Bulgarian Journal of Agricultural Science, 18 (No 1) 2012, 133-137
Agricultural Academy

THE LANGUAGE OF SOME WILD PREDATORS IN SOUNDGRAMS (SPECTROGRAMS)

V. ALEXANDROVA[1] and Y. KOSTOV[2]
[1] *University of Forestry, BG – 1474 Sofia, Bulgaria*
[2] *Animal Language Research Laboratory, BG – 1474 Sofia, Bulgaria*

Abstract

ALEXANDROVA, V. and Y. KOSTOV, 2012. The language of some wild predators in soundgrams (spectrograms). *Bulg. J. Agric. Sci.,* 18: 133-137

This article describes the graphic records of sounds, emitted by some wild predators, the coded signal and its constituent parts are visualized by electronic equipment. The signal, emitted by the animals, was characterized by amplitude and frequency modulation, phase, pause and oscilloscopic form in a graphic curve. The records showed that the signals were modulated in the form of a code of sound vibrations depending on the animal species.

Key words: wild animals, soundgrams, spectrograms

Introduction

It is difficult to identify the physical characteristics of animal sounds in audiogenic reproduction. The more reliable method is the graphic presentation of these sounds. Payne et al. (1986) and McComb (2000) visualized the low frequency and infrasonic vocalizations of an elephant as a scale (spectrogram). Taylor (2008) presented graphic records of frequently used sounds by a bird as well as their frequential characteristics.

Today, a number of authors study, record and interpret the essence of animal language and its importance in communication between specimens of one species as well as between species (D. McFarland, 1988; Kostov and Alexandrova, 2004; Stishkovskaya, 1980; Tinbergen, 1978; Fernand Mery, 1980).

Kostov et al. (2009) described a method for graphic recording of sounds of some animals and birds. The authors concluded that there was a great diversity of coding and modulation of animal language, depending on their physiological condition and the effect of environment.

Material and Methods

We used electronic equipment and recording devices to decode animal language, which had the capacity to decode sounds by amplitude, frequent characteristics, coding and signal modulation. The records were registered on paper at a band velocity of 100 mm/s.

While working on the graphic registration of animal language, we were looking for the technical solution that would allow the registration of

E-mail: violeta_gerasimova@abv.bg

not only the biphasic amplitude of the period of sound vibrations as in computer analysis but also the capacity of the graphic curve to follow the oscillographic shape. We were able to decode the dynamics of sound vibrations in the spectrum of the frequency band with the available equipment, thus visualizing the modulated syllable in the coded signal.

We assumed the module was the basic element of the soundgram (spectrogram). The reason for that was the phenomenon of modulation of the strictly coded animal signal. It could be compared to the syllable in human spoken language. That is why separate sounds and notes can be identified in frequency analysis.

On the other hand, modules of similar or different structure produce phrases. Equal or different phrases generate themes.

Results and Discussion

Figure 1 shows the soundgram (spectrogram) of sounds, emitted by the lion. It registered two types of modules. Module (a) had a half-spherical shape and started on a lower level than the initial. The sound waves were grouped by 4-5 in a package and appeared after a short pause. The structure of module (b) was different. It was formed by 8-10 waves, followed by a fluctuation with a change of phase. The module had three shapes of this type.

The phrase in the soundgram (spectrogram) of the tiger was very interesting (Figure 2). It also consisted of two types of modules. Module (a) was short and dome-shaped; the curve had overlapping waves of average amplitude. Module (b) was registered after a short pause. It was continuous and with a quick rise of the front shoulder into the higher frequency band, gradually going down. The module had overlapping waves as well.

