

Habitat preference

of the African *...*

It is an opportunistic breeder which reaches an outbreak population size during maximum reproduction. The genus is usually associated with grassland habitats. It feeds on a wide variety of food items ranging from grasses and seeds to animal matter, particularly insects (NEAL, 1970; DELANY, 1964b; CHEESEMAN 1977; SICARD *et al.*, 1994; RABIU and FISHER, 1989). Presently, the number of species recognized for the genus reaches the maximum number of 6 (CORTI and FADDA, 1996). On the other hand, some investigators have also lumped all the taxa into one species i.e. *Arvicanthis niloticus* (MISONNE, 1971; HONACKI *et al.*, 1982). The variation in the number of species described for the genus suggests that there is a need for further taxonomical investigation. However, there is a common understanding that populations from the Nile delta and West Africa belong

to *A. niloticus* while those from East Africa and the Horn belong to any one of the six species *A. blicki*, *A. abyssinicus*, *A. dembeensis*, *A. somalicus*, *A. nairobae*, and *A. testicularis* (CORBET and HILL, 1991; MUSSER and CARLETON, 1993).

VOLOBOUEV *et al.* (1988) provisionally grouped populations of *A. niloticus* into three cytotypes. Populations of *A. dembeensis* have been observed to be similar to the ANI -1 cytotype (CORTI *et al.*, 1996). Following this, it is strongly believed that *A. dembeensis* is a geographical variant of *A. niloticus* (CAPANNA *et al.*, 1996).

This paper is an attempt to add to the already existing few studies on habitat use of African small mammals. It is also targeted to initiate further research in this area so that a balance could be maintained between the various fields of ecological research on small mammals. Habitat use in *Arvicanthis* has not been studied in such details as in other small mammals. The present study is an initiative to fill some of the existing gaps in this knowledge.

Materials and methods

The study was carried out in the Koka Dairy Farm Enterprise located near Koka town, Central Ethiopia (09° 05' N, 39° 00' E) at an alti-

degraded savanna woodland. The farm compound, however, incorporates various modified habitats as a result of plantations of various vegetation like reeds, sisal, maize, and pastoral grass species. These provided the opportunity to investigate the habitat use of *Arvicanthis* in both natural and modified habitats.

Fifteen quadrats, each with an area of 15 x 15 m, were selected to represent the study sites. A number of vegetation parameters that could influence rodents were considered while selecting the quadrats. These were: plant species composition; ground vegetation cover; aerial vegetation cover.

A minimum of 100 m distance was maintained between the sites to secure independent catch records. The fifteen sites were labeled “A” to “O”. The field data collection was carried out from February 1997 to February 1998 on a six month interval. Consequently, three trapping periods were covered i.e. February 1997 (1st dry season), August 1997 (wet season) and February 1998 (2nd dry season).

Trapping was carried out using Victor mouse traps. Peanut butter was used as bait. The trapping stations were established at 3 m intervals along four trapping lines. Consequently, a total of 16 trap stations were established in each site. Traps were set late in the afternoon (3:00-4:00 p.m.) and kept for three consecutive days and nights. Seven of the sites were trapped for the first three days and nights and then the remaining 8 were trapped for the same duration. The animals were retrieved early in the morning (6:00-8:00 a.m.) and in the late afternoon (4:00-6:00 p.m.). The captured specimens were sexed, weighed and measured. Then, they were categorized into their age groups based on their weight and reproductive condition. Individuals which weighed < 26 g were considered as juveniles, between 26 and 60 g as subadults and > 60 g as adults.

The habitat structure of each site was thoroughly described during each trapping session (table 1). Major plant species were collected from each site and identified at the National Herbarium, Biology Department, Addis Ababa University (table 2). Catch records of each site were compared using two-way ANOVAs ($P = 0.05$) and Critical Difference (C.D.) analyses.

