

Project information

Project title

Drift of fish larvae and its effect on Norwegian seabird populations

Year

2011/2012

Project leader

Kjell Einar Erikstad, NINA

Participants

- Kjell Einar Erikstad, NINA
- Frode Vikebø, IMR
- Jofrid Skardhamar, IMR

Flagship

Fjord and coast, Theme: Physical-biological coupling: Oceanography and habitat use by predators and their prey

Funding Source

Fram Centre

Summary of Results

Food availability has long been hypothesized to play a major role in regulating seabird populations. In general seabirds feed on small pelagic fish stocks and/or young age classes of larger predatory fish. Climatic fluctuations, commercial fisheries and interactions between fish species and the environment may cause pronounced spatial and temporal variation in fish abundance and affect seabird populations in many areas. Here we analysed the temporal variation in the population of common guillemots (*Uria aalge*) in a colony in north-eastern Norway (Hornøya) between 1980 and 2010 in relation to the variation in abundance (acoustic and trawl surveys) of important fish prey species in the Barents Sea. The fish species considered, all of which have been described in the diet of Common Guillemot chicks and adults on Hornøya were; capelin (*Mallotus villosus* - all age classes), 0 and I-group herring (*Clupea harengus*) and 0 and I group cod (*Gadus morhua*.) The guillemot population declined by more than 80% during the winter 1986/1987, but thereafter steadily increased reaching and surpassing the pre-collapse level in 2003 (Fig.1A) . Abundance indices of all fish prey species were very low the year the population collapsed (fig.1B). The annual variation in population growth rate could best be explained by the variation in abundance of 0-group cod and the 0-group cod 6 years earlier (equalling the age of maturation of guillemots) (fig 2). Most surprising is the very strong positive relationship between the youngest age class of cod and the variation in the guillemot population growth rate, undermining the previous focus that was put on the collapse in the Capelin stock as being the cause of the population crash in common guillemots. We also utilize a numerical ocean model to identify mechanisms affecting spatiotemporal prey availability of 0-group cod around the colony during the breeding season (fig.3). The modelled arrival of 0-group cod in areas adjacent to Hornøya shows that the different spawning grounds contribute unevenly with prey items for common guillemot. This is particularly relevant as we know that the spawning distribution of Northeast Arctic cod varies on a multi-annual scale .In warm years the spawning distribution tends to shift northwards and opposite in cold years. This is also linked to fisheries, and demographic changes in the cod stock due to size-selectivity may result in maturation at younger age and shorter spawning migration due to the decrease in mean age of adult spawners.

Published Results/Planned Publications

One submitted manuscript;

- Erikstad, K.E., Reiertsen, T.K., Barrett, R.T. and Vikebø, F. Seabirds and fish interactions: the fall and rise of a Common Guillemot population. *J. Animal Ecology* (submitted).

Communicated Results

There will be one workshop at the Fram Center 28 and 29 November 2011.

Interdisciplinary Cooperation

One of the key lessons learned from recent studies on climate and ecosystems was the need for integrated research and a multi-disciplinary approach to understand the dynamics of marine ecosystems. We have approached this challenge armed with observational data and biophysical models, bringing together the disciplines of oceanography, biology and ecology. This has been challenging but definitely positive.

Budget in accordance to results

For what we have done the budget has been ok. The project has made it possible to write up an inter-disciplinary application for the Research Council (Havet og Kysten) and did have success and have received large funding for 3 years (2012-2014); Drift of fish larvae, fish stock interactions and their effects on seabird dynamics. Coordinated by Kjell Einar Erikstad, NINA in cooperation with HI and a number of international partners.

Could results from the project be subject for any commercial utilization

No

If Yes

Conclusions

What we have shown is that drift of 0-group cod is much more important than previously anticipated for breeding seabirds. As a result of the findings of this study we will therefore prioritize modelling efforts to reveal inter-annual variation in spatiotemporal larval and juvenile cod distribution allowing quantification of inter-annual variation in overlap with feeding areas of a number of seabirds along the coast of Norway.

Statistical techniques developed to analyse the link between oceanography drift of fish larvae and population parameters of seabirds gives a good starting point.