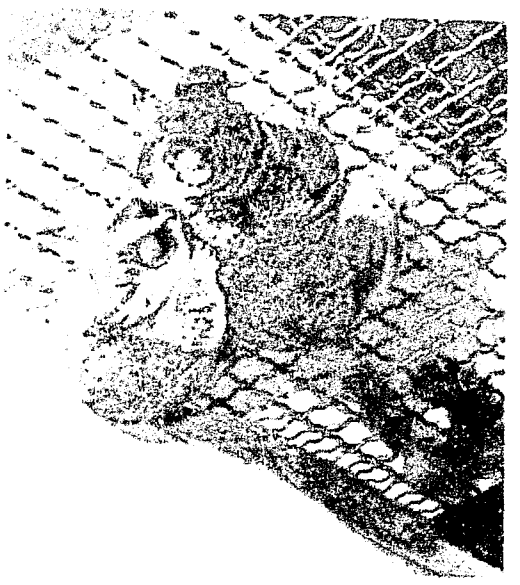


a. Grooming.

b. Play-Fighting.

PLATE V. GROOMING AND PLAY-FIGHTING.

a. Young Infant.

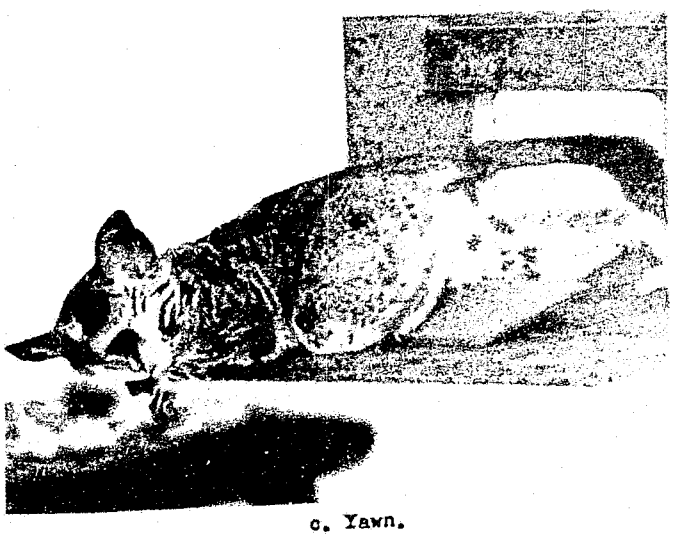
b. Older Infant.

c. Jumping.

PLATE VI. INFANT TRANSPORT.

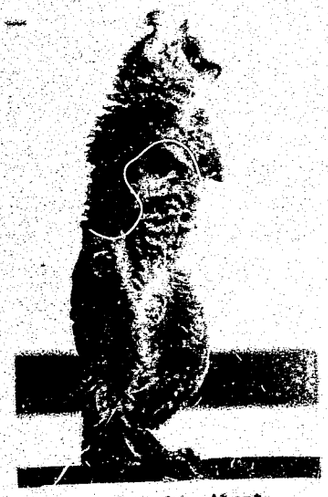
a. Defensive Threat.

b. Defensive Attack.



c. Yawn.

PLATE VII. MOUTH-OPEN SIGNALS.



a. Upright Alert.

b. Upright Defensive Threat.

c. Cringing Posture.

d. Presenting.

PLATE VIII. BODY POSTURES.

a. Showing fighting face.

b. Fighting.

c. Showing boxing posture.

PLATE IX. FIGHTING.

a. Face accompanying Rasp. call.

b. Face accompanying Rasp. call.

PLATE X. ATTACK FACE.

a. Bare Patch outlined.

b. Infant Grin.

PLATE XI. CHEST-PATCH AND INFANT GRIN.

6. AUDITORY COMMUNICATION

The vocal signals used by adult Galago senegalensis moholi in auditory communication may be broadly divided into groups that are associated with specific social situations. For convenience in discussion these have been divided into (A) Agonistic, (B) Friendly and Contact, and (C) Alarm calls.

Terms used to label signals should be descriptive of the signal or its physical structure rather than its function (Jay 1965a) and following authors such as Andrew (1963a), Rowell and Hinde (1962) and Moynihan (1964), the vocal patterns found have been named Bark, Grunt, Spit, etc. It is not intended that these names describe the acoustical properties of the sounds in any detail, but merely that they suggest some similarity to the common sounds called by such names. Semi-phonetic translations, although dependent largely on the author's own acoustic associations, have nevertheless also been included as it is felt that in many cases they may be an aid in distinguishing between calls. (The system used follows that given in the Pocket Oxford English Dictionary, 1942.)

