Integrating conservation and economies: the role of seabird research in supporting sustainable management of coastal waters

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CEH

Marine birds in UK coastal waters

- Marine birds
  - EU legislative protection for 52 species
  - Indicators of change in the marine environment
  - Significant public interest

- Impacts of
  - Climate change
  - Fisheries
  - Marine renewables

CEH

- The Centre for Ecology & Hydrology is the UK's Centre of Excellence for integrated research in terrestrial and freshwater ecosystems and their interaction with the atmosphere.

- Part of the Natural Environment Research Council


Photo: Akinori Takahashi

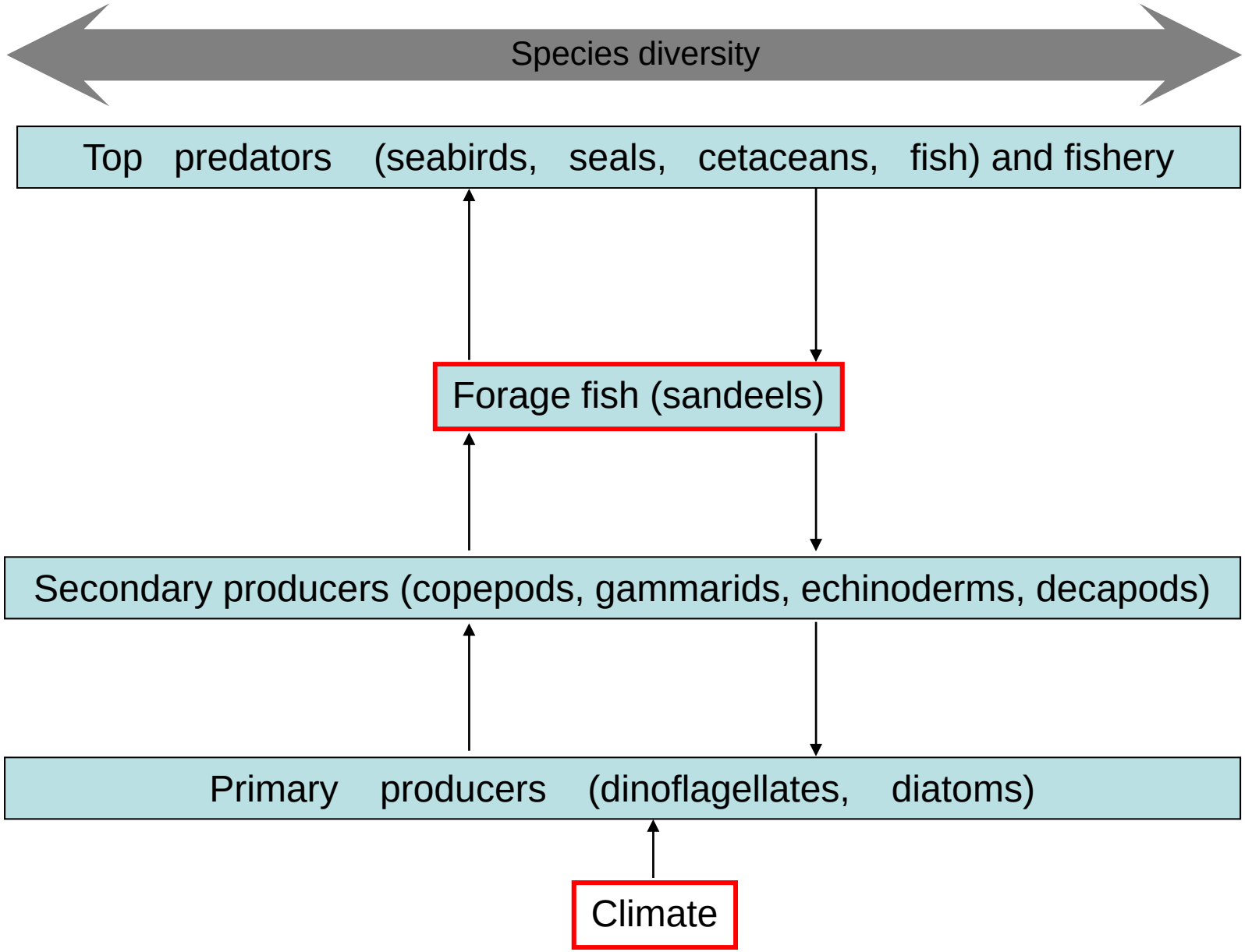
Started 1973

Data collected on:

