THE HABITAT OF THE ROCK HYRAX

By

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Introduction

There are three genera of hyrax and two of these, Procavia and Heterohyrax, are rock hyraces, living in existing cavities in rocky outcrops. Procavia is the larger of the two and is distributed throughout Africa and the Middle East while Heterohyrax is found down the eastern coast of Africa (Sale, 1960). Both genera are gregarious, living in colonies among the rocks and in this respect differ from the solitary tree hyrax, Dendrohyrax, which, unlike the rock hyraces, is strictly nocturnal. Procavia and Heterohyrax in East Africa show no basic differences in behaviour and selection of habitat as far as "lowland" areas are concerned. Only the rather specialised P. Johnstoni mackinderi Thomas inhabits the cold alpine zone of Mount Kenya, however. The tendency of some workers to refer to Heterohyrax as the "bush" hyrax (e.g. Roche, 1962) and accord it an intermediate position, as far as habitat selection is concerned, between Dendrohyrax and Procavia seems to me to be unjustified. Heterohyrax is just as much a rock dweller as Procavia and it is significant that while there are separate native names for tree and rock hyraces, no distinction is made between the two genera.

In all social animals, the structure of the group depends to a large extent on the nature of the habitat and may have to be modified from time to time to fit in with changes in the habitat. If the animal is one which, like many rodents, modifies the habitat to suit its own social needs then a more rigid social structure can be maintained and will be modified only to a minor extent by such factors as terrain, soil type, predominant vegetation and climate. King (1959) says of the prairie dog, Cynomys sp. "By building towns that occupy acres and even square miles, prairie dogs modify their environment and make it more suitable to their needs", and similar statements could be made about many burrowing social rodents. The rock hyrax, however, is not a burrower and, as Bruce (1790) points out, the fleshy part of the toes projects beyond the nails precluding their use in digging. Occasionally one finds evidence of the hyrax having scratched out a small quantity of loose soil in order to enlarge a cavity or widen its entrance but even such minor modification of the environment as this is uncommon and certainly does not confirm Powell's statement (quoted in Shortridge, 1934) that they "do a considerable amount of digging".

The importance of suitable shelter to the distribution of the rock hyrax will be discussed more fully later but it can be stated here that wherever there are rocky cliffs, outcrops or boulder screes providing cavities in which the colonies can shelter, one can reasonably expect to find hyrax (Drake-Brockman 1910; Shortridge, 1934). Within this basic requirement it is difficult to define a "typical" hyrax habitat in terms of environmental necessities, although where colonies exist there are certain visible indications of their presence such as urine deposits on the rocks (see Plate 1 a).

Geology

Throughout the highlands of Abyssinia and East Africa comparatively recent volcanic activity and faulting have resulted in the presence of frequent outcrops of igneous rock. Very many of these outcrops occur along fault scarps where the weathering of the scree has left a loose collection of boulders at the foot of the cliff (see Fig. 1A). These boulder heaps, with large interstices, constitute an ideal habitat for hyrax colonies. Outcrops formed in this way are common throughout the highlands and particularly in the region of the Rift Valley where, in addition to the great walls of the valley itself, there are numerous secondary rifts in the valley floor. In the region of volcanoes, outcrops often represent the front of a lava flow that has had the slag removed by erosion, leaving boulders of volcanic rock (see Fig. 1B). In the large glaciated valleys radiating from the peaks of Mount Kenya similar collections of boulders have resulted from the weathering of lateral and terminal moraines (see Fig. 1C and Plate 1b).

Hyrax colonies are not confined to boulder screes, however, and frequently occupy cracks and crevices that have formed in exposed rock faces due to cooling and erosion. In some places, such as Lukenya Hill in the Ukambani area east of Nairobi, large vertical cracks have resulted in the distal portion of rock falling away and coming to rest as a massive boulder on the slope below (Fig. 2). Where this has happened a shear vertical rock face is left behind in the form of a cliff. Further erosion by wind and water has made horizontal cavities at the base of such cliffs by the removal of soil. These miniature caves form ideal hyrax shelters and are often connected to other similar cavities by horizontal ledges. If the boulder has not rolled far down the slope, its flat upper face forms an ideal basking surface near to the hole (Fig. 2). Any kind of rock may form a suitable habitat as long as it provides shelter and outside the highlands particularly, hyrax are frequently found inhabiting metamorphic Basement System rocks and occasionally sedimentary rocks, such as sandstone.

