

The effect of a colonising superpredator on mesopredator survival and reproductive strategies under declining food availability.

S. R. Hoy*^a, X. Lambin ^a, A. Millon ^b, D. P. Whitfield ^c

^a Institute of Biological and Environmental Sciences, University of Aberdeen

^b Aix-Marseille Université, Institut Méditerranéen Biodiversité Ecologie (IMBE)

^c Natural Research Limited

* contact: sarah.hoy@abdn.ac.uk

Keywords: capture-recapture, population dynamics, multispecies models, spatial ecology

Abstract: Superpredation can exert ‘top down’ control on mesopredator population dynamics and the addition of large superpredators into a community can have far reaching effects on the established species. At a time of global change when food resources for many vole eating raptors are declining at a continental scale throughout Europe, understanding how other factors such as superpredation can affect mesopredator survival is important from a conservation management perspective. We used capture mark recapture data from a 30 year raptor monitoring program, to investigate the effect of increasing superpredator (Northern Goshawks *Accipiter gentilis*) abundance on mesopredator (Tawny owls *Strix aluco*) survival. We also investigated whether the distance to the nearest superpredator territory and connectivity to all known superpredator territories affected mesopredator survival. As juvenile Tawny owl survival is lower than adult survival, survival was estimated separately for each age class and adult only analyses were also conducted. To account for annual fluctuations in survival caused by declining food availability, models included field vole abundance as a standardised temporal covariate as they are the main prey species for Tawny owls. Interactions between superpredator covariates and food availability were also examined and all analysis was carried out in ESURGE. Additionally, we investigated how different reproductive strategies affected survival under increasing superpredator abundance. As predicted, our results suggest both connectivity to goshawks and superpredator abundance have an effect on juvenile and adult survival. Survival was highest for individuals that took ‘rest years’ from breeding and those which spent on average 30% or more of their adult life after becoming reproductively active resting from breeding. This suggests superpredators should be taken into account when formulating mesopredator management programmes as both their abundance and relative spatial distribution is likely to affect both mesopredator survival and could be putting selective pressure on mesopredator reproductive strategies.