6.1 DEFINITION OF TERMS

Terms used in describing the sound spectrographs of the acoustic signals follow those used by Struhsaker (1967) in his paper on the auditory communication of vervet monkeys. The following definitions of terms are extracted from the above-mentioned paper.

"UNIT: The unit is the basic element of a (vervet) sound or call, and is represented as a continuous tracing along the temporal (horizontal) axis of the sonogram."

"PHRASE: The phrase is a group of units that is separated from other similar groups by a time interval greater than any time interval separating the units within a phrase."

"BOUT: A bout is a grouping of one or more phrases separated from other similar groupings by a time interval greater than that separating any of the phrases within a bout."

"NONTONAL UNIT: A nontonal unit is composed of sound that is more or less continuously developed over a wide range of frequencies. (This has also been called 'noise' by Andrew (1963a) and 'harsh noises' by Rowell and Hinde (1962))."

"TONAL UNIT: A tonal unit is composed of sound characterised by one or more relatively narrow frequency bands and has been referred to as 'clear calls' by Rowell and Hinde (1962) and 'sound' by Andrew (1963a). Units with a harmonic structure are included in this category."

"COMPOUND UNIT: A compound unit is composed of both nontonal and tonal sounds that appear as a continuous tracing on the sonogram."

"MIXED UNIT: Units composed of both tonal and nontonal sounds that are rather superimposed on one

another are called mixed units. The tonal and non-tonal aspects are more or less separated by differences in frequency."

"DISTRIBUTION OF MAJOR ENERGY OF NONTONAL SOUNDS: The distribution of the major energy of a nontonal sound is represented and thus determined by the darkest portion of the tracing on the sonogram. This distribution is generally over a smaller range than the frequency range of nontonal sounds."

In addition a few terms from Tembrock (1963) have been utilised.

MONO-SYLLABIC UNIT: Shows no significant variation of pitch and is uniform also as regards the sound quality, e.g. Soft Hoot.

MULTI-SYLLABIC UNIT: During sound formation the position of phonation is varied regularly, e.g. Hiccup Whistle is bisyllabic.

6.2 LIST OF CALLS

The calls which have been heard during the course of the study are as follows:-

(A) Calls associated with Agonistic Situations

(1) Grunt. (Defensive) (Ér'Ér')

(2) Spit and Spit-Chatter. (K' and K'K'K'K')

(3) Spit-Grunt. (G'G'G')

(4) Chatter (Fighting). (Tz Tz Tz)

(5) Explosive Cough. (Chow'-hah)

(6) Moans (Sobs).

(7) Screams.

(8) Single Note High Intensity Spit. (Tzit)

(9) Rasp.

(B) Calls associated with Friendly and Contact Situations

(1) Bark.

(2) Coo (Maternal call).

(3) Soft Hoot. (Chasing call - Whoo Whoo)

(4) Soft Grunt. (Contact, Whispering Grunts)

(5) Squeals.

(C) Calls associated with Alarm Situations

(1) Sneezes. (fft, fft-i-fft, Fu-ut)

(2) Gerwhit.

(3) Cluck. (G'wok)

(4) Shivering-Stutter. (B-B-B-B)

(5) Whistle and whistle variants. (Phew-hah Eojow)

(6) Yap. (Kwik)

(7) Plaintive Yap and Yap-alarm. (De-dah De-dah)

(8) Wuffs.

(9) Wails.

(10) Caws.

(D) Calls uttered by Infants and/or Juveniles

(1) Click and Crackle.

(2) Spit and Spit-Grunt.

(3) Loud Squeaks. (distress)

(4) Soft Squeaks. (nipple notes)

Each call will be discussed separately with a short discussion at the conclusion of each major

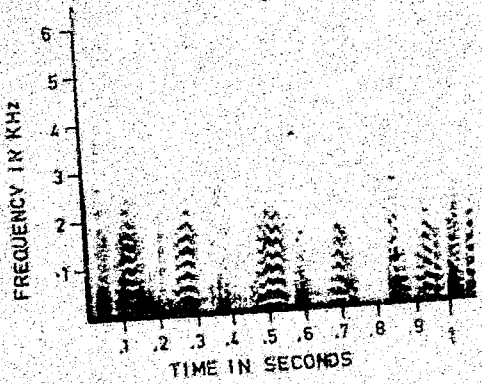
heading. In addition a 7" phonograph record of a sample of typical bushbaby calls is included as an addendum on the inside back cover.

