CHAPTER - XIII
AUDIBLE SOUNDS PRODUCED BY GERBILS

1. Introduction

Vocalizations of a number of rodent species have been accurately documented (Barnett, 1975; Begg, 1975; Hafner and Hafner, 1979). But besides the sounds produced within the human hearing range, their vocal repertoire includes major ultrasonic elements (Sewell, 1970; Begg, 1975; Thiessen and Kittrell, 1979). The structured sounds have signal function and are linked to social, reproductive or other behaviour (Begg, 1975).

The Rattus species produce, however, several kinds of audible noises (Barnett, 1975; Begg, 1975), compared to high-pitched "creaks" elicited from Mongolian gerbils, M. unguiculatus (Finck and Goehl, 1968). Unlike it, ultra sounds are emitted by gerbils over a wider range of the spectrum (Sewell, 1970). Social stimuli are, however, needed for such vocalization (Thiessen and Kittrell, 1979), which shows their potential for communication (Begg, 1975).

Similar high-pitched "creaks" are heard from Indian gerbil, T. indica, during handling and some other situations. Spectrum analysis of their sounds and it's effects, are discussed here.
2. **Material and Methods**

Only adult gerbils were used, of which the body-weight of males ranged from 120 to 192 g and females 115 to 165 g. Some of the latter had litters. Each gerbil had a separate cage; food and water were always available.

Sounds were recorded on a *National* portable tape-recorder of maximum 8 kHz sensitivity. The speaker was suspended above the cage or traps at the time of recordings.

The sounds were elicited in the following situations:

a. The gerbil was trapped in a wooden live-trap (Fig. 30). The trap was placed on a table and an observer (E) approached it at intervals. It was often struck with a metallic rod to induce vocalization.

b. The gerbils, except lactating females, were transferred from their cage to cages of conspecifics of either sex. Agonistic interactions which followed were watched closely to distinguish sounds produced by interlopers and residents.

The recordings were replayed into a "Kay"-electric sono-graph, model 7029A (5-16000 Hz spectrum analyser) for physical analysis of sounds. The sonograms were labelled to find by comparison differences, if any, in sound structure.
Figure 30

A wooden live-trap used for transferring the gerbils
The effects of sounds were studied by playing the recordings near the cages of gerbils, housed individually. Changes in their behaviour were noted.

3. Results

3.1. Conditions of Sound Production: Both males and females produced the same kind of sounds, but the latter vocalized more frequently than the former. The characteristic sounds were heard in many situations, that were either 'novel' or 'strange', or in which the gerbils perceived physical danger. Out of these, the most common that induced sound production, have been used for recordings.

3.2. Vocalizations in the Live-Traps: The gerbils started making sounds soon after being caught in the live-traps. On the approach of observer (E), they made a visible change in posture too, to "crouching", when the same sounds were made more clearly and with breaks, for longer duration than earlier. The males also "crouched" but did not often produced any sound. Strikes with metallic rod on their traps were then found necessary to make them signal.

Lactating gerbils 'crouched' only briefly in the presence of observer, and then continued the struggle to escape, as pushing the door with head and biting the iron on the top. Sounds were produced between such attempts.
There was much variation in the total time that sounds were produced by gerbils. The calls usually lasted less than a minute, but with breaks continued for as long as 7 minutes.

3.3. Vocalization during Agonistic Interactions: Transfer of gerbils to cages of conspecifics invariably resulted in fights between interloper and residents. The dominant male gerbils produced during such agonistic behaviour or kind of "tooth-chattering" sound similar to that reported for Rattus (Barnett, 1975; Begg, 1975). This was more clearly heard during male-female interactions. It was emitted as the opponent was pinned down on its back, while the dominant individual with hand on its chest raised the head up and down or moved it from side to side.

The "sub-ordinate" gerbils emitted, however, the same sounds as heard from them in the traps. Only some male produced the sounds, but the females vocalized without exception.

3.4. Physical Analysis of Sounds: The spectrum analysis of sounds emitted by both sexes in either of the two situations did not reveal any fundamental difference in structure. The energy was concentrated in two narrow, discrete bands with frequencies between 0.2 to 2.0 KHz and 4.5 to 5.0 KHz (Fig.3P). The call consisted of sharp sounds followed by noise. The high-pitched "Creak" lasted 128 ms, while the duration of low-
takes place with harmonics.

