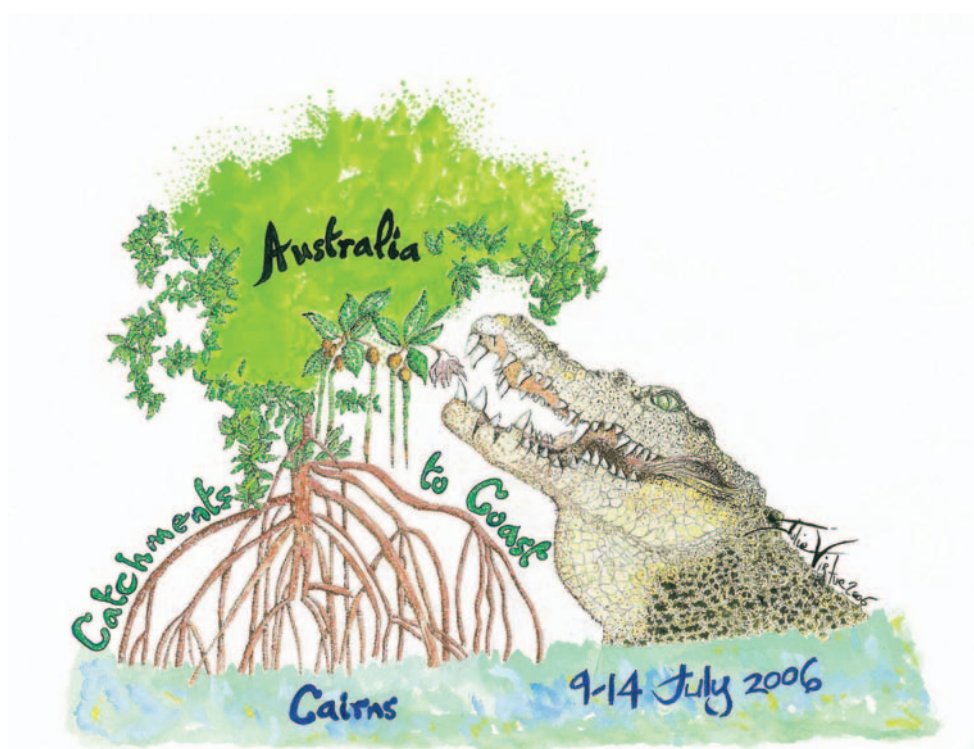


# AMSA2006 POSTER PRESENTATION ABSTRACTS



## **Ahammad, Farzana and Md. Hashibul Islam**

Institute of Marine Sciences, University of Chittagong, Bangladesh

### **A checklist of Fish (Estuarine Set Bag Net Catch) in the Moheshkhali Channel of the Bay of Bengal, Bangladesh**

The present study is conducted out to prepare a checklist of ESN catch of Fish in Moheshkhali Channel, Bangladesh from November 2003 to September 2004. A total of 76 species under 34 Families of fish was identified. The Family Sciaenidae and Gobiidae were dominant. Seasonal Variation also observed in the study.

## **Beretta, Giglia A and David J Booth**

Department of Environmental Sciences and Institute for Water and Environmental Resource Management, University of Technology, Sydney, 2007 Australia.

Giglia.Beretta@uts.edu.au

### **Settlement and early mortality of a Tahitian damselfish and a wrasse on small patch reefs**

Dynamics of settlement and early survival of benthic fishes can drive their population dynamics. Here, we surveyed 48 pairs of small (< 5 m<sup>2</sup>) coral reef patches in Moorea lagoon, Tahiti for newly-settled damselfish (*Stegastes nigricans*) and wrasse (*Thalassoma hardwicki*). One reef of each pair was surveyed, with removal, on a daily basis, while the other reef was surveyed weekly, with removals. By comparing cumulative apparent settlement of reefs cleared daily and weekly, an estimate of early post-settlement mortality for both species was made. In addition, reefs were surveyed for types of habitat, and these results were related to settlement and early survival in both species

The present study outlines the framework of current research that began in February 2006. Initially, the project aims to investigate whether estuaries are having an impact on the productivity and composition of intertidal flora and fauna within adjacent coastal ecosystems. The distribution, abundances and productivity of flora and fauna will be measured on rocky shores and sandy beaches in areas with and without the presence of estuaries. We are predicting higher primary productivity in areas located near estuaries, because of the supply of nutrients and carbon. Results obtained from this study will increase our knowledge but also assist coastal managers in their management of these ecosystems.

## **Billows, Craig<sup>1</sup>, Julie Mondon<sup>2</sup>, David Mills<sup>2</sup> and Janet Gwyther<sup>3</sup>**

cbillows@pipeline.com.au

<sup>1</sup> School of Life and Environmental Sciences, Deakin University, Warrnambool, 3280

<sup>2</sup> School of Life and Environmental Sciences, Deakin University, Warrnambool, 3280

<sup>3</sup> School of Life and Environmental Sciences, Deakin University, Geelong, 3217

### **Ecological responses to improved tidal flows into the Karaaf Wetlands, Breamlea, Victoria**

Investigations of ecological responses to tidal flow changes in a Victorian coastal saltmarsh followed the replacement of a 1200mm diameter concrete pipe with a larger box culvert system in June 2004. Interim results from random quadrat sampling adjacent to the creek draining the marsh indicate no significant change from pre-impact to post-impact percent cover abundance of saltmarsh vegetation. Patches of eelgrass *Zostera muelleri*, not observed prior to culvert installation, had colonised areas within the lower reach of this channel. Nineteen eelgrass patches were monitored between 24<sup>th</sup> March and 18<sup>th</sup> May 2006, showing an average size increase of approximately 20 percent.

