



Ph.D. Thesis Defense

# *Student Presentation*

Monday, 09 May 2022 at 13:00  
Building XΩΔ01, Room 101, Panepistimioupoli Campus

*This seminar is open to the public*

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### **“Ecology and Behavioural biology of *Curruca* species breeding in Cyprus”**

Islands have long been considered arenas of speciation and extinction, with high levels of endemism but also many species of conservation concern. Island endemics can be vulnerable to colonisation by competitors and this vulnerability may depend on the extent of resource and interference competition between resident species and colonizer. Much previous work has investigated competition among *Sylvia* and *Curruca* warblers in the Mediterranean region, where up to eight species have been known to occur sympatrically in continental regions. On islands, where niche space may be limited, fewer species typically coexist and in Cyprus two breeding species, Cyprus warbler *Curruca melanothorax* and spectacled warbler *C. conspicillata* have long segregated by habitat. Recently, however, Sardinian warbler *C. melanocephala* colonised Cyprus and has spread rapidly across the island and the consequences for the existing breeding species has caused much concern.

Since breeding of Sardinian warbler was confirmed in 1994, several studies have reported declines in Cyprus warbler in the west of the island, but two studies focusing on the extent of competition between the two species found little evidence and suggested they occupy different niches. Yet the spread of Sardinian warbler has continued throughout suitable Cyprus warbler breeding habitat and a reassessment of their interaction, as well as the effect of the colonization on spectacled warbler is needed.

The first part of this thesis has elaborated on the ecological preferences and population dynamics of the three *Curruca* species breeding in Cyprus. In total 402 counts of the three species were performed across the island in five habitat types during the wintering, pre-breeding and breeding seasons. The results depicted a significant overall decline in Cyprus warbler populations especially in disturbed habitats, whereas Sardinian warbler remained stable with its numbers negatively associated with the former's abundance. Spectacled warbler population remained stable with clear habitat segregation from Cyprus warbler. Both Cyprus and Sardinian warbler favoured maquis, while the latter occurred in higher densities in disturbed mixed habitats. Although the decline of Cyprus warbler in disturbed habitats may suggest anthropogenic disturbance is largely responsible for its decline, the presence of Sardinian warbler appears to have compounded the decline of Cyprus warbler, by displacing it especially when habitat disturbance occurs.

In the second part of this study, songs of male Cyprus and Sardinian warblers were recorded in six selected areas in Cyprus according to years in coexistence during the breeding period. Several spectral and temporal measurements of songs were taken and analyses showed that songs overlap in some traits but in others where they do differ, they become more similar over time in sympatry. Specifically, Cyprus warbler sang higher entropy songs in allopatry than Sardinian warbler, but progressively more tonal songs the longer the two species had been in sympatry. The same pattern was found for frequency bandwidth and number of inflection points with Cyprus warbler singing songs with narrower bandwidth and fewer inflection points thus apparently converging towards Sardinian warbler song. These results reveal rapid change in Cyprus warbler song towards Sardinian warbler song which may facilitate interspecific territoriality or otherwise act as a mechanism reducing aggression by the dominant congener, in accordance with expectations under competitive mimicry.

In the last part of my research, responses of Cyprus warbler and Sardinian warbler to each other's signals were compared with responses to conspecific stimuli examined in a four-way acoustic playback experiment paired with decoy display using spectacled warbler and European goldfinch as controls. Experiments were performed in Cyprus and Sardinian warbler territories in six areas in Cyprus which varied by number of years the species coexisted in each. The response of target males was quantified for each experiment based on six response measures. Cyprus warbler responded significantly stronger to experiment stimuli compared with Sardinian warbler. In addition, Cyprus warbler had a higher response to conspecific and to Sardinian warbler stimuli than to controls, with its responses being stronger in populations in which it has been interacting for longer with Sardinian warbler. Sardinian warbler responded less strongly to all stimuli than Cyprus warbler with no differences over time. Cyprus warbler aggressiveness towards heterospecifics and the observed pattern of convergence in songs towards those of Sardinian warbler identified in the previous chapter, are mechanisms that support the convergent character displacement hypothesis. Increased aggressiveness of Cyprus warbler to both conspecific and

congeneric stimuli might result in high fitness costs, which could contribute to Cyprus warbler's population decline.

My study enhances our understanding of the interactions between *Curruca* species, with valuable data on competitor recognition as well as on their ecological preferences, whilst supports the need for further investigation on the reasons which cause the continuous decline of Cyprus warbler populations in Cyprus.