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Seasonal feeding habits of small mammals in Kenya

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Abstract

The natural feeding habits of *Acomys percivali* Dollman, *A. wilsoni* Thomas, *Tatera nigricauda* (Peters), *T. robusta* (Cretzschmar), *Taterillus emini* (Thomas), *Saccostomus campestris* Peters, and *Elephantulus rufescens* (Peters) were studied in a semi-arid region of central Kenya.

Insects formed the major resource base of most species and were an important dietary item in all species, at least at certain times of the year. The seasonal changes in diet were generally quite predictable and related to the seasonal availability of certain food items. The maximum consumption of plant stem and leaf material occurred during the rains. Seeds were most frequently consumed during the month-long period after the end of the rains, and insects were most common in the diet during the dry seasons.

The diets of three species were studied in two different habitats. Their diets were similar in the two habitats, but significant differences were detected in the proportions of individual food items consumed in the two areas.

There was a large potential overlap of diets, particularly for the most abundant species, although the actual overlap could not be measured because most food items were not specifically identified.

Introduction

African small mammals are the dominant mammalian fauna in many ecosystems but there is a paucity of information about their food habits (Delany and Happold 1979; Kingdon 1974). Thus, it is not possible in most cases to evaluate the impact of small mammals in African ecosystems, or to determine how food habits affect other aspects of their ecology such as competitive interactions or breeding patterns.

During the past ten years attempts have been made to quantify the diets and examine the seasonal variation in food habits of a few species of African small mammals. Such studies include those of Cole (1975), Emmons (1980), and Genest-Villard (1980) on various species of forest rodents; Field (1975) on two grassland rodent species; Taylor and Green (1976) on rodent species inhabiting agricultural areas; and Hubert et al. (1981), Perrin (1980) and Rathbun (1979) on various species of rodents and elephant-shrews living in semi-arid areas.

This paper documents the feeding habits of six species of rodents and one species of

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elephant-shrew collected from two habitats in Meru National Park, Kenya. Seasonal changes in diet were studied in *Acomys percivali, A. wilsoni, Tatera nigricauda, Saccostomus campestris,* and *Elephantulus rufescens,* but only the general feeding habits of *Tatera robusta* and *Taterillus emini* were noted. The partitioning of the food resources by the various species was investigated for each habitat, and the diets of species common to both habitats were also compared.

Nomenclature follows MEESTER and SETZER (1971–77), except for *Acomys* which follows the revision of PETTER (in press).

Study areas and climate

One study site was an area of approximately 2 km² at the southern edge of the Rojewero Plains (0° 11′ N, 38° 10′ E) at an altitude of 650 m. The plains are open grassland dominated by *Chrysopogon plumulosus, Sehima nervosum, Cenchris ciliaris* and *Chloris virgata* (AMENT 1975). There were a few stunted bushes and trees, mainly *Combretum apiculatum, Acacia* spp., and *Terminalia* sp.

The other study site was a 2 km² area of deciduous *Acacia/Commiphora* bushland immediately south of Rainkombe (0° 07′ N, 38° 12′ E) at an altitude of 550 m. A variety of tall *Acacia* and *Commiphora* bushes dominated the area, with a few *Acacia* spp., *Terminalia* spp., *Stercularia africana, Delonix elata* and *Adansonia digitata* trees. In some areas there was a thicker understory of *Bauhinia taitensis, Grewia villosa, Combretum aculeatum* and other species of bushes (AMENT 1975), but there was no herbaceous layer for most of the year and much of the ground was badly eroded.

Rainfall and temperature were monitored at the Park headquarters 3 km east of the Rojewero Plains study site. The rains occurred during the periods November 5–December 31 and April 13–May 16 (Table 1). This rainfall pattern was typical of the long term pattern in the area. There are normally two rainy seasons which occur sometime during the periods March until May and October to December (MORTH 1970). There was also a seasonal variation in temperature that was correlated with

Table 1

Rainfall and temperature records for Meru National Park during the period July 1, 1974 to June 18, 1975

For the purpose of studying seasonal changes the year was divided into the 7 time periods indicated

