**Project title:** Predicting dispersal abilities in birds and mammals  
**Level:** Master  
**Start:** Anytime  
**Project duration:** 6 months (MSc internship)  
**Project form:** Ecological modelling.  
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Dispersal behaviour plays a determinant role in a number of ecological processes and is considered a key element in biogeography (McDowall, 2004) and conservation biology (Macdonald & Johnson, 2001). In order to predict how far animals can move, several studies have developed allometric models relating mean, median or maximum dispersal distance with species biological traits (e.g. body mass; Sutherland et al., 2000; Bowman et al., 2002; Dawideit et al., 2009; Whitme & Orme, 2012; Santini et al., 2013). Although these models are widely used for many conservation applications (e.g. connectivity or climate change as in Schloss et al., 2012; Visconti et al., 2015; Santini et al., 2016), they present several conceptual problems. First, dispersal distances are highly heterogeneous even within the same species and their frequency in a given population is typically represented by a positively skewed distribution (where most of the animals move short distances and a few of them make long distance movements). Second, a recorded dispersal distance generally represents a “minimum distance covered”. Similarly, maximum recorded distance are dependent on how intensively a species has been studied. Third, most models in conservation require the probability of dispersing a certain distance rather than an Euclidean distance (which varies from individual to individual). Therefore, it is conceptually incorrect to predict an average (or maximum) dispersal distance, and its applications are highly uncertain because require ad-hoc assumptions about dispersal distance distributions, and are highly dependent on the accuracy of recorded distances.

To overcome these limitations, statistical models predicting the probability of dispersing a certain distance (rather than an absolute dispersal distance) are needed. The **aim of this project is to develop a new generation of models for predicting the probability of dispersing a range of distances based on species biological traits.** The project will focus on birds and mammals, and traits such as body mass, home range area, and wing morphology, that have proved to be important predictors of dispersal distance.
Approach
The project will consist in a first phase of data collection from the literature. Lists of references including dispersal distance data are already available (Whitmee & Orme, 2012; Santini et al., 2013; Butchart unpublished). The student will be responsible of extracting the raw (original) data from these publications (distance covered by each individual). The data will be then used to build a statistical model relating biological traits with the probability of covering a given distance (phylogenetic binomial generalized linear model). These models will be used to predict the probability of dispersing a distance will be used to fit a second model relating biological traits and distance, with the probability of covering that distance (beta regression). Finally, the models will be validated to measure the predictive accuracy for further applications.

Requirements of the candidates:
- Interest in animal ecology, ecological statistical modelling and conservation biology.
- Basic knowledge of R.

References