Supporting information

Demography of the critically endangered Balearic shearwater: impacts of fisheries and time to extinction

Table S1. Population matrix model defining the average dynamics of the whole Balearic shearwater population. N1: individuals 1 year old, N2: individuals 2 years old, $N3_{NB}$: individuals 3 years old not recruited, $N4_{NB}$: individuals 4 years old not recruited, $N5_{NB}$: individuals 5 years old not recruited, N_B: breeders, N_{NB}: animals in sabbatical, that have bred at least once. Υ: sabbatical probability, $r_{3,4,5}$: recruitment probability (probability of breeding for the first time) at 3, 4 and 5 years old, respectively; ρ: hatching sex ratio, S1: survival for the first and second year of life; S2: adult survival for a non-breeder, S3: adult survival for a breeder; f: fertility (fledging/female*year). See Fig. 1 for details about the life-cycle expressed in this model.

	N1	N2	$N3_{NB}$	$N4_{NB}$	$N5_{NB}$	N_B	N_{NB}
N1	0	0	0	0	0	f*S1*ρ	0
N2	S1	0	0	0	0	0	0
$N3_{NB}$	0	S2*(1-r_3)	0	0	0	0	0
$N4_{NB}$	0	0	S3*(1-r_4)	0	0	0	0
$N5_{NB}$	0	0	0	S3*(1-r_5)	0	0	0
N_B	0	S2*r_3	S3*r_4	S3*r_5	S3	S3*(1-Υ)	S2*(1-Υ)
N_{NB}	0	0	0	0	0	S3*Υ	S2*Υ

Table S2. Survival estimates for other shearwaters species of the genus *Puffinus*.

Species	Adult survival	Juvenile survival	2nd year survival	Reference
Puffinus puffinus	0.93*			(Schreiber & Burger 2002)
Puffinus yelkouan	0.82 (0.70–0.94)			(Oppel *et al.* 2011)
Puffinus huttoni	0.93 (0.89-0.96)	0.54*		(Cuthbert, Fletcher & Davis 2001)
Puffinus tenuirostris	0.92 (0.01)	0.58 (0.02)	0.88 (0.01)	(Hunter, Moller & Fletcher 2000)
Puffinus tenuirostris		0.70*		(Serventy & Curry 1984)
Puffinus tenuirostris	0.93-0.94*			(Schreiber & Burger 2002)
Puffinus griseus	0.92 (0.86–0.97)			(Clucas, Fletcher & Moller 2008) Taiaroa Head colony
	0.97 (0.93–0.99)			(Clucas, Fletcher & Moller 2008) Whenua Hou colony
	0.96 (0.71–0.99)			(Clucas, Fletcher & Moller 2008) The Snares colony
Puffinus griseus	0.92 (0.89-0.95)	0.85 (0.77-0.94)		(Scofield, Fletcher & Robertson 2001)
Puffinus griseus		0.54 (0.41)		(Fletcher *et al.* 2013)
Puffinus griseus	0.95*	0.45*	0.76*	(Hamilton & Moller 1995)
Puffinus griseus	0.93			(Schreiber & Burger 2002)
Puffinus carneipes	0.94 (0.93-0.95)	0.50 (0.48-0.52)	0.32 (0.30-0.34)	(Barry Baker & Wise 2005) Assumed vital rates.
Puffinus newelli	0.9*			(Schreiber & Burger 2002)

*These values should be taken with caution because are not estimated with capture-recapture methods.

References

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Serventy, D.L. & Curry, P.J. (1984) Observations on colony size, breeding success, recruitment and inter-colony dispersal in a Tasmanian colony of Short-tailed Shearwaters Puffinus tenuirostris over a 30-year peroid. *Emu*, 84, 71–79.

Table S3. European Union fisheries reports and plans that relate to the study

Issue	Link
Action Plan for reducing incidental catches of seabirds in fishing gears	http://ec.europa.eu/fisheries/cfp/fishing_rules/seabirds/seabirds_communication_en.pdf
Common Fishing policy	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:354:0022:0061:EN:PDF
Discard banning plan	http://ec.europa.eu/fisheries/cfp/fishing_rules/discards/index_en.htm

Table S3. Sensitivity and elasticity of the population growth rate (λ) to the matrix entries for the deterministic population model, assuming an equal sex ratio in the population. The most sensitive and largest elasticity entries are shown in bold. The stable age distribution (the right eigenvector with respect to λ) is also shown.

Sensitivities	N1	N2	N3$_{NB}$	N4$_{NB}$	N5$_{NB}$	N$_B$	N$_{NB}$
N1	0.000	0.000	0.000	0.000	0.000	0.284	0.000
N2	0.094	0.000	0.000	0.000	0.000	0.000	0.000
N3$_{NB}$	0.000	0.050	0.000	0.000	0.000	0.000	0.000
N4$_{NB}$	0.000	0.000	0.047	0.000	0.000	0.000	0.000
N5$_{NB}$	0.000	0.000	0.000	0.032	0.000	0.000	0.000
N$_B$	0.000	0.056	0.051	0.034	0.009	**0.664**	0.167
N$_{NB}$	0.000	0.000	0.000	0.000	0.000	**0.616**	0.155
Elasticities							
N1	0.000	0.000	0.000	0.000	0.000	0.048	0.000
N2	0.048	0.000	0.000	0.000	0.000	0.000	0.000
N3$_{NB}$	0.000	0.046	0.000	0.000	0.000	0.000	0.000
N4$_{NB}$	0.000	0.000	0.032	0.000	0.000	0.000	0.000
N5$_{NB}$	0.000	0.000	0.000	0.008	0.000	0.000	0.000
N$_B$	0.000	0.002	0.014	0.023	0.008	**0.493**	**0.124**
N$_{NB}$	0.000	0.000	0.000	0.000	0.000	**0.124**	0.031
Stable age distribution (%)	1276 (10.2)	645 (5.2)	586 (4.7)	389 (3.1)	100 (0.8)	7595 (60.8)	1908 (15.3)

Fig. S1. Relationship between Balearic shearwater breeding success (expressed as fledging per breeding pair) at the Sa Cella colony (Mallorca) and trawling landings in a fishing harbour where the species is known to forage. Data correspond to a 12 years period (between 1997-2004 and 2010-2013), and modeling indicated that the association was statistically significant (see Results).