

# Half Year Task Report

For the Financial Period 1/7/02 - 31/12/02

**Task Number:** C2.2

**Title:** Assessing Impacts of Terrestrial Run-off on Inshore Reefs

**Start Date:** 01-Jul-00

**End Date:** 30-Jun-06

## Task Contacts

**Task Associate:** HAYNES, David (Dr D)

**Task Leader:** FABRICIUS, Katharina (Dr K)

## Research Progress Summary

The group has analysed most field and experimental data collected in the first 2 years of the Task, and identified a number of community ecological properties that can be used as early-warning indicators for reef degradation. In particular, there is a gradient of declining hard and octocoral biodiversity with increasing nutrient and chlorophyll loads within both the PCB and Innisfail regions. However, only octocorals with zooxanthellae are affected by high nutrient loads, indicating the importance of water clarity for reef biodiversity. We identified a number of coral and octocoral indicator species for the 2 regions. Rates of coral reproduction, and density and diversity of recruits and juveniles, are very low in areas exposed to runoff, raising concern about their capacity to recover from disturbances such as bleaching. Results for algal abundance patterns are consistent with previous finding suggesting that direct overgrowth by algae is not a major cause of coral mortality. Rather a range of results support the task's emphasis on effects of runoff and algae on coral recruitment and population recovery. The findings were presented as Plenary Address at the International Conference for Reef Studies in Cambridge, and locally. The next field season has commenced, focussing on further work on the effects of runoff (and bleaching) on coral recruitment, and three new student project have commenced.

## Task Associate Comment

**HAYNES, David (Dr D)**

Task Associate changed from S. Morris to D. Haynes late in 2002. Presentation of synthesis of data collected to date presented to Task Associate in November. Data generated by the project has added enormously to the current debate on WQ in the GBR and the appropriate management actions necessary to prevent decline in nearshore GBR ecosystems. Task workshop/seminar being planned for early 2003.

## Task Objectives

### Objective

1. To document and quantify the status of nearshore reef communities in relation to gradients to enhanced levels of exposure to sediments, nutrients, and contaminants in terrestrial run-off from

human-influenced catchments bordering the GBRWHA.

2. To identify key environmental factors influenced by terrestrial runoff and materials in runoff that directly influence the life histories, physiological state and ecological performance of key organisms living on nearshore reefs.
3. To identify organisms or ecological features on nearshore reefs which show potential as bioindicators of impact or stress from enhanced terrestrial runoff of sediment, nutrients or contaminants.
4. To identify and document objective measures of physiological stress, degraded or altered ecological performance associated with exposure to enhanced terrestrial sediment, nutrients or contaminants, and from them, to develop robust and useful tools for the early detection of sublethal stress in corals or other key organisms on nearshore reefs.
5. To provide reef managers and users with timely and appropriate information to assist them in the management and conservation of nearshore reef systems, particularly with respect to the management of enhanced terrestrial runoff.

## **Progress Towards Milestones**

**Milestone:** December 2002

Exploration of the potential use of standardised turf algal mats as bio-indicators of nutrient supply

**Progress:** No specific milestones were defined for this year, however we made significant progress towards fulfilling all 5 of our set Objectives.

## **Problems & Difficulties**

Group is still understaffed, given the complexity and importance of the Task.

New diving regulations further limit the amount of work that can be carried out in the field.

Review of the theoretical and technical complexity of the "algal turfs as indicators of nutrient supply" study concluded that successful completion of the study was unlikely in the available time.

## **Requested Variations to Milestones**

As per discussions with relevant people, including Task Associate, algal turfs as bio-indicators of nutrient supply study postponed. Initial work indicated study was not feasible in available time (turfs failed to colonise plastic mats).

## **Changes to Contracted Annual Budget**

## **Outcomes/Achievements**

Our identification of community-based ecological indicators for runoff-related reef degradation has been communicated to GBRMPA, who use our findings to shape management actions on a day-to-day basis at high political level as well as in community outreach (e.g. presentations to NQ Rivers Trust, QFVG Board, Banana Committee, Conservation Gps). Visualisation of the state of the reefs in the Wet Tropics (video

documentation, presentations, TV documentary, etc) has further helped communicating our research findings.