6.3 CALLS ASSOCIATED WITH AGONISTIC SITUATIONS

6.3.1 Grunt (Êr'Êr')

This short (0.04 - 0.1 sec.) soft tonal call has units with the main formants at 0.1 - 0.4 KHz with harmonics on occasions reaching 3 KHz but more often only reaching 1.5 - 2 KHz. (See Plate XII)

The Grunt is given by an animal in response to the approach of a threatening stimulus and may accompany low intensity Swaying. This call is often uttered while the animal displays an open mouth, teeth covered, defensive threat face. The Grunt indicates a tendency to flee that is accompanied by a tendency to freeze as is seen when it is uttered during Swaying and Fighting-Chatter bouts. An animal uttering Grunts will flee immediately the threatening stimulus moves away. It often occurs in situations where the animal is unable to flee as it is cornered in some manner, for example, in a nest box with the threat approaching from the only exit. It may also be given by an inferior showing a 'cringing' submissive posture in response to the approach of a superior. Long slow Grunts are given when the threat is at a distance and may change to rapid short Grunts when the threat approaches.



Short Grunt.

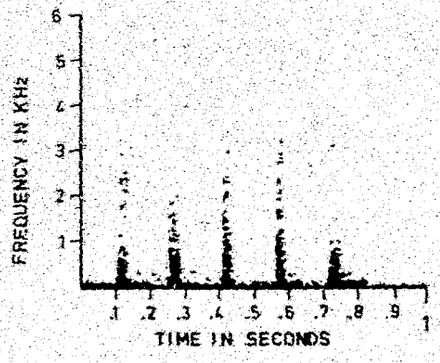
PLATE XII. GRUNT.

6.3.2 Spit and Spit-Chatter (K' and K'K'K')

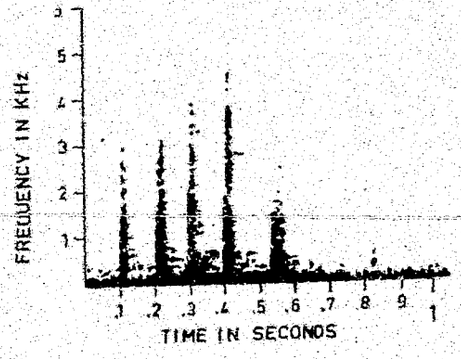
The Spit is a non-tonal non-voiced call consisting on the spectrograph of very narrow vertical units that may be given singly or in a series of four or five units. (See Plate XIII fig. a) A higher intensity form of this call is the Spit-Chatter where Spit units are given in a very rapid lengthy series. (See Plate XIII fig. b, showing a short Spit-Chatter)

The Spit accompanies the upright defensive attack posture with mouth open, teeth showing. It frequently follows a Grunt or a Spit-Grunt if the intensity of the threatening stimulus increases. A tendency to attack and a tendency to flee appear to be involved, the former being the stronger.

This may be clearly seen if a threatening stimulus, such as a pencil, is quickly thrust close to the face of the animal. It rears up into the upright defensive-attack posture with hands held at head level. If the pencil is then held stationary the animal will make alternating small bi-pedal jumps towards and away from the pencil while uttering rapid Spits. If the pencil is again advanced on the animal it will lunge forward and downward inflicting a rapid bite and spring clear again.



a. Spit.



b. Spit-chatter.

PLATE XIII. SPIT.

6.3.3 Spit-Grunt (G'G'G')

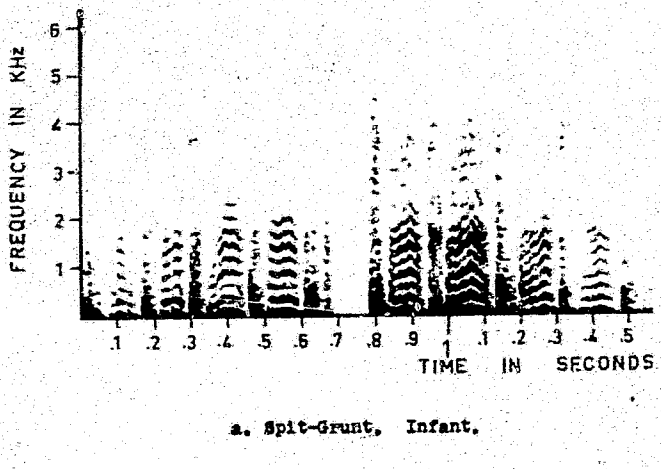
The Spit-Grunt is a compound unit made up of alternating units of Spit and Grunt that occur in such rapid succession (0.01 sec. between units, in sections) that to the human ear they appear to be single units.