Sites	Description
A	Thick bushes, about 1.5 m high, dominated by sisal plants (<i>Agavae sisalina</i>) and other shrubs and scrubs. The ground cover within the range of 1-20 cm height was scanty. The bush was continuous on both right and left hand sides while the back and the front sides were open grass fields.
B	Thick bush, about 1.75 m high, entirely dominated by <i>Achyranthus aspera</i> with well covered ground. However, there was no ground vegetation in the form of hedges and grass strips. Almost at the center of the site there was a big <i>Ficus</i> tree whose branches shade the entire site. The very ground is covered with dried, broad leaves which fall down from the <i>Ficus</i> tree.
C	Relatively open bush, about 1 m high, with ground well covered by dried grasses, about 30 cm high. It was dominated by <i>Solanum</i> spp. The front and back sides were fairly open while left and right sides were continuous about 10 m on both sides.
D	Extremely dense bush, about 2 m high, with a number of shrub, scrub and grass species. The ground was also very thick and dark. On each of its four corners it was surrounded by fields of cut grasses. It appeared like an island of thick bush.
E	Had fairly thick ground cover, about 40 cm high, provided by dried grasses. It was full of dried unbranched, leafless Castor oil trees (2.3 m high). However, they didn't provide any good aerial cover.
F	Except its species composition, it had quite similar vegetation structure as site B. The ground was devoid of any growth but only dried fallen leaves. It was surrounded by acacia trees (about 4 m high) and bushes (about 1.5 m high), part of an extensive bush system composed of shrubs and scrubs.
G	A fallow land with bare ground. There were only few individuals of herb species. It was well exposed.
H	Totally covered with grasses. However, the grass cover was fairly spaced. The aerial cover was non-existent. The total vegetation canopy was about 70 cm high.
I	An open field similar to site G. The ground was covered with sand grains. Some stations, however, were fairly shaded with grasses (about 60 cm high) which form a nest like harbour. Further out of the site, along these fairly shaded stations, there was a dense bush. Opposite to this end of the site there was a pile of harvested waste of maize.
J	It was part of an extensive acacia bush. The average height of the vertical growth was 2.5 m. The ground was covered with dense grasses where ever there was an acacia tree. But on those spots where the acacia trees were not present. the ground was bare.

Sites	Plant species
A	<i>Gloriosa simplex</i> , <i>Agavae sisalina</i> ,
B	<i>Cynodon dactylon</i> , <i>Achyranthus aspera</i> , <i>Bidens pilosa</i> , <i>Ficus sur</i>
C	<i>Tagetes minuta</i> , <i>Cynodon dactylon</i> , <i>Solanum incum</i>
D	<i>Ehretia cymosa</i> , <i>Vernonia leopoldii</i> , <i>Cynodon dactylon</i> , <i>Sesbania sesban</i>
E	<i>Amaranthus hybridus</i> , <i>Cynodon dactylon</i> , <i>Solanum marginatum</i> , <i>Solanum incum</i> .

Species	1 st dry season	2 nd dry season	Wet season
<i>Arvicanthis</i>	98	43	20
<i>Mastomys</i>	78	41	55
<i>Tatera</i>	2	11	4
<i>Crocidura</i>	6	3	–
<i>Rattus</i>	2	1	1
Total	186	99	80

Table 3
Number of small mammals caught in each season.

This was done because both periods represent the dry season, with similar vegetation structure for each site. The August 1997 trapping data, however, are presented separately as the habitats changed during this period owing to the climatic change.

The catch records of the 15 sites were significantly different ($P < 0.05$) for both seasons. However, since the wet season sample size was very

small, the corresponding data were not analyzed further. Consequently, the C.D. analysis was conducted only for the dry seasons. We have compared the means of the three day captures recorded for each site from the ANOVA table. Figure 1 shows the mean values for each site. Based on the C.D. analyses, it was possible to rank the sites as favoured (high catch records) and disfavoured (low catch records) (table 5). The sites which belonged to the 1st rank recorded from 21 to 32 individuals, 2nd rank 14, 3rd rank 13, 4th rank 8, 5th rank 3-5 and 6th rank 0-1.

Discussion

The present data show that habitat selection of *Arvicanthis dembeensis* is more influenced by the vegetation structure than by its species composition. This is in agreement with what BOND *et al.* (1980) found. Habitats that possessed dependable cover yielded high catch values.

Sites	Dry seasons	Wet season
A	21	1
B	14	–
C	13	2
D	8	–
E	1	2
F	5	2
G	–	–
H	–	3
I	8	–
J	1	1
K	32	2
L	21	–
M	3	–
N	–	2
O	14	5
Total	141	20

Table 4
Catch distribution
of *Arvicanthis*
among the 15 sites.

On the other hand, those that did not have fairly thick vegetation were not preferred. In fact, there is an apparent explanation for these observations. *Arvicanthis* is a diurnal rodent. Rodents in general are highly vulnerable to predators, particularly birds as observed in the study area. They can not afford an extended stay in exposed habitats as they will be picked up by the birds. Consequently, their survival is highly dependent on the presence of shelter. In addition, well covered habitats provide them with good nesting sites. The observed catch distribution in the selected habitat types is in good agreement with this simple habitat selection strategy. Those sites which fall in the 1st rank (K, A, and L) had thick bushes with dependable cover. The same was true with those which belonged to the 2nd (B and O) and 3rd ranks (C). However, all these sites were different in their species composition (table 2). These observations could lead one to inquire about food. Does *Arvicanthis* consume whatever plant species is available, or does it completely depend on sources of food other than the vegetation profile? Studies showed that *Arvicanthis* is mainly herbivorous (DELANY and MONRO, 1986; SENZOTA, 1982). However, it also

