Joint Nature Conservation Committee

Impacts of offshore wind energy development on marine birds in Europe

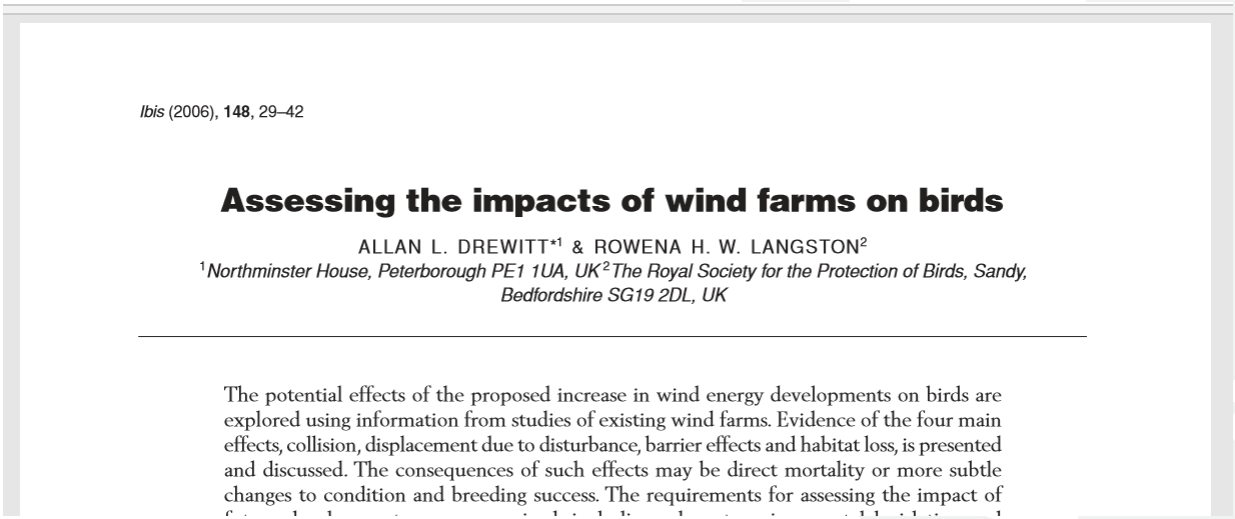
sue.obrien@jncc.gov.uk

Dr Sue O’Brien

- Senior Marine Ornithologist
- JNCC = Joint Nature Conservation Committee
- Funded by UK Government to advise on nature conservation
- Advise on effects of offshore wind development on marine birds
- Also industry-funded strategic research and coordination

How to offshore wind farms affect birds?

- Three mechanisms assumed (Drewitt & Langston, 2006)
- Collision: direct mortality by collision with turbine
- Displacement: displacement from wind farm and surrounding area – effective habitat loss
- Barrier effect: birds alter migration flyways or local flight paths



Ibis (2006), **148**, 29–42

Assessing the impacts of wind farms on birds

ALLAN L. DREWITT*[1] & ROWENA H. W. LANGSTON[2]
[1]*Northminster House, Peterborough PE1 1UA, UK* [2]*The Royal Society for the Protection of Birds, Sandy, Bedfordshire SG19 2DL, UK*

The potential effects of the proposed increase in wind energy developments on birds are explored using information from studies of existing wind farms. Evidence of the four main effects, collision, displacement due to disturbance, barrier effects and habitat loss, is presented and discussed. The consequences of such effects may be direct mortality or more subtle changes to condition and breeding success. The requirements for assessing the impact of

Collision

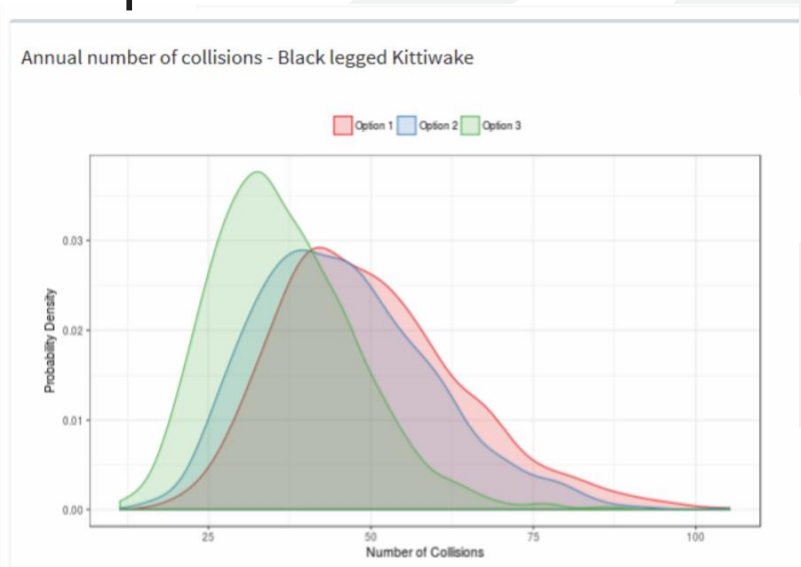
- Species vulnerable:
- Northern gannet
- Large gulls
- Kittiwakes
- Terns
- Others species (e.g. auks, fulmar, assumed to fly too low