There are several accounts in the literature of hyrax living in the disused holes of other animals (Roberts, 1951). Thomas (1946) describes how one population of P. capensis Pallas in South Africa increased greatly following the destruction of wild predators (especially jackal) by local sheep farmers. The result was over-population of the rocky habitat, forcing the hyrax onto the plains where they lived in the holes of the antbear, Orycteropus afer Grote, and Meercat, Suricata suricatta Schreber. They also took refuge in road culverts, holes in stone walls and any other available shelter. It is thus apparent that hyrax are adaptable in the matter of the type of substrate in which they will occupy holes. Although hard rocks are most commonly used, holes in softer rock and even soil are inhabited in some areas.

The colony site

It is also difficult to establish definite rules about the size or extent of holes required. Floor space would seem to be the critical factor in hole size, as many holes are merely horizontal crevices no deeper than an adult hyrax in the crouching position (14 cm. for Procavia and 11 cm. for Heterohyrax). In fact, holes with a high ceiling are generally not used as living quarters. Providing there are several holes large enough to house a family group of about five adult hyrax (about 1 m^2 of floor space), then there is the possibility of a small colony becoming established there. It is extremely rare to find a group living in a single isolated hole or crevice. In boulder screes, of course, there is usually an entire ramifying system of interstices comprising large cavities interlinked by smaller holes and cracks. In weathered rock faces, however, there are often large individual holes or crevices separated by a considerable distance from other cavities. Unless a cavity has similar shelter within about 10m. it will not be used as living quarters by hyrax, although they may take temporary refuge in it during flight from an enemy.

Well worn paths among the rocks or along ledges serve to link together holes that have no internal connection. Such paths are mainly horizontally disposed and often a number of them, at approximately the same level on the cliff, are linked together forming horizontal trunk paths which may extend along the entire length of a cliff or ridge (Fig. 4). Occasionally a vertical minor path links together the horizontal ones. Vertically arranged paths also lead directly from the holes to the main feeding areas which are generally above or below the rocky cliff. These paths often pass near to an isolated boulder under which shelter can be taken if the animals are disturbed during feeding. In any case, the directness of these vertical feeding paths allows very rapid retreat to the living holes on such occasions.

It is extremely difficult to determine what happens inside the the holes. It is impossible to dig out the system, except in a few cases where there is soil on one side of the hole, and the thickness of the dense rock precludes the use of radioactive tagging methods (Godfrey, 1954). Hence it is not possible to say with certainty whether a group of hyrax always live in the same part of a hole system or whether there is any functional subdivision of the system. Circumstantial evidence, however, suggests that there is some constancy in use of various areas of the holes. For example, individual animals tend to use one entrance more than others. The habit of hyrax of having common urinating and defaecating places for each set of holes is widely known (Sale, 1960). It has also been observed that individuals in a group tend to occupy a regular place on the rocks when basking. These facts show that there is a positional constancy in hyrax, and in all probability this also applies when they are inside their holes. Its application must, of course, be adapted to the particular arrangement of holes in which the group is living and it would not be possible to produce the rather stereotype burrow plan that has been presented for many burrowing mammals.

