# Change-point analysis tech group meeting minutes

Thursday 22nd May 2014

Attendees: Stacy, Brandon, Erin, Catriona, Patrick

## Simulation of DTAG data

The aim of this meeting was to discuss the Mahalanobis distance methods paper.

The purpose of this analysis is to assess the performance of Mahalanobis-distance-based change-point detection by applying it to simulated DTAG data, with simulated responses of varying intensities added.

Stacy presented some examples of simulated DTAG data and asked for feedback. Brandon commented that the simulated data has more variable heading than real data, and also that the MSA and ODBA are “spikier” in the real data than simulated. None of this should cause particular problems for the Mahalanobis distance analysis but Stacy will have another look at these data streams and make further efforts to improve the simulations.

## Species to be included

We then discussed which species should be the focus of the paper. It was agreed to use one beaked whale, one delphinid and one baleen whale species: Cuvier’s beaked whale, blue whale, pilot whale. **An updated white paper will be circulated with these minutes;** it specifies these chosen species, and outlines which baseline data from the BRS projects will be used in the analysis (as verbally agreed during this meeting). Only baseline data will be used (no exposure or pre-exposure data), and it will only be used to parameterise the simulation model (the data itself will not be analysed or presented).

## Responses to be simulated

We then discussed which responses should be simulated. These responses should be plausible, reasonable, and representative given BRS findings to date, but need not include all possible responses. It was agreed to focus on 2 response types (avoidance and foraging disruption), with 3 severities within each response type and also different durations within each of these. We will also assess the performance of the change-point analysis when different parameters are included, for example, including only input variables which display a response, or alternately including many inputs (some with and some without responses, which might swamp the signal).

It was agreed that responses of the same type, but of different intensities, would have the same characteristics. In other words, mild and severe responses would differ in magnitude, but not in qualitative description.

Finally we discussed the characteristics of the response types for the different species, as summarised in the table below. **Additions, changes and edits to these are requested at this stage; we would like to have consensus that these are acceptable before proceeding further with the analysis**.

|  |  |  |
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| SPECIES | AVOIDANCE | CESSATION OF FORAGING |
| *Ziphius* | Decreased heading variability; decreased pitch variability; increased body movements (e.g., ODBA, MSA). | Decreased variability of body movements (ODBA, MSA); longer deep dives and longer inter-deep-dive intervals; longer bottom and ascent phases of deep dives; less variability in pitch & vertical velocity during deep-dive bottom phase. |
| Blue whale | Decreased heading variability; increased ODBA/MSA; increased pitch variability during ascent/descent; increase variability in vertical velocity (wiggles during ascents/descents) | Decreased variability in ODBA/MSA, pitch, and vertical velocity; fewer spikes in ODBA/MSA; no deep dives; “foraging-shape” dives replaced by shallow dives. |
| Pilot whale | Decreased heading variability; increased ODBA/MSA | Decreased variability in ODBA/MSA and roll; more shallow and fewer deep dives; less-steep pitch angles; higher average speed; decreased average ODBA. |

## Which variables to compute MDist for?

Section added 6/8/2018

Based on publications that have looked at Mdist time series (fine scale) which variables should we be looking at?

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| --- | --- | --- | --- |
| Paper | Species | Type of Response | Variables |
| Wensveen | Bottlenose whale | Avoidance | dive profile wiggliness, sine and cosine of heading, variability of pitch, and variability of heading |
| Wensveen | Bottlenose whale | Energetic | ODBA and pitching relative to the body axis |
| Miller et al. 2015 | Bottlenose whale | Avoidance | dive profile wiggliness, heading (decomposed into sine and cosine components) and variability of animal pitch and heading |
| Miller et al. 2015 | Bottlenose whale | Energetic | ODBA and pitching movements relative to the body axis |
| Stimpert et al. 2014 | Baird’s beaked whale | (No name) | fluke rate, ODBA, RMS flow noise, heading  (decomposed into sine and cosine components), variability of heading, and depth inflections |
| Southall et al. | Blue whale | Directed movement | MSA, heading variance, horizontal speed, lunge rate |
| Antunes et al. 2014 | Long-finned pilot whale |  | Speed, easting, and northing |
| Kvadsheim et al. 2017 | Minke whale | Avoidance | animal speed and variability of heading |
| Kvadsheim et al. 2017 | Minke whale | Energetic | animal speed and respiration  rate, variability of respiration rate, and ODBA |
| Literature consensus set |  |  | ODBA, sin/cos of heading, heading variance, pitch variance |