	Time period											
	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr 1–Apr 13	Apr 14–May 16	May 17–June 18
Rainfall (mm)	0	0	0	0.8	153	99	0	0	0	0	317	0
Temp. (°C)												
Min.	–	–	21.1	22.2	22.0	21.3	20.7	22.2	23.2	24.0	22.8	21.3
Max.	–	–	32.3	34.3	31.1	30.6	31.8	34.6	35.4	35.1	32.2	30.9
Mean	–	–	26.7	28.3	26.5	26.0	26.3	28.4	29.3	29.6	27.5	26.1
	↓		↓		↓		↓		↓		↓	↓
Season	Dry		Dry		Wet		Int.		Dry		Wet	Int.

the pattern of rainfall (Table 1). The mean temperature decreased during the rains, reaching a minimum of 25–26 °C at the end of the rains, and increased throughout the dry seasons to a maximum of 29–30 °C just prior to the start of the rains.

The vegetation responded to the seasonal rainfall pattern in a very predictable way, with the most pronounced changes being observed in the area of *Acacia/Commiphora* bushland south of Rainkombe. After the onset of the rains the grasses became green and resumed growth and several species of annual herbs grew. In the Rainkombe area virtually all the ground vegetation grew from seed during the rains, and the bushes, which prior to the rains had looked dry and dead, came into leaf. The main seed set occurred at the end of the rains and during the first month of the dry season in both areas. During the latter period, called the intermediate season in this paper, the vegetation dried up, and the leaves fell off the bushes in the Rainkombe area. In the latter area, there was virtually no ground vegetation remaining one month after the end of the rains.

Materials and methods

Both areas were sampled by standard trap lines of Reporter break-back traps baited with peanut butter, with the traps set at 10 pace intervals. In addition, approximately half of the *Elephantulus* were collected by trapping out family territories using unbaited Sherman live traps. Collections were made in each area for approximately 10 days each month for a period of one year.

Diets were quantified in the following manner for all species except *E. rufescens*. Entire stomach contents of adult animals were combined according to species, time period, and area collected, and the composite samples were sent to the Composition Analysis Laboratory at Colorado State University for analysis by microhistological techniques. Each sample was bleached to make the cellular characteristics more visible, and then washed in warm water to remove the bleach and any peanut butter bait contaminating the samples. Five subsamples were taken from each sample and mounted on microscope slides in Hoyers' mounting medium. There were approximately three identifiable food fragments per microscope field when viewed at a 100 X magnification. Food fragments were categorized as 1. arthropods, 2. seeds, 3. grasses or sedges, and 4. leaves of herbaceous plants or bushes, by using cellular and other morphological characteristics. A few plant fragments were identified to the genus level. A total of 20 microscope fields, or approximately 60 identifiable food fragments, were counted for each of the five subsamples per sample. The percent relative density and standard deviation (n = 5) was then calculated for each identifiable food category for each sample.

The diet of *E. rufescens* was known to be almost entirely insect material (Rathbun 1979), and so the proportion of seeds and plant material in the diet was visually assessed by examining entire stomach contents under a dissecting microscope. The proportions of the various food items at different times of the year were determined by assuming that the stomach contents of all individuals were of equal volume.

The year was divided into seven time periods (Table 1) in order to determine seasonal changes in feeding habits of *T. nigricauda* and *A. wilsoni* from the Rojewero Plain and *A. percivali* and *E. rufescens* from the Rainkombe area. Sample sizes and their distribution within the seven time periods is detailed in Table 2. However, seasonal changes in the diets of *Saccostomus campestris* from the Rojewero Plains and *A. wilsoni* and *T. nigricauda* from the Rainkombe area were evaluated by grouping the stomachs into those collected during the dry seasons and those collected during the rains (Table 3). Finally, single composite samples were assessed for *Tatera robusta* and *Taterillus emini* (Table 3) because only a few stomachs were available for these species.

Results

Seasonal changes in food habits

Tatera nigricauda

In grassland areas of the Rojewero Plains the proportion of arthropods (mainly insects) in the diet was at a maximum during the dry seasons, declined during the rains, and reached a minimum during the intermediate seasons (Table 2). The proportion of seeds in the diet exhibited an inverse relationship to that of arthropods. The proportion of plant material was at a maximum during the rains and a minimum during the dry seasons (Table 2).

In the area of *Acacia/Commiphora* bush south of Rainkombe the differences in feeding habits between the wet and dry seasons were similar to those already described (Table 3), except that the proportion of seeds in the diet declined significantly during the rains.