e.g. Dierschke et al, 2014; Furness et al, 2013; Wade et al 2016

Estimating collision mortality

- Stochastic collision risk model for seabirds in flight
  https://www2.gov.scot/Topics/marine/marineenergy/mre/current/StochasticCRM
- Inputs:
  - Wind farm and turbine characteristics
  - Bird characteristics (flight speed, bird size, activity)
  - Bird density estimate
  - Avoidance rate (macro, meso, micro)
  - Flight height

Outputs:

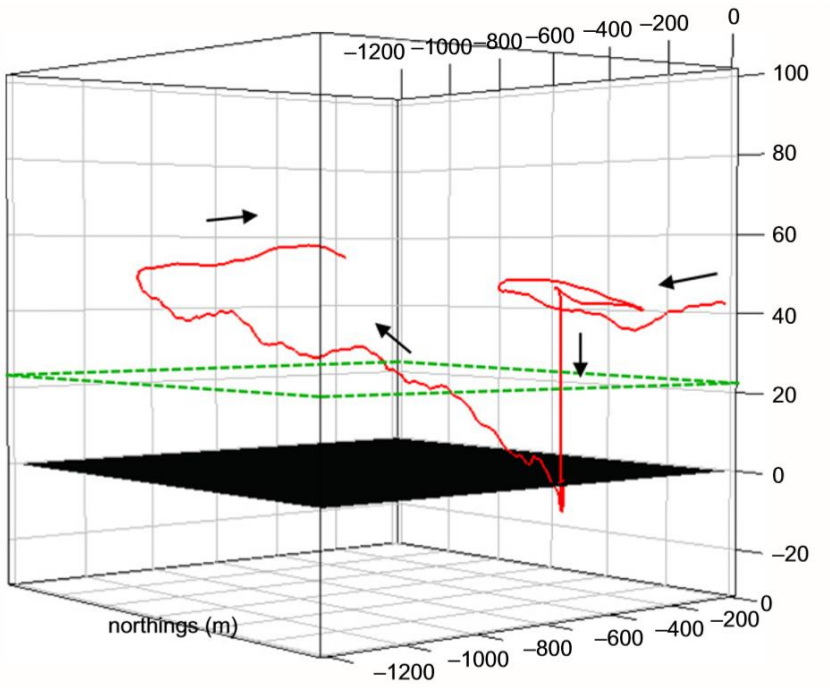


Research on avoidance rate

- Offshore Renewables Joint Industry Programme (ORJIP) Bird Collision Avoidance study
  https://www.carbontrust.com/resources/reports/technology/bird-collision-avoidance/
  - Funded by 11 developers and Government
  - Tracking bird movements at operational wind farm
  - Radar, thermal imaging camera, laser range finders
- 1,555 tracks for five species
- 6 collisions recorded (of 299 observations within the rotor-swept zone)
- Indicates higher avoidance rates but further work underway

Research on flight heights

- Flight height, e.g. GPS + barometric tags
- Gannet track
- Collision risk varies with behaviour (commuting/foraging), weather, season, etc.



Cleasby et al (2015)

Future research on collision mortality

- Direct measures of mortality, e.g. turbine-mounted cameras
- Further work on flight heights and avoidance rates
- Vattenfall current call for bird avoidance research proposals

https://group.vattenfall.com/uk/newsroom/news-press-releases/pressreleases/stories/first-of-kind-bird-study-at-offshore-wind-farm

Displacement and barrier

- Species vulnerable:
- Loons
- Seaduck, e.g. scoters, long-tailed duck
- Auks, e.g. common guillemot (murre)

