Second Joint Meeting of Société Zoologique de France and Unione Zoologica Italiana

Torino, 18-23 September 2017

The evolution of animal diversity: a comparative approach

Abstract Book
MATING CALLS OF BANDED PENGUINS ENCODE HONEST CUES TO THE BODY SIZE IN THE VOCAL PARAMETERS LINKED TO ANATOMICAL CONSTRAINTS

Penguins’ display songs have long been fascinating scientists. These vocalisations play a key role in mate choice and recognition and are highly exposed to ecological sources of selection. Indeed, mechanisms used to encode biologically meaningful information vary according to the breeding ecology of the different species. Non-nesting penguins (genus *Aptenodytes*) use independent contributions from the two sides of the syrinx (two-voice system) to generate display songs with extreme intra-individual stereotypy. Nesting species use the pitch of the call and the relative energy distribution across the spectrum for individual recognition. Accordingly, the source-filter theory of voice production has recently been proved to allow a far greater understanding of the information encoded in banded penguins (*Spheniscus* spp.) vocalisations by considering independent contributions from lungs (determining duration), syrinx (fundamental frequency, $f_0$) and the supra-syringeal vocal tract (formants). In mammals, where vocal features are linked to anatomical constraints that cannot be faked, the vocal signal can also provide “honest” information about the body size of the emitter. Here we tested whether also in penguins, syrinx- and vocal tract-related acoustic parameters has the potential to encode such information. We collected display song from two *ex-situ* colonies of Humboldt (*S. humboldti*) and Magellanic (*S. magellanicus*) penguins in Italy. For each vocalization, we measured the duration and several syrinx- and vocal tract-related acoustic parameters in Praat. We also measured the body weight and seven descriptors of the skeletal size of each penguin. Using a series of Generalized Linear Mixed Models, we showed that call duration positively correlates with bill length, while $f_0$ negatively correlates with the body weight. However, we did not find any effect of body dimension on vocal tract-related parameters. We explained the pitch and duration allometry as a result of the lungs capacity and mass of the vibrating membranes in the syrinx, respectively. We suggest that the lack of relationship between the skeletal size and filer-related parameters should be interpreted in the light of the mobility of the penguins’ trachea, which can be voluntarily contracted to change its length during phonation. Our results add important information to a growing body of literature on the mechanisms used by birds to encode biologically meaningful information in mating vocalisations.

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