Environmental Science and Offshore Renewable Energy

The Scottish Government

Finlay Bennett
Environmental Assessment Advisor
Marine Scotland Science, Aberdeen

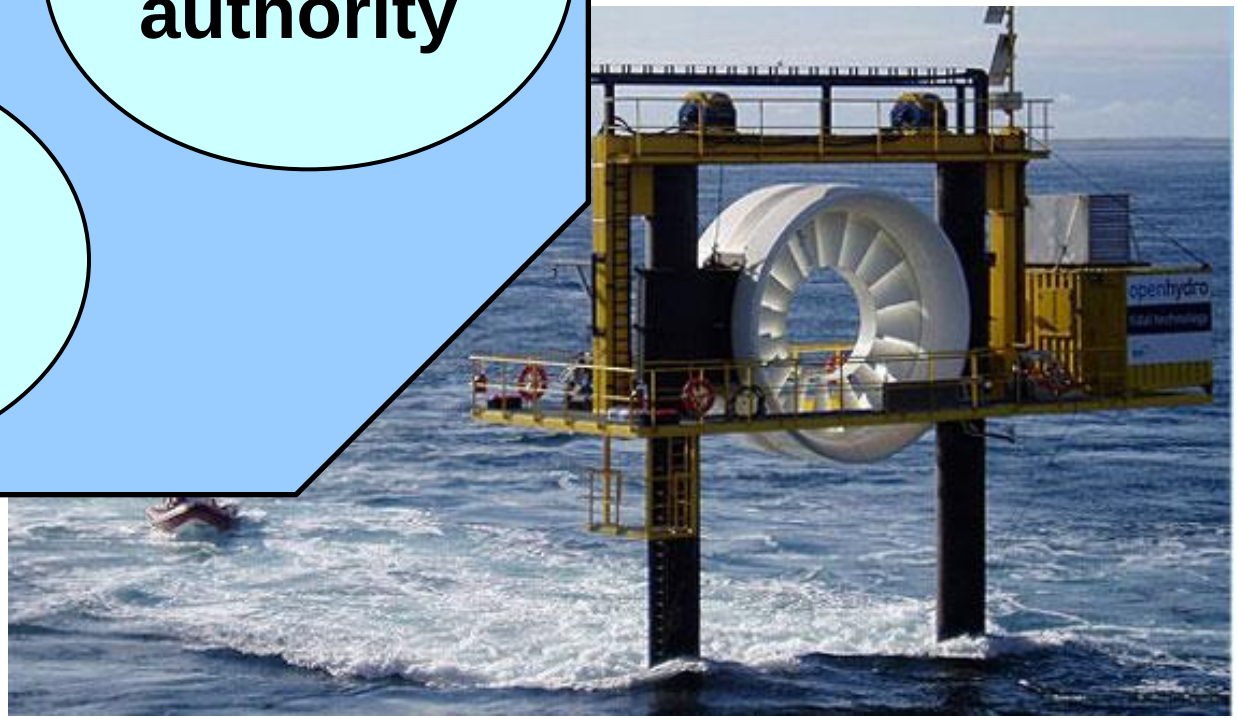
marinescotland

Marine Scotland's roles in renewable energy

Planning authority

Licensing authority

Science support



Improved confidence in Natura site impact assessments (HRA/AA)

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Risks to:

- **Marine mammals**
- **Migratory fish**
- **Seabirds**
  - **Collision**
  - **Displacement**
  - **Barrier effect**

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Strategic and baseline data

Designated areas

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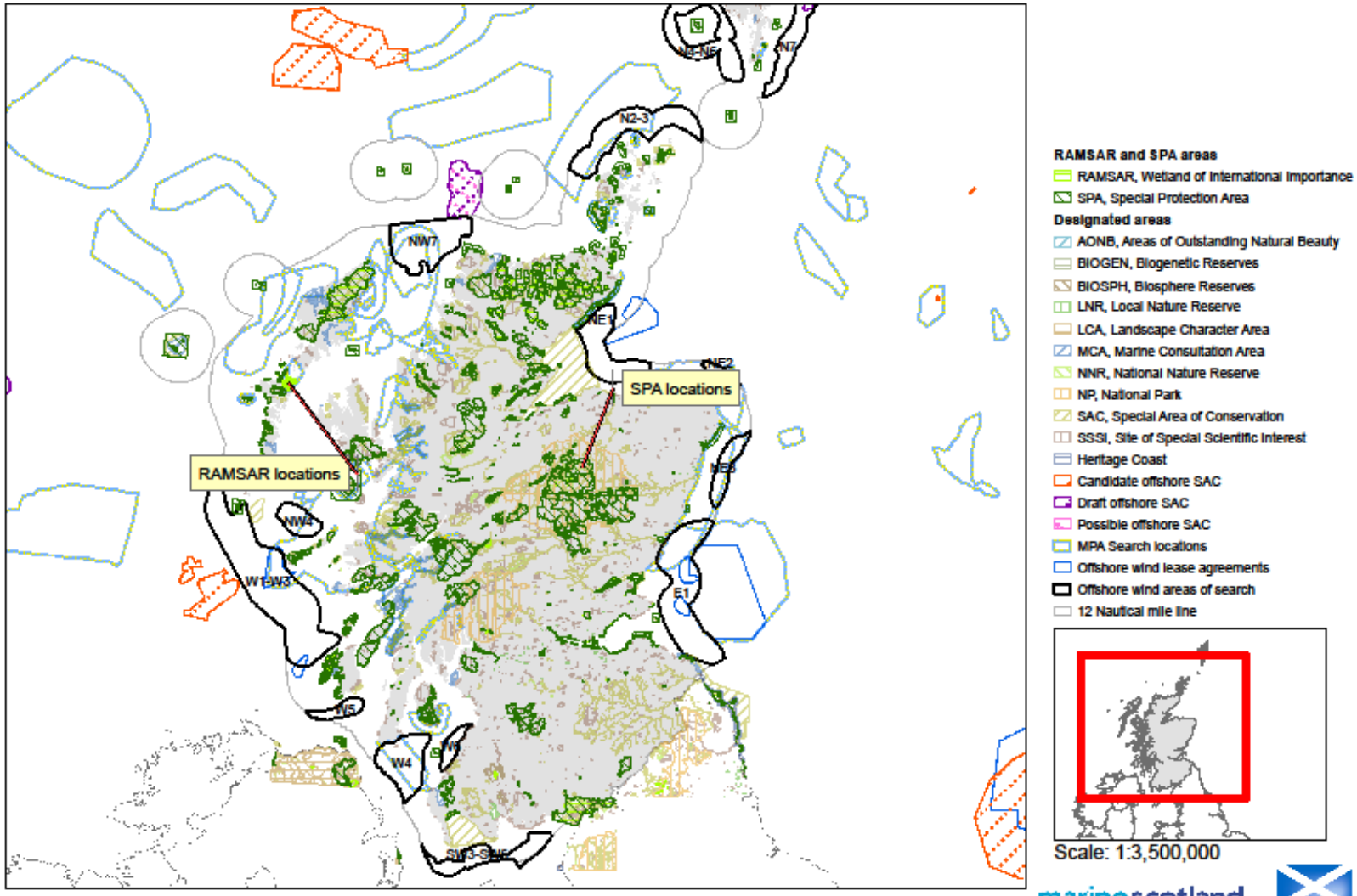
Designated areas relevant to scottish seabirds.



