

Ella Bay Development, Far North Queensland
Expression of Interest in Conducting Research:

Research Topic: Evaluation of subtle impacts of development on tropical near-shore marine fauna

Research Team

<u>Name</u>	<u>Position</u>	<u>Qualifications</u>
Marcus Sheaves	Senior Lecturer	PhD
John Collins	Senior Lecturer	PhD
Janine Sheaves	Associate Lecturer	BSc

Background and research questions

The research will focus on intertidal and immediately subtidal coastal marine habitats and their fauna, in the area adjacent to the Ella Bay development. The development itself is primarily terrestrially based so it would be easy to dismiss impacts on the marine environment as inconsequential. However, at present we lack the knowledge to evaluate this assumption.

Although the most development activities will occur on land, the site is fronted by a near-pristine beach which is one of the sites principal attractions, and that will provide an obvious focus for many recreational activities (swimming, fishing, sail boarding etc.). Although these are seemingly low level effects, they do have the potential to impact intertidal and shallow water subtidal habitats in a variety of ways (eg. Blankenstevn 2006). Impacts are likely to take the form of mechanical damage from foot and vehicular traffic, localized pollution, and increased fishing pressure and bait collection. Consequently, although individual impacts may be subtle they have the potential for substantial cumulative effects. However, all of these are manageable as long as the impacts are recognized.

Sediment dwelling animals are likely to be directly impacted (eg. by bait collection, being damaged by vehicles, or loss of specific habitat) but important indirect impacts are also likely. Effect of loss of crucial habitats on sediment dwelling prey species can proliferate through food webs to impact organisms, such as fish, at higher trophic levels. Habitat alteration can also adversely impact connectivities vital to organisms that require access to multiple habitats (eg. the freshwater jungle perch, *Kuhlia rupestris*, which migrates to marine waters to spawn (Allen et al. 2002)).

The Ella Bay development presents a unique opportunity for comprehensive, on-going research that can start by developing a pre-impact baseline, and continue throughout the development and post-development phases. Thus the opportunity exists to monitor change from a pre-impact baseline, as well as evaluating the effectiveness of management responses to detected impacts.

The underpinning logic for this project is that any impacts of the development on the marine environment are likely to be most apparent at the land/sea interface. Consequently, the project will concentrate on habitats, ecosystems or organisms at this interface, and address the research question:

Are there impacts flowing from the development that are identifiable above natural variation, and have sufficient ecological significance to warrant management intervention?

In particular, the project will address the specific questions:

1. What if any are the responses of sediment faunal composition and biodiversity to altered levels of anthropogenic disturbance during construction and operation of the development?

2. What if any are direct (eg. increased fishing pressure) and indirect effects (eg. from alteration to habitats or changes in sediment fauna) on fish use of intertidal habitats?
3. What if any are the effects on mobile fauna (eg. jungle perch, or mangrove jack) that migration between fresh and marine waters?
4. How successful at achieving their objectives are any mitigation measures implemented in response to any identified impacts?

Aims and objectives

The aim of the project is to investigate and monitor biodiversity and assemblage structure of intertidal and immediately subtidal marine habitats with the potential to be impacted by the Ella Bay development. The monitoring will continue throughout the period prior to, during and subsequent to development, with a view to detecting early warning signs of any adverse impacts, and so inform managers to allow remedial measures to be implemented in a timely manner. In this way the project will work directly towards ensuring environmental sustainability and development best practice protocols.

Methodology

Four sampling regimes will be implemented:

Component 1. ***Changes in sediment faunal composition and biodiversity*** over time will be studied using a strong *Beyond BACI* sampling design (Underwood 1994). Samples will be collected from 10 replicate areas of each identifiable habitat type adjacent to the development, and compared to samples with similar replication from 5 control areas. Sampling techniques use will be those known to be most effective in the available habitats, and will include a suite of specific techniques developed by one of the team (JC) for detecting subtle anthropogenic effects against a background matrix of environmental variability. Sediment fauna are likely to show the most direct changes, particular once the project becomes operational and the beach becomes heavily used.

Component 2. ***Changes in fish utilization of intertidal areas*** during high tides will be monitored using digital split-beam sonar and validated using netting methods appropriate to the sampling situation. Split-beam sonar is a high resolution instrument capable of providing precise estimates of fish identity, abundance and biomass in shallow water. The trophic roles of fish from these habitats have been studied in detail by members of the group (Wilson & Sheaves 2001, Baker & Sheaves 2005) so no fish will need to be retained for dietary studies. However, a small number of fish will be retained for stable isotope analysis, a procedure for directly linking animals with the sources of primary production they rely on. Understanding impacts on fish communities will be important, because they can be impacted directly (eg. fishing pressure) and indirectly (through habitat alteration and changes to the availability of prey (see component 1)).