Regular water quality monitoring since October 2005 showed that the saltmarsh creek and the main channel of the estuary were nutrient enriched. From a total of 27 samples collected at eight monitoring points over four separate occasions, 24 exceeded the total phosphorus trigger value set for estuarine waters of south-east Australia, whilst 21 exceeded the trigger value for total nitrogen. Twelve samples exceeded the trigger value for soluble phosphate, with five of those exceeding by more than ten-fold.

Fyke netting across the channel on the falling tide captured 14 fish species that utilised the new culvert to access the saltmarsh from the main estuary. Two other species were also identified from angling and incidental observations. Of these 16 species, six are regarded as commercially significant and sought after by recreational fishers. Several of these are juvenile marine species (including Australian Salmon *Arripis trutta* and Silver Trevally *Pseudocaranx dentex*). Yellow Eye Mullet *Aldrichetta forsteri* has been the most numerically dominant species to date and contributes to the bulk of the biomass.

Interpretation of the combined project data, including planned bathymetric and geospatial analyses, will inform future restoration efforts for this and other tidally manipulated coastal wetlands.

## Brearley, Anne

abrear@cyllene.uwa.edu.au

School of Plant Biology Faculty of Natural & Agricultural Sciences The University of Western Australia, Crawley, WA 6009

## Considering Ernest Hodgkin's SWANLAND

The estuaries of south-western Australia are unusual. They are dominated by river flow rather than the classic model for estuaries of tidal domination. Salinity varies greatly from fresh to saline or hypersaline. In many of the estuaries bar formation is so extensive that the estuaries close when river flow is low and they may remain closed for months or even years. These features were central to Ernest Hodgkin's pioneering work on the evolution of the estuarine form and how this affects the processes and ecology.

Before his death in 1998 "Hodge" organised a bequest, The Ernest Hodgkin Trust for Estuary Education and Research "to provide funds necessary to write and publish an account of what is known about the estuaries of south western Australia in an easily-read form for the general public. The aim was to:

- stimulate informed interest in the estuaries of south Western Australia.
- create and awareness of and respect for them and their catchment landscape, our place in it, and responsibility for managing the estuaries so that future generation can enjoy them.
- equip readers to take a critical interest in relevant environmental debates.
- show how estuaries functions as ecosystems, between land and sea, both part of their catchment landscapes and their marine environments, with their unique life systems.
- recognise that they have natural value of their own and are not merely places that belong to use and abuse for our convenience.'

The book 'Ernest Hodgkin's SWANLAND' was published in December 2005. This poster illustrates features of the estuaries of south-west Australia, from the Murchison on the west coast to the Esperance area on the south coast, i.e. SWANLAND, and the treatment of the subject material to create an overview of a landscape.

## Burfeind, Dana D<sup>1</sup>, Katherine R O'Brien<sup>2</sup>, James W Udy<sup>1</sup>

burfeind@uq.edu.au

<sup>1</sup> Centre for Water Studies, University of Queensland, St. Lucia Qld 4072. j.udy@uq.edu.au

<sup>2</sup> Environmental Engineering, University of Queensland, St. Lucia Qld 4072. k.obrien@uq.edu.au

## Building a predictive model for *Caulerpa taxifolia* growth

*Caulerpa taxifolia* is an invasive alga which first gained notoriety in the Mediterranean Sea. From its introduction in 1984 to 2000, *C. taxifolia* expanded from a one square metre patch to cover over 13100 ha. While *C. taxifolia* is native to tropical and subtropical Australia (Queensland, Northern Territory, and Western Australia), invasive populations have recently been discovered in New South Wales and South Australia. *C. taxifolia* can reproduce asexually by fragments breaking off plants and colonising new locations. In order for *C. taxifolia* to successfully colonise, a new location it must first be introduced, attach to the substrate, and grow to establish a new population. There are many factors that regulate *C. taxifolia* growth including temperature, light, nutrients, and substrate type. Here we present a conceptual model, which describes how environmental factors interact to affect *C. taxifolia* growth. This conceptual model is used to design a series of experiments to quantify the impact of different environmental factors on *C. taxifolia* growth. This information will enable the development of a predictive model for *C. taxifolia* growth, and identification of regions at risk from successful *C. taxifolia* colonization.