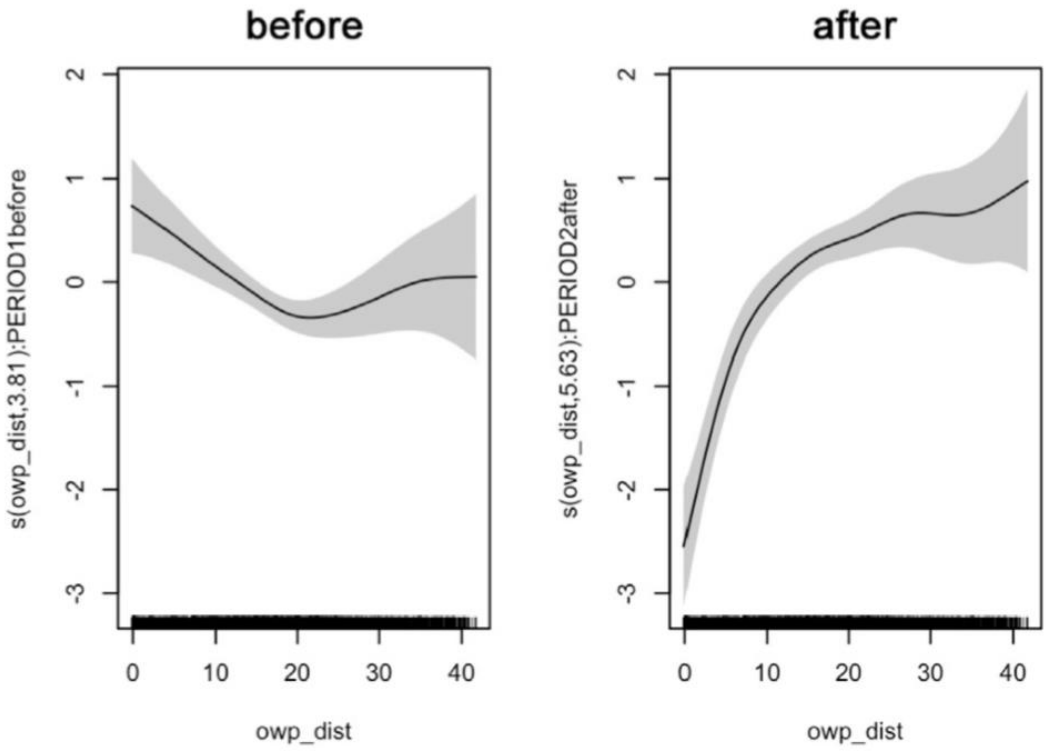
e.g. Dierschke et al, 2014; Furness et al, 2013; Wade et al 2016

Displacement and barrier: considerations

1. Quantifying extent of displacement and barrier effects
2. Understanding the demographic consequences (energetics)
3. Habituation (reduction in displacement response through time)

1. Extent of displacement

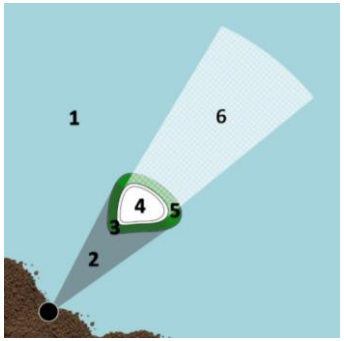
- Before After Gradient (BAG) studies
- Mendel et al (2019): red-throated loon displacement up to 16km from OWF



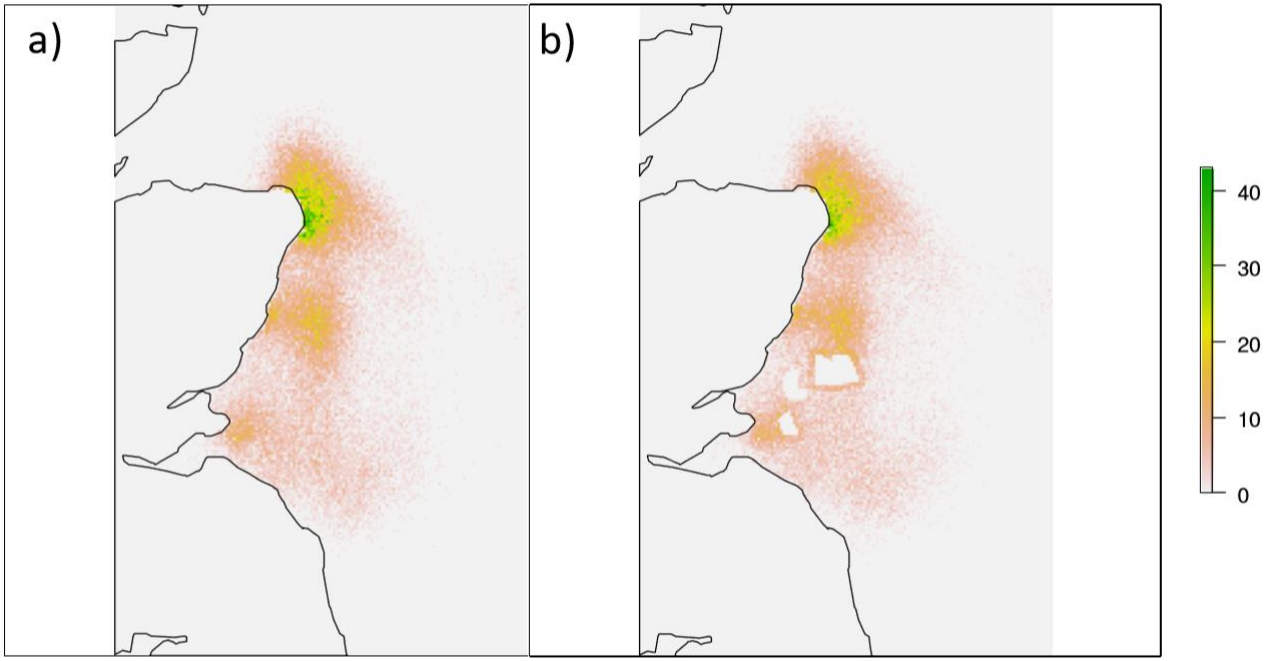
Mendel et al (2019)