1st rank	2nd rank	3rd rank	4th rank	5th rank	6th rank
K	B	C	D	F	E
A	O	-	I	M	G
L	-	-	-	-	H
-	-	-	-	-	J
-	-	-	-	-	N

Table 5
The rank of each trapping site (A - O) based on the C.D. analyses.

includes animal matter, particularly insects, in its diet (RABIU and FISHER, 1989). In the study area, it has been observed feeding on the larvae of termites (casual observations). It also feeds upon grasses, seeds, fruits, and cereals when found near agricultural areas (TAYLOR and GREEN, 1976; RABIU and FISHER, 1989). It is an opportunistic feeder. However, indigestible woody vegetation can not be used as food. All the major vegetation types which were found in our trapping sites fall under these categories. *A. dembeensis* may not use the major plant species as a source of food. Instead, the food source could be insects, small blades of grasses, weeds and fallen leaves which were widely distributed almost among all the sites. It could also be possible that the rats pay short visits to nearby areas with potential food sources and return back to their permanent residence. In fact, the catch record observed in site I could truly illustrate this. The site was a rather exposed area with regard to both aerial and ground cover, and was hardly favoured by rodents. However, along one side of the site, there existed a thick bush which can possibly harbour a good population of rodents. The 8 individuals caught in site I were probably residents of this bush which pay short visit to the nearby site, which in turn was located near a pile of the waste components of harvested maize.

Although most of our results support the idea that vegetation structure is the most important factor determining habitat selection, some of the catch records showed inconsistencies. For example, the catch record of site D was much less than what was expected. It was an extremely thick, well protected and diverse habitat. However, as

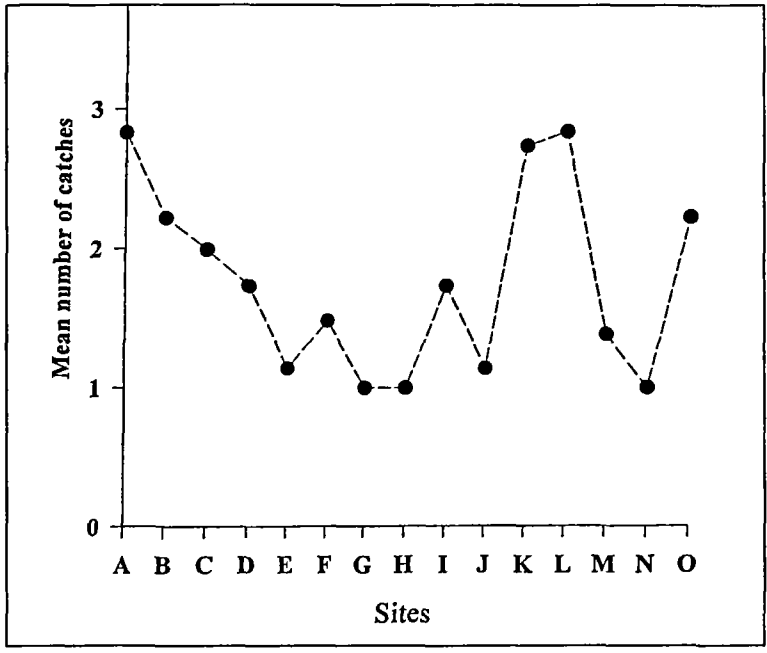


Figure 1

SENZOTA (1982) found out, the site might have discouraged colonization. SENZOTA (1982) observed low catch records (67 individuals/ha) in habitats with 40% bush cover, against 320 individuals/ha in habitats which had 10% bush cover. Probably the rats are discouraged by congested habitats due to lack of free space for movement. The low catch records observed in sites E, H, and J were also surprising. Site E had dense ground cover of dried grasses. However, its

like an umbrella. The ground was covered with dense grasses which provided good nesting sites and hiding places. One may hypothesize that the area was not fully colonized by *Arvicanthis* yet because it was distantly isolated at the northern boundary of the enterprise's enclosure.

In summary, we emphasize the importance of vegetation structure as the governing factor of habitat selection by *Arvicanthis dembeensis*. Most of our data support this assumption. However, since the number of trapping sessions we have employed was very limited, some observed apparent inconsistencies between catch records and vegetation structure in some of the sites could result from chance. From there, it becomes apparent that detailed micro-habitat studies are required to better understand the habitat selection of *Arvicanthis*.

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