**Cumming, Rebecca<sup>1</sup> and Maria Schreider<sup>2</sup>**

rebecca.cumming@studentmail.newcastle.edu.au

<sup>1</sup> School of Applied Sciences, University of Newcastle, Ourimbah 2258

<sup>2</sup> School of Applied Sciences, University of Newcastle, Ourimbah 2258. maria.schreider@newcastle.edu.au

**The ecology of the ghost shrimp *Trypaea australiensis* (Decapoda: Thalassinidea) at Port Stephens, NSW**

Callianassid or 'ghost' shrimps are an abundant and diverse group of burrowing decapods whose bioturbatory habits can cause significant modification to the intertidal marine environment. Despite this importance, the ecology of the group is poorly known largely because of their fossorial habits. This study focuses on the ecology of a common species of callianassid shrimp, *Trypaea australiensis*, on the intertidal sandflats of Port Stephens, central NSW and aims to examine aspects of life history, spatial and temporal patterns of abundance, larval development and migration. Population samples were taken over a 7-month period at four locations within the estuary. Spatial distribution was very patchy and there was a significant variation in abundance and size of *T. australiensis* among locations. Sex ratio was biased toward females and the degree of bias was variable between locations. In the lead up to the breeding season, males and females tended to co-occur in comparison to other times during the study period. A distinct period of reproductive activity began in March at all 4 locations. Low survivorship of larvae in an artificial environment restricted study of larval development, however results suggest a long larval period which raises questions regarding the interconnectedness of *T. australiensis* populations along the central N.S.W. coast that are currently being considered.

**Danaher, Karen**

karen.danaher@dpi.qld.gov.au

Department of Primary Industries & Fisheries, Brisbane, Qld

**Mangrove and saltmarsh mapping at a regional scale for all of Queensland and the Northern Territory, Australia**

Northern Australia's mangroves and saltmarshes support the majority of commercially and recreationally important fish, prawn and crab species at some stage of their life cycle. It is recognised that detailed information is required on the coastal wetlands to ensure that existing fisheries are productive well into the future. The intertidal mangroves and saltmarshes include a diverse range of community types from sparsely vegetated salt pans through to dense mangrove forests over 36 metres tall. Data collection for the Queensland and Northern Territory's 24 000 kilometre coastline can be difficult with challenges from monsoonal weather, extreme (10 metre) tides, mud substrates and crocodiles.

A cost effective method has been devised to create a digital dataset of mangroves and saltmarshes using Landsat Thematic Mapper imagery and colour aerial photography with minimal ground truthing, resulting in approximately 90% accuracy. All of Queensland and the Northern Territory's mangroves and saltmarshes have been mapped at 1:100 000 and classified by the dominant genus of the vegetation. The method has been recognised as an Australian standard.

The coastal wetlands dataset resides on the Coastal Habitat Resources Information System (CHRISweb <http://chrisweb.dpi.qld.gov.au/CHRIS/>), an online GIS which also includes commercial and recreational fish catch data. Through CHRISweb the coastal wetlands dataset is being used to maintain a comprehensive, adequate and representative system of protected areas (Fish Habitat Areas). Other applications include fauna/habitat interactions, with the recent calculation of mud crab stocks for all of Northern Australia by using habitat as a proxy for abundance

## de Gusmão, Luiz Felipe M<sup>1</sup> and David McKinnon<sup>2</sup>

felipeocean@gmail.com

<sup>1</sup> School of Marine Biology and Aquaculture, James Cook University, Townsville Qld 4811

<sup>1,2</sup> Australian Institute of Marine Science, PMB No3, Townsville MC Qld 4810. d.mckinnon@aims.gov.au

### Controls on egg production and naupliar growth of *Pseudodiaptomus australiensis* (Copepoda : Calanoida)

Two laboratory experiments were conducted with the egg carrying calanoid copepod *P. australiensis*: one to evaluate the effects of food type on female egg production (EP), and another one to assess the effects of different temperatures on the growth rate of the nauplii of this species. The experiments were run with descendants of a continuous cultured population of *P. australiensis* maintained in aquaculture. The EP estimation was done on single adult females that were either starved (S) or fed ad libitum with a single species of algae (*Tetraselmis*, *Proteomonas* or *Isochrysis*). Starved females had the highest mortality and the lowest EP among the treatments. Females fed with *Isochrysis* presented the highest egg production, followed by *Tetraselmis* and *Proteomonas*. *P. australiensis* had a lower EPR than other species of the genus for similar food and temperature conditions. The high EP of females fed with *Isochrysis* and *Tetraselmis*, which are high in DHA and EPA fatty acids, indicates that the nutritional value of food is an important control of egg production in this species. The juvenile growth experiment (JG) was conducted with an artificial cohort composed mainly of nauplii at two temperatures, 20°C and 30°C. The growth rate of the juveniles at 30°C was two times higher than the nauplii at 20°C. Consequently, individuals of the same age reared at 30°C were larger and heavier than the ones reared at 20°C. If food is not a limiting factor, the juvenile growth experiments show that *P. australiensis* growth is controlled by temperature.