Acomys wilsoni

The Rojewero Plains populations did not exhibit any consistent differences between the diets in the wet and dry seasons (Table 2). The only consistent seasonal variation in feeding habits occurred during the intermediate seasons when there were significantly less arthropods (mainly insects) and correspondingly more seeds in the diet (Table 2).

The food habits were also similar during the wet and dry seasons in the Rainkombe area (Table 3), except that, like *T. nigricauda*, seeds comprised a significantly higher percentage of the diet during the dry seasons. However, gum exudates from various bushes and trees

Table 2

Mean (± standard deviation) percent relative density of discerned fragments from stomach samples

Values based on 5 subsamples taken from single composite samples of (n) stomachs except for *Elephantulus* (see Materials and methods). Seasonal changes in the mean percentage of a class of dietary items were tested for significance by the T-method (Sokal and Rohlf 1981) and those labelled with the same letter are not significantly different from one another

Area, Species and dietary item	Months and seasons J–A Dry	S–O Dry	N–D Wet	J Intermediate	F–A Dry	A–M Wet	M–J Intermediate
Rainkombe							
E. rufescens (n)	(6)	(22)	(12)	(9)	(27)	(6)	(4)
Arthropod	>99	>99	93	98	>99	>99	98
Stem and leaf	< 1	< 1	7	1	< 1	0	0
Seed	0	0	1	< 1	< 1	< 1	2
Acomys percivali (n)	(20)	(20)	(20)	(20)	(20)	(16)	(20)
Arthropod	92.1 ± 6.4^{x}	97.0 ± 3.0^{x}	92.4 ± 3.8^{x}	48.3 ± 9.9^{y}	57.4 ± 9.7^{y}	73.6 ± 14.4^{x}	50.5 ± 14.9^{y}
Grass and sedge	0^{n}	0.5 ± 1.1^{n}	0.6 ± 1.3^{n}	3.9 ± 1.9^{o}	0^{n}	0.5 ± 1.2^{n}	0.8 ± 1.7^{n}
Forbs and browse	3.2 ± 3.0^{gh}	0.8 ± 1.1^{g}	4.7 ± 3.7^{gh}	6.9 ± 2.0^{gh}	8.6 ± 7.9^{gh}	17.5 ± 14.7^{h}	11.5 ± 6.5^{gh}
Seed	4.7 ± 4.2^{ab}	1.8 ± 2.1^{a}	2.3 ± 1.8^{ab}	40.9 ± 9.6^{d}	34.0 ± 7.8^{cd}	8.4 ± 5.2^{bc}	37.3 ± 10.5^{d}
Rojewero Plains							
Acomys wilsoni (n)	(10)	(18)	(19)	(7)	(14)	(5)	(7)
Arthropod	71.2 ± 14.1^{xyz}	57.2 ± 17.3^{yz}	87.2 ± 7.8^{xy}	34.3 ± 15.6^{z}	93.1 ± 4.3^{x}	62.9 ± 15.7^{xy}	55.4 ± 12.6^{z}
Grass and sedge	0.5 ± 1.1^{n}	0.7 ± 1.6^{n}	0^{n}	4.9 ± 4.5^{o}	0^{n}	0^{n}	0^{n}
Forbs and browse	0.6 ± 1.3^{g}	3.5 ± 3.8^{g}	0^{g}	11.6 ± 5.8^{h}	2.1 ± 3.8^{g}	5.0 ± 5.7^{gh}	0^{g}
Seed	27.7 ± 13.7^{abc}	38.6 ± 14.6^{cd}	12.8 ± 7.8^{ab}	49.2 ± 20.6^{d}	4.9 ± 0.9^{a}	32.1 ± 11.8^{bc}	44.6 ± 12.6^{cd}
Tatera nigricauda (n)	(14)	(14)	(14)	(14)	(14)	(14)	(6)
Arthropod	96.2 ± 2.3^{x}	91.5 ± 5.0^{xy}	50.6 ± 16.6^{y}	30.2 ± 12.1^{z}	92.1 ± 5.9^{x}	70.3 ± 16.1^{xy}	34.5 ± 11.0^{z}
Grass and sedge	0.8 ± 1.2^{n}	0^{n}	12.9 ± 7.8^{o}	2.6 ± 2.8^{n}	0.8 ± 1.0^{n}	2.7 ± 2.5^{n}	12.2 ± 4.9^{o}
Forbs and browse	2.2 ± 2.2^{gh}	0.9 ± 1.3^{g}	13.3 ± 6.8^{hi}	4.8 ± 4.1^{gh}	2.7 ± 3.2^{gh}	20.4 ± 13.2^{i}	0.6 ± 1.4^{g}
Seed	0.9 ± 1.2^{a}	7.6 ± 5.1^{ab}	23.4 ± 14.2^{cd}	62.3 ± 9.2^{d}	4.5 ± 4.9^{ab}	6.6 ± 4.1^{bc}	52.7 ± 11.9^{d}

