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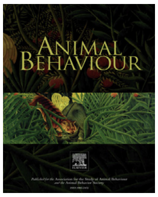

Endangered pink pigeons treat calls of the ubiquitous Madagascan turtle dove as conspecific

Andrew Wolfenden [a], Carl G. Jones [b], Vikash Tatayah [b], Nicolas Züel [b], Selvino R. de Kort [a], *

[a] *Division of Biology and Conservation Ecology, Manchester Metropolitan University, Manchester, U.K.*
[b] *Mauritian Wildlife Foundation, Vacoas, Mauritius*

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Responding to allospecific territorial signals may result in the unnecessary expenditure of energy and time and is therefore, in general, not adaptive. The signals of closely related species are often similar owing to common ancestry, especially when species evolve in allopatry. However, selection for species recognition in sympatry tends to result in distinct territorial signals. The endangered pink pigeon, *Nesoenas mayeri*, endemic to Mauritius, occurs in sympatry with the invasive Madagascan turtle dove, *Nesoenas picturata*, and their perch-coos are remarkably similar. We conducted playback experiments to test whether pink pigeons respond to coos from Madagascan turtle doves. Pink pigeons responded similarly to playback of conspecific and Madagascan turtle dove coos but not to those of the more distantly related and sympatric *Stigmatopelia chinensis*. This study stresses the need to identify the impact of *N. picturata* on the breeding success and conservation of *N. mayeri*.

In general, signals used for territory defence are loud and serve to inform many receivers rather than specific individuals (Ręk & Osiejuk, 2011). If species use the same or similar resources or if signals are misinterpreted, response to territorial signals may not be restricted to individuals of the same species (Murray, 1976). To reduce energy expended on responding to a signal from a noncompetitor, selection is expected to favour individuals that are able to distinguish between relevant and irrelevant signals (ten Cate, Slabbekoorn, & Ballintijn, 2002).

Divergence of signal structure may result from ecological selection, sexual selection or genetic drift (reviewed in Wilkins, Seddon, & Safran, 2013). Owing to common descent, signals of closely related species are often more similar than those of more distantly related species (McCracken & Sheldon, 1997; Seddon, 2005). Where closely related species evolve in sympatry, signal structure may diverge as a result of selection for species recognition (Doutrelant, Leitao, Otter, & Lambrechts, 2000), competition for signal space (Luther, 2009) or as a by-product of morphological change driven by competition for resources (Kirschel, Blumstein, & Smith, 2009). If species evolve in allopatry then territorial signals do not diverge through selection for species recognition. Therefore, in closely related species, the components of a signal that trigger a response could be shared if there was no selection for species recognition, despite the fact that the overall signal structure may have changed considerably (de Kort & ten Cate, 2001). If these species come into secondary contact interspecific response to vocalizations may result in either hybridization (de Kort, den Hartog, & ten Cate, 2002a, 2002b) or exclusion (Vallin, Rice, Arntsen, Kulma, & Qvarnström, 2011). There are examples where sympatry does not result in signal divergence. Similarities between signals may occur if species compete over territories (Price, 2008). Signals may also converge as a result of acoustic adaptation to the habitat (Cardoso & Price, 2010) or if selection favours communication between species (Tobias, Planqué, Cram, & Seddon, 2014).

The pink pigeon, *Nesoenas mayeri*, is the last remaining native columbid on the island of Mauritius. Intensive conservation management, led by the Mauritian Wildlife Foundation (MWF), has seen the population recover from nine individuals in 1990 to 400 in 2013 (Mauritian Wildlife Foundation, 2012). The species is no longer considered critically endangered and its conservation status was downgraded to endangered by the IUCN in 2000 (IUCN, 2012). The continuous monitoring of population dynamics, along with translocations, predator and disease control and supplementary

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* Correspondence: S. R. de Kort, Division of Biology and Conservation Ecology, School of Science and the Environment, Manchester Metropolitan University, Chester Street, Manchester M1 5GD, U.K.
E-mail address: S.dekort@mmu.ac.uk (S. R. de Kort).

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feeding by the MWF, has been in place since the 1980s. Although local populations have stabilized, it remains unclear what prevents *N. mayeri* from fully re-establishing itself in new areas. Disease, inbreeding depression and the loss of suitable habitat are factors that have received attention (Bunbury, Stidworthy, et al., 2008; Jones, Todd, & Mungroo, 1989; Swinnerton, Greenwood, Chapman, & Jones, 2005; Swinnerton & Groombridge, 2004). Habitat loss and predation were the initial drivers in the decline of *N. mayeri* (Jones, 1987) and the parasite *Trichomonas gallinae* has also contributed to reducing the population (Swinnerton et al., 2005). Poor reproductive success resulting from inbreeding depression affects both fertility and fledgling survival (Swinnerton & Groombridge, 2004).