Positions shown relative to WGS 84.
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Windfarm risk to seabirds – ESAS/ McArthur Green

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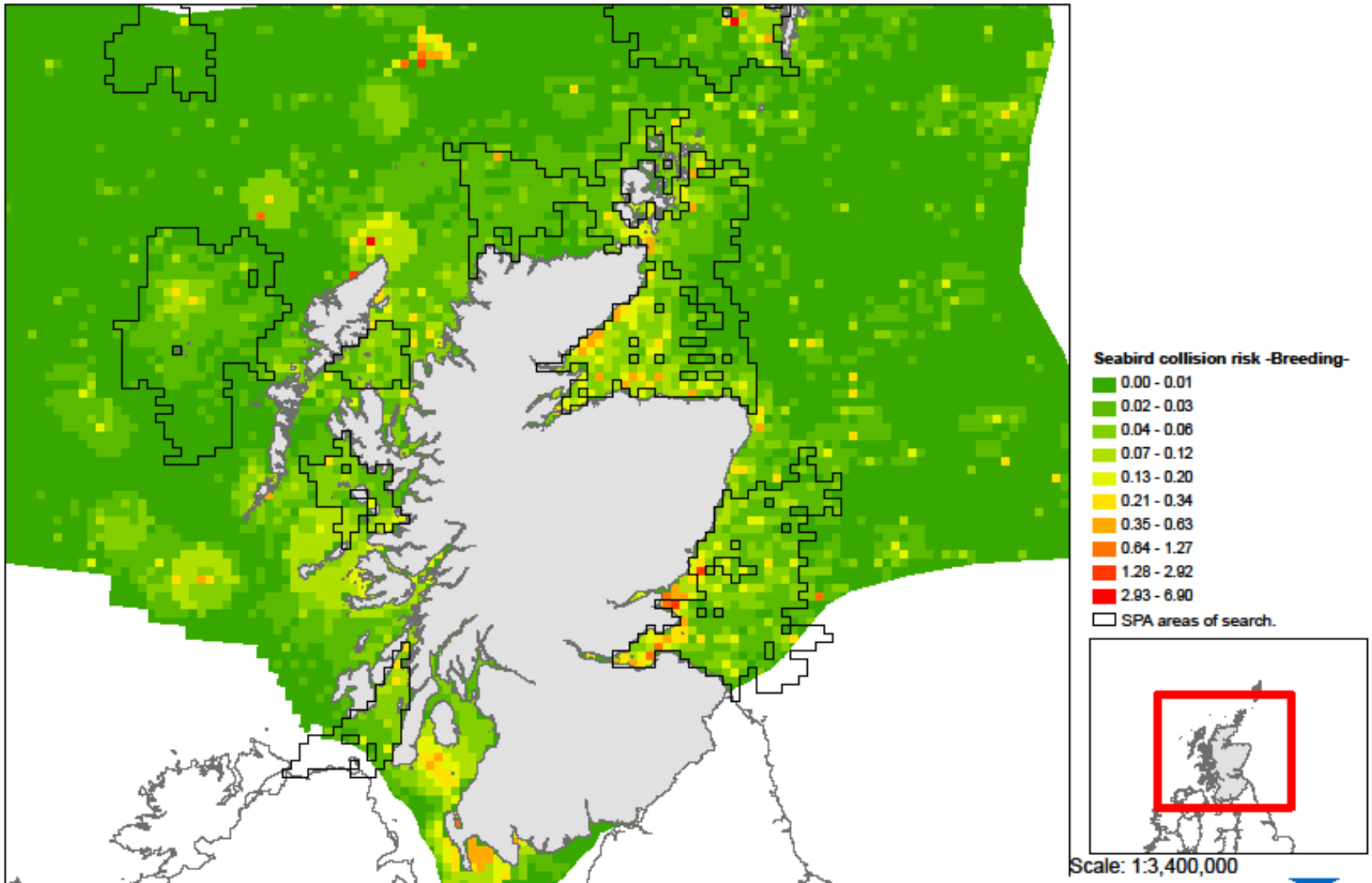
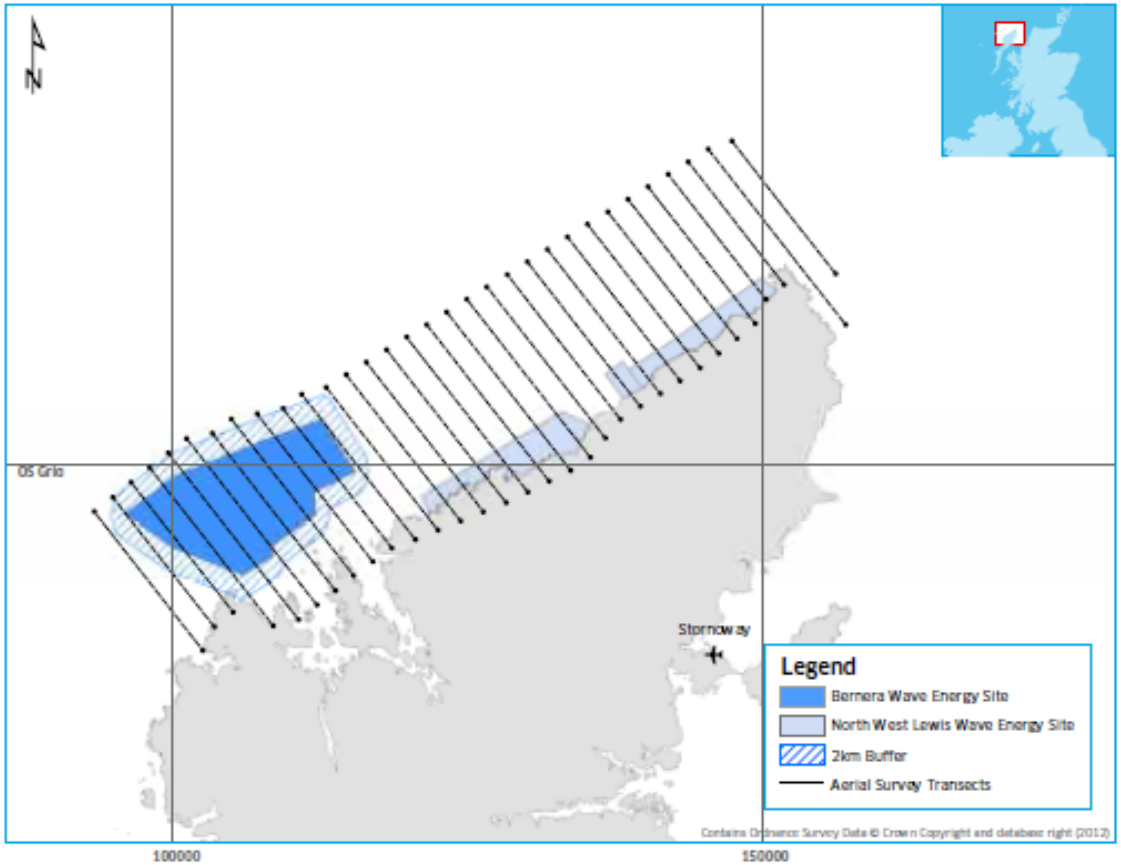
Seabirds at sea, Risk factor calculated by flight height and 5% aggregation layer.



Lewis flight path - HiDef



LOCATION MAP SHOWING AERIAL SURVEY TRANSECTS

Guidance and software development: Statistical modelling of bird and cetacean distributions in offshore renewables development areas (CREEM)

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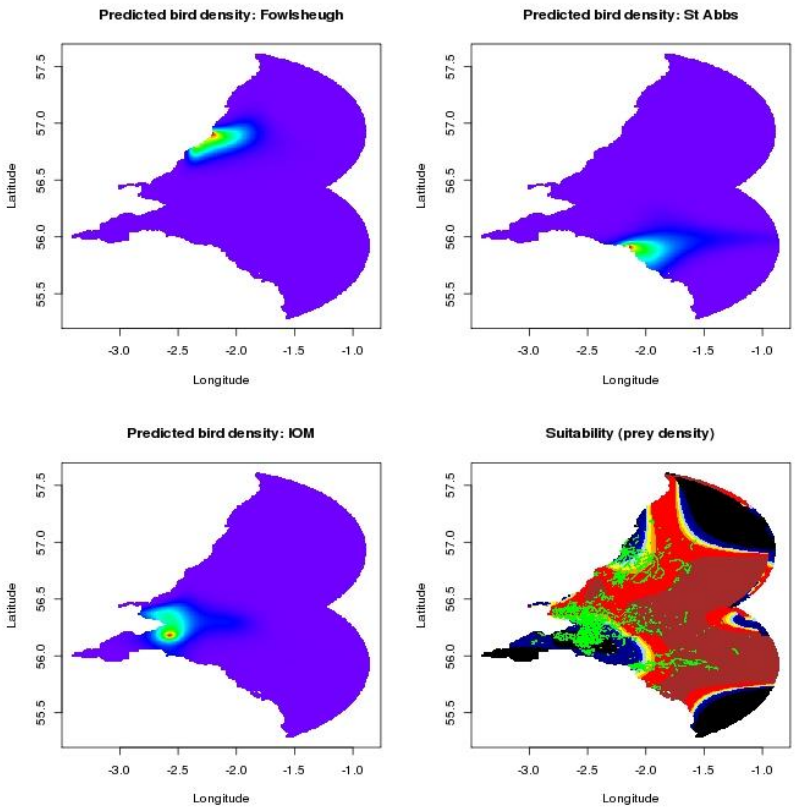