Change in tone, from 4.5 to 5.0 RH frequencies, and narrow discrete bands at 0.2 to 2.0 RH. and the spectrum analysis of audible sounds produced by Gerbil shows that creases consist of two

Figure 31
Fig. 31

TIME IN SECONDS.
tone 'noise' was 48 ms. The calls were repeated at intervals of 272 ms (Fig. 31).

The tooth-chattering sounds of male gerbils were of 0.2 KHz frequency, though body size and weight also influenced its quality. The results obtained were, however, not conclusive, and have been omitted.

3.5. Responses to Recorded Sounds: The calls when replayed evoked a 'stratle' response from recipient females. It also produced some agitation among males. The pinnae were moved and rearing position was adopted.

Some females often started calling simultaneously, afterwards. The males did not show, however, any such response.

4. Discussion

_T. indica_ like Mongolian gerbils possess a very limited repertoire of auditory signals. The characteristic vocalization elicited, or emitted during normal encounters, is entirely associated with defense; with signaller adopting typically the 'crouching' posture. It is produced, in the same context more often, however, by females than males.

The only other sound produced is 'tooth-chattering' by male gerbils. It is solely associated with offensive behaviour.
Obviously, there is great difference in structure of these sounds. The defensive call, similar to "creaks" of Mongolian gerbils, is made up of two frequency bands; with the range, as cited, between 0.2 to 2.0 kHz and 4.5 to 5.0 kHz (frequency range in creaks of Mongolian gerbils - 4.0 to 6.0 kHz; Finck and Goehl, 1968). During emission, as the sonographs show, the change in tone, possibly takes place with harmonics (Fig. 30). Thus, each call is intense to start with, but abruptly decreases in intensity and degenerates into noise. Thus, the quality of sound is varied, and particular calls may contain more sharp tones than noise and vice-versa. Perhaps the higher overtones are developed by vigorous expiration, while the noise is produced from overBlown glottis (Andrew, 1963).

'Tooth-chattering' is a sound of uniform frequency, of around 0.2 kHz; though variation in its intensity with size and age are clearly suspected.

Creaks of Mongolian gerbils represent, however, only few pulses of vocalization, the major elements of which lie in the ultrasonic range (Sewell, 1970). This may also be true of *T. indica*. In that case, ultrasounds have more potential for communication in gerbils than audible sounds. There is, however, not much evidence yet to support this.

In contrast to gerbils, however, wild rats and even some mice, possess a large number of auditory signals (Begg,
1975; Baruett, 1975; Barnet and Stewart, 1975; Hafner and Hafner, 1979). Their vocal repertoire consists of distinct vocalization types, each with some behavioural significance. Thus, the audible sounds have, at least in their case, greater potential for communication. Whether this represents some evolutionary difference, and to what purpose? Whether ability to communicate with a whole range of auditory signals has greater survival value? There are no answers to these questions (Begg, 1975).

Similar confusion exists about the specific function of different sounds, or vocalization types. Some are discrete signals, no doubt (Hafner and Hafner, 1979), but many appear to have little overt effect on the behaviour of conspecifics (Begg, 1975). It is, however, possible that sounds act in combination with other signals, visual and olfactory (Barnett, 1975). Attempts at studying auditory signals in this light have, however, been very few.

The sounds of gerbils, *T. indica*, evoke, however, some immediate responses, as pinnae reflexes, freezing, startling, rearing as in Mongolian gerbils (Finck and Goehl, 1968; Lippman and Galosy, 1969; Galosy and Lippman, 1970). Some females even signal back, but the males are not equally affected. There is some variation in it, but not to the same degree as observed in similar studies on *Rattus*. But the
gerbils produce only one kind of sound, and recognition and responses to it may be 'stereotyped', with extreme repertoire of auditory signals then, more variation is also likely.

Summary

Gerbils, *T. indica* possess a limited repertoire of auditory signals. Spectrum analysis shows that the energy is concentrated in two narrow, discrete bands, of sounds emitted by both sexes. Male gerbils also produce 'tooth-chattering' which is associated with offensive behaviour. Sounds of gerbils evoke some responses, like pinnae reflexes, etc.