2. Understanding the consequences

- Individual based models, e.g. SeabORD
  https://www2.gov.scot/Topics/marine/marineenergy/mre/current/SeabORD



Modelling barrier effects



Kittiwake distribution, eastern Scotland in the (a) absence and (b) presence of planned offshore wind farms

3. Habituation to displacement

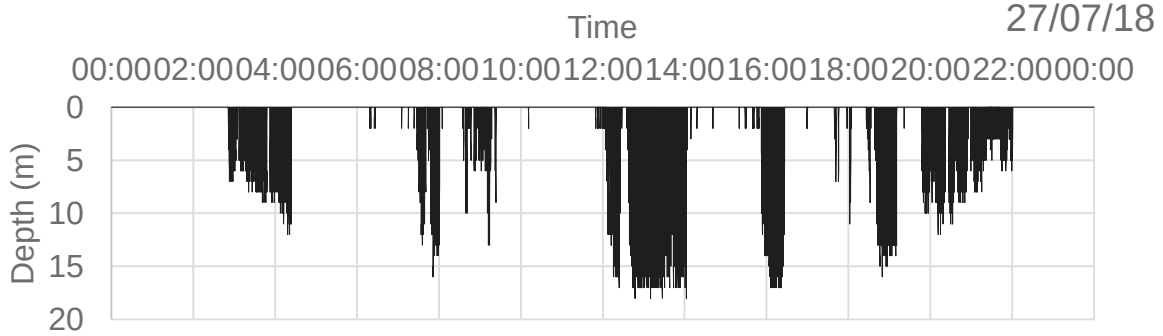
- Little evidence (no displacement or not detected due to monitoring requirements?)
- Habituation observed:
  - Common eider, Denmark, after 2 years (Drewitt & Langston, 2006)
  - Black scoter, Denmark, after 5 years (Leonhard et al., 2013)
- No habituation observed:
  - Long-tailed duck, Denmark, after 5 years (Petersen et al., 2006)
  - Red-throated loon, England, >5 years (several studies from OWF in/near Outer Thames Esutary)

Current research: consequences of displacement

- Collaborative Red-throated Diver Energetics Study
- Are loons energetically constrained in the non-breeding season?
- Tag breeding birds in Finland, Scotland, Iceland

