

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

- **Project No.** – 2009/19
- **Title** - Genetic structure and abundance of fishery-impacted dolphin populations of the Pilbara region, north-western Australia
- **Chief Investigator** – Simon Allen
- **Organisation** – Murdoch University

Activity Period – (since Progress Report #2) 1st May 2011 to 30th April 2012

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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)

We collected ~260 biopsy samples from bottlenose dolphins (*Tursiops* spp.) across the Pilbara to examine population genetic structure. Data have been analysed for ~200 of these samples. The key findings of this component of the research were as follows: (a) Most dolphins (n=63) sampled within the Pilbara Trawl Fishery (PTF) formed a monophyletic clade with the common bottlenose dolphin (*T. truncatus*), while one by-caught individual clustered with the Indo-Pacific bottlenose dolphin (*T. aduncus*). Unexpectedly, six individuals formed a highly supported monophyletic clade with the Fraser's dolphin (*Lagenodelphis hosei*); (b) Repeat samples of individuals collected days to months after initial sampling suggest that some dolphins show fidelity to foraging around trawlers; and (c) Genetic sexing of dolphins indicated a bias toward males being sampled in close proximity to the trawlers. Further, there was no evidence of structure in the PTF-associated dolphins, while those sampled in near-shore locations (all *T. aduncus*) appear structured in a way that reflects isolation by distance. Assessments of effective population size and whether a change in population size can be detected from genetic data will form the basis for a second manuscript.

In order to estimate the number of dolphins interacting with PTF trawlers, two consecutive one-week trips on a trawler were carried out. Twelve 20-minute photo-ID sessions of dolphins were completed from a small boat deployed from an actively fishing trawler: (a) Group sizes of 17 to 46 (mean = 28) dolphins were photo-identified following the trawler, totalling 336 dolphins, including repeat sightings of individuals; (b) A catalogue of 151 individually recognisable dolphins was constructed; sighting frequencies ranging from one to seven in the 12 capture periods; 100 individuals were photographed once or twice, while 51 were identified three to

seven times; and (c) Preliminary analysis yielded a ‘global estimate’ of 183 (± 11) dolphins associated with the trawler over two fishing trips. Furthermore, photographic matches of three individuals were made between this dedicated research and opportunistic photographs taken in 2008 and 2009. These findings, combined with those from the preliminary genetic evidence, indicate that a community/sub-population of dolphins exists that show fidelity to foraging around trawlers over periods ranging from weeks to years.

An aerial survey to estimate abundance of dolphins across the PTF was conducted simultaneously with the dolphin photo-ID. Transects were flown at: 100 kn speed; 500 ft elevation; 2 nm apart; with dual platform observers on one side of the plane and a single observer on the other. We surveyed four of the five Management Areas (1, 2, 4 [fished] and 3 [unfished]) making up the PTF. A total of 87 dolphin group sightings were recorded, ranging in size from 1 to 30 (mean = 5) individuals. Three groups (of 9, 24 and 56 individuals) were recorded associating with trawlers. Abundance estimates will be calculated using program Distance: (a) for the total area; (b) drawing comparisons between fished and un-fished management areas; and (c) between the trawler-associated community estimates calculated in program Mark and a similar region of the aerial survey. Ultimately, we aim to compare the observer-reported dolphin bycatch from the portion of the PTF that corresponds with both our photo-ID estimate and the aerial survey abundance estimate from that region.

Currently, there are two ‘in press’, one ‘accepted’ and seven ‘in prep’ manuscripts that stem, at least partially if not entirely, from this research project. These results, combined with further analyses on the data set, will allow us to assess the sustainability of ongoing dolphin bycatch in the PTF, having national application in reducing negative delphinid-fisheries interactions.

2. The Outcomes/Objectives

| List of the Project Objectives |
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| <ul style="list-style-type: none"> (i) Examine bottlenose dolphin (<i>Tursiops</i> spp.) stock/population genetic structure, effective population size and gene flow across the Pilbara; (ii) Calculate an estimate of the number of dolphins that interact with trawlers in the Pilbara Trawl Fishery by conducting photo-ID; (iii) Estimate the total abundance of dolphins in the Pilbara Trawl Fishery by conducting an aerial survey. |
| The degree to which the Activity has achieved each of the objectives |
| <p>Objective (i): Good sample sizes were obtained for the genetic analyses and the first of two publications on this research will be submitted before mid-2012. The final batch of samples will be extracted and added to the data set for more detailed analyses, resulting in a second publication on effective population size and comparing coastal and fishery-impacted dolphin populations (for submission in late 2012). We also collected biopsy samples from 50 humpback dolphins (<i>Sousa chinensis</i>) and 15 snubfin dolphins (<i>Orcaella heinsohni</i>) that were provided to AMMC project 2008-09/19 (Parra <i>et al.</i>).</p> |

Objective (ii): Obtaining a ‘community estimate’ of trawler-associated dolphins for the entire PTF was not possible due to the logistic constraints of deploying a small boat at sea and being a secondary priority to fishers’ operations. However, the data obtained show that (a) the numbers of dolphins encountered during a trip to sea is not as high as reported by Dept. of Fisheries researchers and fishers (high hundreds to thousands), rather, < 200 individuals were seen over two trips; and (b) certain individuals/groups show fidelity to foraging around trawlers over periods ranging from weeks to years. This finding is crucial to the management of delphinid-fishery interactions and provides the basis for comparisons of abundance estimates from the aerial survey with those from photo-ID work around the trawlers during the same period.