Climate and predators in relation to the habitat

It can be seen from this brief account of colony sites that there is no fixed pattern for the hyrax dwelling. The animal adapts itself to any shelter that provides adequate protection from the elements and predators. In areas where there is a tendency to strong winds the animals avoid using rocks which are facing the prevailing wind, or if they do so they select a set of holes with protected entrances. For example some holes may have entrances on the leeward side of a large boulder. The Uaso Kedong gorge, where many of the present observations have been made, well illustrates the relationship of colony sites to prevailing wind (Fig. 3). The gorge runs in a north-south direction and at times there is a strong easterly wind in the area, especially during the night. This wind blows over the top of the east wall of the gorge but catches the rocks on the west wall with considerable force and enters any east-facing cavities in these rocks. There are a number of Procavia colonies along the sheltered east wall but no permanent colonies on the west wall and the rocks are heavily covered with lichen. One or two, apparently lone animals have been observed from time to time on the west wall but no real colonies. Other colonies in the area are also on rocks that face west and are thus sheltered from the strong east wind. In areas where, because of the physiography, there is little wind, no such directional bias in the distribution of colony sites is observed.

Climatic data for three areas where Procavia spp. are very common is given in Table 1 and it can be seen that the distribution of this genus shows wide tolerence in relation to altitude, temperature and rainfall. The main connection between rainfall and an herbivore population is the vegetation and this factor has been discussed in a paper on feeding (Sale, 1965). The wide tolerence of the rock hyraces in respect to food plants is largely responsible for the fact that rainfall is not a primary factor in their distribution. Hyrax are adapted to a wide temperature range by their daily behaviour cycle which results in the animals avoiding the thermally extreme parts of the habitat.

Location of Procavia spp.	Altitude	Mean Annual Temperature		Mean Annual Rainfall (approx.)
		Maximum	Minimum	
Magadi	613 m.	35° C	17.8° C	56 cm.
Naivasha	1,900	25	9.4	56
Mt. Kenya	4,200	10	-5.0	89

Table 1.

The exposed rocks on which the lowland hyrax bask during the early part of the day often reach a very high temperature by the middle of the afternoon, with correspondingly low humidity. Air temperature recorded under a canopy above one of these exposed rocks at Uaso-Kedong was frequently up to 39° C with a relative humidity of around 10%. At Magadi even higher temperatures were recorded (Table 2). The night temperature at Uasa-Kedong was 16° - 18° C and humidity up to 85%. Thus the outside air around the rocks shows diurnal fluctuations of temperature and humidity of 23° C and 75% respectively. A simultaneous recording of the temperature (but not humidity) 2m. inside a hyrax hole showed a maximum of 17° C and minimum of 14° C, i.e. an absolute fluctuation of 4° C. No doubt the humidity in the hole was of a similar relative order. Table 2 compares these temperature measurements at Uaso-Kedong with similar recordings at Magadi, a much hotter area, and the Hausberg Valley on Mount Kenya where air temperatures are much lower (recordings here were not made above an exposed rock).

Table 2.

LOCATION	PERIOD	OUTSIDE TEMP. °C			HYRAX HOLE TEMP. °C		
		Mean Max.	Mean Min.	Range	Mean Max.	Mean Min.	Range
Magadi	5 days	41.6	26.0	16.6	31.6	26.7	5.9
Uaso Kedong	7	38.6	17.5	22.1	16.6	14.4	3.2
Mt. Kenya*	4	9.0	-4.0	14.0	9.0	0.6	9.4

In all three areas the air temperature of the hole shows much less fluctuation (range) than that outside and thus provides a relatively constant microclimate into which the animals can withdraw in order to avoid extremes outside. At Magadi the mean minimum outside and in the hole is about the same but the high maximum temperatures on the rocks are never reached in the hole. The converse is true on Mount Kenya, where the mean maxima are the same but the low night temperatures outside are avoided in the hole where it seldom goes below freezing point.

The shade of trees and other vegetation provides the animals with a moderate alternative to the extreme microclimate of the exposed rocks. Measurements of temperature and humidity in heavily shaded areas of the habitat confirm the anticipated intermediate range between figures for the rocks and the hole.

