*

collected only 8 per cent (11 Nos) were trapped in wooden traps but 92 per cent (134 Nos) in Sherman.

Spatial distribution

Though *R.r. wroughtoni* and *M. booduga* were the two major rodent species in the coconut-cacao mixed habitat the former was more predominant on the branches and the latter on the ground constituting nearly 65 per cent and 70 per cent, respectively of the total small mammals in those two conditions. Among other small mammals which compete with these animals in their respective micro-habitat, *V. oleracea* and *F. tristriatus* were important on the branches and *R.r. wroughtoni* and *S. murinus* on the ground (Table 1).

Frequency of collection of each species at two different levels in the coconut-cacao mixed habitat (Table 3) revealed that *V. oleracea* was active mostly above ground, whereas *M. booduga* and *S. murinus* on the ground. *F. tristriatus*, *R.r. wroughtoni* and *R.r. rufescens* were trapped more on the branches, but also represented on the ground occasionally. Samples of *T. indica* were insufficient to draw any definite conclusion on its spatial distribution.

DISCUSSION

In the catches in the traps used in the

present study, revealed that *R.r. wroughtoni* and *M. booduga* were the two predominant species of small mammals in coconut-cacao mixed habitat. The former was trapped mostly on wooden traps and the latter on Sherman. Advani (1984), using wooden traps, found that *R.r. wroughtoni* was the only frequently trapped species in the coconut and cacao gardens. In his collection, *M. booduga* constituted only 0.08 per cent of the total catch. As Advani (*op. cit*) has not used Sherman traps in his study; a major portion of *M. booduga* might have escaped trapping resulting in poor catch of this species. Neal and Cock (1968); Cheeseman and Delany (1979) and Manfred and Jackson (1979) have suggested to use different sizes of traps for collecting unbiased samples of different types of rodents. Martell (1979) and Maly and Cranford (1985) felt that the type of trap used might significantly influence the estimates of the relative abundance of the species in the community.

Though the population of *R. rattus* (both *R.r. wroughtoni* and *R.r. rufescens*) was about seven times that of *F. tristriatus*; it was observed that the intensity of squirrel damage to cacao was nearly three times more than that caused by rats (Bhat, *et al.*, 1981; Bhat,

TABLE 3. SPATIAL PREFERENCES OF SMALL MAMMALS IN COCONUT-COCOA MIXED HABITAT

	<i>Number of animals collected</i>						
	<i>R.r.w.</i>	<i>M.b.</i>	<i>R.r.r.</i>	<i>F.t.</i>	<i>V.o</i>	<i>T.i.</i>	<i>S.m.</i>
Branches	177	0	13	29	54	0	0
Ground	37	145	4	3	1	2	15
X ² (1)	91.6	145	4.8	21.1	51.1	2.0	15.0
P-Value	0.001	0.001	0.05	0.001	0.001	NS	0.001

1982). This was mainly because of the greater capability of squirrels to damage cacao pods. Laboratory studies by Kamarudin and Lee (1981), revealed that individual squirrels were capable of damaging on an average four pods per day, whereas rats damaged only 0.5 pods per day.

Both *R.r. wroughtoni* and *M. booduga*, the two major rodent species in coconut-cacao mixed habitat, in the study locality have reduced competition for food and shelter between themselves by occupying different vertical levels in the garden. In semi-arid shrub lands of South West America there was some evidence of vertical distribution among rodents on the shrub trees which minimised direct competition between species (Rosenzweig, *et al.*, 1975). Similarly, the coexistence of *Peromyscus leucopus* and *Microtus pennsylvanicus* in grassland ecosystem (Morris, 1983 and 1984) and *Clethrionomys glareolus*, *Microtus agrestis* and *Apodemus agarius* in forest lands (Chelkowska, *et al.*, 1985) appeared to depend upon micro-habitat difference.

Among rodents, *R. rattus* and *Funambulus* spp. were identified as pests of cacao in South India (Bhat, 1978; Abraham & Remamony, 1979; Bhat *et al.*, 1981). The present study revealed that *V. oleracea* is another arboreal rodent prevalent in cacao gardens. But so far there is no report of its feeding on cacao pods. It has been shown that cacao feeding behaviour in rodents was an acquired character which could be learned either by constant trial and error gnawings or by imitating other rodents feeding on cacao pods (Everard, 1968; Williams, 1973; Jackson, 1979; Bhat, 1982). As cacao is a relatively new introduction to South India (George, 1977), there is every

possibility of *V. oleracea* becoming another rodent pest in this crop by learning to feed on cacao, in due course.

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