## Dias, Daniel, Priyanka Reddy and Sylvia Urban<sup>1</sup>

<sup>1</sup> School of Applied Sciences (Discipline of Applied Chemistry), RMIT University, GPO Box 2476V Melbourne, VIC 3001, Australia

sylvia.urban@rmit.edu.au

### Bioprospecting for drugs from the marine environment

Bioprospecting is the term coined to describe the search for biologically active substances from nature. Natural products have served as a major source of drugs for centuries with about half of the pharmaceuticals in use today derived from natural origins.<sup>1</sup>

With over 70% of the earth's surface covered by oceans, the sea represents an enormous resource for the discovery of potential drugs. Bioprospecting of marine natural products has yielded a considerable number of drug candidates as exemplified by many of the leading marine derived anticancer drugs at advanced stages of clinical trials.<sup>1-4</sup>

The Marine and Terrestrial Natural Products (MATNAP) research group is a relatively new initiative to the School of Applied Sciences (Discipline of Applied Chemistry) at RMIT University, having being formed in 2003. Further details about the activities of the MATNAP research group can be found at [http://home.iprimus.com.au/sylvia\\_urban/](http://home.iprimus.com.au/sylvia_urban/) or accessed through my personal profile on the RMIT University webpage <http://www.rmit.edu.au/> (simply type in Sylvia Urban into the search query).

Over the last 3 years the MATNAP research group has been steadily building up a library of extracts and compounds. With approximately 200 samples from marine and terrestrial sources housed in the MATNAP database greater than 70% of these are of marine origin. As a result of the biological screening carried out the group has concentrated its efforts on targeting marine invertebrates such as marine sponges and algae from Southern Australian waters for chemical investigation. An overview of the research activities will be presented.

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**Fahey, Bryony, Claire Larroux, Marcin Adamski, Sandie Degnan and Bernard Degnan**

s201187@student.uq.edu.au

School of Integrative Biology, University of Queensland, St Lucia Qld 4072

clarroux@zen.uq.edu.au, m.adamski@uq.edu.au, s.degnan@uq.edu.au, b.degnan@uq.edu.au

***NK* homeobox gene cluster predates the origin of *Hox* and *paraHox* genes**

Members of the *Antennapedia* class (*ANTP* class) of homeobox genes, and most notably the *Hox* genes, are widely known for their conserved roles in axial patterning and other important developmental phenomena in bilaterians. The genes, which are generally found in clusters, are thought to have evolved through multiple rounds of tandem duplication and divergence. The sequence and genomic organization of *ANTP* class homeobox genes from the demosponge *Reniera* provide insight into the stepwise evolution of the family over the course of metazoan history. *Reniera* possesses eight *ANTP* class genes of the non-*Hox/paraHox* type, seven of which are distributed within two distinct clusters of four and three genes each. Five of the genes can be confidently placed within the *NK2*, *Tlx/Prox2*, *Hex*, *Msx* and *Bsh* families. Our data suggest that the duplications leading to the origin of the *Hox* and *paraHox* clusters occurred in the eumetazoan lineage after the divergence of the Porifera from the rest of the animal kingdom.

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**Gauthier, Marie E<sup>1</sup> and Bernard Degnan<sup>2</sup>**

s802379@student.uq.edu.au

<sup>1</sup> School of Integrative Biology, University of Queensland, Qld 4072

<sup>2</sup> School of Integrative Biology, University of Queensland, Qld 4072 bdegan@zen.uq.edu.au

**Innate immune defence of the sponge *Reniera***

Sponges (phylum Porifera) are the phylogenetically oldest extant metazoan phylum and share a common ancestor with other metazoan phyla. They are known to possess efficient defence systems to discriminate between self and non-self and/or to protect themselves from invasion by other organisms. Studies looking for receptors and signal transduction pathways underlying some of these mechanisms have demonstrated that sponges possess some molecules that are similar in structure to those involved in the immune system of other metazoans. For the first time, a global survey of immunity-related pathways is possible in Porifera with the recent genome sequencing of the demosponge *Reniera*, which will shed light on the origins of the metazoan immune system. Of particular interest is the innate immune reaction against Gram-negative bacteria which involves the recognition of surface lipopolysaccharides (LPS). This mechanism has been detected in other sponges and this study proposes to identify further members of the pathway in *Reniera* and describe their function.

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**Guenther, Jana<sup>1</sup> and Rocky de Nys<sup>2</sup>**

jana.guenther@jcu.edu.au

<sup>1</sup> School of Marine Biology and Aquaculture, James Cook University, Townsville 4811<sup>2</sup> School of Marine Biology and Aquaculture, James Cook University, Townsville 4811 rocky.denys@jcu.edu.au**Epibiont communities on sea stars: Only specialists need apply**