The hyena produced many and different sounds, depending on its behavior and the surroundings. This is reflected in the phrase on Figure 3. It shows three types of modules (syllables) registered. Module (a) had a shorter duration in the higher frequency band. Four small fluctuations can be seen

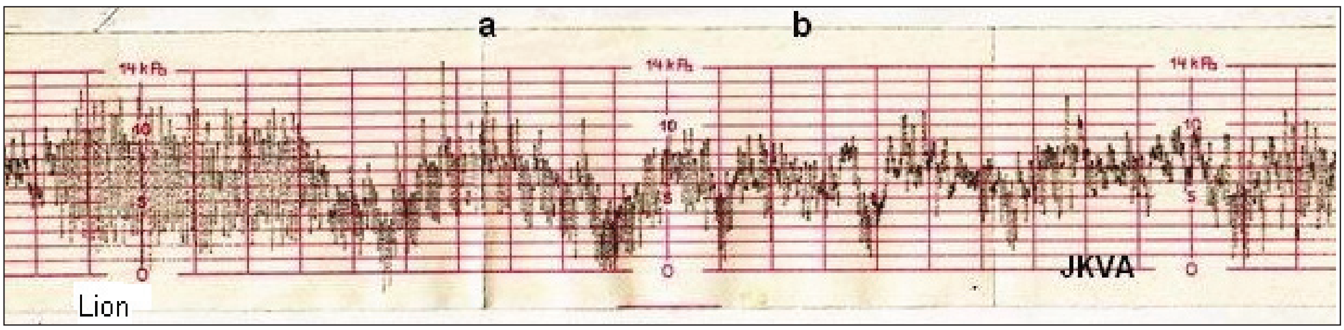

Fig. 1. Soundgram (spectrogram) of the lion

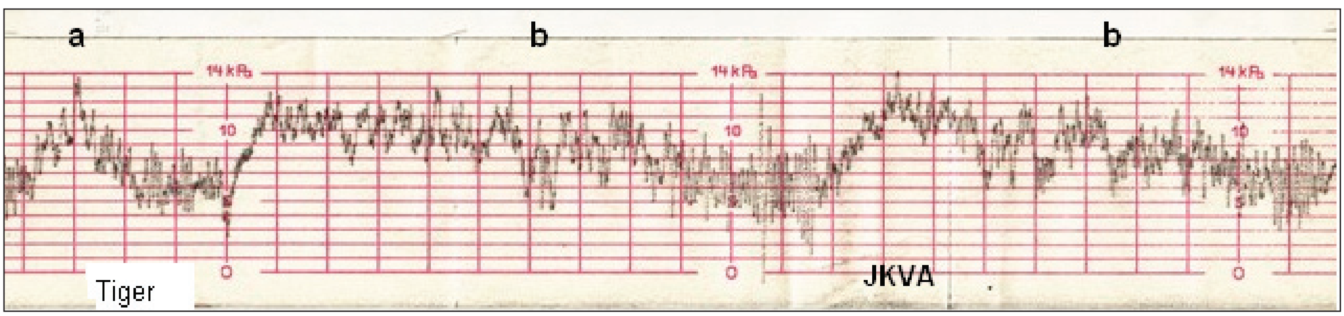

Fig. 2. Soundgram (spectrogram) of the tiger

in its plateau. The configuration of module (b) was quite interesting. It consisted of two symmetrical halves that started with a short positive deviation, followed by low-amplitude and low-frequency vibrations. The latter ended with negative short deviations, the first of which was bifurcated. Module (c) had 5 uniform fluctuations that rose suddenly and descended gradually with overlapping waves. It ended with a short pause. We should note that the first phase was strictly repeated immediately after its end. This could be regarded as a theme.

The sounds of the brown bear were within the range of low frequencies, also indicated by the changes in the sound dynamics close to the initial level. The soundgram (spectrogram) on Figure 4 was constructed of similar modules. Module (a) started with a short and high fluctuation with overlapping waves, followed by waves of average amplitude and frequency that rose gradually. Modules, similar to the one described above, appeared after a short pause and the vibrations of the third module (a) did not rise after the first deviation.

The polar bear had a bigger dynamics of emitted sounds (Figure 5). Module (a) was longer, rising over the axial line and with overlapping waves. Module (b) consisted of smaller fluctuations (4-5) with overlapping waves as well. There could be other modifications of the modules in the phrase.