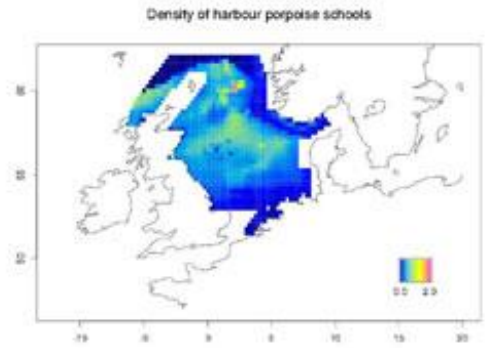

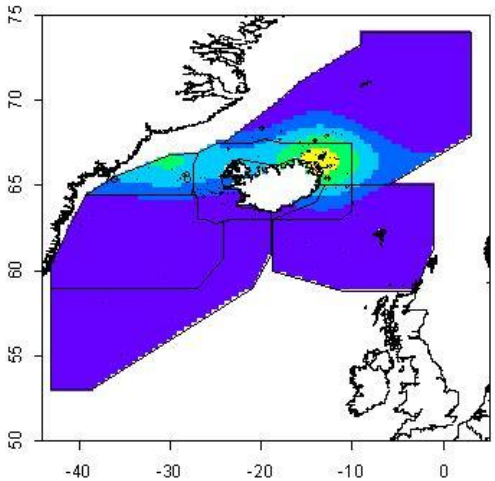

Population trends at seabird SPAs – Natural Power

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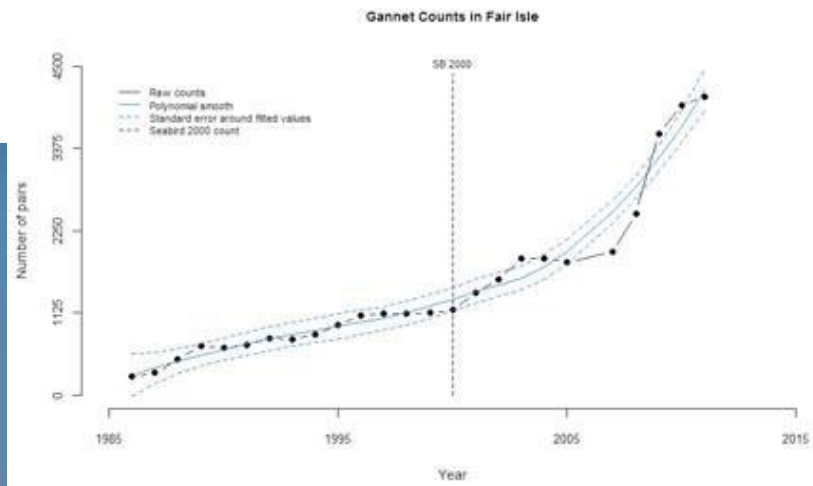

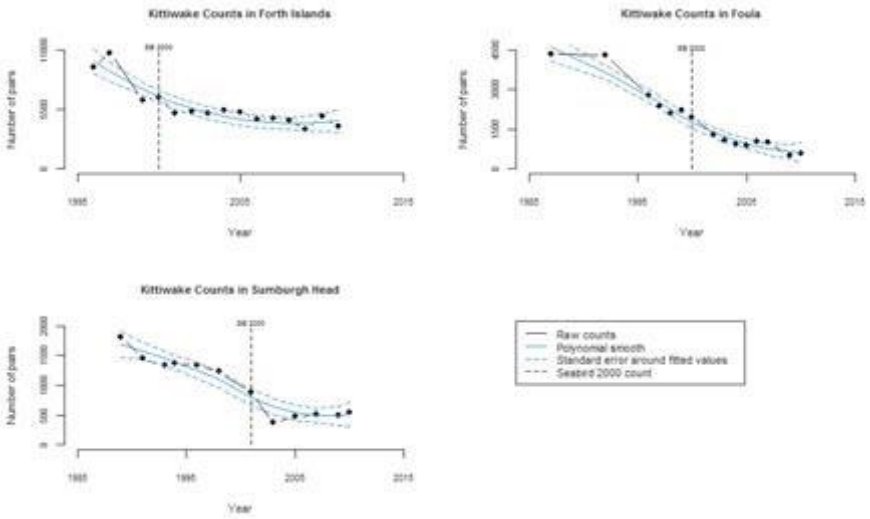

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Seabird tagging studies

Contributed to FAME breeding seabird tracking project (EU/RSPB)

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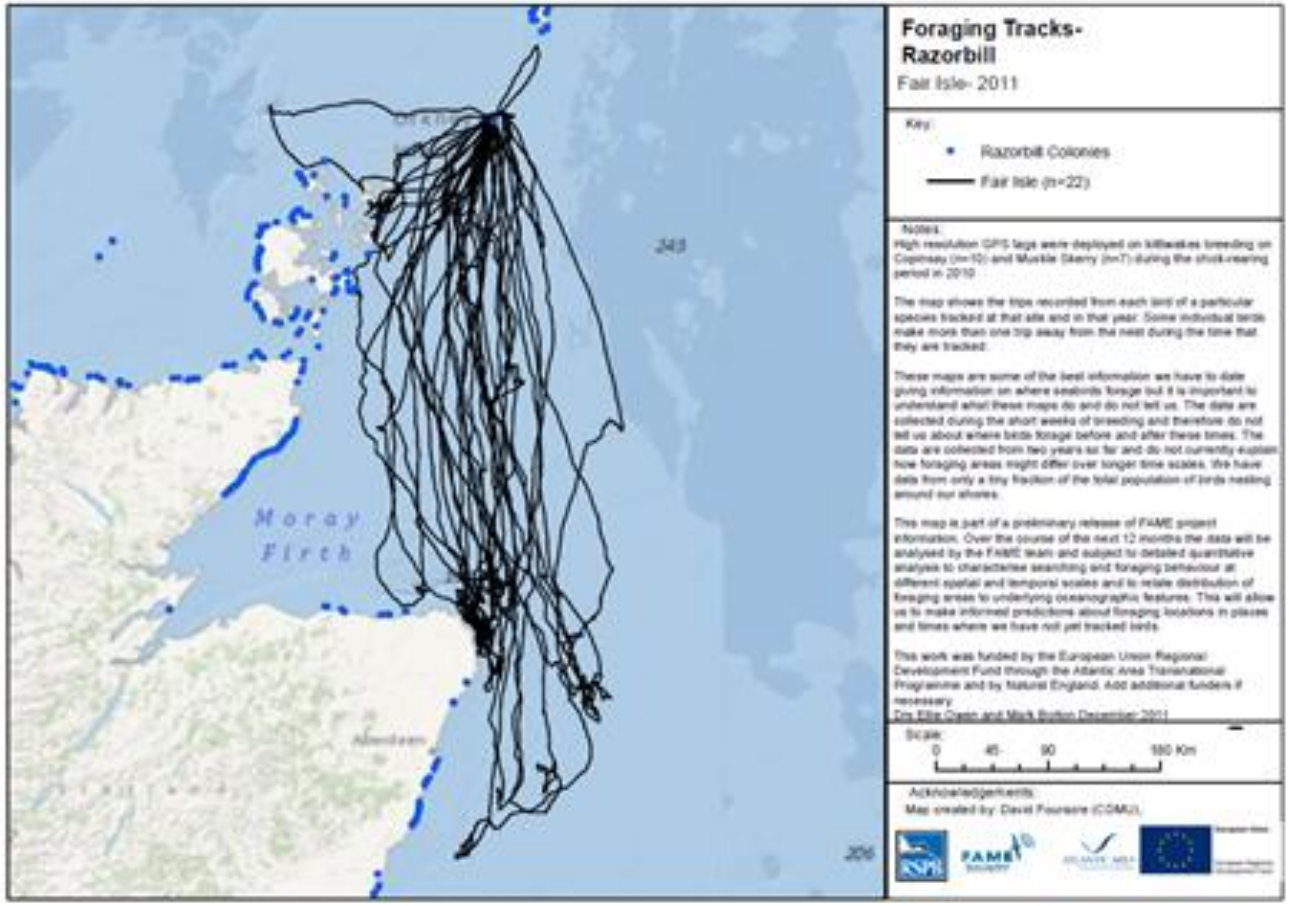
FAME maps available through FAME data portal