- Demography: survival and breeding success
- Diet
- Behaviour

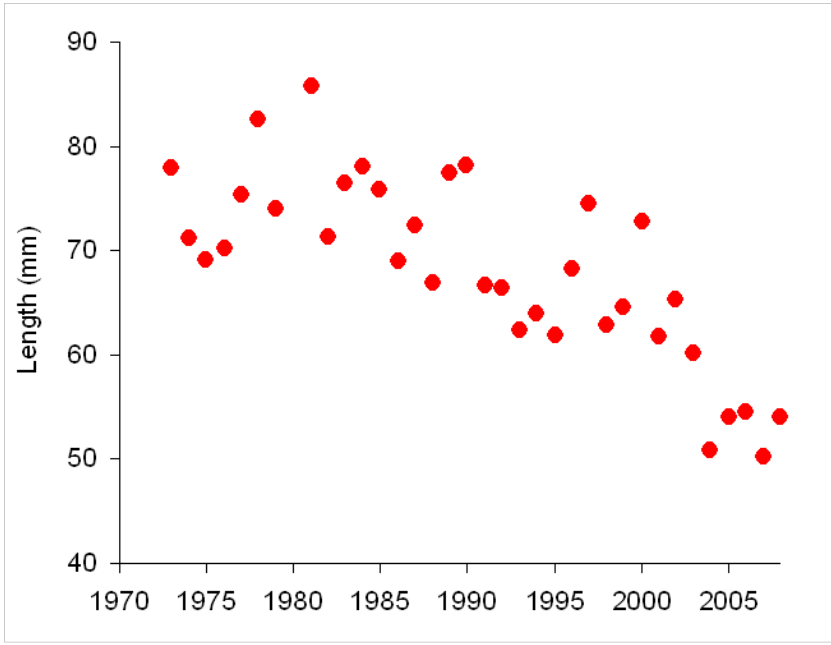
Aims and approaches:

- To address ecosystem level questions
- To provide information relevant to developing marine policy


Species diversity
Top predators (seabirds, seals, cetaceans, fish) and fishery
Forage fish (sandeels)
Secondary producers (copepods, gammarids, echinoderms, decapods)
Primary producers (dinoflagellates, diatoms)
Climate

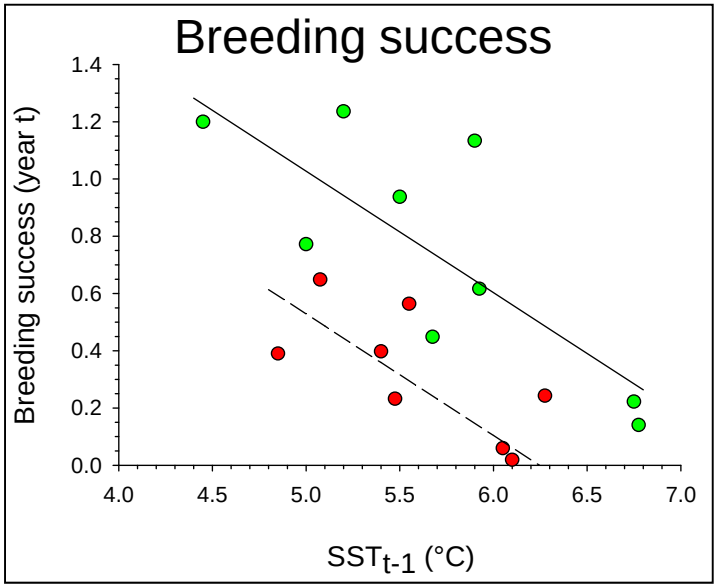
North Sea changes

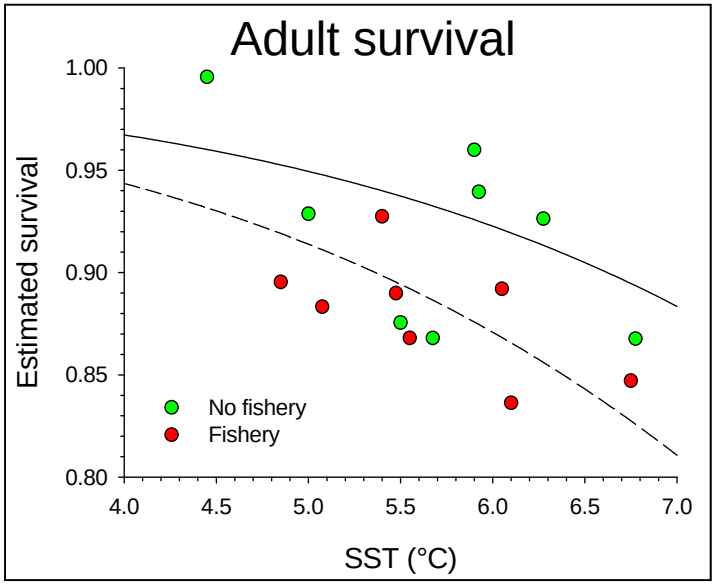
- Ocean has warmed
- Changes in low trophic level structure
- Decline in sandeel size