Component 3. ***Movement of migrating fish***. Jungle perch, *Kuhlia rupestris*, that migrate from fresh to marine waters to spawn (Allen et al. 2002) and mangrove jacks, *Lutjanus argentimacultus*, that use freshwater nursery habitats then migrate offshore to spawn (Sheaves & Molony 2000) will be captured in the small creeks on the site and at control sites, and tagged with acoustic transponder tags. The movements of these species between the creeks and the marine environment will be monitored using passive receiving posts situated at the mouths of each creek. Because of the specific needs of fish like these to move between fresh and marine waters ensuring the integrity of their migratory paths is important.

Component 4. Changes in utilization of the beach and intertidal area by birds will be monitored on each sampling trip. The beach is used by a variety of water birds, as well as birds from the adjacent coastal woodlands, and these are likely to be particularly sensitive to any changes. Of

particular concern are the vulnerable or threatened bird species the Beach Stone-curlew *Esacus neglectus*, the White-bellied Sea-eagle *Haliaeetus leucogaster* and the Osprey *Pandion haliaetus*. Each of these is closely dependent on coastal intertidal habitats meaning local populations may rely extensively on beachfront resources. Of particular interest is the Beach Stone-curlew, which occupies restricted home ranges comprising the beach and littoral vegetation and feed on intertidal invertebrates, and so is likely to be vulnerable to changes in anthropogenic pressure. Beach Stone-curlews are nocturnally active so they will be censused at night. Data collected will include population densities and feeding activities.

Sampling will be initiated as soon as possible to enable the establishment of a pre-impact base line at both the Ella Bay site and the control sites. Sampling will be continued throughout the construction and operational phases to allow the detection of any change in any of the 3 components. Samples will be collected seasonally, so that comparisons can be corrected for seasonal influences.

Team responsibilities: Because of their extensive experience in the study of tropical invertebrates JC and JS will be responsible for benthic sampling and laboratory studies. MS will be responsible for fish sampling and identification because of his broad experience of tropical coastal fish fauna, and he will be the primarily responsible for data analysis because of his advanced biometrics background.

The scope of this project is extensive but it can be carried out cost effectively by including specific components of the work into PhD research (supervised by MS and JC), which the project will support for its duration. The successful completion of all parts of the project will be assisted by the employment of a part-time research assistant, required to ensure that a large enough field team to satisfy health and safety requirements is always available.

Outcomes

Component 1 will allow determination of any changes in sediment faunal composition and biodiversity through the construction and operational phases of the development. Component 2 will address changes in fish faunal composition and their pattern of usage of intertidal habitats. Component 3 will establish if there are any changes fish migration patterns or abilities. Component 4 will investigate impacts on potentially vulnerable foreshore-associated birds. Together these 4 components represent a diverse and sensitive suite of measures likely to be able to detect quite subtle impacts of the development on marine ecosystems if they exist, and so answer the key research question, *Are there impacts flowing from the development that are identifiable above natural variation, and have sufficient ecological significance to warrant management intervention?* Over the long-term the study will provide a diverse background against which the success of any measures taken to mitigate any perceived impacts can be judged.

Funding

<i>Activity</i>	<i>Funding Requirements</i>	<i>Source of Funding</i>
Digital Split-beam sonar	\$75,000	(JCU in kind)
Benthic grab and sledge samplers, sieves, corers equipment for beach profiles	\$3,200	(JCU in kind)
Cast, seine and gill nets	\$1,500	(JCU in kind)

External fish tags (100)	\$350	(JCU in kind)
Boat hire (per year)	\$900	(JCU in kind)
Salinity, Temperature, Turbidity meters	\$1,300	(JCU in kind)
Sampling trip travel & accommodation (per year)	\$19,000	Requested
Sampling and computer consumables (per year)	\$800	Requested
Acoustic fish tags (50)	\$14,500	Requested
Passive acoustic receivers (10)	\$11,750	Requested
Boat fuel and maintenance (per year)	\$900	Requested
PhD scholarship (per year incrementing)	\$20,204	Requested
1/3 time research assistant	\$18,522	Requested
Total requested	\$85,676	
Total in kind	\$82,250	
Total project	\$167,926	

References

- Allen, G.R., S.H. Midgley and M. Allen, 2002 Field guide to the freshwater fishes of Australia. *Western Australian Museum*, Perth, Western Australia. 394 p.
- Baker R, Sheaves M (2005) Redefining the piscivore assemblage of shallow estuarine nursery habitats. *MEPS* 291:197-213
- Blankenstevn, A (2006) Use of the ghost crab *Ocypode quadrata* (Fabricius) (Crustacea, Ocypodidae) as an indicator of human impact on the sandy beaches of the island of Santa Catarina, Santa Catarina, Brazil. *Rev. Bras. Zool.* 23(3): 870-876
- Sheaves M, Molony B (2000) Short-circuit in the mangrove food chain. *Marine Ecology Progress Series* 199: 97-109
- Underwood A. J. (1994) On Beyond BACI: Sampling Designs that Might Reliably Detect Environmental Disturbances. *Ecological Applications*: Vol. 4, No. 1, pp. 3–15
- Wilson J, Sheaves M (2001) Short-term variations in taxonomic composition and trophic structure of a tropical estuarine fish assemblage. *Marine Biology*, 139: 787-796.