One factor that has not been considered is increased competition through behavioural interactions with its sister species (Johnson et al., 2001) the Madagascan turtle dove, *Nesoenas picturata*. The latter's status on Mauritius is uncertain following the discovery of fossilized bones similar to those of *N. picturata* (Mourer-Chauviré, Bour, Ribes, & Moutou, 1999). Nevertheless, it has been suggested that the current population of *N. picturata* originates from Madagascar having being introduced around 1770 following the extinction of a small dove species (Hume, 2011). The coos of *N. mayeri* and *N. picturata* are remarkably similar, at least to the human ear, whereas the species are not particularly similar in morphology or ecology (Johnson et al., 2001; Slabbekoorn, de Kort, & ten Cate, 1999). Closely related *Streptopelia* species mainly use temporal and low-frequency features in the coos to categorize congeneric coos for their perceptual similarity to conspecific coos (Beckers, Goossens, & ten Cate, 2003; Beckers & ten Cate, 2001) and these features are similar in the coos of *N. mayeri* and *N. picturata* (Fig. 1). In the field, closely related dove species from the genus *Streptopelia* respond to the calls of allopatric, but not sympatric congenerics, and response intensity is inversely related to phylogenetic distance (de Kort & ten Cate, 2001).

We hypothesized that similarities in vocal structure between *N. mayeri* and *N. picturata* may trigger an allospecific response. In this study, we examined whether coo similarity is biologically relevant by testing whether *N. mayeri* responds to the coos of *N. picturata*. Results from this study may be relevant to conservation managers if the presence of *N. picturata* affects the breeding success of *N. mayeri*.

METHODS

Study Species and Sites

The wild population of *N. mayeri* consists of seven subpopulations grouped in the southern part of Mauritius. Birds are intensively monitored year round by MWF staff at supplementary feeding stations and in their breeding territories to assess condition and breeding status. All breeding birds have identifying rings and young birds are captured and ringed at these feeding stations. Observations for this study were taken from three subpopulations within the Black River Gorges National Park, Bel Ombre (20°28′S, 57°25′E), Brise Fer (20°38′S, 57°45′E) and Pigeon Wood (20°44′S, 57°48′E), and from the nature reserve of Ile aux Aigrettes (20°42′S 57°73′E; see Fig. 2). Habitat type within the study sites ranges from temperate, predominantly pine forest to tropical, coastal forest. *Nesoenas mayeri* breed year round except for a short period that coincides with the cyclone season (Bunbury, Jones, Greenwood, & Bell, 2008), which typically occurs around March to April.

Playback Trials

Playback trials were conducted from August to October 2012, between 0600 and 1800 hours. Territories were initially located using GPS data provided by MWF and individual birds were found by scanning with binoculars or listening for vocalizations. Both *N. mayeri* and *N. picturata* defend territories year round utilizing perch-coos to attract females and repel rival males. If a territory holder is challenged a display flight is usually made to locate the intruder, during which a flight call is often given. The perch-coo may also be directed towards an invading male. This call is generally given from a high perch within the sender's territory (de Kort et al., 2002b). Once we had found a male we identified it from the unique combination of coloured rings on its legs, avoiding repeat sampling of the same individuals. No trials were conducted on moulting birds or birds that were incubating.

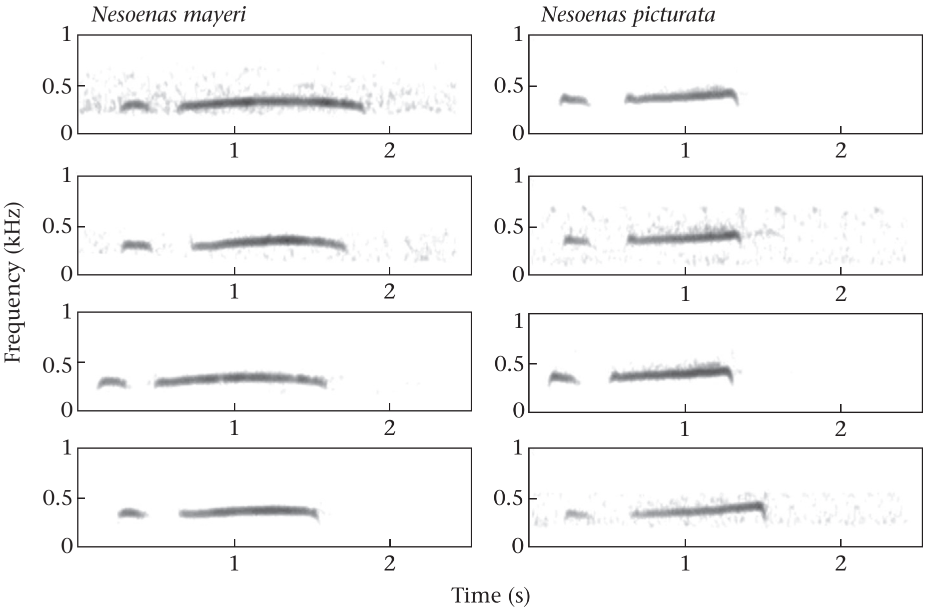

Figure 1. Spectrograms of *N. mayeri* and *N. picturata* perch-coos of four individuals each, showing the similarities in spectral and temporal parameters between and within species. Recordings were made with a sampling frequency of 44.1 kHz. Spectrograms were created in Avisoft (Avisoft Bioacoustics, Berlin, Germany) using the following parameters: fast Fourier transform = 512, frequency resolution = 8 Hz, Hamming window, overlap 87.5%, temporal resolution = 16 ms.