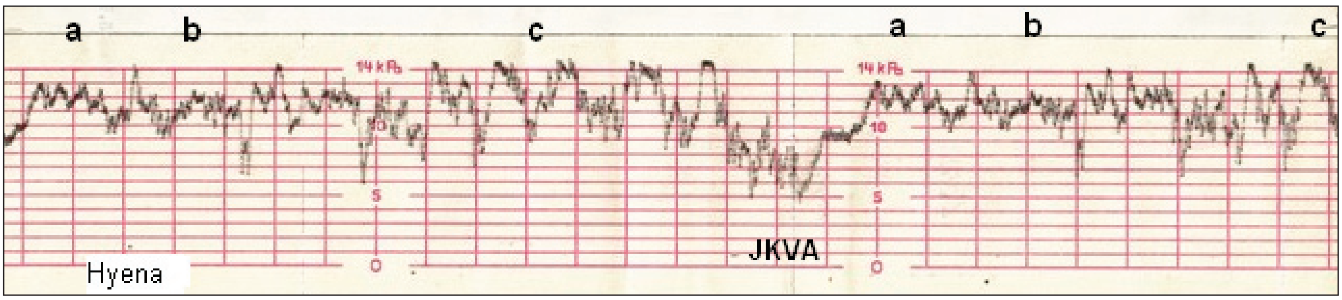

Fig. 3. Soundgram (spectrogram) of the hyena

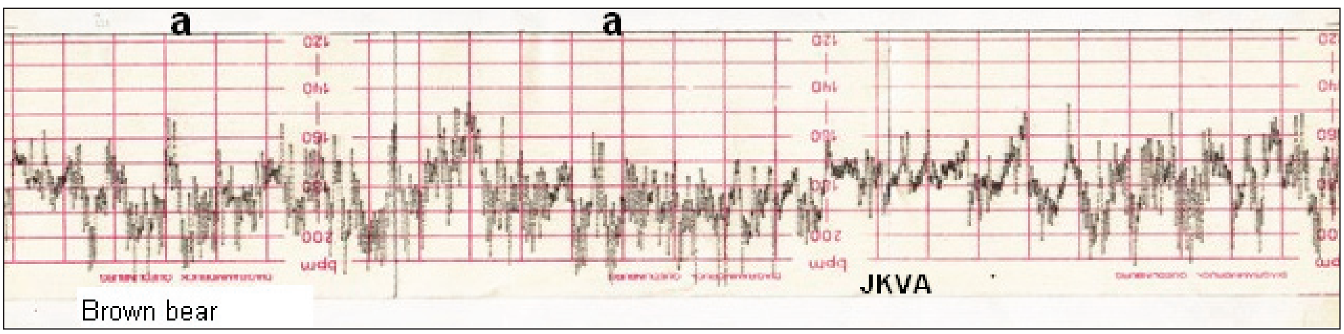

Fig. 4. Soundgram (spectrogram) of the brown bear

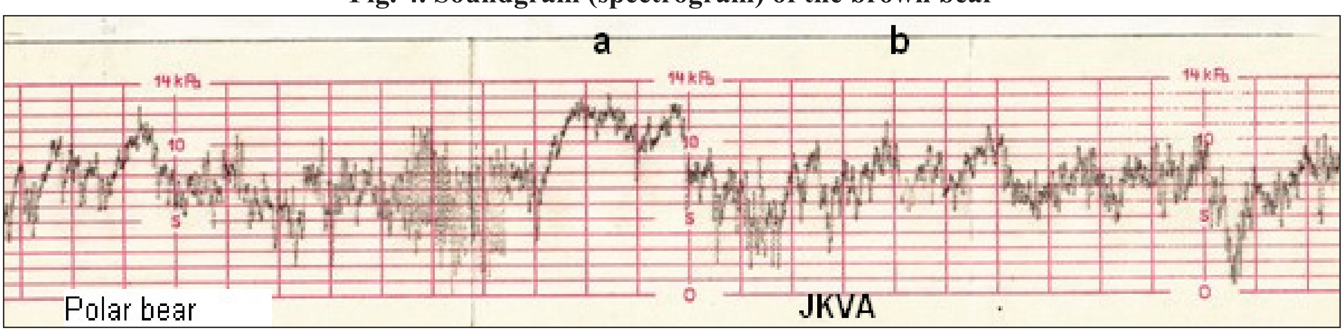

Fig. 5. Soundgram (spectrogram) of the polar bear

Different sounds, emitted by the wolf, were recorded, especially during the mating period. Wolves emit continuous sounds when gathering into a pack, which are defined as howling. Figure 6 presents such a record. Module (a) started with several short fluctuations of different amplitude, which went back to their initial level. This was followed by a quick rise of the curve into another frequency band, where it stayed in a continuous plateau with overlapping low-amplitude waves. The module ended up in a descending mode with several short fluctuations.

The recording on line 2 of this figure is of particular importance. This is an amazing recording of a human (a researcher), who imitated wolf howling in a remarkable way. As seen in the figure, the curve of the recording was very close to that of the wolf.

The soundgram (spectrogram) of the leopard (Figure 7) consisted of module (a) at the initial