To determine the presence of fouling-resistant surfaces on sea stars, field surveys were conducted in the intertidal and subtidal zones of the northern part of the Great Barrier Reef, Australia, during the dry and wet season in 2005. A total of twelve sea star species were identified and examined for both micro- and macro-fouling organisms. To quantify the abundance of micro-fouling organisms, five specimens per species were collected. Samples were taken from various positions of the aboral surface, stained with 4',6-diamidino-2-phenylindole and observed under a fluorescence microscope. Numbers of bacteria across sea star species ranged between 0.5 to  $11.8 \times 10^4$  bacteria.cm<sup>-2</sup>. There were significant differences in numbers of bacteria between sea star species, however there were no marked differences between seasons. To quantify the abundance of macro-fouling organisms, ten specimens per species were visually examined and no macro-fouling organisms were found. However, there were a number of species-specific parasitic or commensal gastropods, shrimps, polychaetes and copepods living on the surfaces of the sea stars. The parasitic gastropod *Parvioris fulvescens* was found exclusively on the aboral surface of the sea star *Archaster typicus*, while the gastropods *Asterolamia hians* and *Granulithyca* sp. were only found on the aboral surface of *Astropecten indicus* and *Nardoa pauciforis*, respectively. The gastropod *Thyca crystallina* was found on the oral surface of *Linckia laevigata* and the commensal shrimp *Periclimenes soror* between spines of the aboral surface of *Acanthaster planci*. An unidentified polychaete species was found in the adambulacral groove of *Archaster typicus*, whereas unidentified copepods were found on the aboral surface of both *Linckia laevigata* and *Echinaster luzonicus*. As no macro-fouling organisms were found on sea stars, they offer an exceptional model to investigate and understand the mechanisms driving general fouling-resistant surfaces and the selective settlement of specialist invertebrates.

**Heimann, Kirsten<sup>1</sup>, Stanley D Hudson<sup>2</sup>, and Britta Schaffelke<sup>3</sup>**

kirsten.heimann@jcu.edu.au

<sup>1</sup> School of Tropical Biology, James Cook University, Townsville 4811<sup>2</sup> School of Tropical Biology, James Cook University, Townsville 4811. stanley.hudson@jcu.edu.au<sup>3</sup> Australian Institute of Marine Science, Townsville 4810. b.schaffelke@aims.gov.au**Factors controlling growth and colony formation in a Great Barrier Reef colonial chrysophyte**

Blooms of the colonial microalga *Chrysoyctis fragilis* were recorded in the GBR in the 1980s and 2000-04. Monoclonal cultures were established in ES medium from Moore Reef material and maintained under a 12:12 h light:dark cycle at 28°C. Temperature tolerance between 22 and 34°C was determined in 2°C temperature step experiments with 2 days acclimation. Growth of single cell isolates was monitored by cell counts over five days. *C. fragilis* grew poorly at 22 and 24°C, exhibited sustained growth between 26 and 32°C with a temperature optimum at 30°C. Cells at 34°C failed to divide and did not resume growth when relocated to 28°C. The results are in line with reported blooms during summer and low winter abundances of *C. fragilis*, the latter potentially providing seed material for blooms under favourable conditions..

Cell age (cells isolated from one to eight week old cultures) had no significant effect on survival or success of colony establishment. Single nutrient enrichment experiments revealed increased growth rates in the presence of either inorganic or organic phosphorous compared to inorganic nitrogen. Statistically, there was no demonstrable preference for either inorganic or organic phosphorous in the absence of inorganic nitrogen; however, growth rates were always slightly higher for organic phosphorous. In the presence of nitrogen there was no significant effect of either phosphorous source on growth rates, colony establishment or viability of *C. fragilis*. In summary, the results suggest that temperature is possibly the main driver for *C. fragilis* bloom events on the GBR.

## Holme, May-Helen, Chaoshu Zeng, Paul C Southgate

Mayhelen.holme@jcu.edu.au

Tropical Crustacean Aquaculture Research Group, School of Marine Biology & Aquaculture, James Cook University, Townsville, Qld 4811

### Use of microbound diets in larval culture of mud crab, *Scylla serrata*

Routine commercial production of mud crab (*Scylla serrata*) seed is currently restricted due to limited understanding of the nutritional requirements, as well as the problems commonly associated with live foods. This study investigated (1) the potential use of commercial available protein sources to replace the live food component of a semi-purified microbound diets (MBD) successfully developed for *S. serrata* megalopa, and (2) the potential for MBD as a complete or partial replacement for live food at the zoea III stage. For the first experiment, four MBD containing different protein sources (rotifer meal, *Artemia* meal, fish meal and squid meal) were evaluated. The results show that megalopae fed MBD containing either fishmeal or squid meal had higher survival and similar development rates compared to those fed the MBD containing rotifer meal and *Artemia* meal. This suggests that a MBD can successfully be developed for *S. serrata* megalopae using common protein without impacting megalopal survival and development. In the second experiment the potential for MBD as a complete or partial replacement for live prey was tested with zoea III larvae. The results indicate that co-feeding of MBD with live *Artemia* reduces the reliance on hatchery culture of live food, and it may provide certain beneficial nutrients lacking in *Artemia*. However, at this stage total replacement of live food is not a feasible option for the zoeal larvae. Together the results of the two experiments show promise for further refinement of MBD for *S. serrata* larvae and for increasing use of such diets in the hatchery culture for the mud crab species.

Research into the nutritional requirement of *S. serrata* larvae is ongoing in this lab, and up to date results will be included in the conference presentation.

