

4th Working Group Meeting on the Multi-study OCEAN acoustics Human effects Analysis (MOCHA)

Duke Marine Lab, Beaufort, North Carolina
4-6 September 2013

1. Summary

This document briefly reports on the fourth meeting of the US Office of Naval Research sponsored MOCHA working group, held on 4-6 September at the University of Duke Marine Laboratory. The overall aim of the group is to develop and implement innovative statistical methodologies for the analysis of behavioral response study (BRS) data. In this fourth meeting we focused on pilot whales, and the related analyses that the MOCHA team and BRS project teams have been working on thus far.

2. Background and objectives of working group

The background to the work and the objectives of the working group are described in full in the report of the 1st Working Group Meeting and in the project proposal. Both of these documents are available for download from <http://www.creem.st-and.ac.uk/mocha/>

The specific objective of the 4th Working Group Meeting was to focus on analysis carried out by BRS project teams and the MOCHA team on the pilot whales, to discuss priorities for development of analysis tools for these species, and to plan ahead for the 4th workshop (on baleen whales). The focus on pilot whales extends our previous work on other social odontocete species, and throws up the challenge of identifying behavioural changes against a background of complex and variable baseline behaviour.

3. Summary of fourth working group meeting

Following a brief introduction to the MOCHA project, the meeting began with an overview of the relevant work that has been/is being carried out on pilot whales. Presentations were given by Quick and Sayigh (representing the AUTECH BRS data), Curé (representing the 3S BRS data), Read (representing the Cape Hatteras BRS data), and Jensen (representing data from the Mediterranean). Each presenter suggested potential metrics that may be used to assess behavioural changes, such as call rate, the use of particular call types e.g. stereotyped calls, group size, and horizontal movement. Detailed technical discussions followed each presentation. In particular there was much discussion relating to the use of acoustic data as there has already been significant effort expended on the acoustic records from some of the BRS studies (i.e. much of it has already been audited and some has been classified into call types).

The purpose of the second session was to generate new ideas for the analysis of pilot whale BRS data in terms of which data streams to look at and how to combine data streams into useful metrics. The aim was to select a few ideas to take forward in break-out groups. An

extensive list of ideas was generated and two were chosen for further development during the meeting:

- Developing a tool to examine, in detail, the 30 seconds before, during and after a playback or after each sound transmission in a ramp-up sequence (30 seconds relates to duration of playback in Cape Hatteras experiments); then, considering methods to assess the significance of any change-points identified in these fine-scale snapshots.

- Investigating the correlation between call rate and behaviour from (visual) behavioural observations to try to understand the context of calls.

Two groups were set up to work on these ideas over the course of an afternoon. Both groups were very productive and it was agreed that we will take forward the ideas and continue development as part of technical group meetings.

The MOCHA team are particularly interested in developing state-based methods for pilot whales, and odontocete species in general. We therefore spent a session reviewing the progress made by MOCHA and by individual BRS projects. MOCHA presented the latest developments on a Hidden Markov Model (HMM) that is being developed for application to BRS type data to allow us to look at behavioural states from tag or focal follow data and look at transition probabilities between states in the presence of covariates (e.g. acoustic exposure). We also presented a non-hidden state-space model being applied to sperm whale dive data. There was interest in applying the latter to existing pilot whale datasets. Isojunno presented a HMM model that has been applied to 3S sperm whale dive behaviour data and again there was discussion about how to use the same approach on pilot whale data. Finally Bowers presented an update on progress with fitting state-space models to pilot whale data with a multinomial logit. Detailed technical discussions followed each presentation.

We held a summary discussion session identifying priorities for development over the coming months.

The final session focussed on plans for the 5th working group meeting on baleen whales which will be hosted by Cascadia Research Collective and the SOCAL project in Olympia, Washington in March 2014. The 3S and SOCAL project teams presented the data they hold on baleen whales and the analysis they have conducted and plan for the near future. In addition, we have invited the BRAHSS project (Behavioural Response of Australian Humpback whales to Seismic Surveys) to attend the baleen whale working group meeting and Harris presented an overview of the BRAHSS project and data on their behalf. It was agreed overall that there should be a coordination of efforts over the coming months in the lead-up to the baleen whale meeting. Unlike most of the working group meetings to date, we are now in a situation where for this species group there is a good sample size for some species (humpback and blue whale in particular) and analysis is well underway within individual project teams. Finally, it was agreed that the format of the pilot whale working group meeting had worked well and the development sessions were enjoyed by all, so we will allow time for more of these development sessions at the baleen whale meeting.

4. Acknowledgements

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