



University of
St Andrews



Duke
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Developing the next generation framework for modelling marine mammal responses to noise:

A workshop to identify key elements for future models

Saana Isojunno si66@st-andrews.ac.uk
Catriona Harris catriona.harris@st-andrews.ac.uk



Messages from the community

MANAGEMENT PERSPECTIVES

We asked for....

- 2-3 key challenges that regulators face when making management decisions based on the current available science and models
- 2-3 wants that regulators need to include more than received level (RL) thresholds in their assessments

Challenge #1

Dose-response relationships important, but poorly understood

“The relationship between the characteristics of sound (other than RL) and the probability of a response (and nature of the response) are important.....and are not very well understood”

“Hearing thresholds for many species are unknown or poorly known”

“difficult to use data, especially older data not from controlled exposure experiments, that document marine mammals responding in a certain way to sound exposures, when the studies or observers do not attempt to document marine mammals that have not responded under the same conditions.....(not always the case, but enough that it is a problem for development of a comprehensive function).”

Challenge #2

Sparcity of data: How do we extrapolate to data-poor species or areas while sticking to the **precautionary principle**?

“Compound precaution” into regulation of industry: e.g., renewables and oil & gas development further offshore; “we know little about what species are present, even less about population sizes and demographic parameters in these regions, so we are making increasingly precautionary assumptions to build approximations of biological data into complex assessment methods”

Incorporating new information quickly vs. being too reactionary: “balance between reacting effectively, and extrapolation of one result to different locations/regions/ methodologies”

Considering context

Challenges

- “How to evaluate the impact of a disturbance considering context.....exposure in quiet areas vs noisy areas, migration vs feeding areas....”
- “Exposure effects on cow-calf pairs.....available information is sparse.”
- “distance is especially critical (independent of received level), as is understanding whether other activities or sounds might be present in the area, but also the behavioral states of the exposed animals.”

Wants

- Further data and monitoring, “methods to collect data which have the power to detect trends in population size, changes in distribution, etc”
- “A simple quantitative **method for incorporating into the assessments the contextual variables that have the greatest impact** on making the necessary determinations under the various statutes and/or regulations”

'Significant' impact

Challenges

- “The ‘so what’ question: we can predict responses using dose response curves, modelled animal density and modelled received levels but we have difficulty in predicting what those responses mean for individuals..... let alone populations...”
- “disruption to migration patterns and consequences of that --- e.g. animals possibly arriving too late to feeding or breeding areas for optimal utilization.”
- “Do the animals recover lost calories and what happens if they do not ?”
- “Translating numbers of takes to numbers of individuals taken and to the impact those takes have on a species or stock”

Wants

- “Need a better definition of a **‘biologically meaningful’** response and not ‘just’ a change in density or a movement away.”
- “A simple way to implement thresholds based on dose-response functions for both **estimating numbers of takes and informing monitoring zones** “

Uncertainty

Challenges

- “A lack of standard approach regarding **whether and how** to incorporate uncertainty into density estimates when extrapolation is necessary”
- “where uncertainty can be quantified in a metric, what level of probability exceedance should decisions be based on? Will this depend on the type of data being considered or is it possible to agree a standard approach?”

Wants

- “A simple quantitative method to address the various levels and types of uncertainty inherent in an impact assessment”
- “Consensus on what level of uncertainty should be used to guide decision making”

Wanted: cumulative impact framework

“A suitable framework for cumulative assessment of marine mammal population impacts, well informed from an industry perspective (i.e. what is happening, where, and when)”

“Mostly we regulators only look at part of the animals history; this is especially relevant for highly migratory species like cetaceans. So we might only regulate on activities in a feeding area, not considering exposure in other life phases. (So maybe we need in addition to RL thresholds something like a cumulative “yearly exposure” for species.)”

Wanted: management consensus

- Consistency of management across industries and territories
- “Management units which are biologically meaningful (which they tend to be), but that can be used within management/assessment frameworks (for which they are at present unhelpful).”