Mid-year Report on Access to the AATAMS Facility 2008-09

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Project: Movement patterns and habitat use of rabbitfishes (f: Siganidae) on the Great Barrier Reef as a link to ecosystem function

Summary of progress to date:

Access to eight (8) Vemco VR2W acoustic receivers was provided through IMOS's AATAMS Facility in November 2008. Initial range-testing of receivers to determine approximate range and performance in the reef environment was conducted at the study site in late November 2008. On the basis of these tests, the effective range of receivers in the reef environment was found to be between 50-150m and the detection efficiency averaged 52 per cent, comparable with the performance of the same receivers in a riverine setting (Simpfendorfer 2008). The array design was based on these results.

In February 2009 eight receivers were deployed at Orpheus Island, GBR (wet-season flooding and inability to access the field site meant a slight delay in deployment from the January). A further seven receivers purchased by Prof. Bellwood, JCU (supervisor) were added to the array in April 2009. The array provides coverage of adjacent bays on the leeward side of Orpheus Island, GBR (Pioneer Bay and Little Pioneer Bay) (Figure 1). This arrangement allows us to monitor the degree of movement of the study species between adjacent bays. Receivers were positioned at a depth of approximately 3m just off the reef crest, the primary habitat of the study species. Receivers are moored 1m above the substratum (attached to poles sunk into concrete blocks) and marked with sub-surface buoys positioned approximately 5m from the receiver.

The initial aim of the study was to track the movement patterns of members of the family Siganidae. Two species within this family (*Siganus lineatus* and *Siganus doliatus*) have been included in the study. Plans to include the species *Siganus canaliculatus* in the study were amended due to a paucity of individuals in the study area available for tagging. In order to maximise this opportunity of access to AATAMS facility receivers and the establishment of an array at Orpheus Island during 2009, three further species have been added to the study of movement patterns as a link to scale of ecosystem impact: the reef excavator *Chlorurus microrhinos*, the reef scraper *Siganus rivulatus* and the invertebrate feeder and potential macroalgal remover *Platax orbicularis*. Numbers of individuals currently tagged are summarised below (Table 1). Future tagging trips are planned for August. Receivers will be removed from the study site in November 2009 in accordance with the 12 month loan period.

Receiver array:

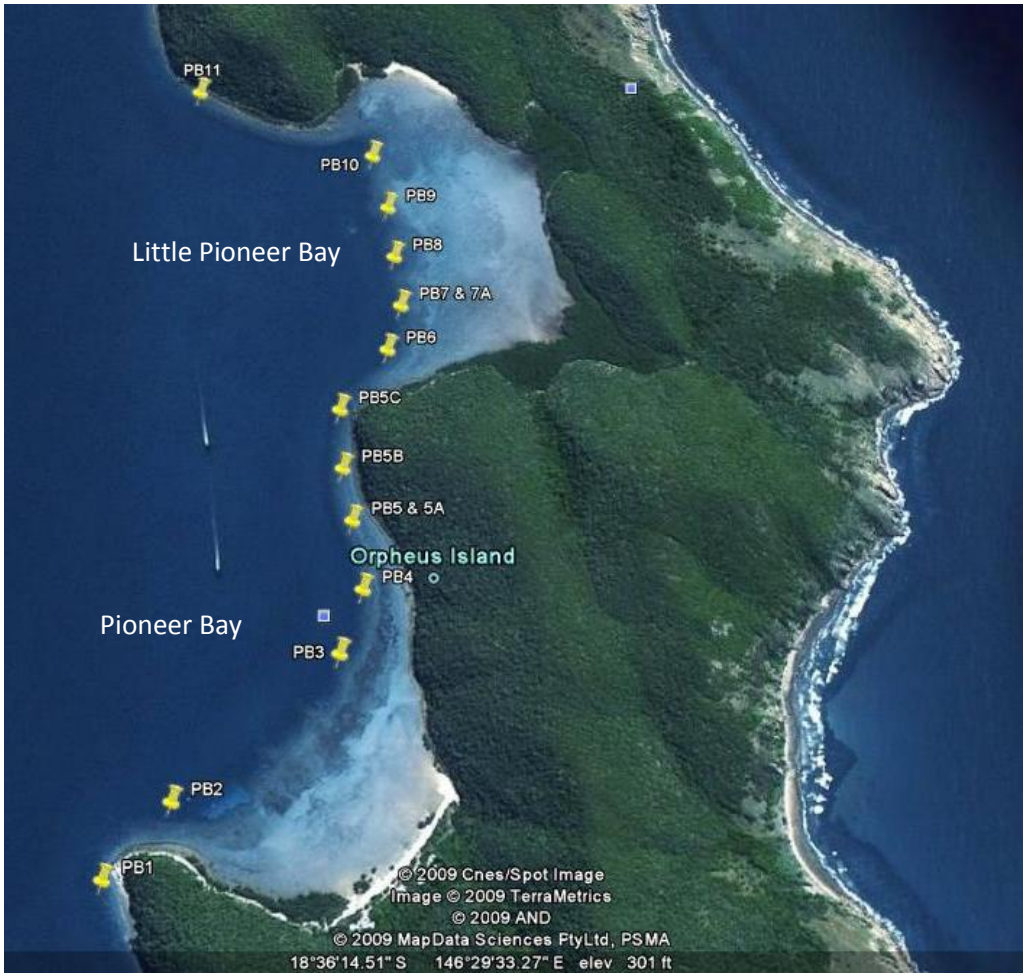

Figure 1: Map of VR2W acoustic receiver array at Orpheus Island, GBR. Yellow icons denote receiver positions in Pioneer and Little Pioneer Bay on the leeward side of Orpheus Island. Receivers PB1, PB2, PB3, PB4, PB5, PB6, PB7 and PB8 deployed in February 2009. Receivers PB5A, PB5B, PB5C, PB7A, PB9, PB10, PB11 added to array April 2009.

Table 1: Summary of individuals tagged at the study site (all Vemco V9-1L transmitters)

Species	n	Dates of tagging
Siganus doliatus	8	Feb, Apr, Jun 2009 (3 individuals no longer registering)
Siganus lineatus	5	Apr, Jun 2009 (1 individual no longer registering)
Scarus rivulatus	7	Apr, Jun 2009
Chlorurus microrhinos	6	Feb, Apr, Jun 2009 (2 individuals no longer registering)
Platax orbicularis	4	Jun 2009

Results to date:

Data downloaded from the receivers in April and June 2009 has provided initial information on the movement patterns of three of the five study species. These three species have already been shown to dominate the biomass of roving herbivorous fishes at the study site (Fox & Bellwood 2007).

Species	Summary of Movement Patterns
Siganus doliatus (Siganidae)	Of the three species, *Siganus doliatus* demonstrates the least consistency in terms of diurnal movement patterns and site-fidelity. For this reason, 4 more individuals will be added to the study in August to increase the sample size of data available for analysis. To date, individuals have shown opposing patterns in terms of on-reef presence, with one *S. doliatus* recorded moving on the reef at night-time and the other during daylight hours. One individual has shown extremely low levels of site fidelity, being recorded by the array on just a few days in each month.
Scarus rivulatus (Labridae - scarid)	Two different types of movement pattern have been detected for this species. Initial phase individuals tend to demonstrate high levels of site fidelity to small (150m) lengths of reef crest. This result is interesting, given the propensity of such individuals to form part of supposed "roving" herbivore schools. Terminal phase individuals, that might be supposed to be more territorial, have demonstrated the largest movement patterns for this species, with one individual regularly moving between the two bays at the study site and covering distances of up to 2km in a day.
Chlorurus microrhinos (Labridae - scarid)	Predictable diurnal movement patterns have been recorded, with individuals showing high levels of site-fidelity to surprisingly small areas (150m length) of reef crest during the daytime but then travelling longer distances (up to 750m) to their night-time sleeping areas (Figure 2). This movement patterns is consistent across individuals.

