LENFEST OCEAN PROGRAM

A workshop summary

July 2018

SUPPORTING SCIENCE AND COMMUNICATING RESULTS.

bearacreative, iStock

FIRST WORKSHOP OF THE OCEAN MODELING FORUM WORKING GROUP ON MARINE MAMMAL BYCATCH

OVERVIEW

The Ocean Modeling Forum's working group on marine mammal bycatch

The Ocean Modeling Forum has convened a working group to develop scientific tools to assess data sets and methods for evaluating the rates and impacts of bycatch on marine mammal populations, in support of nations working to comply with the Marine Mammal Protection Act (MMPA) Import Provisions issued by the National Oceanic and Atmospheric Administration (NOAA). Under this new rule, nations that export fish and fish products to the U.S. are asked to adhere to bycatch standards comparable to those of the U.S.

Working group charge

The working group will produce scientific tools aimed at assisting nations in their efforts to apply to NOAA for a comparability finding. Led by Dr. André Punt, University of Washington (UW) and the UW Ocean Modeling Forum, and co-chaired by Dr. Tessa Francis, UW Ocean Modeling Forum, and Dr. Rob Williams, Oceans Initiative, the working group will identify and recommend data sets and methods that could be used to assess marine mammal bycatch and its impacts, with a focus on data-poor fisheries and/or poorly monitored marine mammals. The working group will meet four times over 2018 and 2019, and will also develop user-friendly, web-based software that nations can tailor to their needs and use to evaluate potential management strategies.

First workshop

The working group members met for their first workshop on May 16 – 18, 2018, in Seattle, Washington. Workshop participants included working group members, invited management experts from NOAA, and several observers from government and NGOs. Day one of the agenda included a series of presentations from the working group leads and invited experts to allow participants to deepen their understanding of management needs and the working group charge. On day two, participants scoped the products that the working group plans to produce over the next two years. Finally, during day three, participants identified next steps, including writing assignments.

WORKING GROUP PROJECTS

The working group identified four projects that it plans to undertake over the next two years.

Project 1: Abundance estimation methods best practices

Lead: Philip Hammond

Product: A synthesis document

In this project, the working group will produce a comprehensive synthesis of methods that can be used to estimate marine mammal abundance, with the aim of providing a best practices resource for users. The summary will include an overview of available methods for obtaining information on abundance, including: extrapolating counts (e.g., pinniped haul-out counts, land-based counts of cetaceans on migration); line-transect/distance sampling to generate area-based estimates of abundance; mark-recapture analysis of individual recognition data (especially photo-identification); abundance estimation based on static and towed acoustic surveys; use of opportunistic data (e.g., sightings from ferries, strandings); and model-based abundance estimation. For each method, we will:

- identify assumptions and how their violation can lead to bias;
- outline practical details of data collection and analysis; and
- discuss strengths and weaknesses of each approach, including logistics and cost.

We will illustrate each approach with examples, give references for users interested in additional information, and provide guidance on a minimum set of information that should be provided to support any reported abundance estimate. To conclude, we will provide a step-by-step decision tree for use in determining the most appropriate estimation method for specific locations and species. The resulting document will be aimed at scientists and managers with minimal experience in estimating marine mammal abundance, while providing relevant additional detail for more experienced practitioners.

Project 2: Best practices for marine mammal bycatch estimates

Lead: Andy Read

Product: A synthesis document

In this project, the working group will synthesize information on methods and provide an overview of best practices to estimate rates and levels of marine mammal bycatch in fisheries, meaning the number of pinnipeds, cetaceans, and other marine mammals that die entangled in fishing nets or other fishing gear. Most commonly this involves observing a portion of the fishery to estimate a bycatch rate, and then applying that rate to some measure of total fishing effort (of both the observed portion and unobserved portion of the fishery). We will direct the reader to more detailed information on how to actually conduct bycatch estimation projects, such as fishery observer programs.

Among the primary approaches to data collection that we will review are on-board observer programs (commercial or research vessels), on-board camera systems, observer programs from secondary platforms, logbook records (self-reporting), and structured interviews with fishers, including dockside surveys. A special category we will consider is how to estimate or quantify bycatch in fisheries that are not directly observable; the most common example being entanglement of large whales in lines attached to pot gear. Another special category we will consider is how to handle situations where marine mammals are observed to be injured but whether they ultimately died is unknown (e.g., whales hooked on longline gear seen trailing gear when swimming away).

