

Sensitivity analysis of a migratory population of Redshanks *Tringa totanus*: a forewarning of a population decline?

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Several wader species breeding in agricultural landscapes are declining in Europe. Here, we present evidence that reproduction in a subpopulation of an abundant but vulnerable wader species, the Redshank *Tringa totanus*, is too low for self-sustainability. We used population data collected from Gotland, SE Sweden, during the breeding seasons of 1997–2003. We used analytic and simulation-based sensitivity analyses of a stage-based matrix model of female Redshanks to compare the relative importance of specific vital rates to λ (population growth rate). For each vital rate, we present estimates of mean values and parameter limits. At mean values of vital rates, λ is estimated to 0.876, while the computer simulation yields an average λ of 0.860 (95% confidence intervals: 0.770–0.950), which is significant lower than 1. Further, analytic sensitivity of λ is highest to adult survival followed by chick survival and nest success. Analytic elasticity of λ ranks vital rates in a similar way as analytic sensitivity, and the computer simulation also indicates that the rankings of sensitivities and elasticities are robust to parameter uncertainties. In the simulated data, almost half of the variation in λ was explained by variation in adult survival (41%). The explanatory power of chick survival (27%) and nest success of first clutches (22%) was intermediate while other vital rates accounted for negligible amounts of variation. We conclude, however, that the potential to increase an already high adult survival is limited. Therefore, management actions should aim to increase reproductive success mediated via decreased nest predation rates and increased survival of Redshank chicks simultaneously.