REPORT FROM A BOU-FUNDED PROJECT

The role of cognitive ability in the use of social information for breeding site selection: an empirical approach in passerine populations

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Background:

How individuals cope with changing environments, using for example complex information sources to make optimal decisions remains poorly known. However, the spatio-temporal variation of breeding habitat quality can strongly affect reproductive success. Information meaning may depend on both individual (e.g. competitive ability) and environmental (e.g. time in the season) factors (Pärt *et al.* 2011), in such a way that information may need to be used in a complex, condition- and phenotype-dependent way. This complexity suggests that individual cognitive abilities may play a main role in the ability to optimally use information in decision-making in the wild, and shape between-individual variation in breeding site selection strategies and their fitness consequences in natural populations.

Recent studies have revealed potential links between cognitive abilities, measured via innovation and learning performances, and individual mating and reproductive success (Boogert *et al.* 2008; Keagy *et al.* 2009; Cole *et al.* 2012; Cauchard *et al.* 2013). One possible mechanism underlying these relationships can be that individuals with higher cognitive abilities may achieve higher success because of a higher ability to optimally exploit their habitat (Cole *et al.* 2012), and this may rely on a better processing and use of the information available about habitat quality.

The aim of this project was to experimentally test this hypothesis by manipulating a source of social information associated with breeding sites and testing whether the ability of individuals to use such

information in their subsequent breeding site choice was linked to their cognitive ability, measured by their problem-solving performance.

Method summary:

The study was performed in a natural population of two passerine species, the great tit *Parus major* and the collared flycatcher *Ficedula albicollis*, located on the Swedish island of Gotland. Previous work in this and other populations has shown that individuals of both species use social information from their conspecifics and individuals of the other species to adjust reproductive decisions, including breeding habitat choice at various spatial scales (site or patch) (Doligez *et al.* 1999; Doligez *et al.* 2002; Seppanen & Forsman 2007; Seppanen *et al.* 2007). Social information was manipulated following Seppanen et al. (2007) and nests were monitored as part of the general population monitoring scheme to determine nest site preference with respect to the symbols. After hatching, cognitive ability of individuals breeding in the experimental patches were measured using a novel problem-solving task already developed in the population in previous years for both species (see details on Cauchard *et al.* 2013). The performance in solving the task was measured by the ability to enter in the box for each member of the pair (solver vs. non-solvers; see Cauchard et al. 2013). We then tested whether measures of problem-solving performance breeders of both species were related to their nest box choice with respect to the use of the artificial symbols, accounting for potentially confounding variables (measures of the motivation and neophobia of breeders, as well as age, breeding experience, local breeding density, time and meteorological variables).

Main findings:

If the use of social information is linked to individual cognitive ability, we expected that individuals with the highest problem-solving performance show a higher probability to choose the "right" symbol, i.e. settle in nest boxes with the same symbol as previously settled great tits in the patch.

On the 270 breeding Great tit pairs tested for social information use, we did not find any preference for 'right' choice with respect to the symbol chosen by conspecifics ($X_1^2 = 0.256$, $p = 0.612$). We were able to test 144 out of the 270 breeding pairs for their problem-solving ability, but preliminary analyses did not show any difference between solvers (n = 69) and non-solvers (n = 75) in their probability to choose the 'right' symbol ($X_1^2 = 0.684$, $p = 0.408$). However, these results were not yet corrected for several confounding variables cited above, and analyses are still in progress to confirm these results. Results are still in progress for the second species too, the collared flycatcher. Due to the high number of breeding pairs tested and thus to the corresponding number of video recordings to analyse, we were not able to achieve this work for the report deadline scheduled. Final results will be achieved by the end of 2014 and scientific papers submitted for publication in the same time.

An accumulating number of studies suggest that information use is crucial for optimal decision-making in many taxa. The field of information use has provided intriguing and novel perspectives, nevertheless, the mechanisms of information use are poorly understood, in particular the origin of individual variation in the ability to acquire and use information. This project may provide the first experimental piece of evidence of a link between the ability of individuals to use social information and some cognitive abilities possibly required for processing this information. It will therefore shed light on the origin of between-individual variation observed in the use of social information for breeding habitat selection in this and other populations. Furthermore, these results will have implications in understanding the adaptability potential of natural populations in increasingly varying environments due to global change.

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