



Australian Government

Department of the Environment, Water, Heritage and the Arts

## Marine and Tropical Sciences Research Facility Milestone Report, 31 March 2009

**Program 8: Sustainable use and management of marine resources of the Great Barrier Reef**

**Project 4.8.2: Influence of the GBR Zoning Plan on inshore habitats and biodiversity, of which fish and corals are indicators: reefs and shoals**  
[Objective (b) Measure the response of biological communities (fish and benthos) to differential zoning of human use on inshore shoal habitats]

**Project Leaders: Dr Peter Doherty, Australian Institute of Marine Science (AIMS)**

**Investigators: Mike Cappo and Marcus Stowar, AIMS**

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### Summary

For Year 3 of the MTSRF Program (2008/2009), we proposed to test whether or not the 'effects of fishing' signals detected by shallow-water surveys are also reflective of relative abundance of deepwater sweetlips (*Lethrinus miniatus*), snappers (*Lutjanus sebae*), cods (*Plectropomus leopardus*, *Epinephelus undulatostratus*) and tusk fish (*Choerodon venustus*). The abundant starry triggerfish (*Abalistes stellatus*) and iodine bream (*Gymnocranius audleyi*) will be analysed as unfished 'controls' to ensure comparability in habitats.

We proposed to use baited remote underwater video stations (BRUVS) to sample fish abundance in deep (~45-60m) water around sixteen of the 'blue/green' reef pairs where diver surveys have shown either weak or strong contrasts in coral trout abundance in shallow water. These 32 target reefs lie offshore in the Mackay, Swains and Capricorn-Bunker regions.

Our second major objective was desktop work to refine the use of baited video techniques to establish definitive methods to detect differences in fish abundance and length compositions amongst 'green' and 'blue' reefs. The data for these analyses were collected in Year 3 from fieldwork completed in MTSRF Year 2 on the southern shoals (Barcoo and Karamea Banks, and the east and west Warregoes).

Objective (b) has been split into two studies for future scientific publications:

**1. Measure the variation among three readers, and among separate readings within three readers, in recording abundance and making species identifications.**

**Rationale:** BRUVS are becoming a popular tool for detecting the effects of zoning on fish numbers and species richness. However, there has been no accounting for differences amongst readers, or other biases:

- Where does the variation in counts of *MaxN* and species richness lie, and how bit is it?
- What are 'probabilities of agreement' for species identifications (i.e. which species, genera or families are problematic in a random and systematic way, amongst readers?)
- What would be a suitable quality-assurance protocol?

## 2. Develop objective strategies to measure fish using stereo video to detect the effects of Representative Area Program zoning?

**Rationale:** Stereo-video can be used to detect 'green' vs. 'blue' differences in fish size, but there is no standard protocol, other than to go straight to the time of maximum abundance and measure fish there. This strategy may 'miss' smaller size classes that may be displaced by bigger ones as the tape progresses. Secondly, there is no objective way to compare length distributions amongst zones.

In MTSRF Year 3, we have developed two strategies based on Time of first arrival (*Tarr*) and Time of maximum abundance (*TMaxN*) for a selected range of 'target' and 'control' fish.

- Technique 1 (T1) – Measurements are made at *Tarr* and *TMaxN* initially, and thereafter with a one-minute increment from *Tarr* to the end of the tape; and
- Technique 2 (T2) – Measurements are made at *Tarr* and *TMaxN* initially, and thereafter at multiple *TMaxNs* as the abundance of fish accumulates throughout the tape.

We aim to develop algorithms to obtain length frequency information from the 'mixed normal' distributions of measurements obtained by each technique for each species.

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## Project Results

### ***Description of the results achieved for this milestone***

Despite the passage of two tropical cyclones (*Charlotte* and *Eddie*) during our field campaign, we managed to complete the sampling of all 32 reefs during 34 sea days on site in late summer (January and February 2009) using the RV "James Kirby", which was well suited to the tight manoeuvring required near reefs.

Each reef was sampled on its leeward side, where more fishing is expected, with a single drop of twelve BRUVS.

This resulted in the collection of 344 one-hour video tapes, and we are over half way through reading this tape load. Numerous 'target' species are evident in the tape reading to date.

Once this dataset is complete and debugged, we will analyse it in a hierarchical design in order to account for regional effects, but our focus will be on the main effect (zoning). The analyses will also include depth and micro-habitat type (recorded in the immediate field of view of the BRUVS) as explanatory variables, using regression trees.

The analyses are underway for comparison of intra- and inter-reader biases in tape reading. A subset of sixteen southern shoals tapes were read twice or three times by three readers, whose experience ranged from veteran to experienced to unfamiliar. It has been encouraging

that almost 100% of the variation in the data set for red emperor (*Lutjanus sebae*) was due to differences among tapes [and not readers/readings].

The dataset of 1,226 fish measurements from twelve pairs of 'open vs. closed' stereo-video sets is now complete for comparing the two best strategies to measure fish on stereo-video tapes, but analyses of this data set have not yet commenced.

Red emperor (*Lutjanus sebae* n=264), common coral trout (*Plectropomus leopardus* n=167) and Venus tuskfish (*Choerodon venustus* n=224) were measured as key target species. Iodine bream (*Gymnocranius audleyi* n=479) and starry triggerfish (*Abalistes stellatus* n=92) were measured as 'control' (unfished) species.

### ***Problems and Opportunities***

The resignation of Dr Ed Cripps (statistician) delayed progress on the desktop studies refining the use of baited video techniques. This work has been transferred to Dr Glenn De'ath of AIMS.

### ***Communications, Major Activities and Events – During the milestone reporting period***

Mike Cappo gave a presentation on the 'shoals' BRUVS and mapping work at a meeting involving representatives from the Great Barrier Reef Marine Park Authority, RecFish Australia, CapReef and MTSRF research providers on 12-13 February 2009.

### ***Communications, Major Activities and Events – During the next milestone reporting period***

Further results will be summarised by the Project leader and presented at the third Annual Conference of the MTSRF in late April 2009.