were also eaten in this area but the amount eaten could not be assessed by the method of diet analysis used in this study. If the amount consumed varied seasonally, and was correlated with the availability of gum exudates at different times of the year, then the seasonal changes in diet would be greater than indicated by this study.

Acomys percivali

There were no consistent differences between the diets during the wet and dry seasons, but significantly less arthropods and proportionately more seeds were consumed during the intermediate seasons (Table 2). The latter trend was also generally observed throughout the last six months of the study compared to the first six months (Table 2). It should be noted that this species, like *A. wilsoni*, also consumed unknown amounts of gum exudates.

Elephantulus rufescens

Almost all of the diet was arthropod material (mainly termites and ants) and so there was little seasonal variation in food habits (Table 2). There was an increase in stem and leaf material during the November-December rains, but there was no increase in this food item during the April-May rains. A small number of grass seeds, amounting to 1–2 percent of the diet, was consumed during the intermediate seasons (Table 2).

Saccostomus campestris

Diets were compared during the wet and dry seasons in a population of animals from the Rojewero Plains (Table 3). The proportion of arthropods and seeds were higher during the dry seasons, whereas the proportion of forbs and browse was higher during the rains (Table 3).

Table 3

Mean (± standard deviation) percent relative density of discerned fragments from stomach samples

Values based on 5 subsamples taken from single composite samples of (n) stomachs. Asterisks indicate level of significance for comparison of dietary items between the wet and dry seasons. Samples compared by t-tests (Sokal and Rohlf 1981)

Area, species and season	Arthropods	Grass and sedge	Forbs and browse	Seeds
		Rainkombe		
Acomys wilsoni				
Dry (n = 14)	77.2 ± 10.8	0	8.2 ± 7.2	14.5 ± 6.5
Wet (n = 10)	84.4 ± 11.1	0	12.0 ± 6.8	3.6 ± 4.1**
Tatera nigricauda				
Dry (n = 10)	62.6 ± 5.9	0.6 ± 1.3	9.5 ± 9.6	27.3 ± 7.8
Wet (n = 11)	49.1 ± 15.1*	19.2 ± 7.2***	29.6 ± 11.5**	2.2 ± 2.0
Tatera robusta				
All seasons (n = 7)	25.8 ± 9.2	12.8 ± 3.2	4.7 ± 4.6	56.8 ± 5.8
Taterillus emini				
All seasons (n = 11)	61.5 ± 10.3	30.9 ± 9.4	0.7 ± 1.6	6.8 ± 2.3
		Rojewero Plains		
Saccostomus campestris				
Dry (n = 8)	21.7 ± 8.1	2.3 ± 2.1	43.0 ± 10.6	32.9 ± 9.3
Wet (n = 15)	6.7 ± 5.2**	1.5 ± 2.0	82.7 ± 17.9**	9.1 ± 4.0***
Tatera robusta				
All season (n = 6)	28.8 ± 9.9	3.5 ± 2.5	2.5 ± 3.1	65.3 ± 10.7

* $P < 0.1$; ** $P < 0.05$; *** $P < 0.001$

Tatera robusta and *Taterillus emini*

Seasonal changes in food habits were not assessed for these two species. *T. robusta* was primarily a seed eater with arthropods (mainly insects) being of secondary importance (Table 3). *T. emini* primarily ate insects and secondarily grasses (Table 3).

Comparison of species and areas

The seasonal pattern in food habits of the various species, were generally quite similar (Tables 2 and 3). All species, except for *A. wilsoni* on the Rojewero Plains, had a tendency to eat a greater proportion of stems and leaves during the rains. Similarly, all species switched to seeds during the intermediate seasons. In most cases there was also a greater proportion of seeds in the diet during the dry season compared to the rains.

