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Rosà, R., Bolzoni, L., Rosso, F., Pugliese, A., Hudson, P. J. and Rizzoli, A. 2011. Effect of *Ascaridia compar* infection on rock partridge population dynamics: empirical and theoretical investigations. – Oikos 120: 1557–1567.

Appendix 2

Introduce parasite-induced mortality in model 1

We analysed the possible role of parasite-induced mortality in rock partridge–*A. compar* dynamics using the extension of model 1 proposed by Rosà and Pugliese (2002). The equations of host–parasite interactions can be written as follows:

$$\begin{aligned}
\frac{dN}{dt} &= N(b\omega(A,x) - d - r\,N/N_K - \alpha x)\\
\frac{dx}{dt} &= x(-\sigma - \alpha A - b\omega(A,x)) + \psi\beta L\\
\frac{dA}{dt} &= -(A-1)(\sigma + \alpha A + \frac{\psi\beta L}{x}) + b\omega(A,x) + \frac{\psi\beta L}{x}\lambda\\
\frac{dL}{dt} &= hNx - \delta L - \beta LN,
\end{aligned} \qquad \text{(S.1)}$$

where α is the parasite-induced mortality as described in Rosà and Pugliese (2002), and other parameters and variables have the same meaning than in model 1.
Mimicking Fig. 3 results, we computed the bifurcation diagram for model S.1 in the [δ, N_k] space (Fig. S.1). In order to compare the results of models 1 and S.1, we computed the bifurcation diagram for different levels of parasite-induced mortalities, using the estimated value for the red grouse–*Trichostrongylus tenuis* system in Scotland as the reference parameter (Dobson and Hudson 1992).

Figure S.1 shows that both the threshold for parasite invasion (*TC*) and the Hopf bifurcation (*H*) computed for $\alpha = 0$ (black curves) are only marginally influenced by α values starting from red grouse–*Trichostrongylus tenuis* system estimate ($\alpha = 3\times10^{-4}$, red curves) to 5-time ($\alpha = 1.5\times10^{-3}$, cyan curves) and 10-time ($\alpha = 3\times10^{-3}$, blue curves) that value.
Furthermore, Rosà and Pugliese (2002) have already showed that also the cycle period length is only marginally affected by α (Fig. S.2).

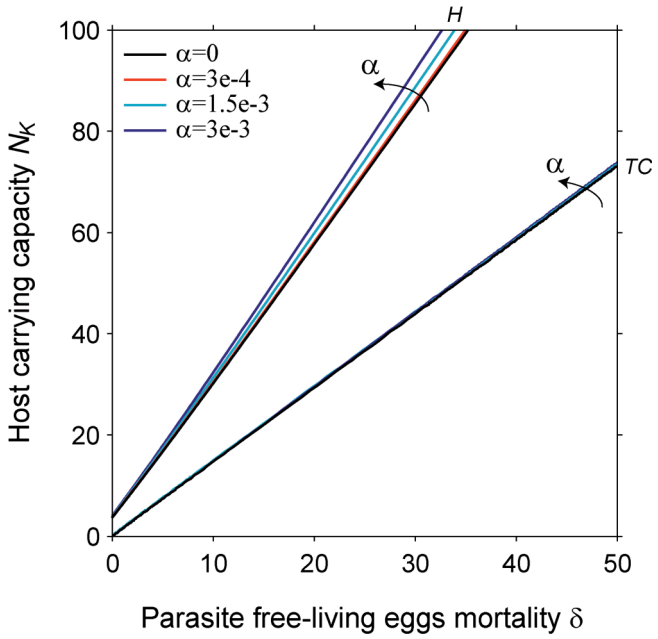

Figure S1. The effects of variation in parasite free-living egg mortality (δ) and host carrying capacity (N_K) on the behaviour of populations of *A. compar* in rock partridge in model (S.1) for different values of parasite-induced host mortality (α). TC: transcritical bifurcation; H: Hopf bifurcation. All other parameter values as in Fig. 3.

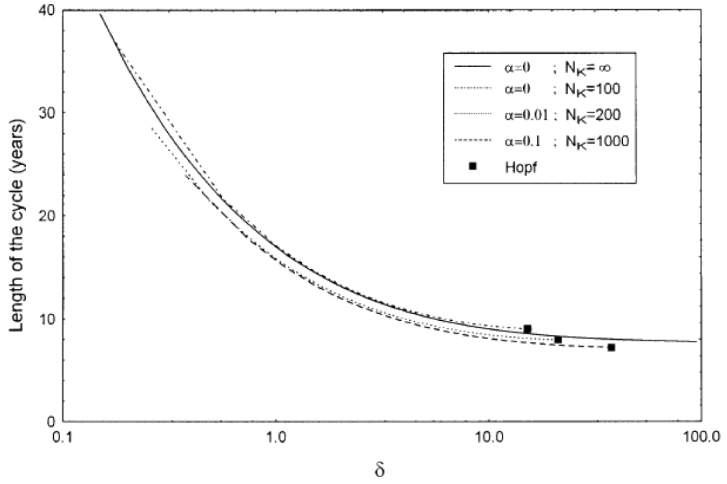

Figure S2. Effect of different parasite-induced mortalitis (α) for varying parasite free-living egg mortality (δ) on the cycle period length in model S.1 as computed by Rosà and Pugliese (2002). The figure is redrawn from Fig. 9 in Rosà and Pugliese (2002).

References

Dobson, A. P. and Hudson, P. J. 1992. Regulation and stability of a free living host–parasite system: *Trichostrongylus tenuis* in red grouse. II. Population models. – J. Anim. Ecol. 50: 376–387.

Rosà, R. and Pugliese, A. 2002. Aggregation, stability and oscillations in different models for host–macroparasite interactions. – Theor. Popul. Biol. 61: 319–334.