## McArdle, Alicia<sup>1</sup>, Joan Whittier<sup>2</sup> and Adrian Bradley<sup>3</sup>

a.mcardle@uq.edu.au

<sup>1</sup> School of Biomedical Sciences, University of Queensland, St Lucia 4072

<sup>2</sup> School of Medicine, University of Tasmania, Hobart 7001 [Joan.Whittier@utas.edu.au](mailto:Joan.Whittier@utas.edu.au)

<sup>3</sup> School of Biomedical Sciences, University of Queensland, St Lucia 4072 [a.bradley@uq.edu.au](mailto:a.bradley@uq.edu.au)

### Factors influencing the orientation and swimming behaviour of green turtle (*Chelonia mydas*) hatchlings in Malaysia

The influence of artificial light on the orientation and behaviour in hatchling *Chelonia mydas* was studied at two locations on Peninsular Malaysia's east coast during the nesting season (June-August 2005). Study sites were a hatchery and an *in situ* beach. The impacts of other environmental factors that might affect hatchling orientation, such as weather and moon phases were also considered and analysed. The swimming behaviour and speed of hatchlings in natural conditions (*in situ* site) to reach an 80m open water marker was identified by swimmers following 3m behind hatchlings that were equipped with chemical light sticks. An observer on the beach recorded the journey of the hatchlings with way points being recorded on a map.

There were significant differences ( $P=0.004$ ) between the orientation of hatchlings tested at the hatchery site and those at the *in situ* site. Weather conditions, moon phases, artificial lights (from boats and offshore) and the position on the beach in which hatchlings were released demonstrated that all factors have a significant impact ( $P < 0.001$ ) on hatchling seafinding behaviour. The "powerstroke" style was the main form of swimming behaviour in hatchlings. Moreover, hatchlings exhibited a prolonged dive (3-5secs) once they entered the ocean, and wave height ( $P=0.01$ ) influenced the direction in which hatchlings swam.

The findings of this study are important because they can be used by the Department of Fisheries in Malaysia to establish and/or refine new hatchery management practices for sustainable sea turtle population conservation in this region. Malaysia is considered to be at the forefront of sea turtle conservation in the south-east Asian region and thus the information garnered from this research will contribute to long-term survival of this endangered species for the benefit of future generations.

**McKenzie, Jessica<sup>1</sup>, Gerry Quinn<sup>1</sup>, Ty Matthews<sup>1</sup> and Alecia Bellgrove<sup>1</sup>**

<sup>1</sup> School of Life & Environmental Sciences, Deakin University, Warrnambool 3280  
jlmck@deakin.edu.au

**The influence of estuaries on surrounding sandy beaches and rocky shores**

Estuaries are an integral part of the coastal zone, lying at the interface between marine, freshwater and terrestrial systems. Previous studies have suggested that open estuaries have profound influences on coastal marine ecosystems. However, few studies appear to have tested this directly, and therefore there is a growing need for a greater understanding of whether estuaries have a significant impact on the productivity of coastal marine systems. This lack of knowledge is surprising, considering the number of estuaries along the southern Australian coastline, e.g. more than 100 estuaries along the Victorian coastline alone. Most previous ecological studies that have focused on aquatic ecosystem productivity have investigated marine and freshwater habitats separately. Although previous studies suggest that material from rivers and therefore estuaries flowing out into the coastal zone increases coastal productivity, few, if any studies have attempted to measure the productivity of coastal marine environments directly adjacent to estuary mouths.

Müller, Jochen F, **Michael Bartkow**, Anita Kapernick, Tanja Komarova, Pam Quayle, Renee Muller, Melanie Shaw, Janet Tang, Karen Kennedy, Scott Stephens, Ben Tan, Ulrike Bauer, Dominic O'Brien, Leisa Toms

j.mueller@uq.edu.au  
National Research Centre for Environmental Toxicology, University of Queensland. 39 Kessels Road, Coopers Plains, 4108.

**Anthropogenic pollutants: Monitoring, analysis, effect characterisation and reporting**

Traditional techniques for monitoring trace level organic pollutants in water and air are often insensitive, require specific and expensive equipment and need trained personnel to operate. Furthermore such systems may only provide information about a short period and can be impractical to use in remote areas. Time integrated passive sampling techniques are increasingly used to augment traditional, active sampling techniques. These types of samples represent an effective, low-cost means of measuring the concentration of trace level organic pollutants in water and air. Here we present a 'toolbox' of examples of passive sampling techniques and their applications for monitoring pollutants in air and water. This overview will also detail the types of pollutants which can be sampled and analysed. Discussion will include an outline of various invitro toxicity tests available for the toxicological evaluation of sampler extracts.