This call occurs in intraspecific agonistic encounters when the inferior, while being chased, will swing round to face its pursuer and Spit-Grunt. If an infant is held in the observer's hand and stroked, it will give a loud 'annoyance call' (Lowther 1940) which is a slow Spit-Grunt in which it is possible for the human ear to hear the two alternating units separately. (See Plate XIV fig. a)

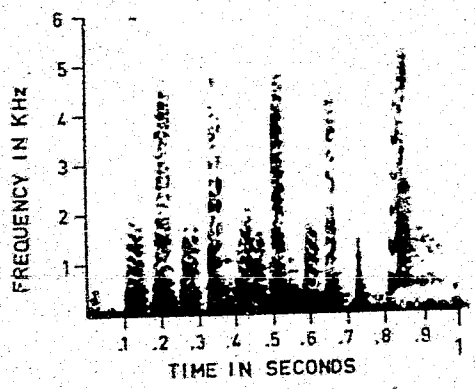
An adult chased and caught by the observer will utter a rapid Spit-Grunt (See Plate XIV fig. b) which may turn into a pure Spit call prior to biting if the animal struggles violently to free itself. During hostile encounters the Spit-Grunt is given by the inferior and may be mixed with units of the Yap, Explosive Cough, Spits and Gerwhits.

The Spit-Grunt call is also commonly given by a female while pursued by a male when she may swing round to face him and box at his face uttering a Spit-Grunt. The male seldom continues to advance on the female but on a few occasions the male has been observed to ignore the boxing and vocalization of the female and continued to advance. He then nuzzles against the chest of the female and she finally

proceeds to groom him. A lengthy grooming bout may ensue. As is seen in the non-receptive female Lemur catta, where this turning to strike at the face of the advancing male is also observed (Evans and Goy 1968), a counter-attack on the part of the male does not occur.



a. Spit-Grunt, Infant.



b. Fast Spit-Grunt, Adult.

PLATE XIV. SPIT-GRUNT.

6.3.4 Fighting-Chatter (Tz Tz Tz)

This non-tonal call consists on the sound spectrograph of units of columns of sound which blur together giving a wide scatter of energy having the major energy distribution between 5 - 10 KHz and comparatively little energy from 0 - 3 KHz. The spectrographs indicate that the call exceeds the 12 KHz frequency limit of the Kay Sonagraph. (See Plate XV)

The general impression received by the human ear is one of very intense spitting or hissing that comes in a wavelike succession of beats. The observer frequently gains the impression that it is a loud call but this appears to be incorrect as the sonagraphs are not very dark. Units of the Spit-Grunt may immediately precede, be interspersed with, or follow, Chatter phrases. In some cases Spit-Grunts appear, to the human ear, to be underlying the Chatter units and the animal is apparently giving the two calls simultaneously. The spectrographs show that Spit-Grunts actually occur between the Chatter phrases.

This call is given by the inferior animal during actual or imminent contact in high hostility attack by the aggressor. Other calls commonly occurring during the periods when Fighting-Chatter is given are Sobs, Moans, and Screams. The animal giving this call is very 'frightened' and shows a strong tendency to flee. If the animals are not separated into different cages, the inferior suffers rapid

and extensive loss of fur although open wounds are seldom inflicted. The aggressor seldom loses fur indicating that the tendency to flee on the part of the inferior is stronger than the tendency towards defensive attack. Although it is difficult to ascertain facial expressions during fights of this nature, it is thought that the mouth is open while this call is being uttered.

Fights of this nature occur in situations where two previously unacquainted animals are introduced to each other and one immediately exerts dominance over the other in that one is the aggressor and silent attacker. Fights of this nature also occurred in a cage where a mature but exceptionally small female was kept for some time with three juvenile males. This female, W, was at first clearly dominant over the young males and no fighting occurred in the cage. However, as the juvenile males overtook her in weight and began approaching maturity, fighting of this nature started between the female W and the largest and oldest of the juvenile males, Y, who suffered extensive fur loss. As the only condition that changed in the cage environment was that of the size and age of the inhabitants, it appears that this fighting is important in establishing a dominance hierarchy under laboratory conditions. The Chatter given by the inferior may indicate subdominance and inhibit the full scale attack between two equally dominant animals who do not utter calls while fighting. This call would then aid in the reduction of intraspecific damage.