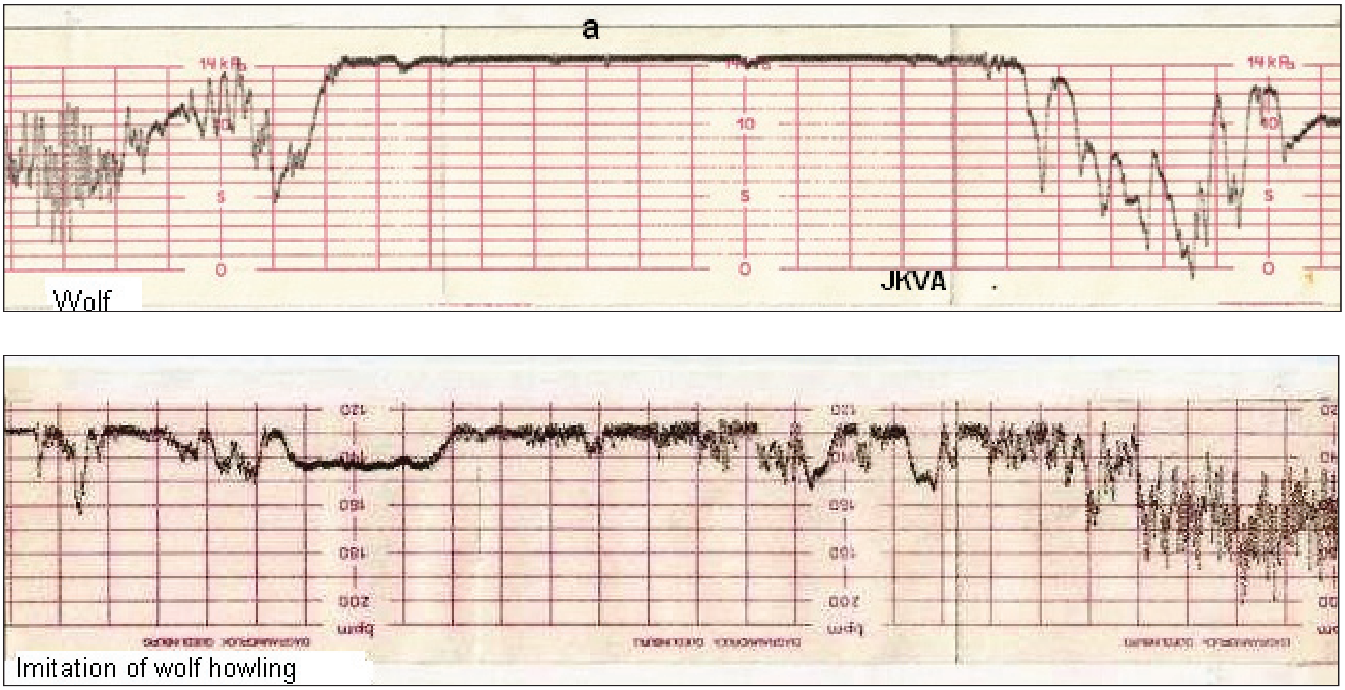

Fig. 6. Soundgram (spectrogram) of the wolf

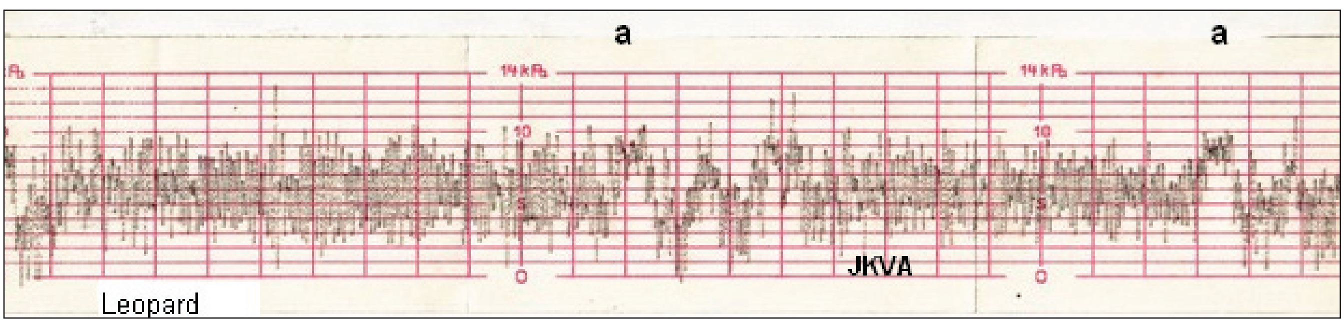

Fig. 7. Soundgram (spectrogram) of the leopard

level. In this case, there was no special dynamics in it. It consisted of three short similar fluctuations with overlapping vibrations.

It is still an open issue how to mark the grouping of sound vibrations when coding the signals. The sound spectrum is usually defined as linear (tones) and continuous (noise) and this is the way to study the smallest unit of spoken language - the phoneme. Our opinion is that these notions of human speech should not be transferred mechanically to the study of animal language.

The recordings we have shown are similar to those published by Taylor (2008).

Conclusion

We consider that animals have their own language of communication that is strictly coded and modulated depending on their physiological condition and the effect of environment. Different species have a certain number of sounds to communicate with each other that are genetically inherited and acquired during the ontogenetic development of the specimens.

