Seabirds and Tidal Energy

Aly McCluskie

rspb giving nature a home

Potential effects

Direct:

- Collision
- Entrapment
- Disturbance
- Habitat exclusion
- Displacement
- Pollution

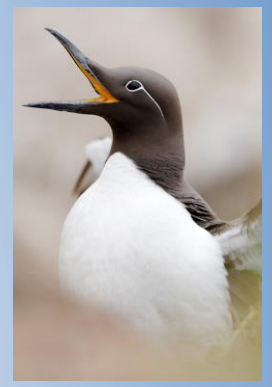
Indirect:

- Increased turbidity
- Increased predation
- Changes in prey availability

Species potentially affected:









Photos © Laurie Campbell

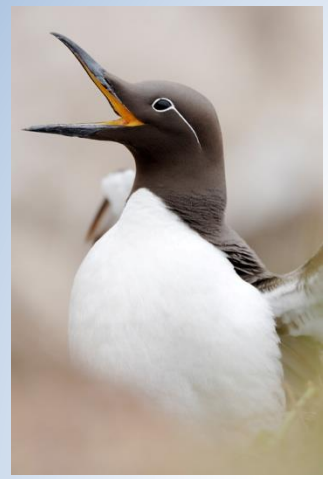
From Furness *et al.*, 2012

Potential Vulnerability

- Physiology
  - Visual
  - Aural
- Geography
  - Designated areas
  - Breeding areas
  - Wintering areas
  - Foraging areas
  - Rafting and moulting
- Demography
- Ecology
  - Foraging behaviour

Contrasting foraging behaviour and vulnerability

Guillemot vs razorbill



Guillemot	Razorbill
Fly close to surface	Fly close to surface
More time diving	More time flying
Few long, deep dives	Lots of short shallow dives
Faster dive speed	Slower dive speed
Narrow spread of foraging locations	Broad spread of foraging locations

Thaxter *et al.* 2010 J.Exp.Biol.

Contrasting foraging strategy and risk

Cormorant vs shag

Cormorants
Assumed to be pursuit divers, until dissected eyes:
Have poor eyesight, so catch prey at close
quarters, shortly after detection

Shags
Cameras revealed use different foraging strategies for different
benthic substrates

Novel investigative techniques invaluable

These examples are *inferences* of impact from ecological evidence, the actual *evidence* of interactions with devices is scant

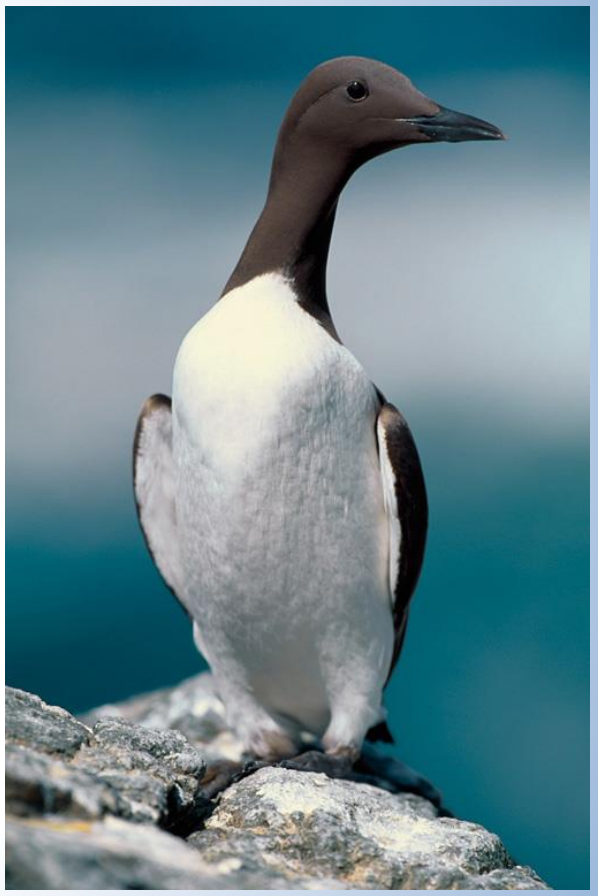
In the absence of evidence impacts must be modelled for assessment

Two models for collision impacts

- Encounter Rate Model
- Collision Risk Model

Both models need to account for avoidance/evasion, usually included as “Avoidance Rate”

Similarly need to account for attraction, due to aggregation of prey species.



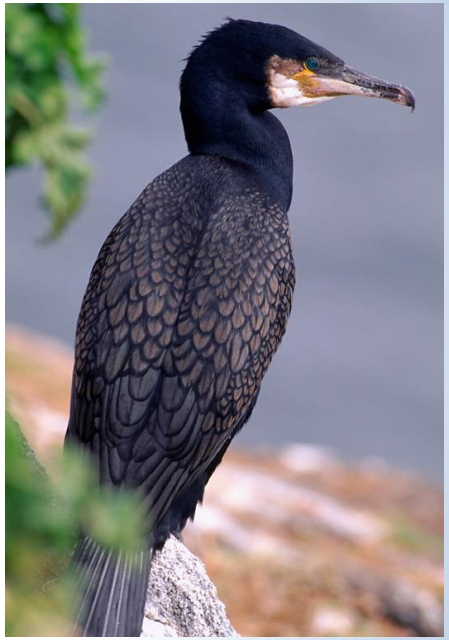
The results of monitoring must feedback to modelling to improve model parameterisation and to validate models

Monitoring methods

Previous examples are inferences of impact from ecology, the actual evidence of interactions with devices is scant, hence the need for monitoring

Monitoring can be:

- Tracking potentially impacted individuals
- Monitoring the potentially impacted population
- Direct observation above the sea surface
  - From the shore
  - From planes or boats
  - From surface mounted cameras
- Direct observation below the surface
  - Hydroacoustic
  - Underwater cameras



In particular we need to understand the three dimensional behaviour of birds in the vicinity of devices and the relationship with risk
Ideally we would follow the individual through interaction with the device through to population scale impact of any lethal or sub-lethal interaction.

Uncertainty and the Precautionary Principle

There remains considerable uncertainty over the impact of tidal energy devices.
Until monitoring and other studies provide evidence, the precautionary principle must be used

"Primum non nocere"
"First, do no harm".

"Where uncertainty still exists, we must give the environment the benefit of the doubt." (Former Norwegian Prime Minister Jan P. Syse)

Conclusions

- Considerable uncertainty remains over the impact of tidal energy devices
- In particular, understanding of the three-dimensional behaviour of birds in the vicinity of turbines is needed
- The technology to fully capture this behaviour is not available
- The population consequences of individual interactions with devices must be understood
- What will happen when we scale-up?

Thank you

rspb giving nature a home