New project exploring non-breeding season movement of seabirds (RSPB)

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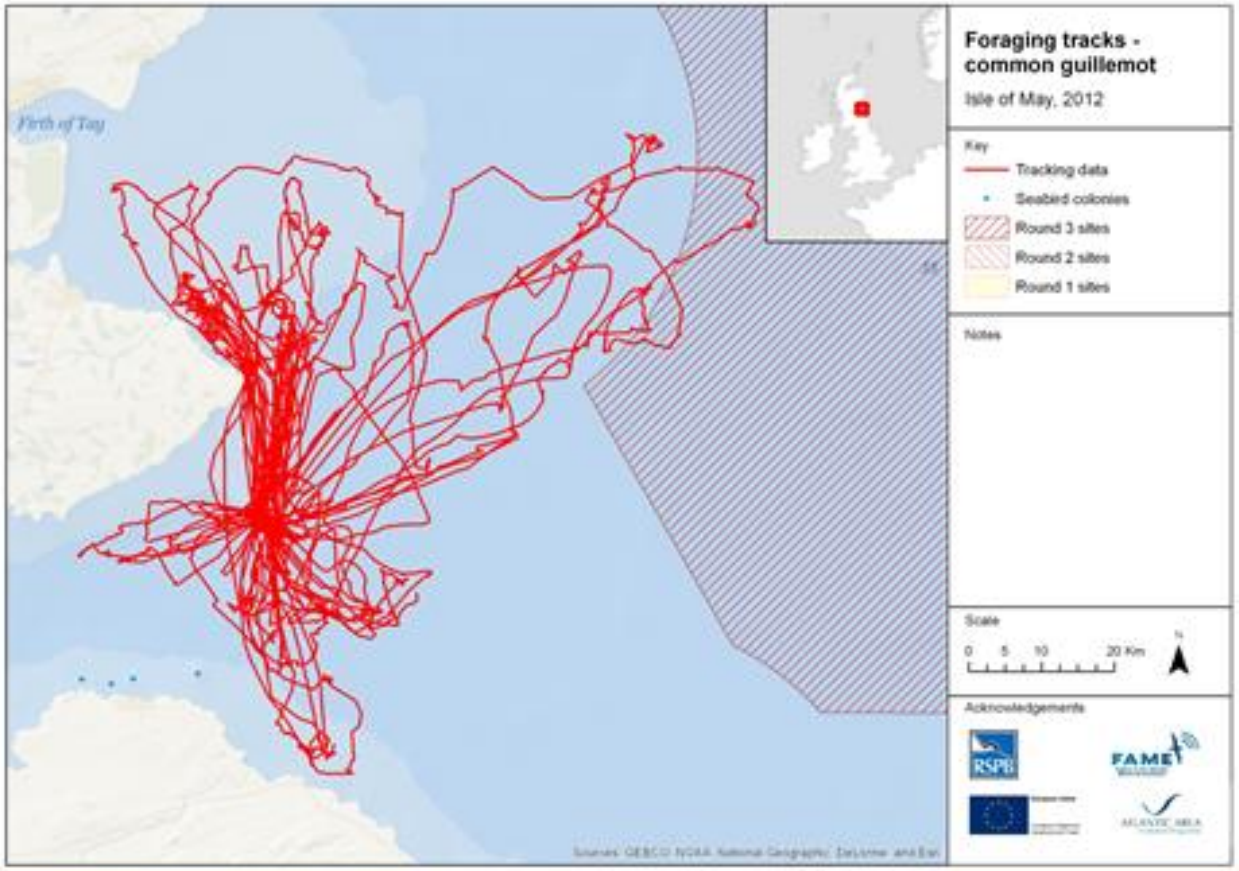

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Improvements to collision modelling of collision risk

Kittiwake flight height distribution (MSS/Band)

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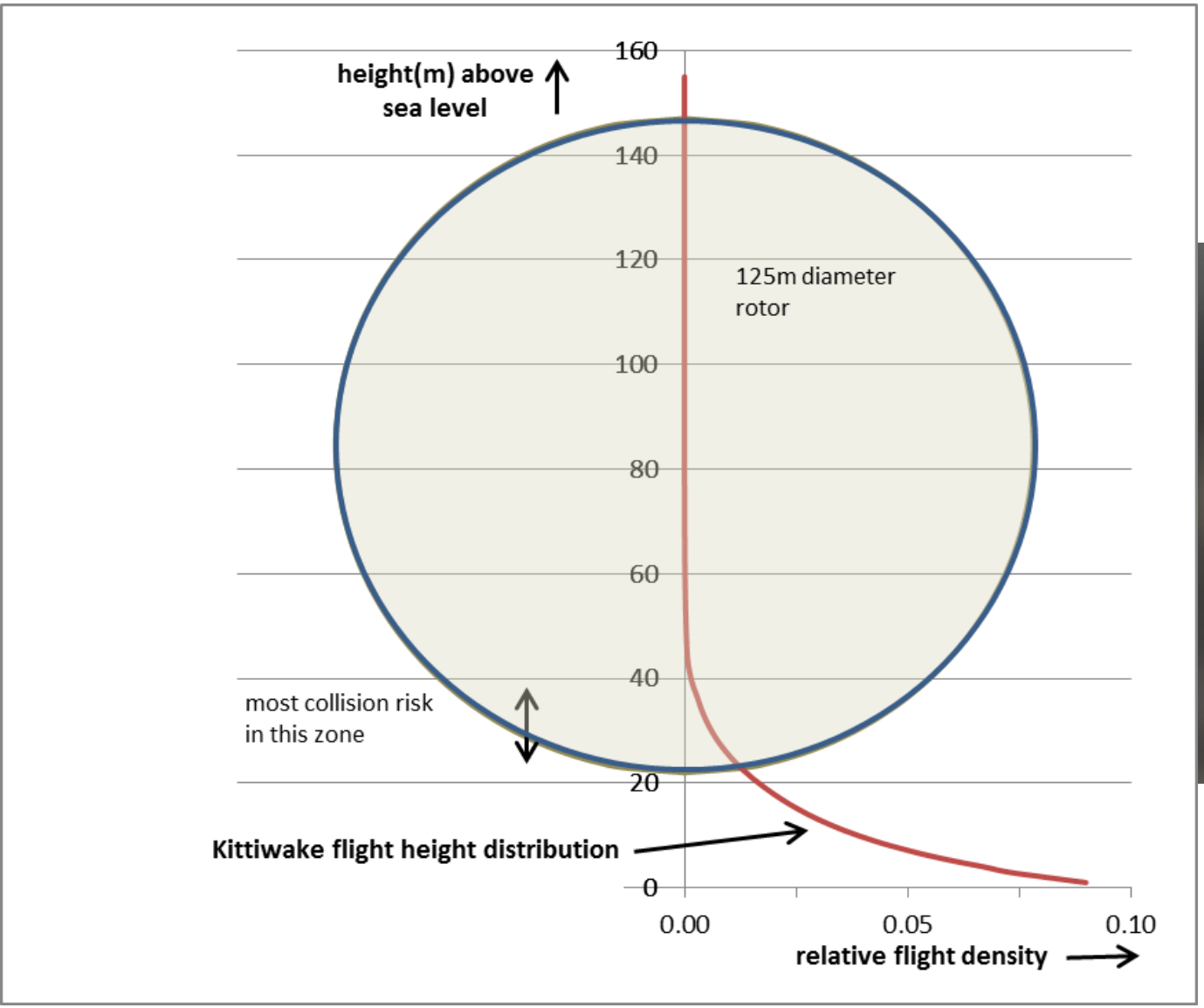