Objective (iii): It was only possible to complete aerial surveys of dolphins for four of the five PTF Management Areas (MAs). However, the area that was not surveyed (MA #5) has the least fishing effort and is where the fewest dolphins are caught. The trawl fishery operates between the 50 m and 100 m depth contours and the four MAs surveyed included three areas open to fishing and one that is closed to fishing, and the area in which the majority of the photo-ID work was carried out. A sound data set was gathered that will be analysed further in coming months and form the basis of an abundance estimate for the fishery as a whole and, thus, assessments of the sustainability of ongoing dolphin bycatch in the PTF. NB: Importantly, we have recently secured external support that will allow us to obtain accurate dive-time data from PTF dolphins. This will then allow us to make more realistic estimates of the availability/detection parameters for PTF bottlenose dolphins and, hence, a tighter abundance estimate.

3. Appropriateness

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

All of the approaches used in the development and implementation of this project were suitable and appropriate for gathering data and conducting analyses. The broad dissemination of results to management agencies, researchers and industry validates this approach. The results from this study will inform a serious and ongoing resource management issue in WA and global waters: marine mammal bycatch in commercial fisheries.

4. Effectiveness

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

The Activity has met the stated objectives effectively (further details above in section 2b “The degree to which the Activity has achieved each of the objectives”). NB: More refined analyses will continue throughout 2012, resulting in numerous peer-reviewed publications in late- 2012 and early- 2013. Thus, while the contract for the project has been completed with this Final Report, management-oriented research results will continue to be produced from this AMMC-funded research. Our original proposal of 2009 listed three publications as “expected outputs” from this project, but six or seven are more likely to result (see list under Communication below).

5. Communication

How results will be communicated to management

During this project, we maintained open communication via phone, email and face-to-face meetings with both industry and management. Conference presentations have been, and will continue to be, delivered. Updates have been posted occasionally on the research group's website (<http://mucru.org/>). Numerous peer-reviewed journal publications are 'in press', 'accepted' or 'in preparation' as a result of this AMMC-funded research (*some in combination with the prior FRDC-funded research; **some that are presented as data summaries until more refined analyses and manuscript writing are completed; ***one presented as a short report that will be submitted to a regional journal). To that end, please find the following PDFs attached (the full papers of those 'in press' are attached, while the titles and abstracts only of those 'accepted' or 'in prep' are attached – full manuscripts are available on request):

1. **Allen SJ**, Cagnazzi DD, Hodgson AJ, **Loneragan NR** & **Bejder L** 2012. Snubfin, humpback and bottlenose dolphins of north-western Australia: Unknown quantities along a changing coastline. *Pacific Conservation Biology* 18: xxx-xxx.
2. **Bejder L**, Hodgson AJ, **Loneragan NR** & **Allen SJ** 2012. Coastal dolphins in north-western Australia: The need for re-evaluation of species listings and short-comings in Environmental Impact Assessments. *Pacific Conservation Biology* 18: xxx-xxx.
3. Brown A, **Bejder L**, Cagnazzi D, Parra GJ & **Allen SJ** In prep. The North West Cape, Western Australia: An Indo-Pacific Humpback Dolphin Hotspot? *Pacific Conservation Biology*
4. ***Allen SJ**, **Loneragan NR**, Kopps AM, Kobryn HT, **Bryant K** & **Krützen M**. In prep. Genetic status of trawler-associated dolphins off the Pilbara, Western Australia. *Marine Mammal Science*
5. ***Allen SJ**, Tyne J, Kobryn HT, **Bejder L** & **Loneragan NR** In prep. Spatial and temporal patterns of dolphin bycatch in a north-western Australian trawl fishery. *Fisheries Research*
6. *Jaiteh VF, **Allen SJ**, Meeuwig JJ & **Loneragan NR** Accepted. Sub-surface behavior of bottlenose dolphins (*Tursiops truncatus*) interacting with fish trawl nets in north-western Australia: implications for bycatch mitigation. *Marine Mammal Science*
7. *Jaiteh VF, **Allen SJ**, Meeuwig JJ & **Loneragan NR** In prep. Efficacy of two bycatch reduction devices for protected and vulnerable species in an Australian fish trawl fishery. *Marine and Freshwater Research*
8. ****Allen SJ**, McElligott DB, **Loneragan NR** & **Pollock K**. Photo-identification of bottlenose dolphins associated with the Pilbara Trawl Fishery, Western Australia. *Journal of Cetacean Research and Management*
9. ****Allen SJ**, Smith J, **Loneragan NR** & **Pollock K**. Abundance estimates of bottlenose dolphins in the Pilbara Trawl Fishery, Western Australia. *Fisheries Research*
10. *****Allen SJ** 2012. Photo-identification and biopsy sampling of four dolphin species off the Dampier Peninsula, Western Australia. Unpublished report to MUCRU (<http://mucru.org/>) 6 pp. (*Western Australian Naturalist?*).

