NOAA FISHERIES

Northeast Fisheries Science Center

NOAA NEFSC workshop on Integrating Visual & Passive Acoustic Datasets

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Aim

- The aim of this workshop was to come up with new analytical frameworks that will allow better integration and use of visual and passive acoustic data streams
  - In recent years, passive acoustics has moved from being an experimental technology to becoming standard tool.
  - That being so, we're establishing large scale, long term monitoring projects that inform the spatial distribution and seasonal occurrence of right whales and other large baleen whales.
  - We now want to move beyond descriptive studies using passive acoustics to more integrated approaches

Attendees / structure

- Attendees – mixed group
  - Right whale gurus
  - Cetacean habitat modelers
  - Modelers working on approaches not used on cetaceans yet
  - Mix of gov't (Fed & State), University & research NGO (e.g. WHOI, NEAq) & contractors
- Aim was to have new modeling eyes look at this integration problem, along with
  - (a) some of the folks who're doing the modeling now and
  - (b) researchers with the experience & expertise with right whales to ensure that the modelers don't get lost down any rabbit holes.

The meeting

- **The first day**: was spent presenting the framework for why this integration is needed and what types and formats this significant amount of data is available in for the Western North Atlantic seaboard
- **The first half of the second day** had the statisticians and modelers step forward to present their experience with integrating disparate data sets and their ideas for what approaches we could take to move this problem forwards.
- **The second half of the second day, and the third day** we agreed on three approaches worth pursuing & came up with a work plan to start these analyses.

Approaches - 1

- Spatial Capture-Recapture Models
  - *Background*: SECR relies on PhotoID as a starting point and so is feasible for NARW [and possibly humpbacks]. SECR models are built as a first step with PA & visual data (line transect &/or opportunistic) added as the second layer.
  - *Analysis:* Fine-scale approach to utilize data from two areas (Cape Cod Bay and Nantucket WEA) to develop "proof-of-concept" capture-recapture models, incorporating visual sightings and photo-ID mark/recapture data, and subsequently, PA data

Approaches - 2

- Occupancy modeling without spatially explicit information
  - *Background*: Occupancy models address the problem of imperfect detectability of a species & do so using repeated observations from the same site. End up knowing whether species are present in a site & when, from detection / non-detection data. Set up to combine visual & PA data. No need for photoID so applicable to a wider range of species
  - *Analysis:* Initially, fit occupancy model using density surface data. See how they compare and what information both types of models provide – visual data only. Broadscale, exploratory approach using data along the whole coast as needed.

Approaches - 3

- Adding to Habitat Based Density Models (HBDM)
  - *Background*: Uses the vast information available from both PA presence & opportunistic sightings of whales to
    - validate HBDM predications,
    - inform HBDM's where current line transect data is lacking
    - attempt to integrate these data more comprehensively
  - *Analysis:* Again, broadscale, exploratory approach using data along the whole coast as needed. Initial analysis will invovle qualitative comparison of east coast PA data & HBDM for baleen whale species for which new data would be valuable (NARW, minke whale, sei whale)

Approaches - future

- Potential further steps include:
  - converting visual & acoustic data to presence-only for quantitative statistical comparison;
  - using acoustic data as covariate into visual models;
  - exploring “joint species” models using visual & acoustic data input as separate species
- Another option - broader occupancy modeling using historic visual and acoustic data for multiple baleen whale species; this discussion was tabled for now but can be revisited in future once the more immediate priorities are met.

Final thoughts:

- Our initial steps are to try to combine visual & acoustic data to do produce new versions of the (*descriptive*) models that are currently being requested by managers
  - but that's only the start
- Can we do a better job of using models & data to understand *process* (and not by just saying – oh this explains a lot of variability in a GAM so it must be important)?
- If not how can we ever get to *prediction*?
  - especially given the interest in how things are changing in the ocean at present