Relative collision risk for kittiwake and gannet (MSS/Band)

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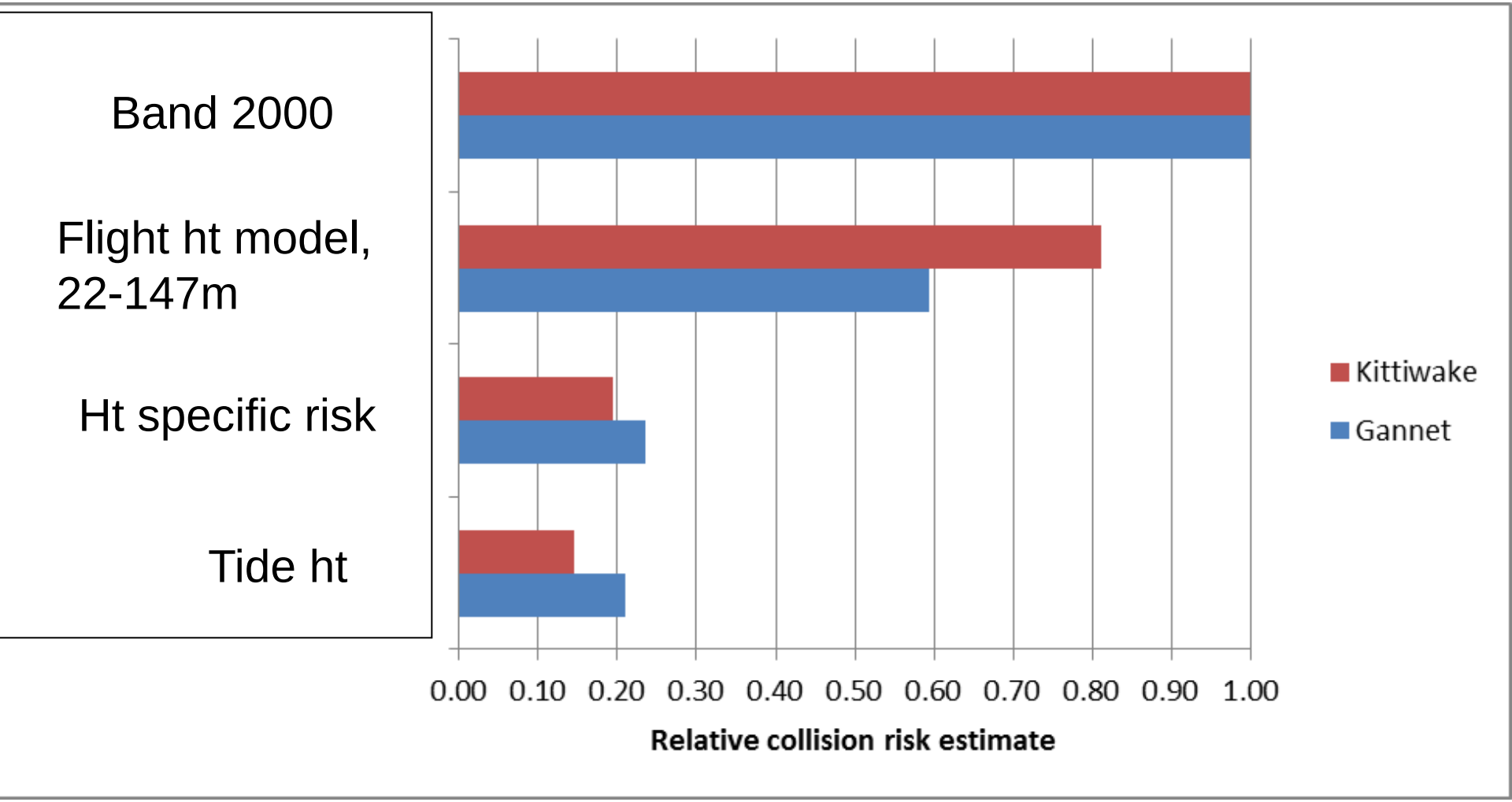

Relative collision risk variation with turbine clearance height (MSS/Band)

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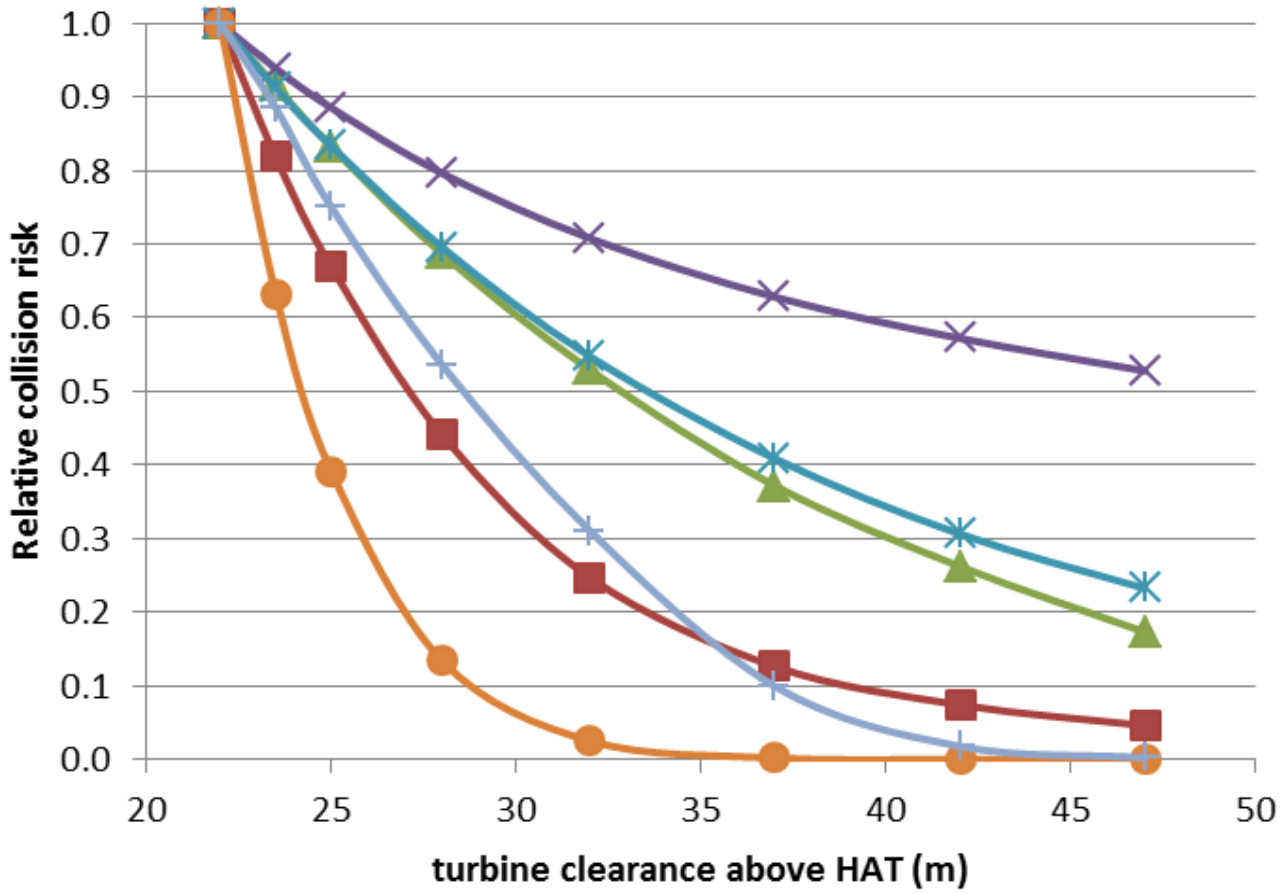

Kittiwake

Fulmar

Herring gull

Greater BB gull

Common tern

Arctic tern

Strategic assessment of collision risk of offshore wind farms to migrating birds

(WWT/ McArthur Green)

ORJIP Projects Overview

Impact Assessment Projects

Project 1: Avoidance Rate Monitoring at Existing Sites to **improve Collision Risk Assessments** for Sensitive Bird Species