The synthesis document will discuss what can be learned from stranding data and scars on live animals about bycatch rates. We will also summarize ways to analyze bycatch data and provide examples. We will evaluate the strengths and weaknesses of each approach in terms of assumptions made, tradeoffs, biases, cost effectiveness, etc., with a view to minimizing bias and cost while maximizing accuracy and completeness. To the extent feasible, we will structure the information by fishery type, such as gillnet, trawl (surface, midwater,


Rob Williams

demersal), purse seine, longline, pot or trap gear, and anti-shark net. We will suggest best practices, and attempt to identify minimum requirements for obtaining credible estimates of bycatch.

The synthesis document will focus on empirical studies that have generated quantitative results (with uncertainties and limitations specified). However, it will also briefly summarize new developments such as model-based approaches to bycatch estimation. We will put forward a step-by-step outline for decision-making (decision tree) to guide researchers and managers in selecting methods that best suit their needs and circumstances. Finally, we will provide guidance on the minimum set of information that should be provided to support any reported bycatch estimate (e.g., number of fishing trips observed, number of marine mammals killed). Our target audiences include scientists without previous experience with bycatch estimation, and fisheries managers with minimal scientific training.

Project 3: A user-friendly app for exploring bycatch rates

Lead: Margaret Siple

Product: Web-based app

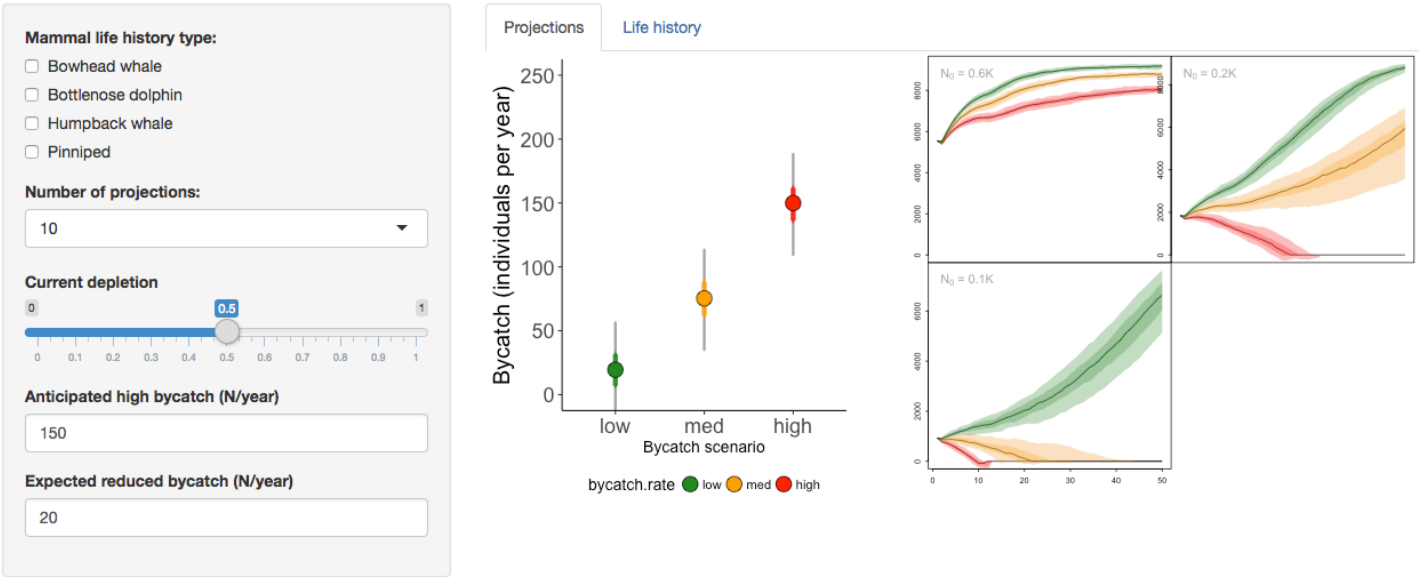
In this project, we will develop an interactive tool that allows users to visually explore the impacts of different bycatch management actions on marine mammal abundance, given limited information about the fishery or the marine mammal of interest (i.e., abundance, current bycatch, and productivity). Users will be able to compare outcomes among various bycatch and abundance scenarios, and explore the impacts of additional mortality besides bycatch (e.g., ship strikes). The tool will operate at various levels of complexity, using inputs chosen by the user. The tool will be based on an age-structured model that projects abundance into the future, given possible values for abundance and bycatch rates. Users can apply specific life history parameters or broad life history types (humpback whale, bottlenose dolphin, bowhead whale, pinniped, or a 'generic' life history type), along with possible ranges for abundance and catch.