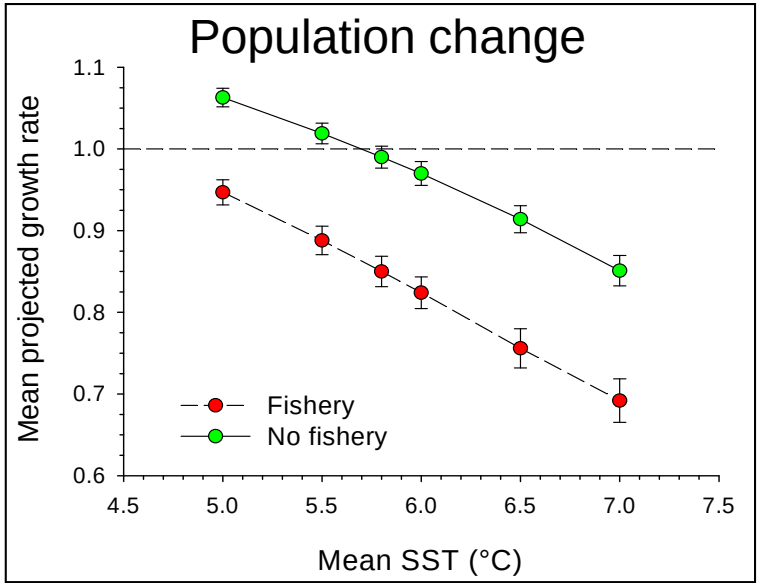
Sandeel fishery

Fishery closed in 2000 because of concern there may be negative impact on top predators

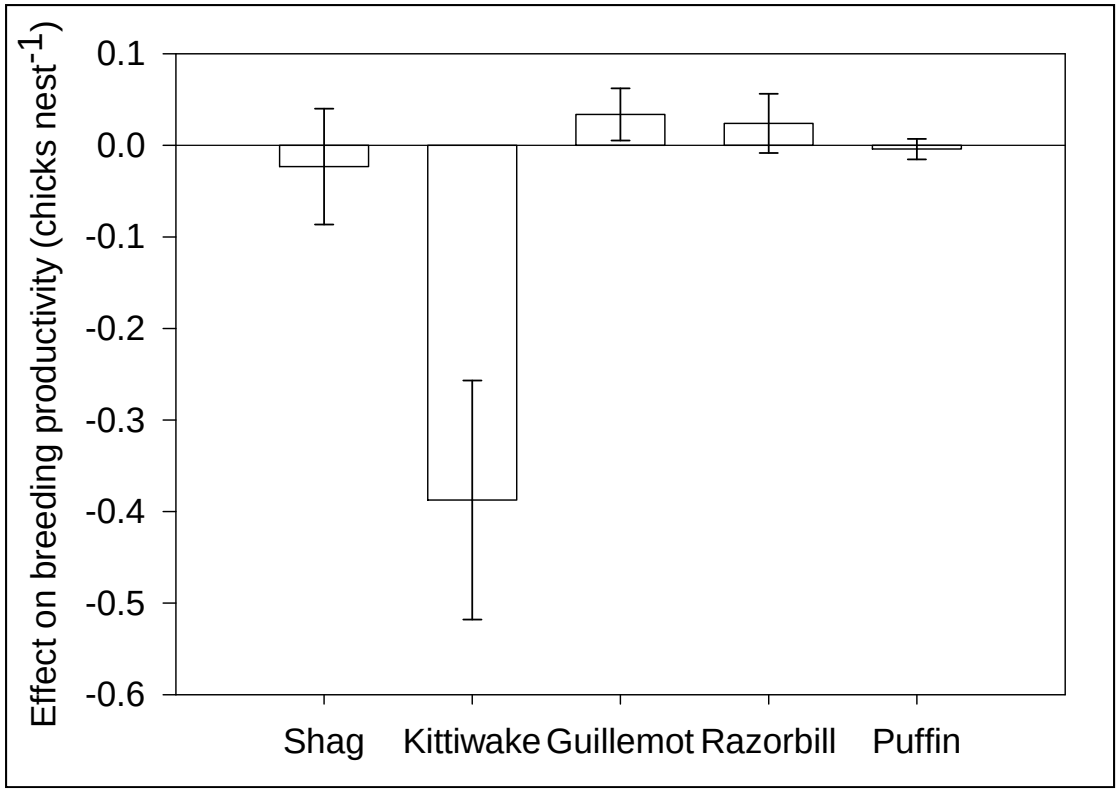

Breeding success
Breeding success (year t)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
4.0
4.5
5.0
5.5
6.0
6.5
7.0
SST$_{t-1}$ (°C)