References

D. McFarland, 1988. Animal Behavior. *Mir.* M., 519 pp. (Ru).

Fernand, M., 1980. Animals have a language of their own. *Zemizdat,* S., 267 pp. (Bg).

Kostov, Y., V. Alexandrova and V. Peycheva, 2009. Animal language is like telegraphic symbols. *Veterinary News,* (3): 26-28 (Bg).

Kostov, Y. and V. Alexandrova, 2004. The Bases of Animal Ethology. *Eniovche Publ.,* S., 177 pp.

McComb, K., C. J. Moss, S. Sayialel and L. Baker, 2000. Unusually extensive networks of vocal recognition in African elephants. *Animal Behaviour*, **59**: 1103 - 1109.

Payne, K., Jr. W. R. Langbauer and E. Thomas, 1986. Infrasonic calls of the Asian elephant (*Elephas maximus*). *Behavioral Ecology and_Sociobiology,* **18**: 297- 301.

Stishkovskaya, L., 1980. What do animals say? *Lesnaya Promishlennost Publ.,* M., 175 pp. (Ru).

Taylor, H., 2008. Decoding the song of the pied butcherbird: an initial survey. *Revista Transcultural de Música Transcultural Music Review*. (12) ISSN 1697-0101.

Tinbergen, N., 1978. Animal Behavior. *Mir.* M., 191 pp. (Ru).

Received August, 2, 2011; accepted for printing, November, 12, 2011.