THE EVOLUTION *of* LANGUAGE

Editors

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ACOUSTIC POTENTIAL FOR REFERENCE-LIKE COMMUNICATION IN WILD INDRI

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1. Introduction

In nonhuman Primates there is evidence that some vocalizations can be combined according to structural rules to form complex utterances (Zuberbühler, 2002). This combinatory ability, which resembles human language, is sometimes linked with changes in vocalizations meaning in relation to the context in which the vocal signal is emitted. Long-distance calls are relatively common among primates, including lemurs. However, indri (*Indri indri*) represents a unique case because of its impressive howling cries, known as “the song of the indri” (Sorrentino et al., 2010). The song is a complex sequence of vocalizations emitted by group members in a coordinated manner. The song informs neighbouring groups about the occupation of a territory and also may serve a cohesion function for the group members (Pollock, 1986). Within this study, we analyzed the acoustic features of indri’s songs given in two different contexts: when the group members are in visual contact (Territorial songs, hereafter TS) and when indris are dispersed in their territory (Cohesion, hereafter CS). We aimed to investigate to what extent songs given in the two contexts showed acoustic differences that could show a potential for reference-like communication in these lemurs.

2. Materials and Methods

For the purpose of this work we studied 59 songs of 11 groups from different populations of indris (*Indri indri*) in Eastern Madagascar. We audio-recorded 31 individuals, both males and females, both adults and sub-adults. We recognized individual contribution to the song. For each song we measured: the number of

notes, song duration, the percentage of individual contribution and the number of signallers. Statistical analyses were performed using SPSS 17.0 for Mac.

3. Results

We observed that while the group members usually did not show specific movements after TS, movements towards the direction of one of the emitters always followed the emission of CS. Analyzing the timing of each individual contribution we have found out that TS showed longer duration ($127.4 \text{ s} \pm 74.8 \text{ s}$) than CS ($74.6 \text{ s} \pm 24.8 \text{ s}$; t-test, $N = 59$, $t = 2.918$, $p = 0.005$). TS showed a higher number of notes uttered (70 ± 37), on average twice the number of the notes given in CS (35 ± 18 ; t-test, $N = 59$, $t = 3.752$, $p < 0.001$). Even if indris have shown that they do generally produce more calls during TS, the percentage of individual contribution is greater in CS (t-test, $N = 59$, $t = -2.378$, $p = 0.021$). Notes emitted during TS and CS showed differences in Fundamental frequency modulation in relation to the sex of the emitters.

4. Discussion and conclusion

This study provides evidence that the acoustic potential for functionally referential communication is present in the loud vocalizations of free-ranging strepsirrhines. Our results showed that songs given by the indris differ in timing of sound production and duration of the individual song depending on the context of emission (territorial vs. cohesion) and on the sex of signallers.

These differences are in agreement with the prediction that utterances serving different functions show characteristic acoustic cues (Clarke et al., 2006), even if, in the indris' song, they are mainly related to temporal parameters.

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