Outputs include abundance trajectories under different management scenarios, and performance with respect to various management objectives. The tool could also be used to find the strategy most likely to meet certain management objectives. Drawing on previous research on estimating abundance and bycatch rates with limited data, this tool will also include a simple decision tree to guide users in selecting how best to generate abundance estimates for their population of interest. This tool will expand the utility of simulation-based risk assessment models to a broad, international user group with diverse data needs.

Figure 1

BYCATCH IMPACTS EXPLORATION TOOL

Sample visualization



Source: M. Siple

Project 4: Extended evaluation of the PBR approach

Lead: André Punt

Product: A publication in an academic journal

The Potential Biological Removal (PBR) approach is widely used to provide management benchmarks for human-induced removals of top predators. The parameters of the PBR formula were selected using simulation to achieve pre-specified conservation-related management objectives. The PBR formula was originally developed using a simple population model and assuming that all human-caused mortality is managed using the PBR approach. Subsequent work has found the PBR approach to be generally robust to more complex and uncertain situations.

In this project, we will further evaluate the PBR approach by exploring the implications of alternative population models that include environmental as well as demographic stochasticity, catastrophic events, and trends in biological parameters such as carrying capacity and natural survival. Past analyses of PBR performance have focused on the case of a single stock, but many potential real-world applications include multiple stocks and spatial population structure. In this publication, we will develop a framework to consider such aspects.

In relation to fishery impacts, this work will extend previous analyses by devising scenarios where the PBR approach is applied to only a subset of fishery sectors, with other sectors remaining outside of the management system to mimic situations where only a portion of a fishery's impacts can be managed. We will develop simulations for both cetacean and pinniped life histories. In addition, we will evaluate the consequences of alternative formulations for a "PBR formula," including those that use more data.


Tessa Francis

ADDITIONAL PRIORITY NEEDS

The working group identified two additional projects as high priority. While these projects are beyond the budget and capacity of this effort, the working group agreed it would be extremely valuable if these projects are undertaken at some point.

Project 5: Fisheries characterization and bycatch exploration tools

Lead: Paul Wade

Products: Two tools

(1) Fisheries characterization tool

This tool would help organize information about fisheries that will be needed by a country requesting a comparability finding. This includes information required in the NOAA rule:

- target fish species;
- gear type;
- the number of boats in the fishery;
- seasonality of the fishery and/or open periods;
- characterization of fishing effort (e.g., sets per day or trip); and
- spatial extent of the fishery.

Although NOAA currently does not require a specific format for comparability requests, a tool that will guide the user to input all necessary information for each fishery could be particularly useful for managers in countries that have never compiled this type of information in a standardized way.

The tool would be online, allowing for simple direct user input from other applications and uploading of documents for sections requiring substantial text. Ideally, it would also allow simultaneous uploading of spreadsheets with information about multiple fisheries. The final

product would enable the user to create a report that summarizes all the information in an organized fashion for submission to NOAA for a comparability finding. The tool would save information online, and allow report downloading to a pdf or text format.

(2) Bycatch exploration tool

From the information above, one could develop a second tool aimed at exploring potential levels of bycatch in a country's fisheries. This would require two additional databases:

- Database of marine mammal bycatch rates by gear type, scaled to cetacean density
- Database of observed marine mammal densities organized by ocean basin, broad habitat category, and other information

The global database of marine mammal densities should be a compilation of marine mammal density observations, summarized by species, referenced to latitude, ocean basin, and some (broad) habitat designations (e.g., near coastal, shelf, slope, pelagic/basin). It is not intended to be a detailed multivariate analysis of habitat association. For each species, the tool would allow the user to conduct a simple assessment of variability in density across the above-referenced variables. The final output would be a predicted distribution of marine mammal densities in a specific locale. In areas that lack survey data, verbal descriptions of species abundance (i.e., 'rare,' 'uncommon,' 'common,' 'abundant,' etc.) could be used for creating distributions.

With the information on bycatch rates and marine mammal densities, combined with the fisheries characterization tool, the bycatch exploration tool would guide users in identifying the most relevant information on bycatch for their country's fisheries. This additional information about a fishery could then be used to predict a range of potential bycatch levels. This would help countries prioritize which fisheries were most in need of additional survey data, including both observer programs to estimate bycatch rates, and marine mammal abundance estimates.