**Richards, Gemma<sup>1</sup>, Vervoort, Michel<sup>2</sup>, Adamski Marcin<sup>1</sup> & Degnan Bernard<sup>1</sup>**  
s355446@student.uq.edu.au

<sup>1</sup> School of Integrative Biology, University of Queensland, Brisbane 4072, m.adamski@uq.edu.au, b.degnan@uq.edu.au

<sup>2</sup> Evolution et Developpement des Protostomiens, Centre de Genetique Moleculaire, Gif-sur-Yvette Cedex, France  
Michel.Vervoort@cgm.cnrs-gif.fr

**Cell communication via the Notch-Delta signalling pathway in sponges: Evidence from the *Reneira* genome**

The Notch signalling pathway enables one cell to communicate directly to its neighbours by way of the transmembrane proteins Notch and Delta. In bilaterians this pathway plays a key role in initiating cell fate decisions and we are interested in whether it is also directing the acquisition of cellular identity in the demosponge *Reneira sp.* We have searched the *Reneira* genome for specific members of the Notch pathway by targeting sequences which are similar to the conserved domains of bilaterian pathway proteins. We report the presence of putative *notch* and *delta* genes, as well as a homolog to *cs1*, the primary effector of the Notch signal in the nucleus of recipient cells. Additionally, we present genomic assemblies for 16 members of the basic helix-loop-helix family of transcription factors. Genes from this family are employed in a wide range of interactions related to notch signalling in bilaterians; we aim to examine the ancestry of this relationship by characterising their expression in *Reneira*.

Stapley, JM

jason.stapley@dpi.qld.gov.au

Department of Primary Industries and Fisheries, Northern Fisheries Centre, Cairns, Qld

## Queensland Observer Program

Through numerous research projects and monitoring programs the Department of Primary Industries and Fisheries (DPI&F) has collected, analysed and managed data and biological samples obtained on target and bycatch from a range of commercial line, net and trawl fisheries in Queensland since the late 1970's. Of the 26 fisheries which occur in Queensland State waters which are managed by the State government through DPI&F, 14 have had observer associated projects and/or programs linked to them at some stage. Most of the historical work has been dedicated research projects tailored to address specific research or monitoring requirements. In more recent times many new requirements have been placed on Fisheries Agencies, including DPI&F, to progressively implement new and more comprehensive monitoring programs to address sustainability issues across all fisheries. One component of these new monitoring programs developed by DPI&F was the implementation of a dedicated State wide Observer Program, which was established in 2004. The Fisheries data and samples are collected by observers for scientific and fisheries management purposes. Most of the observer trips are conducted on a voluntary basis, with fishers agreeing to provide access to onboard observations of their fishing operation and catch.

The Observer Program is an evolving program but overall it is designed to characterise the operational procedure, gear types, catch, discards and protected species interactions. This data will provide technical information, which cannot be obtained by any other means, to assist in developing and measuring the performance of Fisheries Management Plans. The Observer Program information has, and will allow DPI&F to more confidently assess the impacts of commercial fishing when considering the sustainability of Queensland's fisheries.

**Taylor, Helen**<sup>1,2</sup> and Michael Rasheed<sup>1,2</sup>

helen.taylor@dpi.qld.gov.au

<sup>1</sup> Queensland Department of Primary Industries & Fisheries, Northern Fisheries Centre, Cairns 4870

<sup>2</sup>CRC Reef Research Centre, Townsville, 4810

## Monitoring seagrass after the Gladstone oil spill

On the 24<sup>th</sup> of January 2006 an oil spill occurred after a collision between a tug boat and a bulk carrier in Port Curtis, Gladstone. Twenty five tonnes of heavy fuel oil was spilt from the carrier, covering an area approximately 15km long by 4km wide including known seagrass habitat.

A long-term seagrass monitoring program established in Port Curtis was used as a baseline to compare any post oil spill changes to seagrasses. The seagrass assessment indicated that intertidal seagrass meadows in Port Curtis had not been significantly affected by the 'Global Peace' oil spill. Although most of the meadows showed a significant decline in biomass (density) and area, these changes were consistent with similar declines that occurred in meadows outside of the oil spill area. The declines in seagrass meadows were most likely attributable to natural seasonal variation, coupled with a combination of other climatic factors and anthropogenic impacts. Tidal conditions and the relatively quick response were thought to have limited the impact of oil on seagrass meadows.

Verrier, Frances<sup>1</sup> and Helen Whan<sup>2</sup>

<sup>1</sup> Great Barrier Reef Marine Park Authority, Australian Government

<sup>2</sup> Reef Water Quality Protection Plan Secretariat, Queensland Department of the Premier and Cabinet, PO Box 15185 City East Qld 4002. helen.whan@premiers.qld.gov.au

## Reef plan: A cooperative, whole of catchment approach to improved water quality for the Great Barrier Reef

Declining water quality is one of the major threats to the Great Barrier Reef Marine Park and World Heritage Area. This decline is largely attributable to activities occurring in and around the adjacent land, rivers and coastal regions (known collectively as the Great Barrier Reef Catchment). One of the key strategies for addressing declining water quality from the Great Barrier Reef Catchment is the Reef Water Quality Protection Plan (the Reef Plan), which was launched by the Australian and Queensland governments in December 2003. The goal of the Reef Plan is to "Halt and reverse the decline in water quality entering the Reef within 10 years". The Reef Plan identifies 9 main strategies and 65 actions to address declining water quality from diffuse sources of pollution, mainly runoff from agricultural lands. The strategies cover sustainable agricultural practices and better land-use decisions to reduce the load of pollutants entering the Reef, as well as the conservation and rehabilitation of ecosystems that play a role in removing water-borne pollutants from rivers before they discharge into the Reef. The Plan is being implemented through partnerships between the Australian, Queensland and local Governments, Regional Natural Resource Management bodies, industry, the general community, and educational and research institutions. Successful implementation of the Reef Plan will help to ensure the long-term sustainability of the Reef, and the ecosystems, industries and communities it supports.