Seasonal trends in the diets of *T. nigricauda* and *A. wilsoni* from the Rojewero Plains and *A. percivali* from Rainkombe were compared by Kendall's coefficient of concordance. There was significant agreement in the proportion of arthropods ($W = 0.70$; $\chi^2 = 12.6$; $df = 6$; $P = 0.05$) and seeds ($W = 0.68$; $\chi = 12.3$; $df = 6$; $P = 0.05$) at different times of the year, but not in the proportion of stem and leaf material.

There was a large range of different plant types eaten by the various rodent species, particularly *A. percivali* and *T. nigricauda* (Table 4). However, most of the plant material remained unidentified.

Table 4

Identified plant food items in the diets of small mammal species collected from Rainkombe (area A) and the Rojewero Plains (area C)

Food item	*Acomys wilsoni* A	*Acomys wilsoni* C	*Acomys percivali* A	*Tatera nigricauda* A	*Tatera nigricauda* C	*Tatera robusta* A	*Tatera robusta* C	*Taterillus emini* A	*Saccostomus campestris* C
Ameranthaceae									
Achyranthes				●					
Combretaceae									
Combretum			●		●				
Tiliaceae									
Grewia			●	●					
Malvaceae									
Hibiscus	●		●	●					
Caesalpiniaceae									
Cassia									●
Mimosaceae									
Acacia			●	●	●				
Papilionaceae									
Indigofera					●				
Rhynchosia			●	●					●
Burseraceae									
Commiphora			●	●	●				
Solanaceae									
Solanum		●	●	●	●				●
Lamiaceae									
Ocimum	●		●						
Commelinaceae									
Commelina				●			●		
Liliaceae									
Eustachys				●					
Gramineae									
Cenchrus				●		●		●	
Cynodon				●				●	

Table 5

Summary of t-test results comparing the diets of species collected from both the Rojewero Plains and Rainkombe areas

Negative values indicate that the food item made up a greater proportion of the diet in the Rainkombe area compared to the Rojewero Plains, and positive values indicate the reverse

Species	Season	Arthropods	Grasses and sedges	Forbs and browse	Seeds	df
Acomys wilsoni	D	− 0.37ns	+0.81ns	−2.69*	+1.10ns	18
	W	− 1.08ns	0	−3.24**	+2.94*	13
Tatera nigricauda	D	+11.78**	−0.19ns	−2.96**	−7.96***	18
	W	+ 1.17ns	−2.76*	−2.14*	+2.11*	13
Tatera robusta	D+W	+ 0.50ns	−5.12***	−0.88ns	+1.57ns	8

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; ns = not significant

Three species were studied in both study areas (Tables 2 and 3), and the results of statistical comparisons between their diets in the two areas are summarized in Table 5. Plant stem and leaf material formed a larger proportion of the diet of all three species in the Rainkombe area compared to the Rojewero Plains. There was generally a greater frequency of seeds in the diet in the Rojewero Plains compared to the Rainkombe area. The only exception was for *T. nigricauda* during the dry seasons when that species ate mainly arthropods (Tables 2 and 5).

Discussion

Insects were the major resource base of most species and were an important dietary item in all species, at least during certain seasons of the year. Seeds were also a dominant or a secondary food item in many species, particularly during the intermediate seasons. Only one species, *S. campestris,* was primarily vegetarian. The diet was superficially similar to that described for *Arvicanthis* collected from the same area (Neal 1981), except that the latter species ate mostly grass material.

The seasonal variation in diet was similar in its general form in all species (Tables 2 and 3). The most dramatic change in diet occurred during the intermediate season, which is the period of the main seed set, when seeds were more frequently consumed at the expense of arthropod (mainly insect) material. There was less difference in food habits between the wet and dry seasons. There was an increased frequency of plant stem and leaf material during the main growing season of the rains, except in *A. percivali* and *A. wilsoni.* Thus, all species were opportunistic to a greater or lesser extent, and the diet changed in response to the seasonal availability of the various food items.