Project 2: Gathering Evidence of **Population Level Effects of Noise Disturbance** on Marine Mammals

ORJIP Programme Management

Impact Mitigation Projects

Project 3: Trials of Noise Mitigation Equipment Designed to Stop Piling Noise reaching Marine Mammals

Project 4: Developing **Acoustic Deterrent Devices** to keep Marine Mammals away from Piling Operations

DEPARTMENT OF ENERGY & CLIMATE CHANGE

THE CROWN ESTATE

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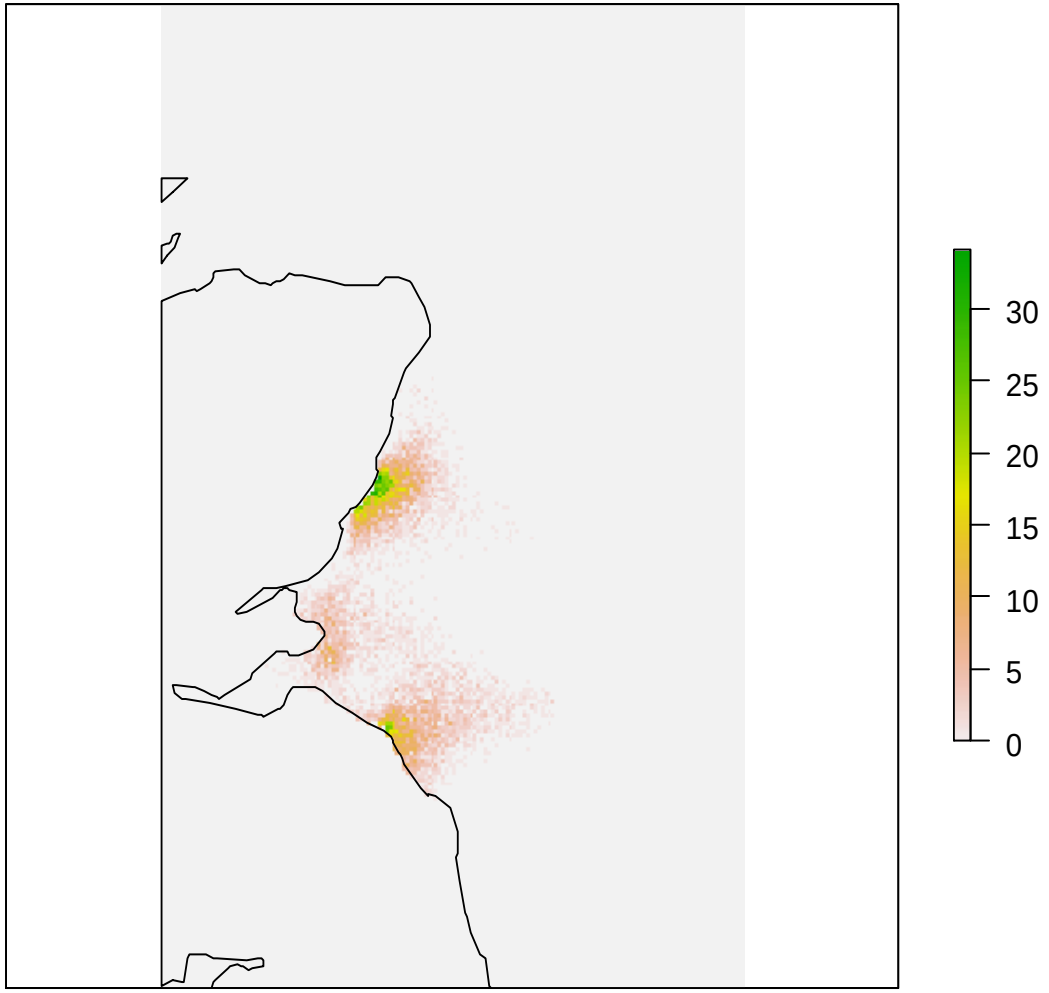
Displacement modelling

Modelled seabird foraging locations and energetic costs with and without wind farm (CEH)

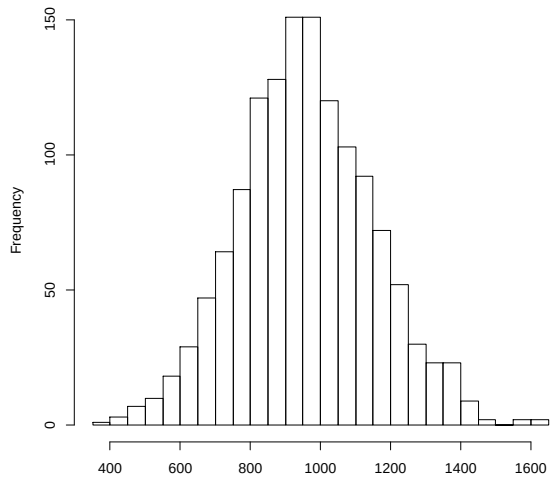
Forage Location, 8046

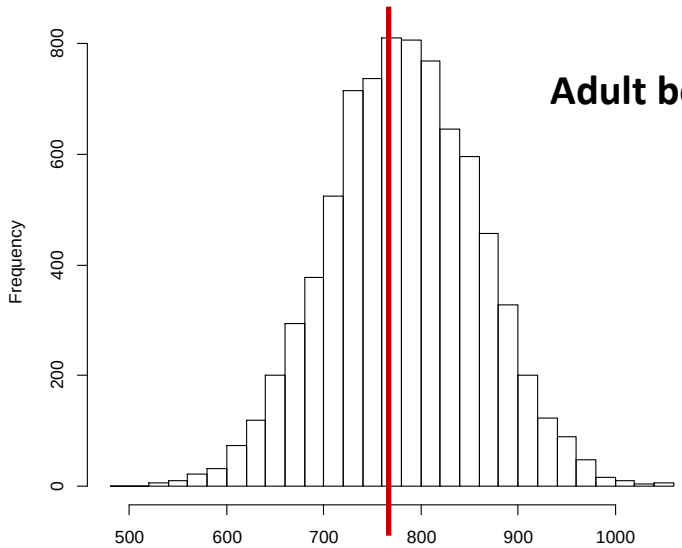


	Wind farm absent	Wind farm present
	Mean cost /hours (± S.D.)	
Flight Cost – Species A	1.15 (±0.75)	1.18 (±0.8)
Foraging Cost – Species A	5.86 (±1.15)	6.34 (±1.21)
Flight Cost – Species B	2.85 (±0.81)	2.98 (±0.88)
Foraging Cost – Species B	6.56 (±1.26)	6.91 (±1.29)

Modelled body mass change resulting from changes in energetic costs in presence of wind farm (CEH)

