Van de Pol, M. et al. 2014. *BOU Proceedings – Avian Demography in a Changing World*
http://www.bou.org.uk/bouproc-net/avian-demography/van-de-pol-et-al.pdf

Proceedings of the BOU's 2013 Annual Conference
From populations to policy impact: avian demography in a changing world
View other papers from these proceedings at www.BOUPROC.net.

Effects of climate change on stochastic demography in a population of Eurasian Oystercatchers *Haematopus ostralegus*

MARTIJN VAN DE POL[1,3], YNGVILD VINDENES[2,3]*, BERNT-ERIK SÆTHER[3], STEINAR ENGEN[4], BRUNO J. ENS[5], KEES OOSTERBEEK[5] & JOOST TINBERGEN[6]

[1] Evolution, Ecology and Genetics, Research School of Biology, The Australian National University, Australian Capital Territory 0200, Canberra, Australia

[2] Department of Biology, Centre for Ecological and Evolutionary Synthesis, University of Oslo, 0316 Oslo, Norway

[3] Department of Biology, and [4] Department of Mathematical Sciences, Centre for Conservation Biology, Norwegian University of Science and Technology (NTNU), 7491 Trondheim, Norway

[5] SOVON Dutch Centre for Field Ornithology, 6573DG Nijmegen, The Netherlands

[6] Animal Ecology Group, University of Groningen, 9750AA Haren, The Netherlands

* Email: yngvild.vindenes@bio.uio.no

Climate change affects the mean, variability and autocorrelation of climatic variables, but their relative impact on the dynamics and persistence of populations is still largely unexplored. The effects of a climate variable on population dynamics depend on the vital rates affected, and on how they are affected. More specifically, the functional relationship between a vital rate and the climatic variable affects how variability and noise colour in the environment is translated into variability and noise colour of the vital rates and population dynamics. Based on a long-term study of the demography of a declining Eurasian Oystercatcher *Haematopus ostralegus* population, we constructed a stage-structured matrix model to evaluate the relative impacts of changes in the mean, variability and autocorrelation of a key environmental variable: winter temperature. The model also includes residual environmental variation and covariation, density dependence through a limited number of breeding sites, and demographic stochasticity affecting the dynamics at small population sizes. In the geographical region of the study population the mean winter temperature is predicted to increase, the variability is predicted to decrease and the autocorrelation is predicted to become more positive in the near future. Our results show that winter temperature has opposite effects on survival (positive) and reproduction (negative). The persistence time of the population is likely to increase due to both an increased mean temperature and a decrease in the variability of temperature. Increasing the autocorrelation has a negative effect on the population persistence, but this is very small compared with effects of changes in the mean and variability. We discuss general mechanisms by which climatic variability and autocorrelation can increase or decrease population viability and how this might depend both on species' life histories and on the vital rates affected. This study illustrates that it is crucial to estimate the impacts of climate change across the entire life cycle, and to explicitly include key environmental variables. The data needed for such studies are unfortunately rare for most species of conservation concern.