Finally, it is important to note is that the tool is not intended to "estimate" bycatch in lieu of data. Rather, it would provide an initial assessment of which fisheries might have the largest bycatch concerns, and allow users to explore possible bycatch ranges for various fisheries to prioritize which fisheries are most in need of data collection on bycatch and marine mammal densities.

Project 6: Area-Based management tools

Lead: Rob Williams

Product: A publication in an academic journal

Area closures offer a practical way for countries to demonstrate bycatch reduction in the absence of marine mammal abundance estimates requiring costly systematic surveys. There is value in exploring a case study (e.g., porpoise and dolphin bycatch in BC salmon gillnet fisheries) in which spatially-explicit data on marine mammal density and fishing effort are available. This could be used to estimate the proportion of an area that would have to be closed to fishing effort (without displacing fishing effort outside of closure areas) to reduce bycatch to a level below PBR.

This project has the potential to leverage NOAA's investments in spatial bycatch tools (e.g., http://cons.scienceontheweb.net/bycatch/) for several species that vary in the patchiness of their distribution and their co-occurrence with fishing effort. This approach is valuable given its opportunity to deliver spatial tools that are affordable and attainable, relative to the cost, data requirements, and level of analytical sophistication needed to implement conventional (PBR-like) approaches.

WORKSHOP PARTICIPANTS

Working group members

- André Punt, Chair, University of Washington
- Tessa Francis, Co-Chair, University of Washington Tacoma
- Rob Williams, Co-Chair, Oceans Initiative
- Philip Hammond, University of St. Andrews
- Jeffrey Moore, NOAA Southwest Fisheries Science Center
- Andrew Read, Duke University (not present)
- Randall Reeves, Okapi Wildlife Associates
- Maritza Sepulveda, University of Valparaiso
- Gudjon Mar Sigurdsson, Marine and Freshwater Research Institute
- Margaret Siple, University of Washington
- Gisli Vikingsson, Marine and Freshwater Research Institute
- Paul Wade, NOAA National Marine Mammal Laboratory
- Alex Zerbini, Contractor, NOAA National Marine Mammal Laboratory
- Genoa Sullaway, Project Coordination, University of Washington

Invited experts

- John Henderschedt, NOAA Fisheries, Office of International Affairs and Seafood Inspection
- Kristy Long, NOAA Fisheries, Office of Protected Resources

Observers

- Rohan Currey, Marine Stewardship Council
- Katie Dekis, AIS Observers
- Dennis Heinemann, Marine Mammal Commission
- Emily Knight, Lenfest Ocean Program
- Sarah Uhlemann, Center for Biological Diversity

Contact

The Marine Mammal Bycatch Working Group is a collaboration between the Ocean Modeling Forum and Oceans Initiative, and is funded by the Lenfest Ocean Program. For any questions, please contact Tessa Francis, Managing Director, the Ocean Modeling Forum, at tessa@uw.edu, or Emily Knight, Manager, Lenfest Ocean Program, at eknight@lenfestocean.org.

The next meeting of the working group will be in November, 2018.

OMF | Ocean Modeling Forum

The Ocean Modeling Forum helps managers, scientists, and the ocean community use models to take on complex ocean issues. We bring expert modelers together with scientists and participants across disciplines. We help managers frame questions, understand the strengths and limitations of different models, and learn how to incorporate models in their work. By creating an environment for experimentation and learning, the OMF is building the innovative models needed to tackle the ocean challenges of the future, and a community to support that exploration. Visit us at www.oceanmodelingforum.org, and follow us @oceanmodeling.

The Lenfest Ocean Program is a grantmaking program that funds scientific research that informs decisions about the world's oceans. Supported research projects target science needs related to pressing ocean policy and management challenges, generating adaptive recommendations, seeding innovation, and empowering people with information. The Program was established in 2004 by the Lenfest Foundation and is managed by The Pew Charitable Trusts. Visit us and sign up for our newsletter at www.lenfest.org, and follow us @lenfestocean.

901 E Street NW,
Washington DC 20004

E info@lenfestocean.org
P 202.540.6389

lenfestocean.org

Lenfest Ocean Program was established in 2004 by the Lenfest Foundation and is managed by The Pew Charitable Trusts

SUPPORTING SCIENCE AND COMMUNICATING RESULTS.