### **Contact with Task Associates**

Contact with our Task Associate occurs regularly on an informal and occasionally ( about twice per half-year) on a formal basis and is mutually beneficial. Communication is further improved due to the previous secondment of Laurence McCook to GBRMPA, and his ongoing participation in meetings, etc with GBRMPA WQ&CD Gp site visits, meetings and presentations to stakeholders.

### **Publications**

#### **Others (CD's etc, brochures):**

Jompa, J. 2002 Interactions between macroalgae and scleractinian corals in the context of reef degradation. Ph.D. Thesis (Completed);

Diaz-Pulido, G. 2002 Algal recruitment and reproduction in the context of reef degradation: interactions with corals, substrates, herbivores and nutrients. Ph.D. thesis (completed).

Birrell, C., McCook, L. J. & Willis, B. Interactions between benthic algae and coral recruitment during recovery from disturbance. MSc Qual. Thesis (completed)

#### **Refereed Journal Articles:**

Philipp E & Fabricius KE (2003) Photophysiological stress in scleractinian corals in response to short-term sedimentation. *J. Exp. Mar. Biol. Ecol.* (in press)

Fabricius KE, Wild C, Wolanski E & Abele D (2003) Effects of transparent exopolymer particles (TEP) and muddy terrigenous sediments on the survival of hard coral recruits. *Estuarine, Coastal and Shelf Science* 57 (5) (in press)

Bastidas C, Benzie JAH & Fabricius KE (in press) Genetic differentiation among populations of the brooding soft coral *Clavularia* sp. on the Great Barrier Reef. *Coral Reefs*

Wolanski E, Richmond, R., McCook LJ, Sweatman, H. (in press) Mud, marine snow and coral reefs: The survival of coral reefs requires integrated watershed-based management activities and marine conservation. *American Scientist*.

Diaz-Pulido, G. & McCook, L. J. "Top-down and bottom-up processes interact with seaweed recruitment on a coral reef " *Ecology* (accepted)

Davis, T. A., Llanes, F., Volesky, B., Diaz-Pulido, G., McCook, L., & Mucci1, A. in press. A <sup>1</sup>H-NMR spectroscopic characterization of sodium alginates extracted from *Sargassum* spp. and its relevance to heavy metal biosorption. *Applied Biochemistry and Biotechnology*.

Diaz-Pulido G, McCook LJ (2002) The fate of bleached corals: Patterns and dynamics of algal recruitment. *Mar Ecol Prog Ser* 232: 115-128

## **Presentations of Research Findings**

### **Keynote/Plenary Addresses:**

K. Fabricius: Plenary Address at the International Conference for Reef Studies in Cambridge, Sept 2002: "Reefs in turbid and polluted waters: why the fuss?"

### **Media Activities (Television, radio exposure, newspaper or magazine):**

K. Fabricius: continued to work on the TV Documentary "Muddy Waters" for SBS TV. L.McCook: Interview *Tvlle Bulletin* on Evidence for Runoff Impacts; minor advice for above documentary.

### **Number of Other Public Presentations, eg Seminars and Confernce Presnetations:**

K. Fabricius: 2 L. McCook: 5

### **Public Meetings, Industry/Interest Group Meetings (relevant to CRC Reef) Attended:**

K. Fabricius: talk to the Board of Tully Sugar Mill Meeting at AIMS in Oct 20 L.McCook: 1. Presentation to Board of Qld Fruit & Vege Growers, July; 2. Meeting & site visit, Bureau Sugar Expt Stn researchers; 3. Meeting & site visit with Banana Industry reps; 4. Presentation to, meeting & and Review of draft Productivity Commission Review of Primary Industry In GBR Catchment; 5. Presentation on Runoff Effects on Reefs, etc, to Qld Rivers Trust Ann. Conf; 6. Presentation to NQ Wildlife Preservation Soc.