There would appear to be a relationship between local predators and the maximum size of hole entrance regularly used by members of a colony. Except on high mountains, the leopard, Felis pardus pardus L., is a common resident of the rocky areas where hyrax are found and is undoubtedly their main enemy. It is certainly the only major predator that would be likely to enter a hyrax hole. It is noticable that holes that are apparently otherwise ideal for hyrax habitation but have an entrance large enough to allow a large cat, such as a leopard, to enter are never used except for very temporary shelter. Holes, however, that are quite near to the surface but with a confined entrance are quite often inhabited and one can sometimes observe a group of hyrax huddled inside such a hole at very close quarters. They appear to "feel quite secure" even when so near to such a large enemy as man. A comparable manifestation of this "intelligent calculation" by hyrax was frequently seen in my captive colony of Mount Kenya hyrax. On an open roof the animals were extremely afraid of any strange intruder, such as a new human or a dog, and would immediately flee into the shelter of their home. When they were later placed in a wire mesh enclosure, however, a Boxer dog frequently tried to molest them through the wire, barking and rushing at them with open jaws. The

* These figures were kindly made available by the Queen Elizabeth College Expedition to Mt. Kenya, 1964/65.

The hyrax very quickly realised that they were quite safe with the wire separating them from the dog and although the younger animals showed threat, the adults took very little notice at all, sometimes even deliberately sitting with their noses against the mesh while the less intelligent dog charged them ferociously. On Mount Kenya there appears to be only a single pair of leopard in most of the large valleys. Considering the very large hyrax population in these valleys, the rate of predation by leopard must be very low indeed, especially as hyrax is not its only food (Coe, 1963). It is interesting, therefore, to note that the Mount Kenya hyrax often lives in holes with quite large entrances, in some cases large enough to permit human entry. There would seem to be a connection between this habit and the comparative rarity of the leopard, especially as there is no shortage of holes with more confined entrances.

Summary.

Rock hyraces do not burrow but inhabit any type of rock providing suitable cavities as dwelling holes. Although the harder types are most commonly used, holes in sedimentary rocks and even soil, are inhabited in some areas.

There is no fixed pattern for the hyrax dwelling but isolated holes are not generally used. The animals adapt themselves to any shelter that provides adequate protection from the elements and predators. The temperature inside the hyrax hole never reaches the extremes of the outside air temperature. Holes facing the prevailing wind or with entrances big enough to allow the entry of a large predator are avoided, especially in areas where such predators are numerous.

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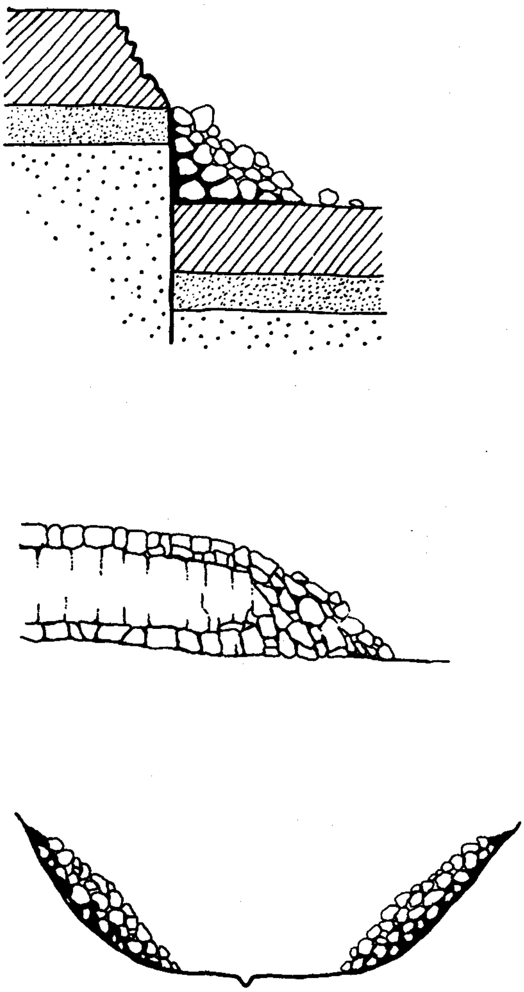


A. A FAULT SCARP

Outer boulders enclosing cavities formed by the washing away of the finer materials.

