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# Progress Report on Rangewide Gray Whale Modelling

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INTERNATIONAL  
WHALING COMMISSION

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## ABSTRACT

The status of the recommendations related to developing a population dynamics model to explore future scenarios for gray whales in the North Pacific is reviewed. In general, the recommendations has been followed up on. The key exception is that fishing effort data are not available so cannot be used to adjust bycatch rates.

## BACKGROUND

The first two workshops on population structure and status of North Pacific gray whales (IWC, 2015a, b) developed a multi-stock age- and sex-structured population dynamics. Punt (2015) summarizes the most recent version of the model and provides fits of the model to available data for three stock structure hypothesis, along with the results of preliminary projections. This document summarizes the recommendations made by the Scientific Committee based on the report of the 2<sup>nd</sup> Workshop (IWC, 2015b), as well as additional recommendations by Punt (2015), along with a summary of progress relative to each recommendation.

## RECOMMENDATIONS FROM SC66A

The SC noted that to successfully complete the modeling efforts required for the workshop, the following data-related tasks needed to be completed:

- (1) Compile updated abundance estimates and variance and covariance matrices for feeding grounds. **Status:** no new abundance data are available for the PCFG and California areas; the abundance estimates for the Sakhalin area have been updated and a variance-covariance matrix is now available (information from Justin Cooke).
- (2) Complete matching of gray whales photographed south of Sakhalin Island along the coast of Asia. **Status:** the matches have been completed and “best” and “possible” matching scenarios have been developed.
- (3) Compile fishing effort along the US and Canadian west coast to determine trends by fishery type (*e.g.* pots, gillnets, set nets, etc.). **Status:** no data on fishing effort data appear to be available.
- (4) Further analyses to narrow the bounds on the stock composition of whales observed at Sakhalin Island. **Status:** Justin Cooke will report on this at the workshop.

The SC identified the following modelling efforts:

- (1) Update modelling framework with revised abundance estimates and mixing matrices. **Status:** The modelling framework has been updated to use the revised abundance estimates.
- (2) Conduct further sensitivity examination to pre-specified parameter values. **Status:** Sensitivity to MSYR and immigration rates is now explored.
- (3) Incorporate available data on fishing effort for the west coast of the US. **Status:** Not completed as there are there are no fishing effort data.
- (4) Evaluate parameter uncertainty using bootstrapping. **Status:** Parameter uncertainty is now explored using bootstrapping.
- (5) Integrate the gray whale and PCFG SLAs into the modelling framework. **Status:** The gray whale and PCFG SLAs have been integrated into the modelling framework.

### **(ADDITIONAL) RECOMMENDATIONS FROM PUNT (2015)**

- (1) The realism of the results needs to be evaluated. For example, stock hypothesis 5a implies an increasing Western breeding stock, while the north and WFG feeding aggregations are all estimated to be well below carrying capacity. **Status:** This should be reviewed at the Workshop
- (2) The scenarios should be expanded. (MSYR, the pulse of animals into the PCFG feeding, data weighting). **Status:** The paper to be presented to the April workshop will include a list of possible factors on which scenarios could be based will provide a set of possible scenarios.
- (3) The model should be fitted to time-series of bycatches where these are available rather than to the average bycatch over the period 2008-2012, but this requires effort data. **Status:** There are no effort data to enable this recommendation to be implemented.
- (4) The software used for minimization is prone to convergence to local minima. This has been explored to some extent, but further checking should take place before final conclusions are drawn. **Status:** The code implementing the minimization algorithm has been checked.

### **REFERENCES**

- International Whaling Commission. 2015a. Report of the Workshop on the Rangewide Review of the Population Structure and Status of North Pacific Gray Whales, 8-11 April 2014, La Jolla, California, USA. *J. Cetacean Res. Manage. (Suppl.)* 16:487-528.
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