Appendix A. Allee threshold for populations with age structure.

In populations with age structure in which density dependence acts during the early life stages, we can model the population dynamics as

(A.1)
$$N_{0,t+1} = \sum_{a=1}^{\infty} N_{a,t+1}\varphi_a \exp\left[f\left(\sum_{a=1}^{\infty} N_{a,t+1}\varphi_a\right)\right]$$

where $N_{a,t}$ is the number of individuals of age a at time t, φ_a is the fecundity of individuals of age a and s_a is the probability that age a individuals survive from t to t+1.

As in the main text, the unknown function f determines the form of density dependence (Courchamp et al. 2008; Quinn and Deriso 1999). Allee effects are present whenever there is an unstable equilibrium at some low population size, such that the production of juveniles falls below the level required for the population to persist (Courchamp et al. 2008; Quinn and Deriso 1999). By analogy with Eq 1, we define $N_{0,Allee}$ as this unstable equilibrium point. At this point, we have

(A.2)
$$\exp\left[f\left(N_{0,Allee}\sum_{a=1}^{\infty} l_a\varphi_a\right)\right] = \left[\sum_{a=1}^{\infty} l_a\varphi_a\right]^{-1}$$

Note that $\sum_{a=1}^{\infty} l_a\varphi_a$ is the lifetime reproductive output, R_0, which, for any extant population must be greater than or equal to 1. Thus, at the equilibrium we must have $f \leq 0$.

LITERATURE CITED

Courchamp, F., L. Berec, and J. Gascoigne. 2008. Allee Effects in Ecology and Conservation. Oxford University Press, USA.

Quinn, T.J., and Deriso, R.B. 1999. *Quantitative Fish Dynamics*. Oxford University Press (USA).