Appendix 1: Short Curriculum Vitae's of the Research Team

Curriculum Vitae

Marcus John Sheaves BSc(hons) PhD

Coastal and Estuary Ecosystems Ecology Group
School of Marine and Tropical Biology, James Cook University
Townsville, Qld., 4811, Australia.
Phone: +61 (07) 47814144 Fax: +61 (07) 47251570

Current Position:

Senior Lecturer Department of Marine Biology, James Cook University, Townsville.

Capability Summary:

- Ecosystem ecology of tropical estuaries and estuarine wetlands
- Fisheries ecology of tropical fishes & crustaceans
- Extensive experience in coastal ecosystems of PNG, northern Australia, Vietnam
- Extensive experience in ecological surveys, experiments, impact assessment
- High level statistical and graphical computing skills
- Advanced biometrics skills [data handling, analysis & interpretation]
- Extensive experience in project design & optimisation
- Public seminars
- Teaching undergraduate & postgraduate, biology and advanced biometrics
- Postgraduate student supervision
- Teaching students with English as a second language

Profile

An **Ecosystem Ecologist** with a wide knowledge of ecological research and particular expertise in tropical estuarine, coastal and wetland systems. A lecturer in **Advanced Biometrics** and **Consultant Biometrician**. Currently leader of the **Coastal and Estuary Ecosystems Ecology Group**, in the School of Marine and Tropical Biology at James Cook University. Joint leader of the **MTSRF project 3.7.1 Marine and estuarine indicators and thresholds of concern**.

Key experience

Research

Extensive research into the ecosystem ecology of tropical coastal ecosystems, focussing particularly on issues of biological connectivity, the ecology of predation, impacts of altered river flow regimes and the effects of global climate change with 37 refereed publications in the field. Personal research focus on fish but includes expertise on a diversity of taxa through supervision of PhD research.

Consultancies

Broad consultancy experience focusing on tropical estuarine, and wetland ecosystems of all types. In particular 15 Environmental Impact Assessments of estuarine and wetland systems in Australia, 1 Strategic Environmental Assessment of hydropower development in Vietnam, 3 environmental assessments of coastal, estuarine and freshwater habitats in Papua New Guinea, 1 review of deep water mine tailing outfalls in Papua New Guinea.

Publications

Author or Co-Author of 38 articles in refereed international journals, 1 refereed book, 2 refereed book chapters, 19 consultancy reports, and many published conference proceedings.

Leadership

Leader of the **Coastal and Estuary Ecosystems Ecology Group**, in the School of Marine and Tropical Biology at James Cook University. Leader of the **Coastal CRC research project** "Contribution of Floodplain Wetland Pools to the Ecological Functioning of the Fitzroy River Estuary". Joint leader of the **MTSRF project 3.7.1 Marine and estuarine indicators and thresholds of concern**. Convener of the Estuary Connectivity Symposium of the 2004 Estuarine Research Federation international conference. Invited speaker at the 2006 Australian Marine Science Association catchment- to-coast conference (topic Connectivity from Catchment to Coast).

Tertiary Teaching

Subject coordinator and principal lecturer of 3rd year and postgraduate level advanced biometrics and estuarine ecology subjects, together with a role as consultant biometrician for postgraduates and staff.

International experience

Extensive research and consultancy experience in Papua New Guinea (Milne Bay, Madang, New Britain) and Vietnam (Quang Nam province).

Recent publications (2005 to date)

Refereed Journal Articles

Sheaves M, Johnston R (in press) Fish fauna of dry sub-tropical estuarine floodplain wetlands. *Marine and Freshwater Research*.

Sheaves M, Johnston R, Dale P, Knight J (in press) Varying patterns of biological connectivity among estuarine wetland pools. *MEPS*

Sheaves, M, Johnston R, Molony B, Shepard G (in press: accepted 14/02/07) The effect of impoundments on the structure and function of fish fauna in a highly regulated dry tropics estuary. *Estuaries and Coasts*

Johnston R, Sheaves M, Molony B (in press: accepted 16/01/07) Are distributions of fish in tropical estuaries influenced by turbidity over small spatial scales? *J Fish Biol*.

