ABSTRACT

Individuality in acoustic signals is crucial for animal communication, facilitating individual recognition across diverse taxa and social contexts. This PhD thesis examines the role of individual vocal signatures in the behaviour, ecology, and conservation of bird species, focusing on the Tawny Pipit (*Anthus campestris*) and the Berthelot's Pipit (*A. berthelotii*). A series of interlinked studies in this thesis assesses the potential of individual acoustic monitoring (IAM) as a non-invasive method for studying and conserving these species.

Chapter 1 investigates IAM's suitability for both male and female Tawny Pipits, a migratory species critically endangered in Central Europe. The findings confirm that Tawny Pipits possess simple, individually distinct songs that are temporally stable within and between seasons. This supports IAM as a reliable approach for monitoring this species, providing a proof of concept for its application in passerines with small repertoires and simple songs.

Building on these insights, Chapter 2 evaluates the long-term behavioural effects of playback-associated mist netting on male Tawny Pipits. The study reveals that males remember negative experiences associated with mist-netting for several years, modifying their responses to similar stimuli in future encounters. This underscores the potential of IAM to replace invasive monitoring practices, which can negatively impact individuals' behaviour and health, thus reinforcing the conclusions from Chapter 1 regarding the advantages of non-invasive monitoring.

Chapter 3 extends the methodology validated in Chapter 1 to Berthelot's Pipits, confirming song individuality in this sedentary island species endemic to Macaronesia. By comparing song variation across geographic scales between Tawny and Berthelot's Pipits, this chapter explores the similarities and differences between the species, evaluating the potential influence of migratory behaviour and population isolation on song divergence. Contrary to our expectations, we found no region-specific song characteristics in either species, possibly due to rapid cultural evolution in birds with simple but individually unique songs, which can override founder effects. Both species exhibited high intrapopulation song variation and increased mean song differentiation at broader scales. In Berthelot's Pipits, however, the gradient of song differentiation was more pronounced, showing higher mean song similarity at the smallest spatial scale, presumably due to their sedentary nature, and the highest mean song dissimilarity between two subspecies of Berthelot's Pipits, which inhabit the Madeira and Canary archipelagos, respectively. This comparative study provides hints into how different ecological and life history traits may influence acoustic communication and cultural evolution in closely related species.

Overall, the thesis demonstrates the efficacy and potential of individual acoustic monitoring for studying bird behaviour and ecology, advocating for its broader implementation in species conservation and management. The findings emphasize the need for such non-invasive monitoring methods in both research and conservation, particularly for species in challenging environments. Finally, this thesis highlights the complexities of acoustic signal evolution and the significance of geographic and ecological factors in shaping vocal behaviour, contributing to a broader understanding of song variation and cultural evolution in migratory and sedentary birds.