

Kämmerle, J.-L. and Storch, I. 2019. Predation, predator control and grouse populations: a review. - Wildlife Biology 2019: wlb.00464

## Appendix 1

Table A1. List of studies investigating the effects of differences in predator abundance on the development grouse populations and their reproductive success. The country of the study, the grouse species for which parameters were recorded, the predator species involved and the spatial scale of the analysis are provided.

| Study                     | Country | Grouse species                                 | Predator                                  | Spatial scales                         |
|---------------------------|---------|--|---|--|
| Lindström et al. 1994     | Sweden  | black grouse<br>capercaillie<br>hazel grouse   | red fox                                   | single site<br>regional<br>nation-wide |
| Kurki et al. 1997         | Finland | black grouse<br>capercaillie                   | red fox<br>pine marten                    | regional<br>nation-wide                |
| Smedshaug et al. 1999     | Norway  | black grouse<br>capercaillie                   | red fox                                   | regional<br>single-site                |
| Thirgood et al. 2000a     | UK      | red grouse                                     | hen harrier                               | single site                            |
| Thirgood et al. 2000b     | UK      | red grouse                                     | hen harrier<br>peregrine falcon           | single site                            |
| Baines et al. 2004        | UK      | capercaillie                                   | red fox<br>carrion crow<br>raptors        | several sites<br>(regional)            |
| Manzer and Hannon 2005    | Canada  | sharp-tailed<br>grouse                         | corvids                                   | regional                               |
| Coates and Delehanty 2010 | USA     | sage grouse                                    | common raven<br>american badger           | several sites<br>(local)               |
| Ludwig et al. 2010        | Finland | black grouse                                   | red fox<br>pine marten<br>stoat<br>weasel | several sites<br>(regional)            |
| Bui et al. 2010           | USA     | sage grouse                                    | common raven                              | several sites<br>(local)               |
| Baxter et al. 2013        | USA     | sage grouse.                                   | red fox<br>coyote                         | single site                            |
| Tornberg et al. 2013      | Finland | capercaillie,<br>black grouse,<br>hazel grouse | goshawk                                   | several sites<br>(regional)            |
| Baines et al. 2016        | UK      | capercaillie.                                  | red fox<br>pine marten                    | several sites<br>(regional)            |
| Lyly et al. 2016          | Finland | black grouse<br>capercaillie                   | golden eagle<br>pine marten               | nation-wide                            |
| Kämmerle et al. 2017      | Germany | capercaillie                                   | red fox                                   | regional                               |

Table A2. List of studies describing the effects of removing predators on grouse population parameters that were not included into the quantitative analysis. The country of the study, the grouse species for which parameters were recorded, the predator species removed, the study design (site design and number; method) as well as the timeframe of the experiments are provided. The final column provides the reasons for not including the study in the analysis. \*Study types were C & T for studies featuring control and treatment sites; B - A for studies employing a before after design.

| Study                | Country | Grouse species               | Predator  | Design* (Sites)                          | Timeframe | $\bar{x} \ln(X_e/X_c)$ | Reasons for exclusion  |
|----------------------|---------|------------------------------|---|--|-----------|------------------------|--|
| Erikstad et al. 1982 | Norway  | willow ptarmigan             | hooded crow   | single (B - A)                           | 1975–1978 | -                      | No real predator removal study. One breeding pair of crows removed in one year of the study (1978).                        |
| Smedshaug 2001       | Norway  | willow ptarmigan             | red fox<br>pine marten<br>8 raptors                       | time-series of regional hunting bag data | 1885–1914 | -                      | No suitable data for analysis due to scale of study  |
| Baines et al. 2004   | UK      | capercaillie                 | red fox<br>carrion crow                                   | multiple, removal: single                | 1991–2001 | -                      | No numerical data; removal not central focus of the study; removal site equals Summers et al. 2004.                        |
| Summers et al. 2004  | UK      | capercaillie<br>black grouse | red fox<br>carrion crow                                   | single (B - A)                           | 1989–1999 | 0.981                  | Predator control confounded with precipitation patterns that were related to reproductive success in a single site design. |
| Ludwig et al. 2017   | UK      | red grouse                   | red fox<br>hen harrier<br>carrion crow<br>stoat<br>weasel | single (B - A)                           | 1992–2015 | 0.936                  | Predator removal confounded with grouse habitat management and diversionary feeding of raptors in a single site design.    |

Table A3. Model selection results. Note that the variable ‘Type (A-F)’, representing the type of grouse population parameters was held fixed in model selection.

| Intercept | Habitat | Study design | Type (A-F) | DF | logLik  | $\Delta$ AICc | weight |
|-----------|---------|--------------|------------|----|---------|---------------|--------|
| 0.219     |         |              | +          | 7  | -29.838 | 0.00          | 0.731  |
| 0.278     |         | +            | +          | 8  | -29.778 | 2.70          | 0.189  |
| 0.302     | +       |              | +          | 9  | -29.366 | 4.84          | 0.065  |
| 0.381     | +       | +            | +          | 10 | -29.262 | 7.74          | 0.015  |

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