**Watson, Renelle, Judith Batts and Brian Bicknell**

renelle.watson@environment.nsw.gov.au

Coastal Waters Science, NSW DEC

## An investigation of environmental sulphur and microbial communities at Bird Lake, The Coorong, South Australia

This study of environmental sulphur and microbial communities extends previous fieldwork and laboratory studies undertaken by Batts *et al.*, (2001) and Bicknell *et al.*, (1999) at Bird Lake. Piezometers allow sediment and groundwater sampling that is geographically close but vary in chemical concentrations, bacterial populations and isotope characteristics. The study aim was to relate bacterial parameters to sulphur isotope fractionations that occur during chemical transformations in the sulphur cycle using samples from the natural environment.

Bird Lake sediment was used to set up laboratory microcosms to study changes in the bacterial population and isotope fractionation of sulphur species. Solution samples were periodically measured for Optical Density, precipitation of sulphate and sulphide ions, measurement of sulphate ion concentration and <sup>34</sup>S isotope analyses. Microcosm sediment samples were used to extract, purify and use DNA as a template for PCR. Sediment samples were examined microscopically using fluorescence in situ hybridisation (FISH) targeting all bacteria,  $\gamma$  Proteobacteria and sulphur reducing bacteria (SRB).

Generally microcosms showed similar trends for all measurements and data confirmed sulphur species in solution were present predominantly as sulphate ion. The  $\delta^{34}\text{S}_{\text{sulphate}}$  values show small fluctuations. This effect is well documented in the literature for pure cultures, but little information exists regarding the responses in mixed bacterial cultures.  $\delta^{34}\text{S}_{\text{sulphide}}$  show a consistent downward trend until a day 67 rise by 14 ‰. <sup>32</sup>S disproportionation may account for large depletions of <sup>34</sup>S found in sedimentary and water-column sulphides. Determination of isotope fractionation during sulphate reduction of natural SRB populations has been explored in only a few cases.

Changes in the microcosm microbial population were observed and while conditions were designed to favour SRB growth, over time these bacteria were replaced by a group of bacteria not known to reduce sulphate. Evidence of concentration and isotope fractionation data for the two sulphur species associated with the bacterial evidence suggest other sulphur species are present and that their dominance varies with the prevailing bacterial populations over time.

**Whalan, S<sup>1</sup>, C Battershill<sup>1,2</sup>, P Ettinger-Epstein<sup>1,2</sup>, A Duckworth<sup>3</sup>, C Wolff<sup>3</sup>, Evans-Illidge<sup>3</sup> & R deNys<sup>1,2</sup>**

stephen.whalan@jcu.edu.au

School of Marine Biology & Aquaculture, James Cook University, Townsville, Qld  
 AIMS@JCU Tropical Aquaculture, James Cook University, Townsville, Qld  
 Australian Institute of Marine Science, Townsville, Qld

## **Managing the impacts of translocation decisions for sponge aquaculture using reproductive biology**

Translocating wild stock to suitable culture sites can pose potential environmental impacts from genetic pollution to local populations if translocated explants become reproductive during their culture life. Additionally, aquaculture enterprises can be impacted through policy decisions restricting distances over which wild stock can be translocated.

Farming trials of the dictyoceratid sponges *Rhopaloeides odorabile*, and *Coscinoderma* sp. are being undertaken in the Palm Islands, Australia. Both sponges show aquaculture potential, growing from explants (9cm<sup>3</sup>) to market size (1000cm<sup>3</sup>) within 18 months. Another dictyoceratid sponge, *Luffariella variabilis* shows potential for biomedical compounds. All sponges are subject to translocation restrictions of 500m. Sponge explants of both *R.odorabile* and *Coscinoderma* sp. were seeded onto culture long lines and left to recover and grow. *Luffariella variabilis* explants were placed into oyster culture baskets and left to recover and grow on the benthos. We sampled *R.odorabile* and *Coscinoderma* sp. sponge explants at 6 months and two years and *L. variabilis* explants at 6 months for reproductive potential. Standard histological techniques were used to assess if explants were reproductive.

At six months explants from both *R.odorabile* and *Coscinoderma* sp. had recovered from explanting however no samples showed any sign of sexual reproduction. In contrast 20% of *L. variabilis* explants samples were reproductive. *L. variabilis* is a simultaneous hermaphrodite that broods larvae and each reproductive sample contained combinations of spermatocytes, embryos and/or larvae. Two year old explants of *R.odorabile* and *Coscinoderma* sp. were reproductive; 20% of *R.odorabile* and 25% of *Coscinoderma* sp. had reproductive propagules. Both species are gonochoristic with males making up 100% and 50 % of reproductive samples for *R.odorabile* and *Coscinoderma* sp. respectively.

This study demonstrates that fundamental knowledge of reproductive life history traits can be a contributing factor to the design of best practise methods for culture and management of the risks associated with translocation.