B. A LAVA FLOW

Cavities formed by removal of slag.

C. LATERAL MORAINES OF A GLACIATED VALLEY (Mt. Kenya).

Fig. 1

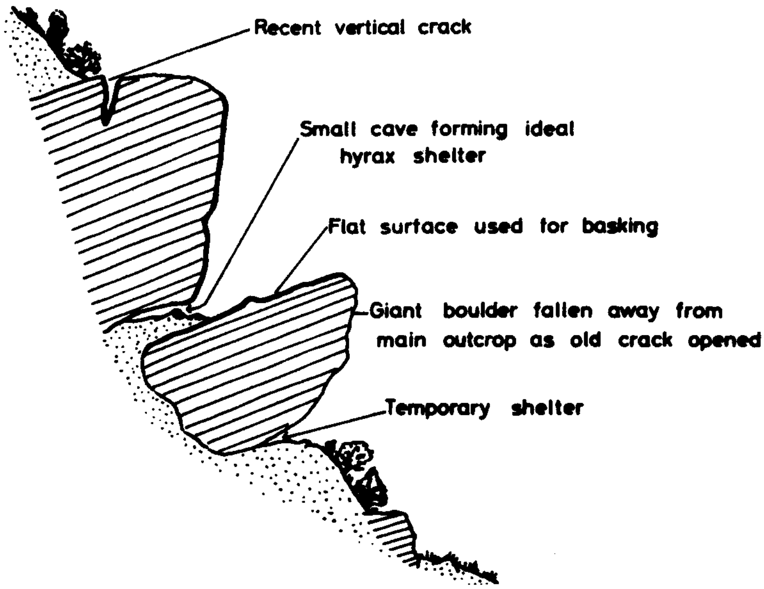


Fig. 2

SECTION OF ROCK OUTCROP SHOWING FORMATION OF HYRAX HABITAT BY VERTICAL CRACKING (e.g. Lukenya).

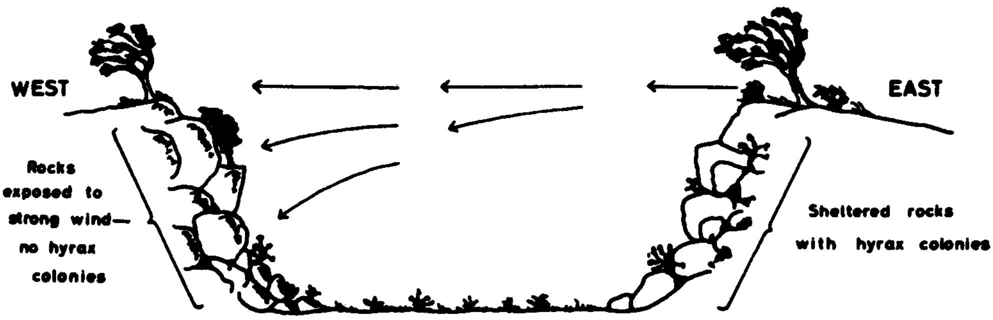


Fig. 3

SECTION OF GORGE AT UASO-KEDONG SHOWING RELATION OF COLONIES TO PREVAILING WIND (shown by arrows).

