Project information

Keywords
habitat use, migration, top predators, seabirds, marine ecology

Project title
Seabird habitat use and migration strategies

Year
2014

Project leader
Børge Moe

Participants

Project participants and network partners

From the Fram Centre and Norway: Sagerup, (Akvaplan-NIVA), Ehrlich, Barrett (UIT), Gabrielsen, Strøm, Descamps, Welcker (NPI), Herzke (NILU), Coulson (UNIS), Hanssen, Bustnes, Fauchald, Reiertsen, Erikstad, Anker-Nilssen, Systad, Dalsgaard-Christensen (NINA), Ask, Bjørnlid, Kilen, Skottene, Fenstad, Bech, Schultner, (NTNU).

International participants: Poland: Dabert (Adam Mickiewicz University), UK: Wynn (NOC), Phillips (BAS), US: Kitaysky (Univ Alaska Fairbanks). France: Chastel, Tartu, Goutte, Boulinier, Gremillet, Ponchon (CNRS), Gilg (GREA), Fort (Univ. La Rochelle), Netherlands: Oudman, Biersma, Loonen (Univ Groningen), van Bemmelen (Imares). Denmark: Schmidt, Hansen, Frederiksen, Mosbech (Århus Univ), Russia: Gavrilo (Arctic & Antarctic Res Inst), Canada: Gauthier, Robillard (Univ. Laval).

Flagship
Fjord and Coast

Funding Source

Fram Centre Flagship

Own funding: ‘Egenforskning’

External funding and other funding:

Summary of Results

This project has provided important new knowledge about habitat use and migration strategies of seven arctic seabird species (kittiwakes, little auks, arctic skuas, long-tailed skuas, glaucous gulls, lesser black-backed gulls, common eiders), results that have relevance for conservation management. All the work has been part of large scale research networks to ensure multi-colony tracking at many Arctic and sub-Arctic locations.

One highlight is the publication rate in 2014, of which six manuscripts has been accepted. In the 2013-report, one of these was listed as ‘in revision’ and two were listed as ‘in press’. These papers were published in the journals Marine Ecology Progress series (3), Biology Letters (1), Experimental and Applied Acarology (1) and British Birds (1).

One of the printed papers, Shultner et al 2014b, highlighted that environmental conditions in the Arctic breeding grounds and particularly the degree of stress during reproduction, affected the subsequent migration strategy in autumn. This is termed ‘carry-over-effects’, and highlights that environmental conditions in one part of the life cycle affects performance in the next part. In Schultner at al 2014a, we also demonstrated that both the reproductive stress and the migration strategy affected the rate of telomere shortening in kittiwakes. As telomere shortening is a proxy for ageing processes and survival, this is another demonstration of carry-over effects. The seabirds that spent the shortest time in the wintering habitats had the highest rates of telomere shortening, indicating fitness costs of spending more time in the Arctic breeding grounds. The study was performed in one year onnly, and it should be repeated over several years to reveal how inter-annual variation in environmental conditions affects the migration strategies and the fitness consequences.

A final highlight is that we are currently having success in developing a model for analyzing inter-annual consistency/flexibility of individual migration strategies. Our project/study model has been successful in terms of getting tracking data on the same individuals over several years. The data sets are promising for several of the species, especially for arctic skuas, long-tail skuas, kittiwakes and eiders. Therefore, this model for investigating individual consistency in migration strategies can be applied for several of our focal species. Investigating within-individual variability over different years with different climatic conditions is of high importance.

For the Management

The findings are highly relevant for management.

-The project reveals

a) sensitive marine hotspots, both in terms of migratory corridors, staging areas and wintering areas.

b) overlap with potential anthropogenic threats

c) breeding origin of seabirds distributed in different marine sectors. Hence, accidents or perturbations in a given sector can be linked to consequences on different seabird populations –often breeding far away from the given marine sector.

d) different scales of which management has to be applied, from local to global, to ensure healthy seabird habitats.

Published Results/Planned Publications

2014:

Dabert, M., S.J. Coulson, D.J. Gwiazdowicz, B. Moe, S.A. Hanssen, E.M. Biersma, H. E. Pilskog & J. Dabert (2014) Differences in speciation progress in feather mites (Analgoidea) inhabiting the same host: The case of Zachvatkinia and Alloptes living on arctic and long-tailed skuas. Experimental and Applied Acarology doi: 10.1007/s10493-014-9856-1

Wynn, R.; D. Brown, G. Thomas, C. Holt, S.A. Hanssen, O. Gilg, B. Moe (2014) Spring migration routes of Long-tailed Skuas around and across the UK – results of observational and tracking data. British Birds107: 220-228

Reiertsen, T.K.., K.E. Erikstad, T. Anker-Nilssen, R.T. Barrett, T. Boulinier, M. Frederiksen, J. González-Solís, D. Gremillet, D. Johns, B. Moe, A. Ponchon, M. Skern-Mauritzen, H. Sandvik, N.G. Yoccoz (2014) Prey density in non-breeding areas affects adult survival of Black-legged kittiwakes Rissa tridactyla Marine Ecology Progress Series 509: 289–302.