Adult survival
Estimated survival
1.00
0.95
0.90
0.85
0.80
No fishery
Fishery
4.0
4.5
5.0
5.5
6.0
6.5
7.0
SST (°C)


Black-legged kittiwake


Population change
Mean projected growth rate
1.1
1.0
0.9
0.8
0.7
0.6
Fishery
No fishery
4.5
5.0
5.5
6.0
6.5
7.0
7.5
Mean SST (°C)

Seabird breeding success 1986-2005



- Clear fishery effect on kittiwakes
- -0.39 chick/nest (p = 0.01)
- No effect for other species

Climate change and fisheries

- Evidence of negative impact of marine climate warming and sandeel fishery on breeding success and survival of kittiwakes on Isle of May
- Effect likely to be mediated through sandeel availability
- No impact on other species
- Sandeel fishery has remained closed

Conservation designation for seabirds

- Special Protected Areas
- Breeding colonies
- Colony extensions
- Offshore MPAs
- New legislation
  - Scottish Marine Bill

Proposed wind farms in the Forth/Tay region

- Large proposed area further offshore in Round 3
- Three areas have been granted licences with the “Scottish” Round

The effects of wind farms on seabirds:

- Quantifying direct effects
  - Collision risk
  - Habitat alteration
  - Noise
- Quantifying indirect effects
  - Barrier effects
  - Displacement of birds
  - Displacement of their prey
- Cumulative impacts
- From individuals to populations

DATA LOGGERS:
seabird distributions, habitat use and foraging activity

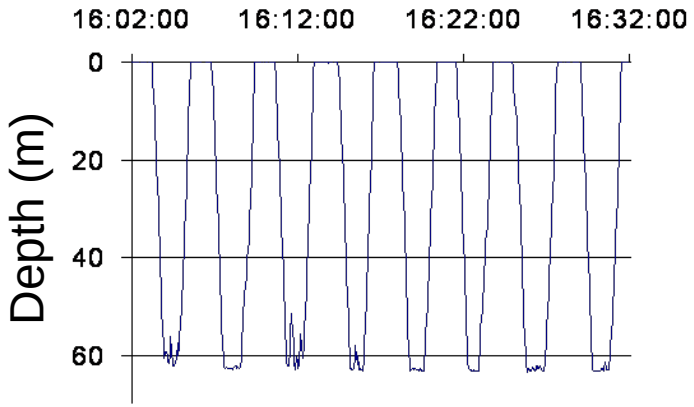
- Range of data loggers used

- Data on:
  - Foraging location
  - Depth usage
  - Time activity budgets

- Relevance to marine renewables:
  - Connectivity
  - Displacement effects
  - Barrier effects

Modelling time and energy

- Input parameters:
  - Time-energy budgets
  - Central place foraging constraint
  - Habitat association
- Displacement/barrier effects:
  - Individual foraging efficiency
  - Area usage
  - Breeding productivity
  - Survival probability



Tidal and wave energy

- Huge potential in UK waters
- Potential impacts on seabirds
  - Collision
  - Habitat alteration
  - Habitat exclusion

Mitigation

- Identify the causes of sensitivity
- Explore design options that reduce risks
- Develop technologies that will manage installation and operation to minimise impacts

Engagement

- Key collaborations:
  - Developers
  - Crown Estate
  - Policy makers/regulators
  - Conservation organisations

Summary

- CEH has studied the ecology of six species of seabirds on the Isle of May for over three decades. This has produced unparalleled understanding of their ecology and environmental pressures

- Climate change and fisheries have both had important impacts on species, in particular the black-legged kittiwake

- Long term monitoring of demography, diet and behaviour:
  - population effects from individual data
  - environmental context required to interpret changes associated with developments
  - powerful tool in addressing new questions e.g. MPAs and renewables

Conclusions: The wider context

- Competing demands on the coastal environment
- Stakeholders must work together to develop coherent spatial planning strategies that safeguard sustainable economies whilst minimising environmental impact
- Set in the context of climate change