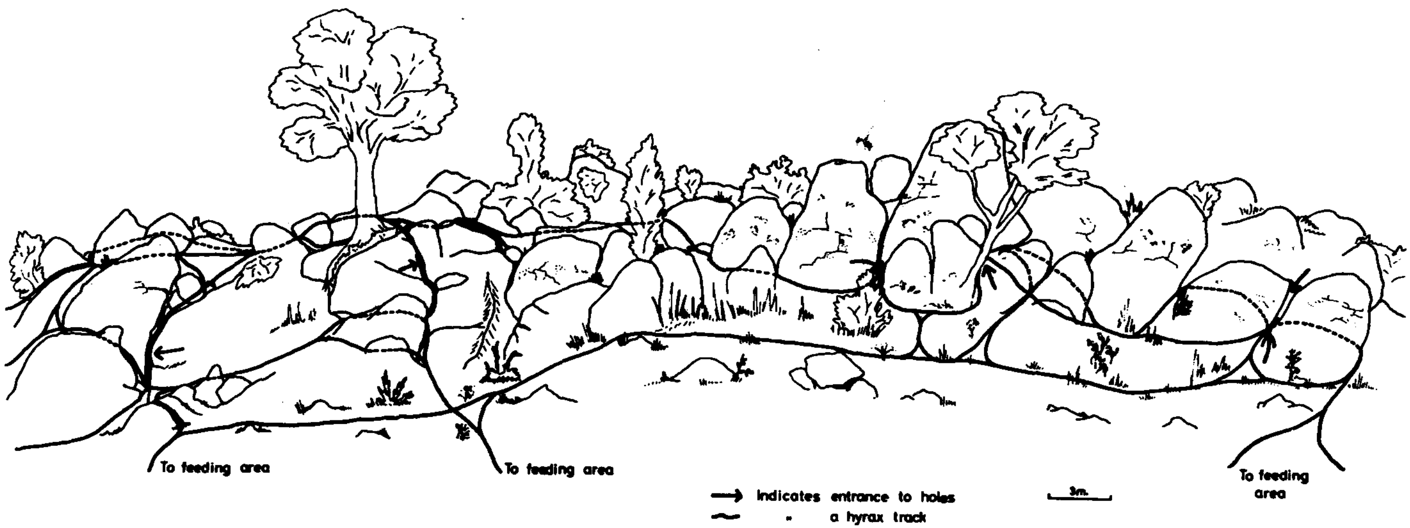
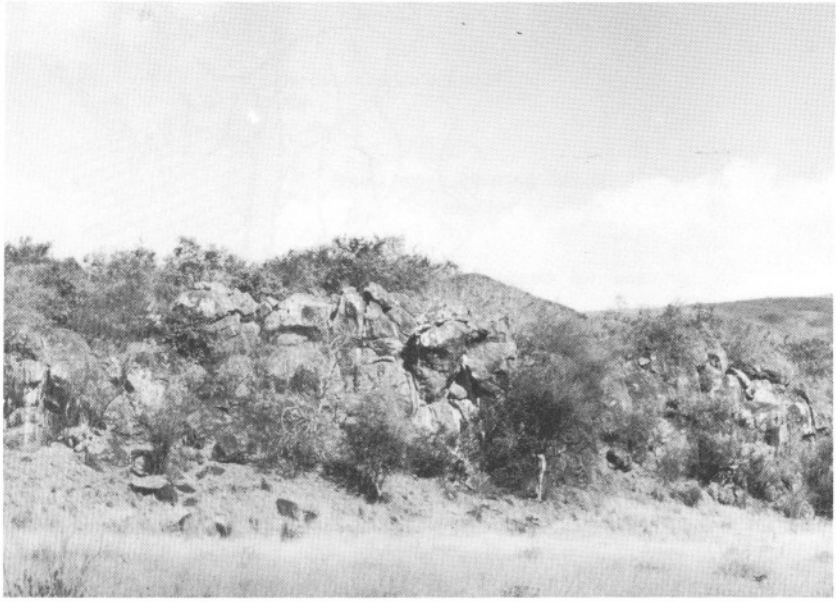


Fig. 4

DRAWING OF A PROCAVIA HABESSINICA COLONY SITE IN THE RIFT VALLEY SHOWING HYRAX HOLES AND MAIN PATHWAYS



1a. Part of the east wall of the Uaso Kedong gorge in the Rift Valley. Fault scarps of this kind are frequently occupied by rock hyrax, whose presence is indicated by white urine stains on the rocks, e.g. the rocks on the extreme left.

1b. The head of the Teleki Valley, Mount Kenya. The lateral moraine in the centre provides an extensive boulder scree habitat, housing a large colony of P.johnstoni mackinderi.