Enhancing the value of ecological data collected by MMOs during seismic acquisition surveys:

assessing the effect of seismic surveys on cetacean occurrence.

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BACKGROUND

- Large volumes of cetacean sightings are available from seismic surveys; data is concentrated in currently under-surveyed areas of Irish waters.
- To fully utilize data from this source we first need investigate if sightings are influenced by airgun activity or survey type.

METHODS

- Cetacean sightings data collected by experienced JNCC qualified MMOs during seismic surveys and control surveys (non-seismic vessels).

- Calculated **encounter rates** (no. sightings per hr of effort) for active and inactive periods of seismic surveys, and for control surveys.
- **Statistical modelling** (GEE-GAMs for binomial data):
  - GEE component accounts for auto-correlation in the data.
  - **Seismic models (airgun activity)** for baleen whales (a), and toothed whales (incl. dolphins) (b): presence during active vs inactive phases of seismic surveys.
  - **Control models (survey type)** for baleen whales (c), and toothed whales (incl. dolphins) (d): presence during active and inactive phases of seismic surveys vs control surveys.
  - Models also incorporated spatial, temporal and environmental factors that could influence cetacean presence.
- Although individual vessel and observer differences could not be taken into account within the models, bias caused by these variables is likely to be minimal:
  - Active and inactive data were available for each seismic vessel.
  - A similar proportion of active and inactive data was collected by observers.
  - Observers were all experienced.
  - Effort level was similar for observers.
  - A large data set was available.

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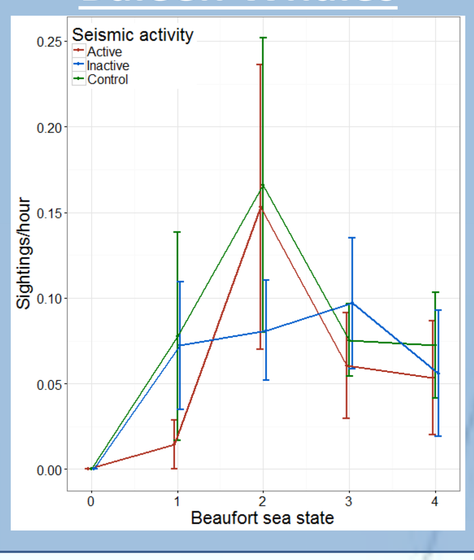
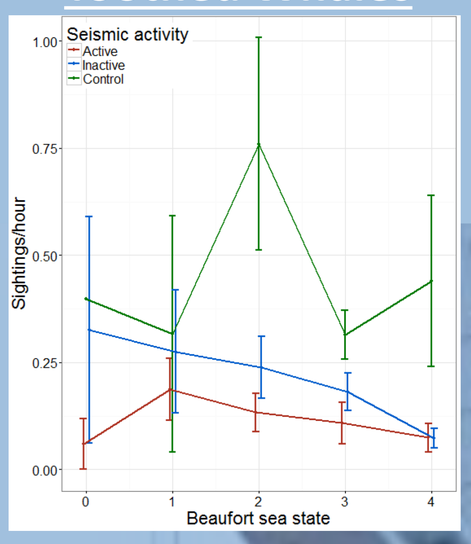
ENCOUNTER RATES

Baleen Whales



Toothed Whales



RESULTS

Baleen Whales

Occurrence not significantly influenced by airgun activity: active vs inactive (a), or survey type: seismic vs non-seismic (c).

Toothed Whales

Less likely to be observed during active phase: active vs inactive (b), and during seismic surveys: seismic vs non-seismic (d)

	Model	Covariate	Coefficient	SE	Wald's *P*
a)	Seismic: Baleen whales	Inactive	-0.0991	0.2320	0.6696
b)	Seismic: Toothed whales	Inactive	0.5137	0.1533	**0.0008**
c)	Control: Baleen whales	Active	-0.5220	0.292	0.0736
		Inactive	-0.5060	0.302	0.0937
d)	Control: Toothed whales	Active	-7.093	1.082	**<0.0001**
		Inactive	-2.813	0.617	**<0.0001**

Models (a) and (b) – active vs inactive phases, 'active' was used as the baseline.
Models (c) and (d) – active and inactive phases vs control surveys, 'control' was used as the baseline.

CONCLUSIONS

Baleen Whales

- No effect of airgun activity or survey type - mysticete sightings comparable both within seismic surveys and across survey type.
- Changes in occurrence can be partially attributed to environmental and temporal variables.

Toothed Whales

- Airgun activity and survey type influences odontocete occurrence, even after accounting for other variables.
- Differences would need to be corrected for prior to combining data from difference sources.

Using the results of this study we can now account for the differences in sightings rates from seismic vessels. This valuable data source can then be used to fill critical cetacean distribution data gaps in poorly surveyed areas of Irish waters.