Schultner J., B. Moe, O. Chastel, C. Bech, A.S. Kitaysky (2014a) Migration and stress during reproduction govern telomere dynamics in a seabird. Biology Letters 10: 20130889

Goutte, A., F. Angelier, C. Bech, C. Clément-Chastel, G. Dell'Omo, G.W. Gabrielsen, A. Lendvai, B. Moe, E. Noreen, D. Pinaud, S. Tartu, O. Chastel (2014) Annual variation in the timing of breeding, pre-breeding foraging areas and stress hormones levels in an Arctic population of Black-legged kittiwake. Marine Ecology Progress Series 496: 233-247

Schultner, J., B. Moe, O. Chastel, S. Tartu, C. Bech, A.S. Kitaysky (2014b) Experimental evidence for corticosterone as a mediator of carry-over effects between breeding and migration. Marine Ecology Progress Series 496: 125-133

Tartu, S., F. Angelier, J.O. Bustnes, B. Moe, S.A. Hanssen, D. Herzke, G.W. Gabrielsen, N. Verboven, J. Verreault, P. Labadie, H. Budzinski, J.C. Wingfield & O. Chastel (2014) Polychlorinated biphenyl exposure and corticosterone levels in seven polar seabird species. Environmental Pollution 197: 173-180.

2013:

O. Gilg, B. Moe, S.A. Hanssen, N.M. Schmidt, B. Sittler, J. Hansen, J. Reneerkens, B. Sabard, O. Chastel, J. Moreau, R.A. Phillips, T. Oudman, E. Biersma, A.A. Fenstad, J. Lang & L. Bollache (2013) Trans-Equatorial Migration Routes, Staging Sites and Wintering Areas of a High-Arctic Avian Predator: the Long-tailed Skua (Stercorarius longicaudus) PLOS One 8(5): e64614

Bustnes, J.O., B. Moe, Helberg, M., & R.A. Phillips (2013) Rapid long-distance migration in Norwegian Lesser Black-backed Gulls along the eastern flyway. IBIS 155: 402–406

J. Fort, B. Moe, H. Strøm, D. Grémillet, J. Welcker, J. Schultner, K. Jerstad, K.A. Johansen, R.A. Phillips, A. Mosbech (2013) Multi-colony tracking reveals potential threats to little auks wintering in the North Atlantic from marine pollution and shrinking sea-ice cover. Diversity and Distributions 19: 1322–1332

Hanssen, S.A., B. Moe, B-J. Bårdsen, F. Hanssen, G.W. Gabrielsen (2013) A natural anti-predation experiment: Predator control and reduced sea ice increases colony size in a long-lived duck. Ecology and Evolution 3: 3554-3564, doi: 10.1002/ece3.735

2012:

Frederiksen, M., B. Moe, F. Daunt et al. (2012) Multi-colony tracking reveals the non-breeding distribution of a pelagic seabird on an ocean basin scale. Diversity and Distributions 18: 530-542

Communicated Results

Users:

Moe and Strøm (2014) Tracking of little auks revealed large scale distribution and potential threats

Fram Forum 2014 (Annual report on the research activities within Fram Centre)

Press:

http://www.forskning.no/artikler/2014/februar/381599

http://www.framsenteret.no/livslengden-hos-sjoefugl-kan-bli-paavirket-av-stress-i-hekketiden.5422599-146437.html#.Uwd79YUdCz0

Workshop:

Moe et al. Climate change and phenological responses of common eiders breeding in the high-Arctic. Kongsfjorden Ecosystem – new views after more than a decade of research. Workshop, Hamn March 2014

Education:

The results have been used in lectures at UNIS (AB-201, AB-202, AB-203) and UiT (Bio-3003) by GW Gabrielsen.

Interdisciplinary Cooperation

The project has benefitted from cooperation between researchers from different disciplines. The listed papers mainly belong to the following disciplines: Distributions/diversity, migration, spatial ecology, ecophysiology and climate change biology. Data from this project will also be used in the field of ecotoxicology.

Budget in accordance to results

The 495k funding from the Fram Centre has played an important role for financing fieldwork, equipment, tracking analyses and for writing papers, and has thus given us the opportunity to have a leading role in this large-scale cooperation. The project also benefitted from external funding as well as a substantial use of own research hours (egenforskning). This project is a huge cooperation, involving many researchers and costly field work and analytical work. Its large-scale success has depended on external funding for the field activities of project partners (e.g. extensive field operations in Greenland and other Norwegian colonies).

Most of the 495k has been allocated to fieldwork in Ny-Ålesund (Svalbard) and Brensholmen (Troms), equipment and tracking analyses, and resources available for writing papers. Publication rate has been very good. The funding of this project has been very important for 4 of the published papers (Schultner et al. 2014a, Schultner et al. 2014b, Dabert et al 2014, Wynn et al.2014. For the other two papers (Reiertsen et al. 2014, Goutte et al. 2014) the main funding has come from other sources, but they are highly relevant for the project.

Money allocated to Fram Centre partners within the project:

90k was allocated to NPI and costs at the Sverdrup Station in NyÅlesund.

30k was allocated to Sagerup/Akvaplan NIVA for field work contribution in Ny-Ålesund, and approximately 25k was allocated to cost/equipment for Ehrlich (UIT) for field work in Yamal.

Could results from the project be subject for any commercial utilization

No

If Yes

No, but the results may have major implications for management and industry (e.g. oil industry, fisheries, shipping)

Conclusions

a) The project has established a strong basis for further work. We have a long-term perspective and will further develop the project to focus on climate effects on migratory strategies and habitat use in arctic seabirds. The project has provided a unique basis for assessing inter-annual as well as inter- and intra-individual variation habitat use, since we now have obtained several years of data from the same individuals and population, in a wide collaborative network. This project has also been relevant for the success of financing SEATRACK (from the Ministry of the Environment (MD), Barents 2020/Ministry of Foreign Affairs (UD) and the oil industry), a large-scale tracking program of seabirds in Norway, Russia, UK and Iceland.

b) The development of small-sized electronic tags has been a prerequisite for the project. However, there is a constant need for further decreasing the size, increasing the battery life and increasing the precision of the electronic tracking tags.