

**Australian Marine Mammal Centre**  
**Final Report**  
(subclause 9 and Schedule Item 5 of the Funding Agreement)

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- **Project No.** – 0708/18
- **Title** - Humpback whales and the impact of noise: Controlled Exposure Experiments
- **Chief Investigator** – Dr Michael Noad
- **Organisation** – University of Queensland

**Activity Period** – 21 November 2007 to 27 March 2009

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**1. Activity Summary**

A clear summary of approximately 500 words outlining the work undertaken and any significant findings (for publication on the Department's web site)

**Over 4 weeks in September and October 2008, we conducted a series of 12 acoustic Controlled Exposure Experiments (CEEs) on humpback whales off the Sunshine Coast north of Brisbane. The acoustic exposures were conducted using an underwater acoustic transducer suspended from a small boat. The movements and behaviours of the whales were monitored by land-based observers before, during and after the exposures (BDA design). As in previous years, the signals used were humpback whale social sounds and a repeated rising, artificial tone. The exposures and monitoring were successful and the data collected added substantially to data collected in previous years allowing us to progress analysis of the full data set. While performing the CEEs, we also obtained biopsy skin samples from six whales and blow mucus samples from five whales.**

**As part of the CEEs, we attempted to place suction cup ‘Dtags’ on the backs of some whales as they moved down the coast so that these whales could be focal groups for exposure. The placement of tags was less successful than anticipated, with only three whales tagged, due to the use of inadequate equipment. We did, however, learn a great deal about Dtags in the process. Originally we planned to send a team member to Woods Hole Oceanographic Institution (WHOI) in the US to learn how to run the Dtags, but we ended up bringing Alison Stimpert, an experienced Dtag user from the Univ. Hawaii out to the field site instead to teach us about tag assembly, tag preparation, programming the computer, degaussing the magnetometers, tag calibration, deployment and data download. This was extremely instructive and provided a great deal of the necessary ‘technology**

transfer' required.

A comprehensive report on the CEEs, incorporating data from this and previous seasons and funded by non-AMMC sources, is being prepared and a copy will be forwarded to AMMC when it is complete. We also hope to publish this in the scientific literature.

In addition to the CEEs, we recorded and acoustically tracked 30 singers and at least seven groups that were producing social sounds in a variety of contexts. The tracking of singers is part of the long term monitoring of song pattern in the east Australian population and the development of acoustic census techniques for humpbacks.

We also performed a comprehensive set of test acoustic transmissions that were used to more accurately measure the propagation of sound at the study and improve our ability to measure acoustic source levels of whales and other sources of interest.

## 2. The Outcomes/Objectives

The degree to which the Activity has achieved the objectives

The objectives of the overall project were a mix of immediate field objectives directly related to the AMMC-funded 2008 fieldwork, and overall project objectives, the realisation of which relied on data collected in earlier years and analyses funded by the oil and gas industry. (The AMMC-funded project did not include data analysis.)

The specific objectives relating to the 2008 fieldwork were mostly met. These included conducting CEEs using humpback whale social sounds and artificial tones, biopsying some whales that were subjected to CEEs to ascertain their sex, and collecting blow mucus from some whales.

We also intended to place WHOI Dtags on some of the whales during CEEs, however this part of the project did not go to plan. This sort of tagging requires a long pole swivel mounted on the front of a boat, and the pole we constructed was not sufficiently rigid for the job. We successfully tagged 3 whales, but not in conjunction with any of the CEEs. (The CEEs still have great value despite this as the behavioural data were still collected from visual observations and tracking.)

Our other immediate but more strategic objectives were also largely met. We were able to invite representatives from the Oil and Gas Producers' Sound and Marine Life Program to the field site during the field season for a meeting. They were impressed with the set up, and we have recently submitted a full proposal to them requesting funds of close to \$7m. Also, despite the lack of success in tagging whales, we did learn a great deal about tag preparation and data handling from Alison Stimpert (Univ. Hawaii) during our fieldwork, providing technology transfer to Australia.

The other objectives covered the larger body of work that included the AMMC-

**funded 2008 fieldwork as well as other series of experiments conducted at Peregian Beach since 2002. The CEEs in 2008 were conducted in sufficient numbers to allow detailed analysis to proceed when added to the previously gathered data. These data are currently being analysed and a comprehensive report, using data from the 2004 experiments as well as the 2008 experiments, is close to completion. This will include analyses of the types of reactions recorded and variation from normal behaviour of the whales during exposure. Received levels at which reactions occur will be included.**

**Finally more survey data, regarding both the numbers of whales seen moving down the coast and the numbers of singers heard, were collected. These will be used in an analysis in the numbers and distribution of whales off the Sunshine Coast during the southward migration and also in the future continued development of acoustic survey techniques for humpback whales.**

### **3. Appropriateness**

**The appropriateness of the approaches used in the development and implementation of the Activity**

**The approaches used were entirely appropriate in the development of the activity. The funded 2008 fieldwork was part of series of CEEs since 2002 and this body of work is now considered one of the world's three foremost series of CEEs on marine mammals. CEEs are the only way to ascertain with experimental rigour how marine mammals react to, and are affected by, anthropogenic sound. Obtaining more data on this is vital to rational management of shipping and other industrial or military activities in the marine environment and so is of great importance.**

**The approach we have developed at Peregian Beach, where we follow focal groups of whales from land and use small, inexpensive sources, is different to those of the other two big CEE programs in the world. This enables us to have much greater sample sizes than in the other studies and we are at the forefront of developing statistical techniques for analysis of these data. This provides further validation of the approach we are pursuing. We also believe that although CEEs have huge potential, they have to be conducted carefully, and in a way that can be demonstrated to not harm the target whales.**

### **4. Effectiveness**

**The degree to which the Activity has effectively met its stated objectives**

**The 2008 fieldwork (the activity) was effective in providing more data which, in conjunction with previously collected data, has allowed the comprehensive analysis of CEEs – the primary objective of the study. As mentioned above, the only part of the activity that really fell short of expectations was our low success at tagging whales with Dtags. Despite this we did tag three whales which provided valuable experience, and we know now what is required for future development of this technique.**