Conservation implications of a mismatch between data availability and demographic impact

Alex Nicol-Harper[1], C. Patrick Doncaster[2], Geoff Hilton[3], Kevin Wood[3], and Thomas Ezard[1]

[1]National Oceanography Centre
[2]University of Southampton
[3]Wildfowl & Wetlands Trust

May 24, 2022

Abstract

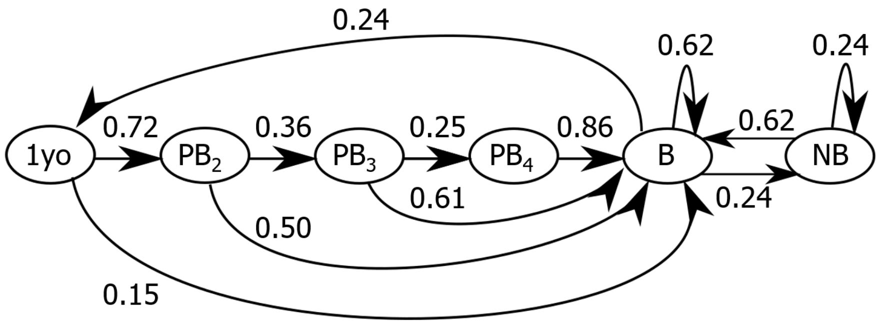
Cost-effective use of limited conservation resources requires understanding which data can most contribute to alleviating biodiversity declines. Interventions might reasonably prioritise life-cycle transitions with the greatest influence on population dynamics, yet some contributing vital rates are particularly challenging to document; such pragmatic decision-making risks suboptimal management if less is known about influential rates. We aimed to explore whether study effort aligns with demographic impact on population growth rate, λ. We parameterised a matrix population model using meta-analysis of vital rates for the common eider (Somateria mollissima), an increasingly threatened yet comparatively data-rich species of seaduck. Female common eiders exhibit intermittent breeding, with some established breeders skipping one or more years between breeding attempts. We accounted for this behaviour by building breeding propensity (= 0.72) into our model with a discrete and reversible 'non-breeder' stage (to which surviving adults transition with a probability of 0.28). The transitions between breeding and non-breeding states had twice the influence on λ than fertility (summed matrix-element elasticities of 24% and 11%, respectively), whereas almost 15 times as many studies document components of fertility than breeding propensity (n = 103 and n = 7, respectively). Through comparative re-analyses, we find similar results for two amphibian species, further supporting our finding that study effort does not always occur in proportion to relative influence on λ. Our workflow could form part of the toolkit informing future investment of finite resources, to avoid repeated disconnects between data needs and availability thwarting evidence-driven conservation.

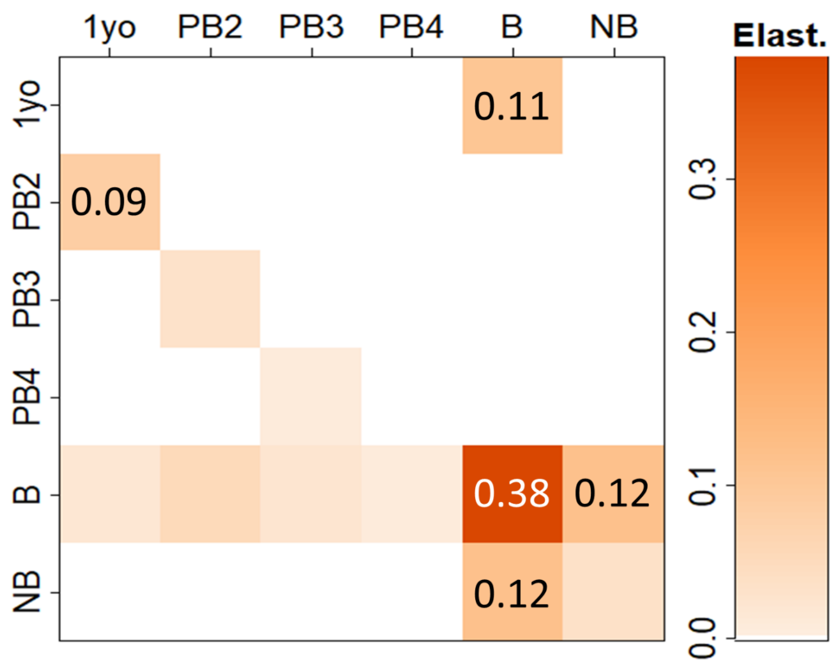
Hosted file

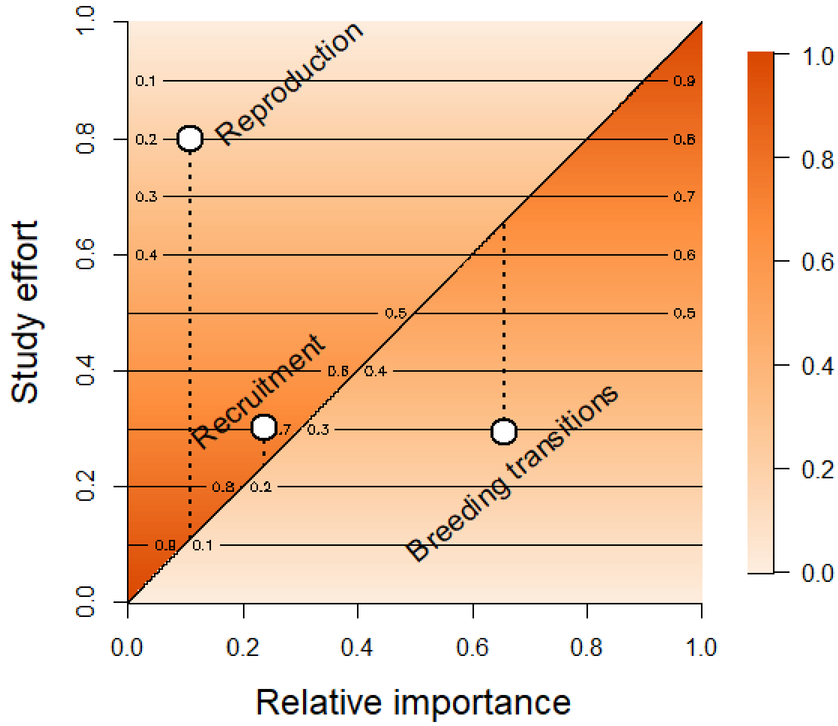
`Conservation implications of a mismatch_ANH.docx` available at https://authorea.com/users/484666/articles/570345-conservation-implications-of-a-mismatch-between-data-availability-and-demographic-impact

Hosted file

`Figure 1.docx` available at https://authorea.com/users/484666/articles/570345-conservation-implications-of-a-mismatch-between-data-availability-and-demographic-impact


0.24
0.62
0.24
1yo
0.72
PB_2
0.36
PB_3
0.25
PB_4
0.86
B
0.62
NB
0.61
0.24
0.50
0.15


1yo
PB2
PB3
PB4
B
NB
Elast.
0.11
0.09
0.38
0.12
0.12
0.3
0.2
0.1
0.0


Reproduction
Recruitment
Breeding transitions
Study effort
Relative importance
0.0
0.2
0.4
0.6
0.8
1.0