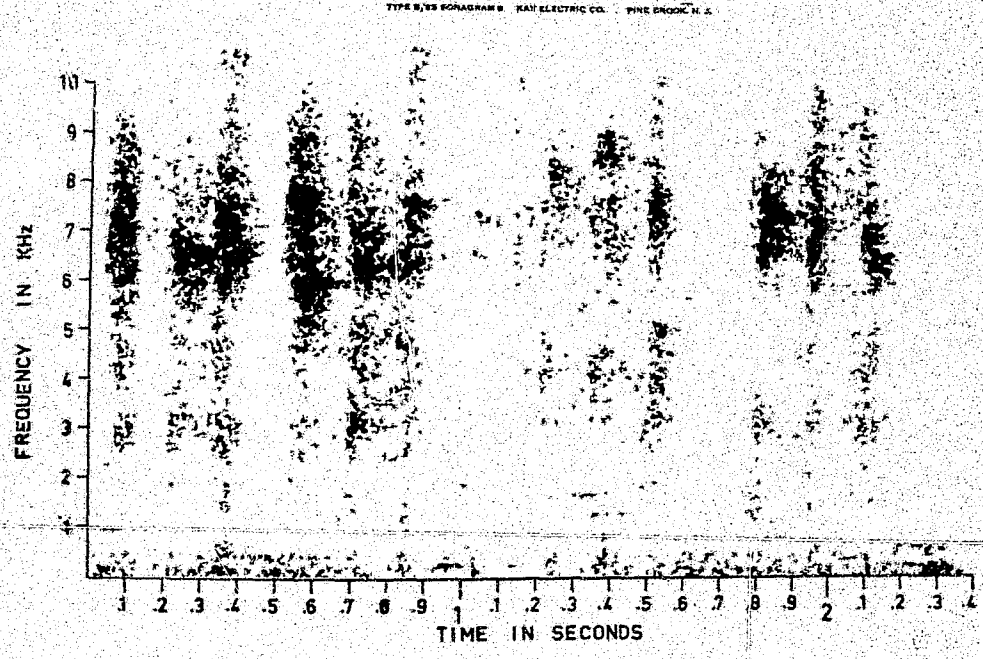
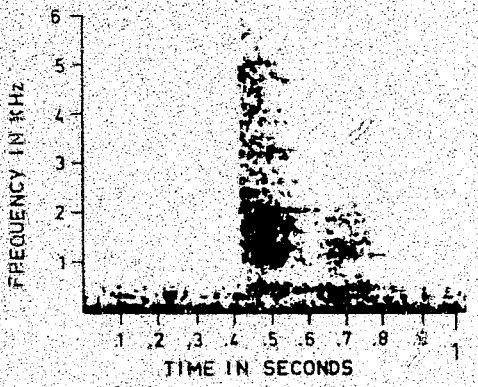


PLATE XV. FIGHTING CHATTER.

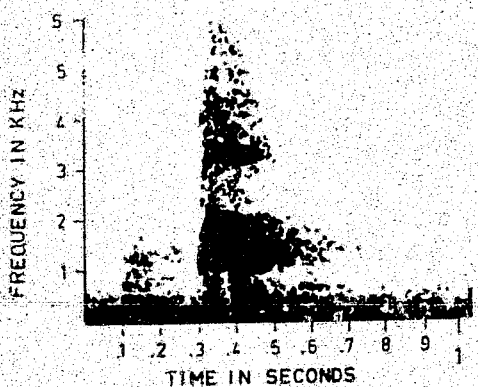
6.3.5 Explosive Cough (Chow'-hah)

The Explosive Cough or Chow'-hah is a non-tonal call with a frequency distribution ranging from 0 - 6 KHz having the major energy concentrated between 1 - 2 KHz. It consists of an exhalatory first unit, followed by a small inhalatory unit which may not always be heard. (See Plate XVI) The mouth is open on the exhalatory unit and closed during the inhalatory phase of the call. A variation of this call is one in which horizontal formants occur embedded in the non-tonal structure between 0 - 1.4 KHz giving the call a slightly plaintive quality.