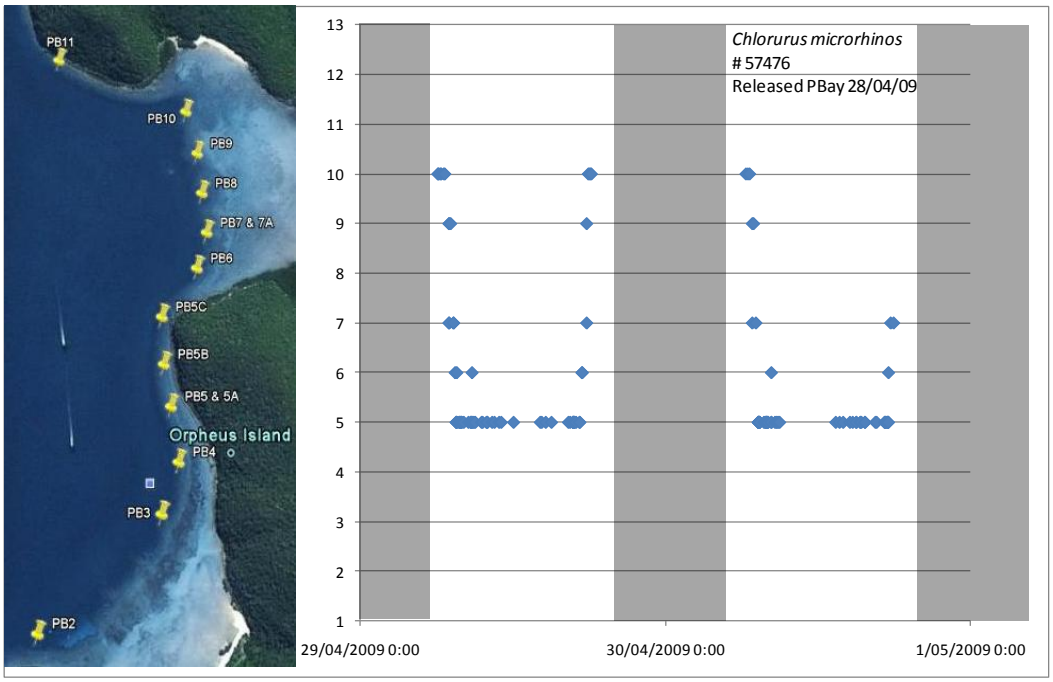

Figure 2: Detections of *Chlorurus microrhinos* (individual #57476) showing predictable pattern of movement between diurnal foraging area in Pioneer Bay (at PB5) and crepuscular migrations to sleeping location at PB8 in neighbouring Little Pioneer Bay.

Expected outcomes:

The data from this project will form the basis of two manuscripts for peer-review journals and will be combined with data obtained from manual acoustic tracking in a third manuscript.
(1) Methodological paper on the performance of acoustic receivers in a coral-reef environment, based on range tests carried out (in prep).
(2) Long-term movement patterns of dominant functional groups in a coral reef ecosystem (degree of connectivity between adjacent bays and the implications for protection of key species).
(3) Data on long-term movement patterns and site-fidelity of *Siganus lineatus* will also be used to provide substantiation of fine-scale habitat use and home range to be determined via manual acoustic tracking in September 2009.

References

Fox RJ, Bellwood DR (2007) Quantifying herbivory across a coral reef depth gradient. *Marine Ecology Progress Series* 339: 39-59

Simpfendorfer CA, Heupel MR, Collins AB (2008) Variation in the performance of acoustic receivers and its implication for positioning algorithms in a riverine setting. *Canadian Journal of Fisheries and Aquatic Science* 65: 482-492