

POPULATION AND FEEDING ECOLOGY OF SOME ACRIDIDS  
IN ARID AND SEMI-ARID NORTHERN KENYA

By

Romanus Omolo Okelo

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A B S T R A C T

The investigation reported here was carried out within the study area of the UNESCO-Integrated Project in Arid Lands (UNESCO-IPAL) in western Marsabit District. About 80% of the area is semi-arid thorn bush scrubland.

The sites of investigation were two habitats at Gatab ( $2^{\circ} 38'N$  and  $36^{\circ} 56'E$ ; alt. 1800m) on Mt Kulal; three habitats at Luai ( $2^{\circ} 36'N$  and  $36^{\circ} 57'E$ ; alt. 1350m) and lying about six kilometers south of Gatab; and four habitats at Balesa Kulal ( $2^{\circ} 32'N$  and  $37^{\circ} 04'E$ ; alt. 650 m) lying about 60 km south east of Mt Kulal, within the Hedad Desert.

All the three sites have two rainfall peaks in a year, in April and in November, with the higher peak in April. Gatab receives more rain than the other two sites while Balesa Kulal receives the least. Following identification of species of acridids associated with the habitats there were further investigations of numbers of species and their feeding habits.

Monthly species densities were investigated in the habitats. Significant differences were found between the monthly densities of nymphs ( $P < 0.05$ ) and also between the habitat densities of adults ( $P < 0.001$ ),

and monthly densities of adults ( $P < 0.001$ ) of the species investigated. Higher densities occurred some time after rains had set in. More or less similar results were obtained for monthly biomass of nymphs ( $P < 0.001$ ). Biomass of adults was significantly different between habitats ( $P < 0.01$ ) and between months ( $P < 0.05$ ).

The sex ratios of seventeen species were examined and in ten species there were significant differences at 5 per cent level, between males and females. The sex that occurred in high numbers varied from species to species. In Gastrimargus verticalis, for example, males were always more in numbers than females, on the average 23 females for 108 males.

The numbers of gravid and non-gravid females, in species and the numbers of species with nymphs, were also investigated monthly for eight months. Over 30% of the species examined each month occurred only as non-gravid adults without nymphs. The percentage of those species with nymphs rose slightly during the dry season. During the same season the percentage of species with gravid females was low.

Using habitat as a resource, niche breadths and subsequently niche overlaps of ten species were calculated by the method of Levin (1968). Acrotylus longipes, found in all the four habitats at Balesa

Kulal, and in the two habitats at Luai had the widest niche breadth. Niche overlaps were used to estimate the intensity of competition for habitats. Species with wider niche breadths and hence higher niche overlaps avoided competition by colonising more habitats than their counterparts. Thus Odontomelus sp. whose niche overlap value was 1.07 against 0.55 of G. verticalis has avoided competition for habitat with the latter species in this manner.

Relative interaction was calculated from niche overlap data by the method of Price (1971). The results indicated that the main factor determining the intensity of interaction was not the size of the niche breadth but rather the density of a species together with the densities of those interacted with.

Examination of mandibular structure revealed that the percentage of grass feeders and forb feeders gradually fell with an increase in aridity. It was highest at Gatab and least at Balesa Kulal. This was reversed in the case of mixed feeders.

Food preference studies were carried out and related to mandibular structures. The results indicated that graminivorous acridids preferred grasses to forbs and vice versa for forbivorous species. Mixed feeders preferred grasses most, implying that there is emphasis on grass feeding by

the mixed feeders in this area. Feeding was timed in the laboratory and the results showed that the time taken before a response is made to presented food had some bearing on mandibular structure and type of plant food presented. Thus graminivorous species responded faster to grasses than to forbs. Amount of oven dry matter required per gramme live weight of an acridid was calculated. It was shown that smaller acridids required more food per gramme live weight than larger ones. Acridids were found to consume about  $10 \text{ kg km}^{-2} \text{ d}^{-1}$  of plant material and this is estimated to be about 2.17% of primary production. The percentage of primary production removed varied from time to time in the three sites. On the average it was 2.5% at Balesa Kulal, 3.2% at Luai and 0.8% at Gatab.

Times of active feeding were inferred from changes in crop weights as a percentage of total body weight during the day. "Crop percentage method" was preferred to crop weight method. The latter would require that individual acridids be of the same age. In this study individual acridids were caught from the field and therefore were not necessarily of the same age. Feeding patterns were found in general to be similar in most of the Oedipodinae and highest activity occurred at noon. Each sex of Parasphena kulalensis (Pyrgomorphinae) had its own

feeding pattern that was constant during both dry and wet seasons. Females fed actively in the morning and noon hours and slowed down in the afternoon. Males fed actively in the morning, less at noon and only slightly in the afternoon.

Some actual feeding was observed in the field and Dictyophorus griseus, for example, was observed during such field studies, feeding on leaves of Ipomea batatas, Brassica oleracea and Aspilia mossambiciensis.

From the results of this, it was evident that acridids compete with livestock for food. Field (1979) has shown that camels, sheep and goats combined take 7% of primary production from this study area, mainly from Balesa Kulal (compare this with 2.5% by acridids). Since oedipodines form the majority, by species, future investigations are necessary and would go along one of the following lines:

Investigating the role of this subfamily in causing desert encroachment in northern Kenya. This would be worthwhile considering that most of the Oedipodinae such as Locusta migratoria, Oedaleus senegalensis,

Chortoicetes terminifera and Locustana pardalina cause some damage to vegetation in their respective arid areas of the world. Secondly, performance studies should be carried out on one or two species of this subfamily using cultivated crops such as

millet, maize and wheat. This would be appropriate considering that some arid zone agriculture may one day be tried in northern Kenya as it is already in the Sahelian zone and these may be some of the crops grown. Such arid zone agriculture would inevitably alter the environment which in turn may be suitable for breeding, for certain acridid pests.