Coughs are given by an inferior animal in the presence of a superior, during or after being chased by the superior. They may also occur if a very timid animal is introduced to a stranger. Here the inferior retreats immediately to the floor and may give these calls without having been chased by the superior. Under these conditions, the calls are given in a slow series with an irregular time interval between them becoming faster if the superior even merely looks in the direction of the caller. More often than not the Cough is heard in conjunction with units of other calls such as Sneezes, Gerwhits, Spit-Grunts and Yaps.



a. Juvenile.



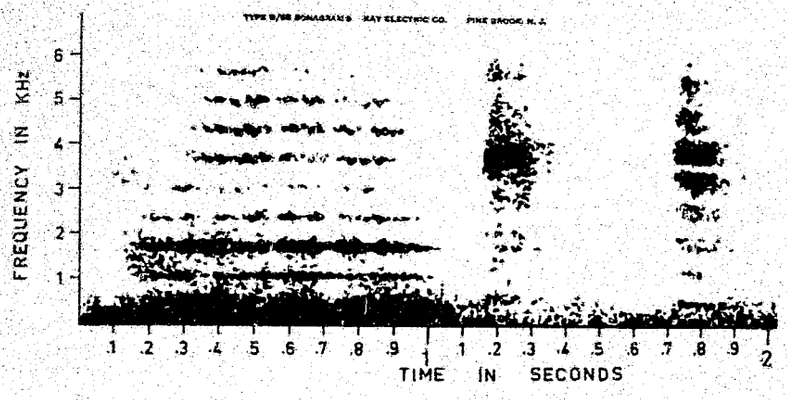
b. Adult.

PLATE)). EXPLOSIVE COUGH.

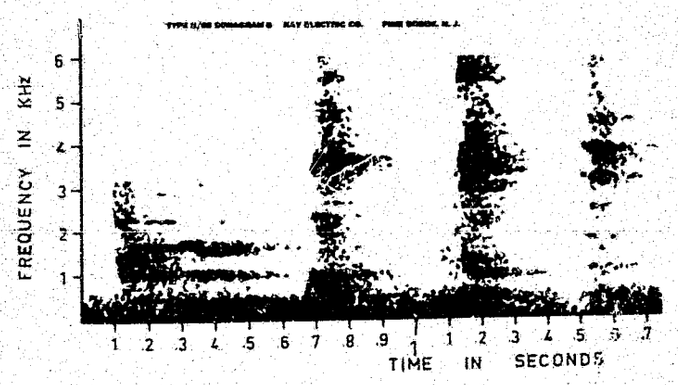
6.3.6 Moans (Sobs)

Moans are monosyllabic tonal calls having the main formants between approximately 400Hz and 1,7 KHz and harmonics which may reach up to 5 - 6 KHz. (See Plate XVII fig. a)

Moans are very plaintive calls that are uttered by the inforiour animal during contact with an aggressive superior. They occur at intensities slightly lower than those which cause Screams to be uttered and are always mixed with units of other calls particularly the Yap. The Moans may occur in short units when they sound like Sobs. (See Plate XVII fig. b)



a. Moan with Yap and Plaintive Yap unit.



b. Moan (Sob) with Yap units.

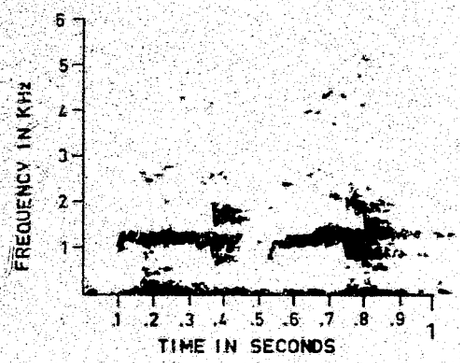
PLATE XVII. MOAN. (Sob).

