

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

- **Project No.** – 0708/3
- **Title** - Improving information on dugong movements and habitat use using innovative tracking technology
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- **Organisation** – James Cook University

Activity Period –

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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)

This project aimed to evaluate how well the new Fastloc-style approach to GPS telemetry overcomes the limitations of infrequent and brief surfacing times on satellite telemetry for dugongs. The technology holds the promise of providing more precise location data more often, thus enabling insights into important features of dugong biology, such as movement pathways between core habitat areas.

We first investigated options for purchasing Fastloc devices. Due to complexity of the technology, and the need for a housing and attachment suitable for dugongs, we opted for Telonics QFP, rather than Fastloc *per se*. The short term of the contract precluded the trialling of design options with other manufacturers. Telonics have worked with manatee researchers extensively so had sorted out these issues, as manatee behaviour and habitat use are very similar. We purchased a total of five Telonics QFP units along with custom-made tethers from Ocean Industries in Perth.

In June 2008 we deployed the five units on dugongs in Shoalwater Bay, Queensland. Unfortunately, one unit ceased functioning very soon after deployment. It was not retrieved and thus we cannot identify the cause of the malfunction. The remaining four units were deployed for approximately three months and data downloaded via the Argos system. Two units were retrieved on an initial retrieval attempt in September via the built in remote-release. The remote release on the remaining two units appeared not to work in a reasonable time and retrieval was deferred for a later second attempt. One unit ceased

functioning in the intervening period and thus was not retrieved. The final unit was retrieved two weeks later after washing ashore in a mangrove area. Ultimately we collected most of the data from one transmitter (via Argos uploads) and full data from the three of the five original units that we recovered.

To date two deployments have been made in Shark Bay, Western Australia, with one unit retrieved and the other still in the water. Operational difficulties (details of which have been relayed to ACAMMS in a more appropriate forum) have led to further deployment attempts being deferred until 2009.

Full interpretation of the ecological significance of the data is not yet available, however the data do show that QFP/Fastloc approaches provide additional data for dugongs that may potentially be very valuable.

Conventional GPS provided 25-35% more locations than Argos/PTT (Classes 1-3) locations alone. It should be noted here that the new generation transmitters also use the GPS/QFP locations to reference an almanac of Argos satellite passes, allowing the tag to “know” when an Argos satellite is available and thus transmit signals only when likely to be received. This alone has allowed considerably more Argos locations to be achieved, while also reducing the drain on battery power. Thus the improvement of GPS shown here is understated relative to earlier models. When the additional QFP locations are included, the improvement of the GPS/QFP relative to Argos was between 75% and 165%. This increases to a 300-500% increase in the number of successful location fixes, relative to Argos, when only the high quality (Class 3) Argos locations are used. Thus, the use of GPS/QFP substantially increases in the amount of quality data available.

More importantly, the addition of QFP technology provides locations at important times when both GPS and Argos fail. When dugongs are in deep water (deeper than the length of the tether used to attach the tag), or when making sustained movements, the tag rarely remains at the surface for long enough to successfully acquire a location fix. Thus movement pathways between core habitat areas have never been identified, and the use of deep water habitats is poorly understood. The QFP data revealed directed movements between two or more habitat areas for three of the four dugongs in Shoalwater Bay. For another dugong a movement of 30km, and subsequent return with no discernible residence time, was revealed by QFP that was not evident from GPS or Argos data.

Thus, while more data remains to be collected in Shark Bay before more formal analysis, there is strong evidence to suggest that QFP/Fastloc technologies will provide important information for management of dugongs. Unfortunately, none of the dugongs tracked made a more substantial movement out of the Dugong Protection Area (DPA) of Shoalwater Bay. However, it is likely that if future work is undertaken, such a movement will occur and be documented by QFP, allowing assessment of a fundamental but untested assumption of the efficacy of DPAs, that movement between DPAs does not expose dugongs to relatively higher risk.

2. The Outcomes/Objectives

The degree to which the Activity has achieved the objectives

As noted above, formal analysis has yet to be undertaken. However, the preliminary assessment suggests that it will be sufficient to meet the core objectives. That is, the improved quality and quantity of tracking data will be able to be assessed and demonstrated from these data. While no large scale (inter-bay) movements were undertaken by dugongs, movements of between 5 and 30km were demonstrated several times, with spacing between subsequent locations during the movement of 2.0-6.5km. Similarly, the data for Shoalwater Bay dugongs show more locations from QFP than for conventional GPS as the distance from shore (and thus depth) increase. This indicates that the objective of improving understanding of the use of deep water habitats will also be met with more extensive use of QFP technology.

3. Appropriateness

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

The approaches used in this activity have repeatedly proven to be appropriate and effective for tracking of dugongs. The only aspect of the project that was less than appropriate was the short time span of the funding and delays in processing of the funding once initially approved (delays introduced by both ACAMMS and JCU procedures). As the technology is new and complex, and requires custom design of the housing for dugongs, the intention to make two three month deployments constrained the amount of time that could be dedicated to design and testing. Thus, while we had originally proposed to use "Fast-loc", the only viable alternative was the QFP offered by Telonics. Fortunately this likely became a benefit rather than a weakness given the advantages of Telonics' use of GPS/QFP location to gain efficiency in Argos transmission schedules.

We note here, too, that the above tight time constraints make achieving the objectives very susceptible to mishaps, such as has occurred in Shark Bay, leaving the data collection there incomplete at time of writing.

4. Effectiveness

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

This matter is addressed above in response to Q1 and 2. The Activity has met its objectives, but formal analysis will be delayed until more data are acquired from deployments in Shark Bay.