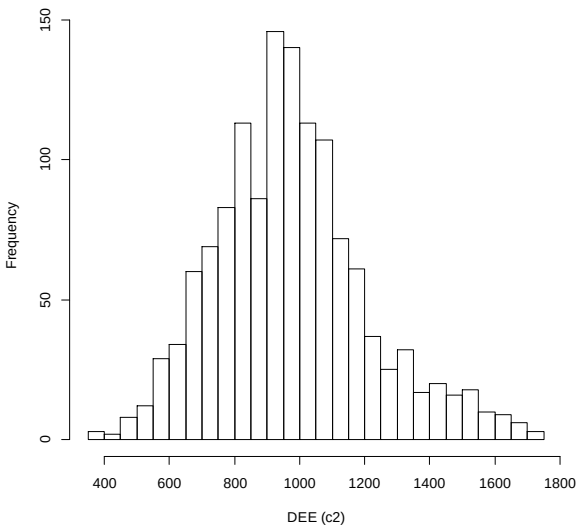
Energy gained

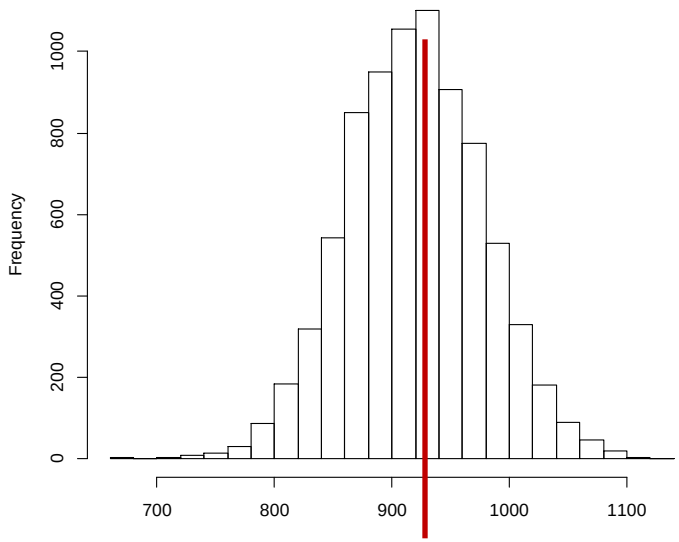




Adult body mass at end of breeding season

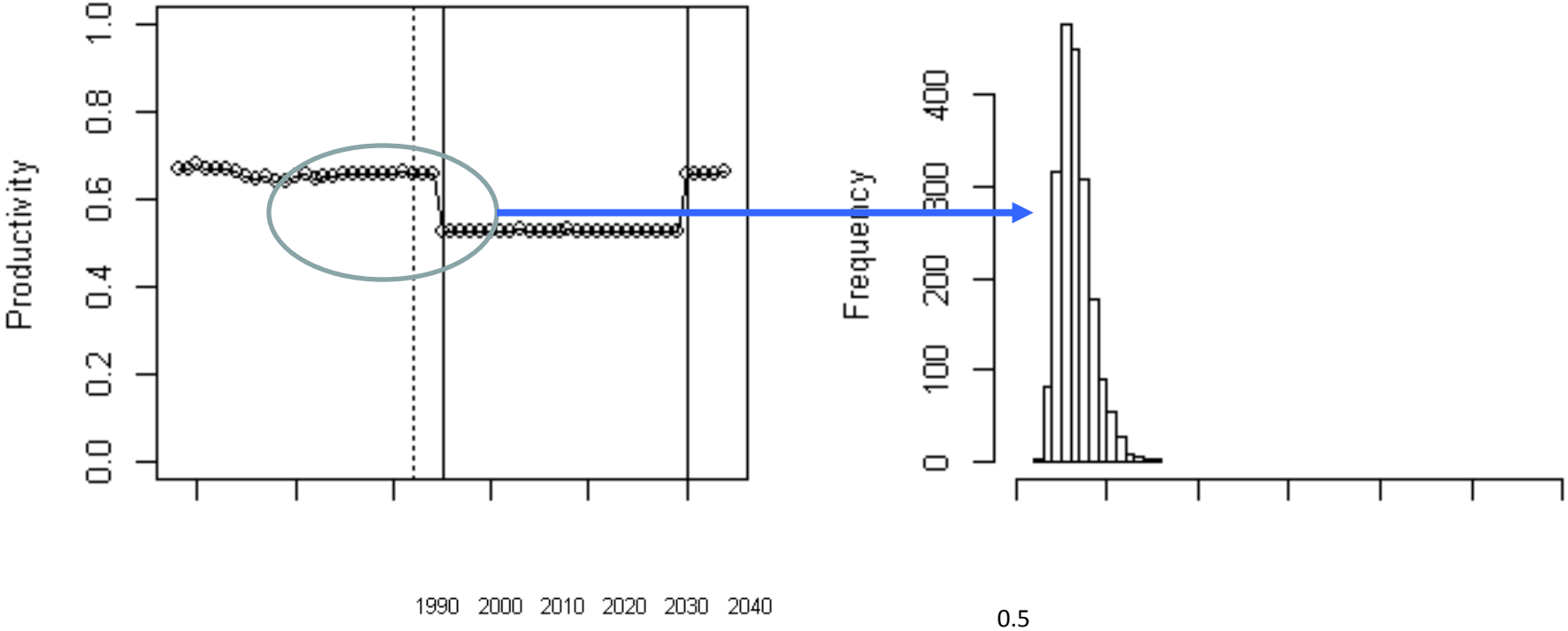
Wind Farm





No wind Farm

Translating change in energetic cost due to presence of wind farm to sea bird productivity (CEH)



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Assessment of significance of interactions

Modelling population level effects of changes in productivity or survival (CEH)

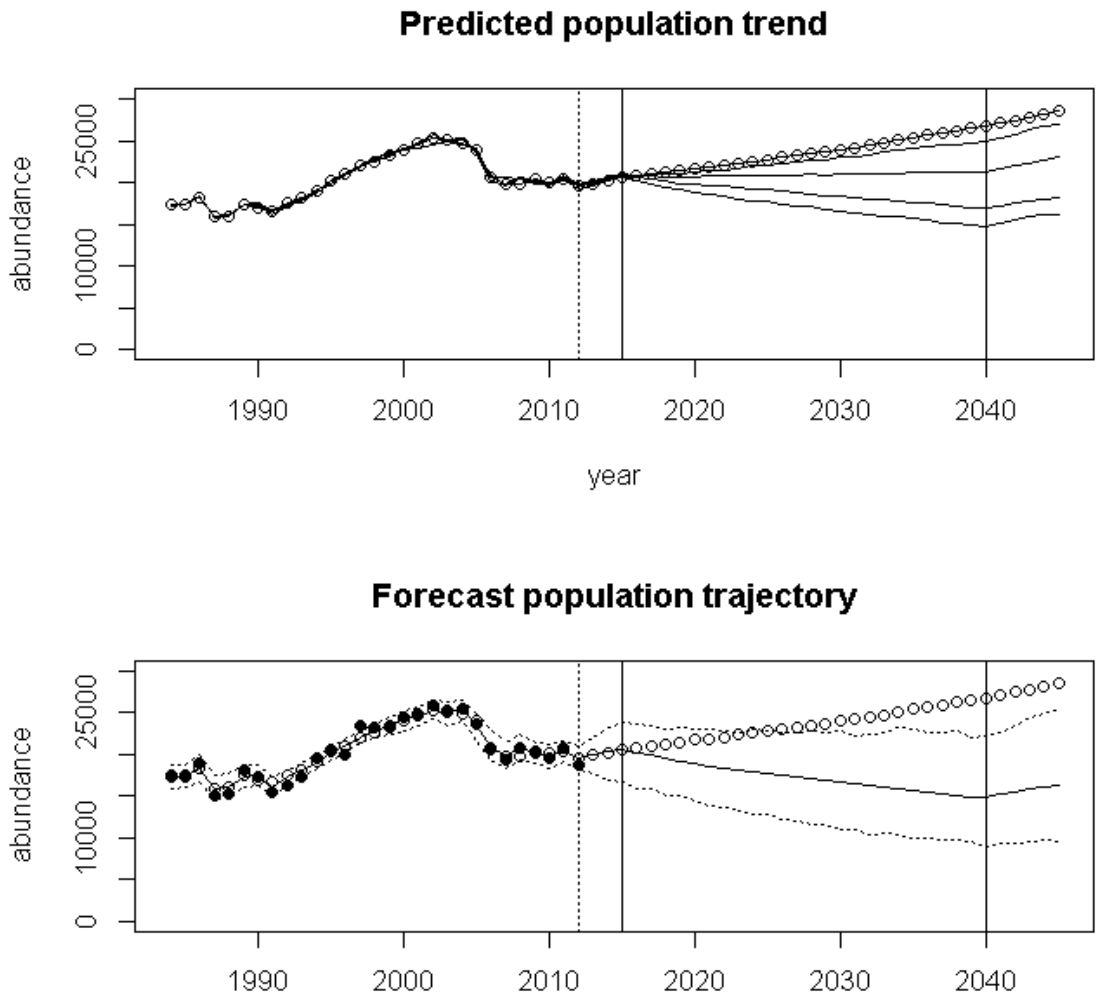
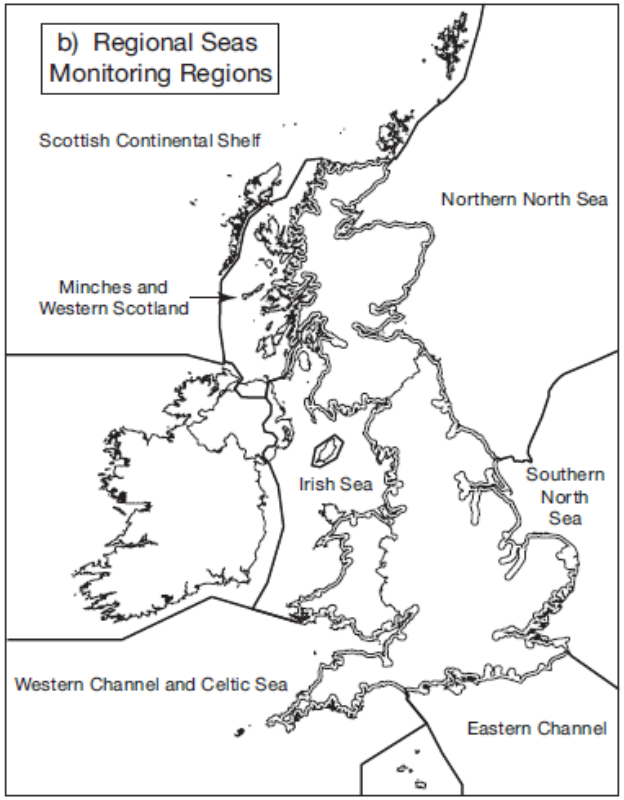