6.3.7 Screams

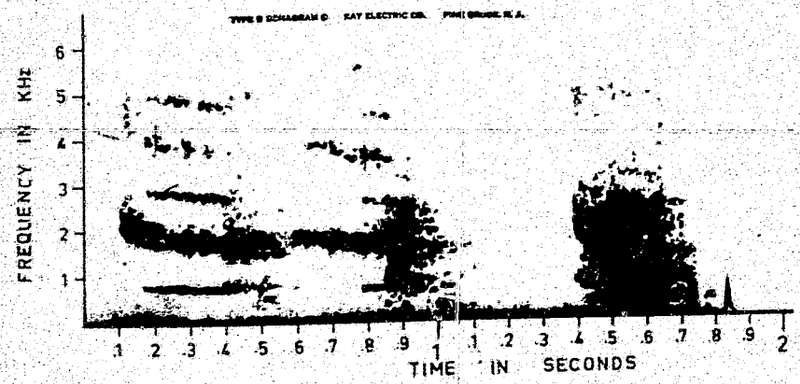
Screams are loud calls having the main formant between 1 and 2 KHZ and harmonics, if present, being very faint. (See Plate XVIII fig. a) These calls are frequently followed by a horizontal prolongation of non-tonal sound that increases in size until the entire call may become very non-tonal in character. (See Plate XVIII fig. b)

This call is given by the inferior during very high intensity hostile encounters with an aggressive dominant animal. During aggressive phases, females may attack their mates and this call is known to have been given by the most dominant animal in the colony when attacked in this manner by his female companion. It indicates a high tendency to flee. Animals in surrounding cages show fear reactions to this call by freezing on the branches or fleeing rapidly to the nest box and remaining crouched until the screaming stops.

This would undoubtedly act as an alarm call in the wild if it was given by an animal in the process of being seized by a predator.



a. Screams.



b. Scream units becoming harsh.

PLATE XVIII. SCREAMS.

6.3.8 Single Note - High Intensity Spit (Tzit)

This call consists of a sharp explosive non-tonal note. The frequency range lies between 0 and 10 KHz with a major energy concentration lying between 1 and 2 KHz and a second concentration between 5 and 9 KHz. (See Plate XIX)

This call has been heard occasionally during high intensity hostile encounters when it occurs as a single unit. It has also been given by three different males during mating although it is not always uttered in this situation and cannot be considered to be essentially a mating call.

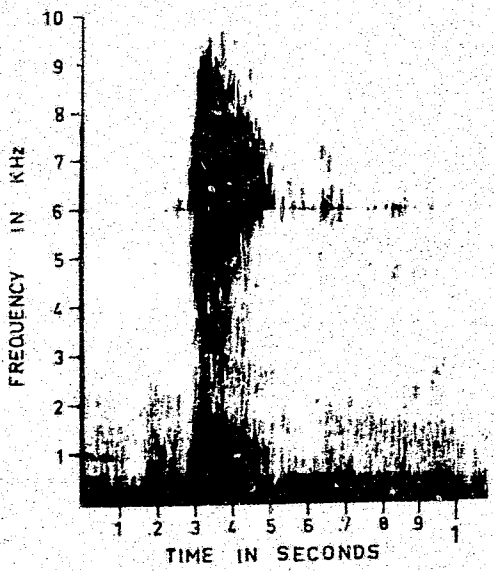


PLATE XIX. HIGH INTENSITY SPIT.

6.3.9 Rasp

This non-tonal call consists of narrow columns of sound that blur together between 6 - 8 KHz to form a very harsh call. Energy is marked from 0 - 12 KHz with a major concentration between 6 - 8 KHz. (See Plate XX)

This call has been heard in one situation only, i.e. by an animal that is highly motivated to attack. It occurs very rarely in the laboratory and has only been observed in very aggressive females.

If parturition is not followed immediately by a post-partum oëstrus the female may act very aggressively towards her mate. The Rasp is given during very aggressive chasing and/or fighting. The male utters Yaps, Explosive Coughs and even Sobs and Screams during these encounters clearly indicating that he is the inferior. The males are removed from the cage when this occurs as apart from the considerable fur-loss experienced by the male, the female neglects her infants almost entirely in order to fight the male if he is left with her. She will utter the Rasp while trying to get through a barrier separating her from the male.

The mouth is open with marked Zygomaticus contractions with the corners drawn back and teeth showing as the Rasp accompanies the attack face. (See Plate X)

The Rasp may also be elicited in a particular female, An, during these aggressive phases by the

smell of any strange bushbaby or by holding a bushbaby out of her reach. This animal will also attack the observer during these phases, if she detects the smell of any other bushbabies.

This is the only situation in which the aggressor is known to utter calls while attacking another animal. In all other encounters the aggressor is silent and all the calls are uttered by the inferior.

Author Andersson A B
Name of thesis Communication in the lesser Bushbaby (Galago senegalensis moholi) 1969

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