



Zurich, July 17, 2012

Dear PLoS Biology editor,

I would like to submit a pre-submission inquiry regarding the suitability of our manuscript **“Temporal segregation of individual and behavioral signatures in banded mongoose close calls”** by David A.W.A.M. Jansen, Michael A. Cant, and Marta B. Manser for publication in PLOS Biology.

Understanding how non-human animals, anatomically constrained in the number of different call types they can produce, encode information in their limited repertoire has been a focus of intense research. Recent studies suggest that through the combination of existing calls into meaningful sequences, the variety and amount of information transmitted through the vocal repertoire can be increased (Arnold and Zuberbühler, 2006/2008). Additionally, senders may exploit vocal signatures to increase the potential information encoded in calls (Shapiro 2010). However, the encoding of multiple vocal signatures using the same components of vocalizations often induces a trade-off in reliability between these signals (Briefer et al. 2010). Peter Marler already recognized this problem in 1960 (Marler, 1960) and he proposed that these tradeoffs could at least be partially resolved using temporal or spatial separated vocal signatures. Segregation of information would allow the encoding of multiple information sets within the same call, while avoiding a tradeoff in reliability. Despite having been proposed over 50 years ago this principle has so far not been shown in animal vocalizations.

In this study, we investigated how banded mongooses (*Mungos mungo*) encode multiple vocal signatures in their close calls. We found that their close calls contain temporally separate individual and behavioral signatures, encoding information on the individual's identity and of its current behavioral context as discrete units. This is the first reported evidence of the use of temporal segregation within a single call type as proposed by Peter Marler. Furthermore, the integrated individual element described, represents the first example in a mammalian vocalization of an identity cue as a discrete element within a single call that is neutral to context.

We highlight the broad application of these mechanisms using examples from frogs and humans, based on descriptions in the literature on call structure and ways of communicating. Given that vocal signatures predominantly encode individual cues related to the sender, we predict temporal segregation to evolve when signalers benefit from communicating multiple unambiguous sets of information. We argue that temporal segregation, in addition to call combinations, provides an additional dimension to the complexity of information coding in animal vocal communication.

We believe that our findings are of interest to the readers of PLOS Biology, as they represent the first empirical evidence for the existence of an important mechanism in animal vocal communication and human language.

Please find the abstract of our study attached. We certify that the submission is original work and is not under review at any other journal. We would very much appreciate to know whether our manuscript is suitable for full submission to PLOS Biology.

Sincerely yours,

David A.W.A.M. Jansen*, Michael A. Cant, and Marta B. Manser

Abstract

Background

Non-human animals are anatomically constrained in the number and variety of call types they can produce [1-2]. Recent studies suggest that by combining existing calls into meaningful sequences, animals can increase the information content of their vocal repertoire despite these constraints [3-5]. Additionally, signalers could use vocal 'signatures' to increase the information encoded in their vocalizations [6-8]. However, encoding multiple vocal signatures using the same components of vocalizations usually reduces reliability of signals [6-7]. Segregation of information (e.g. temporally) could effectively circumvent this trade-off (i.e. segregation of information)[8]. There currently exist no other studies that refer to this principle within a single call type. Here, we investigate how banded mongooses (*Mungos mungo*) encoded multiple vocal signatures in their close calls.

Methodology/Principal Findings

The data for this study was collected on a wild, but habituated, population of banded mongoose. We found that close calls contain temporally separated signatures, encoding information regarding both an individual's identity and its current behavioral context as a discrete unit. This represents the first example of an identity cue as a discrete element within a single call that is neutral to context.

Conclusions/Significance

We provide the first evidence of Marlers' segregation of information [8] within a single call type. By reviewing descriptions of call structures in the literature, we suggest a general application of these mechanisms in birds, frogs and humans. Our study suggests that temporal segregation of vocal signatures is a new and wholly unexplored dimension of information coding in animal vocal communication. We argue that temporal segregation of vocal signatures i) adds an additional dimension to the complexity underlying information coding in animal vocal communication, and ii) evolves in species where communication of multiple unambiguous signals is crucial, but is limited by the number of call types produced.

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