Insects were at a maximum frequency in the diet during the wet and dry seasons, and at a minimum during the intermediate seasons (Tables 2 and 3). This pattern was also observed for *Praomys (Mastomys) erythroleucus* (Temminck) and *Taterillus gracilis* Thomas in Senegal (Hubert et al. 1981). However, the consumption of insects was positively correlated with rainfall in *Lemniscomys striatus* (Linnaeus) in Uganda (Field 1975), and *Rhabdomys pumilio* (Sparrman) in South Africa (Perrin 1980), and possibly for *Arvicanthis niloticus* in Kenya (Taylor and Green 1976). No seasonal relationship was noted for *Praomys (Mastomys) natalensis* (Field 1975; Taylor and Green 1976). The seasonal variation in the frequency of insects in the diet is probably very dependent on the types of insects consumed (Hubert et al. 1981).

The diets of *Acomys wilsoni, Tatera nigricauda* and *T. robusta* were similar in their general composition in the Rojewero Plains and Rainkombe areas (Tables 2 and 3). However, significant differences were revealed between the proportions of individual food

items in the two areas (Table 5). It was surprising that more plant material was consumed in the Rainkombe area compared to the Rojewero Plains considering the virtual absence of a ground vegetation layer for most of the year in the Rainkombe area. It is suspected that most of the plants eaten in the Rainkombe area were succulents, which may provide an important source of water. Obviously, more attention needs to be paid to the influence of habitat on the feeding habits of small mammals.

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Zusammenfassung

Saisonale Nahrungsbeschaffenheit kleiner Säugetiere in Kenia

Die Nahrung von *Acomys percivali, A. wilsoni, Tatera nigricauda, T. robusta, Taterillus emini, Saccostomus campestris* und *Elephantulus rufescens* wurde in einer mäßig trockenen Region Mittelkenias aufgrund von Mageninhaltsanalysen untersucht. Die Hauptnahrung der meisten Arten bestand aus Insekten, und bei allen waren Insekten mindestens zeitweise eine wichtige Komponente. Die jahreszeitliche Änderung in der Zusammensetzung der Nahrung entsprach den Änderungen im Nahrungsangebot. Gräser und Blätter wurden am häufigsten während der Regenzeit, Samen in den daran anschließenden Monaten und Insekten in der trockenen Jahreszeit verzehrt. Für drei Arten aus zwei verschiedenen Gebieten ergaben sich auch deutliche regionale Unterschiede.

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Patterns of G- and C-bands distribution on chromosomes of three *Apodemus* species

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Abstract

Compared the chromosomes of three species of genus *Apodemus: Apodemus agrarius, A. sylvaticus* and *A. flavicollis* by means of G- and C-banding techniques. The characteristics of G-banding are identical for 19 pairs of autosomes and for sex chromosomes. The distribution of crossbands on all chromosomes of *Apodemus sylvaticus* and *A. flavicollis* appeared to be quite the same. The karyotypes of the previous two species and that of *A. agrarius* are different in four pairs of small metacentrics which have arisen by pericentric inversions from chromosomes 16, 19, 22 and 23. The C-bands are restricted to the centromeric area in all the species studied.

Introduction

From numerous descriptions of karyotypic variation in mammals which appeared in the last three decades it seems that there exist two major groups of animals according to the degree of karyotypic differences. The smaller group consists of species whose karyotypes appear to be very uniform, and the bigger group includes species which are karyotypically very different. The differences between these two groups can be explained by biological factors i.e. reproductive potentials and social structure of species (Arnson 1972; Fredga 1977).

Karyotypes made by standard techniques have often been used as the measure of the degree of chromosomal variation (Wilson et al. 1975; Bush et al. 1977; Bengtsson 1980). Detailed studies of patterns of G- and C-bands, which now exist for some groups, show that magnitude of chromosomal variation in some cases is much greater than it was thought at the time when karyotypes were investigated solely by conventional techniques.

By using methods of differential staining Haiduk et at. (1981) found that in eight species of African megachiropterans karyotypic variation is 4.5 times greater than it was suggested by standard karyotypic studies.

Three species of genus *Apodemus,* which by standard techniques appeared to be karyotypically very similar, are studied in this work by means of G- and C-banding techniques. The genus *Apodemus* is widespread over the Palaeartic. According to Martens and Niethammer (1972) it is divided into three subgenera: *Apodemus, Sylvaemus* and *Alsomys.* In this work three species have been examined: *Apodemus agrarius* Pall. which belongs to subgenus *Apodemus; Apodemus sylvaticus* L. and *Apodemus flavicollis* M. both of which belong to subgenus *Sylvaemus.*

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