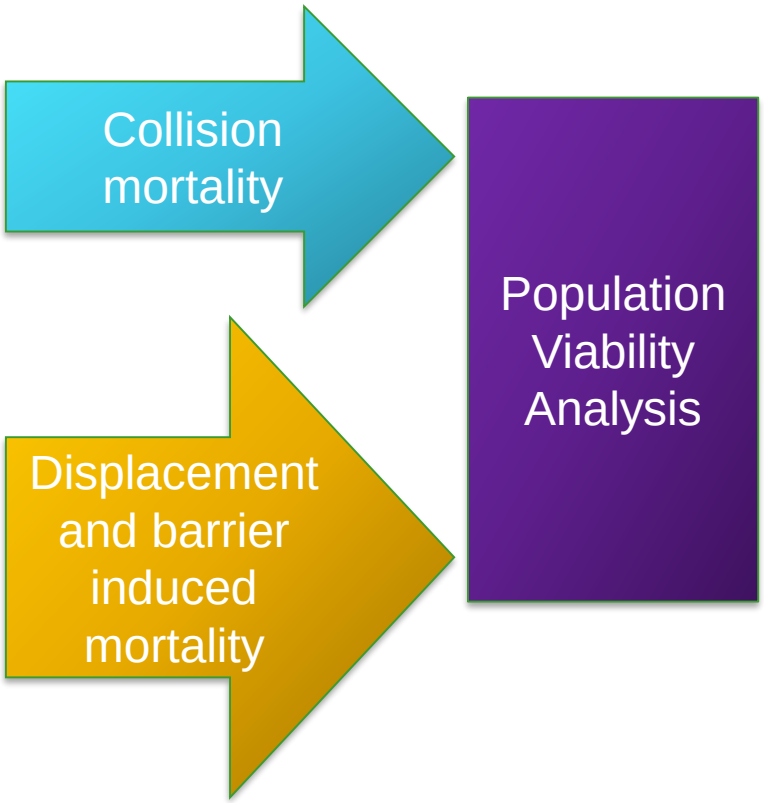

Mark Lewis


Pepe Lehikoinen

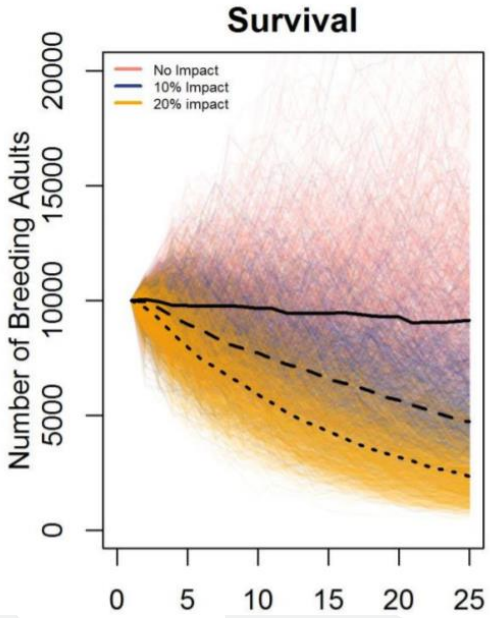


FIRST EVER!!! Red-throated loon dive profile

Population modelling

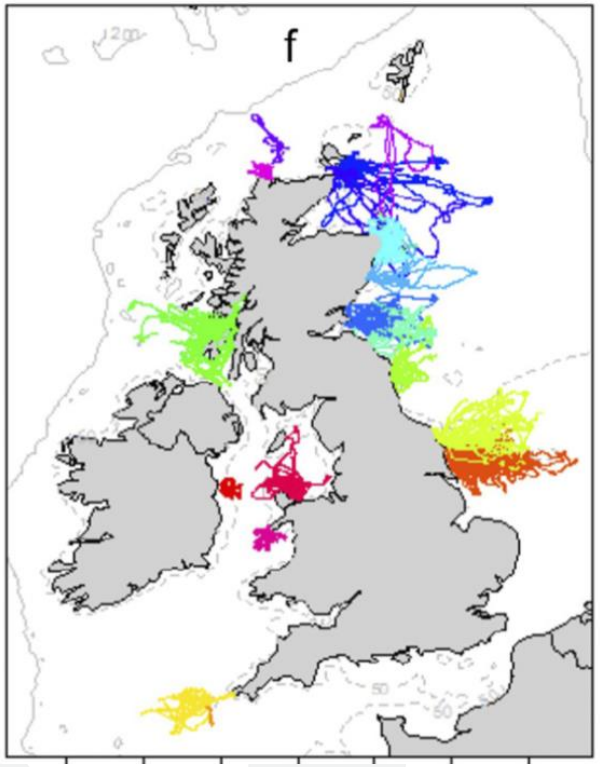


- Is the additional mortality acceptable?
- Leslie matrix population models



Population modelling: current research

- Baseline population studies:
  - Colony-based studies, e.g. UK seabird census, tracking of breeding birds
  - Bird movements in the non-breeding season (gannets, auks, red-throated loons)
    - E.g. 436 guillemots and razorbills tagged with geolocators in 2017
- Population modelling:
  - Sensitivity of metrics to:
  - uncertainty in demographic rates
  - magnitude of impacts



Wakefield et al (2017)

Key evidence gaps remaining

- What are the consequences of displacement?
- Does habituation occur?
- How can we better estimate collision mortality?
- Baseline population information, e.g. improved demographic rates, non-breeding season movements, etc.
- How can we assess the magnitude of cumulative effects across multiple developments and other pressures?