Figure 1: Predicted population trends assuming no change in survival (open circles) or a reduction of 1,2,3 or 4% p.a. (solid lines, top to bottom in top panel) or 4% p.a. (bottom panel, dotted lines show 95% credibility intervals). Observed counts represented by filled circles.

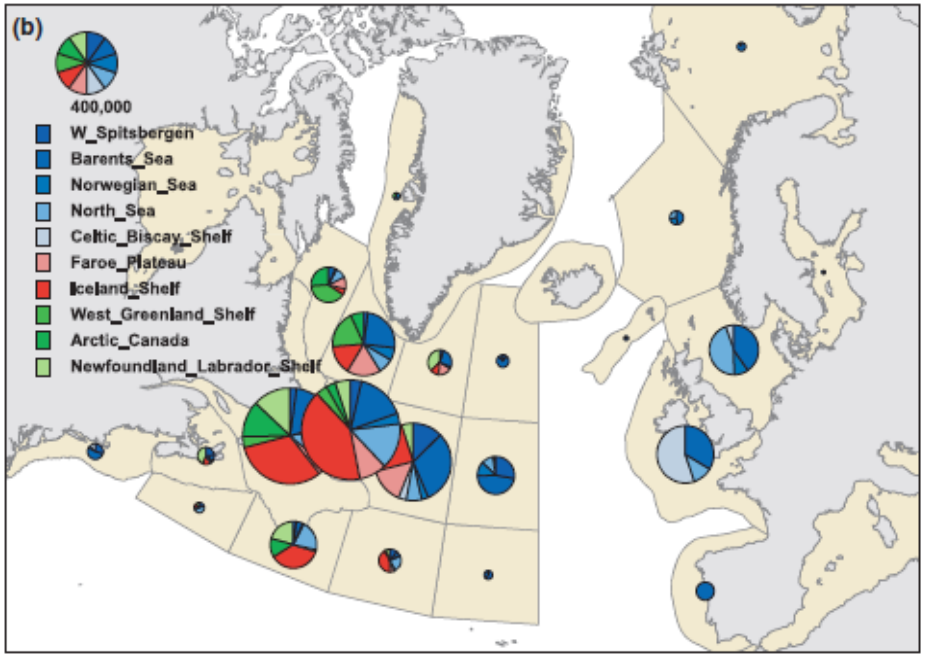
Identifying biologically appropriate non-breeding season population estimates for seabirds

Regional Seas monitoring units



Cook, A.S.C.P., Parson, M., Mitchell, I., Robinson, R.A. (2011): Reconciling policy with ecological requirements in biodiversity monitoring. Marine Ecology Progress Series, Vol. 434: 267-277.

Adult kittiwakes winter distribution and their distribution by breeding origin



Frederiksen, M., Moe, B. et al. (2012): Multi-colony tracking reveals the winter distribution of a pelagic seabird on an ocean basin scale. Diversity & Distribution, 18: 530-542.

MSS Marine Scotland Interactive

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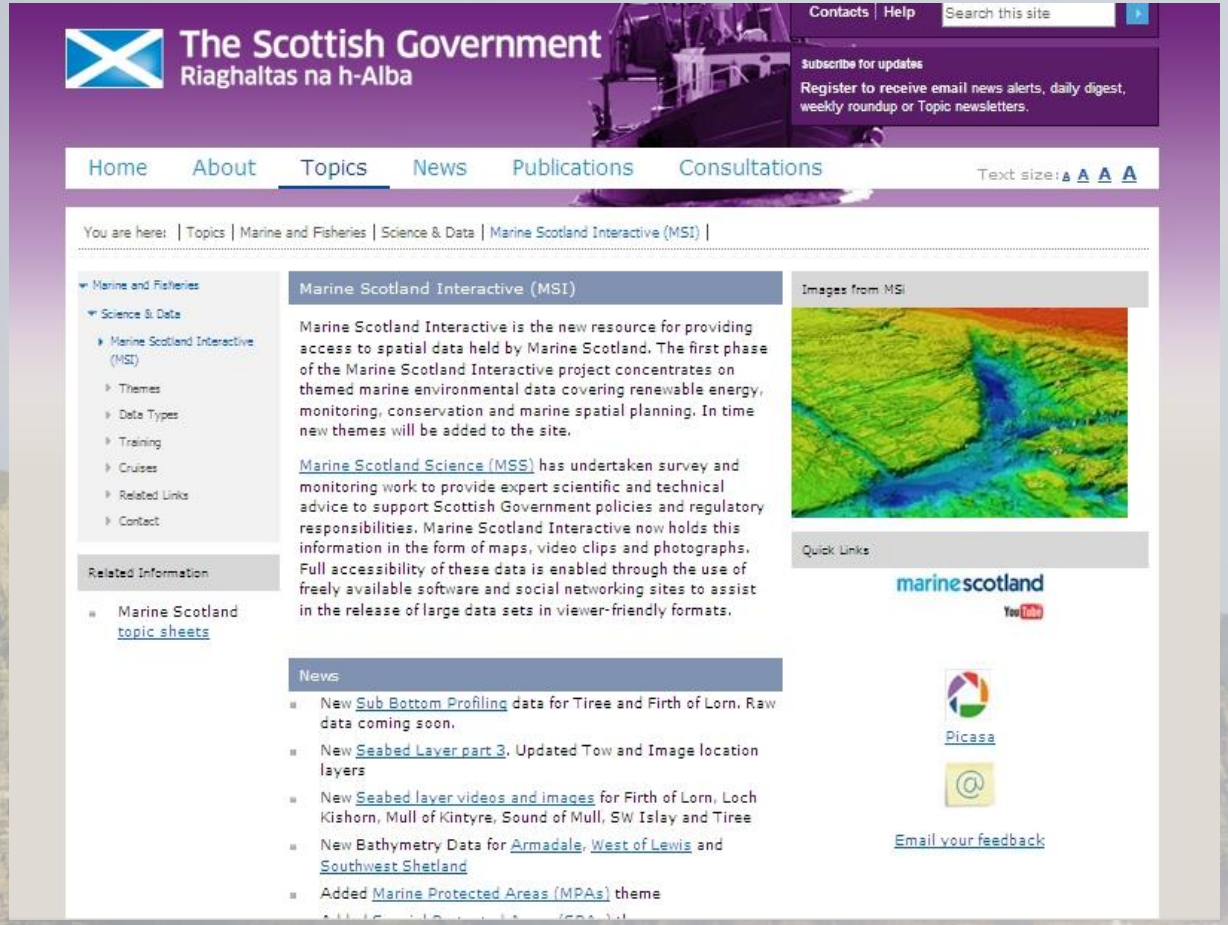

Marine Scotland Interactive provides access to spatial data
held by Marine Scotland.

Data from surveys and monitoring work completed by Marine Scotland is made available as maps, video clips, photographs and raw data downloads for freely available software.