Sheaves M, Abrantes K, Johnston R (in press: accepted 25/12/2006) Nursery ground value of an endangered wetland to juvenile shrimps. *Wetlands Ecology and Management*

Sheaves M (2006) Is the timing of spawning in sparid fishes a response to sea temperature regimes? *Coral Reefs*. 25: 655-669

Sheaves M, Baker R, Johnston R (2006) Marine nurseries and effective juvenile habitats: an alternative view. *MEPS* 318:303-306

Baker R, Sheaves M (2006) Visual surveys reveal high densities of large piscivores in shallow estuarine nurseries. *MEPS* 323: 75-82

Sheaves M (2006) Scale dependent variation in composition of fish fauna among tropical estuarine sandy embayments *MEPS* 310:173-184

Sheaves M (2005) Nature and consequences of biological connectivity in mangroves systems. *MEPS* 302:293-305

Baker R, Sheaves M (2005) Redefining the piscivore assemblage of shallow estuarine nursery habitats. *MEPS* 291:197-213

Refereed Books/Book Chapters

Sheaves, M., Collins, J., Houston, W., Dale, P., Revill, A. Johnston, R., Abrantes, K. (2006) Contribution of Floodplain Wetland Pools to the Ecological Functioning of the Fitzroy River Estuary. Cooperative Research for Coast, Estuarine and Waterway Management. Brisbane. 279 p. ISBN 1 921017 70 8

Sheaves M, Brodie J, Brooke B, Dale P, Lovelock C, Waycott M, Gehrke P, Johnston R, Baker R (in press: accepted 17/01/2007) Assessing Climate Change Vulnerability of the Great Barrier Reef. Chapter 19: Vulnerability of coastal and estuarine habitats in the GBR to climate change. GBRMPA.

Munday P, Jones G, Sheaves M, Williams A and Goby B (in press: accepted 29/01/2007) Assessing Climate Change Vulnerability of the Great Barrier Reef. Chapter 12: Vulnerability of fishes of the Great Barrier Reef to climate change

Reports

Gehrke, P, Sheaves (2006) Research priorities to sustain coastal fisheries resources in the Great Barrier Reef region: A scoping study for the Tully-Murray catchment. CSIRO Water for a Healthy Country. Canberra. 56p

Johnston, R. Sheaves, M. (2006) Fisheries ecology of Townsville freshwater impoundments. Preliminary report prepared for North Queensland Water, Townsville.

Johnston, R. Sheaves, M. (2006) An analysis of fish kills in Curralea Lake during 2005. Prepared for Townsville City Council.

Johnston, R. Sheaves, M. (2006) An ecological study of Gustav Creek (between Barton and Sooning Streets), Nelly Bay, Magnetic Island. Progress report June 2006. Prepared for Townsville City Council.

Johnston, R. Sheaves, M. (2006) Tropical fisheries ecology of urban waterways: Part A Aplin's and Black Weirs. Prepared for Townsville City Council, North Queensland Water, Twin Cities Fish Stocking Society.

Johnston, R. Sheaves, M. (2006) Tropical fisheries ecology of urban waterways: Part B Curralea and Paradise Lakes. Prepared for Townsville City Council, North Queensland Water, Twin Cities Fish Stocking Society.

Sheaves MJ (2005) Recreational Sportfishing in Madang. Report on the 2005 Game Fishing Titles and preliminary evaluation of the potential for the development of a small-boat based sportfishing industry. PNG Fisheries Service.

Sheaves MJ & Johnston RW (2005) Monitoring of fish communities and keystone environmental parameters during the Bluewater Harbour development at Half Moon Creek, Cairns. Incoll TPC. Melbourne.

Johnston, R. Sheaves, M. Penny, A. (2005) The status of fish assemblages in Townsville water bodies. An interim report. Prepared for North Queensland Water, Townsville.

Johnston, R. Sheaves, M. Penny, A. (2005) Tropical fisheries ecology of urban waterways. Annual Report May 2005. Prepared for Townsville City Council, North Queensland Water, Twin Cities Fish Stocking Society.

BRIEF CURRICULUM VITAE FOR

J.D.COLLINS

Name: John Douglas Collins

Present position: Senior Lecturer, Marine Biology, James Cook University

Academic qualifications:

PhD. (JCU) 1978. "Interactive biology of corals"

MSc. (London) 1973. "Trace metal content of marine animals"

BSc. Hons. Zoology (London) 1967

Employment history

1997-2007 Senior Lecturer Marine Biology JCU

1987-1997 Lecturer, Marine Biology JCU

1976-1987 Senior Tutor, Marine biology JCU

1971-1976 Tutor, Marine Biology JCU

1967-1970 Senior Research Technician, Department of Oceanography, Liverpool University U.K.

Research Publications:

Cruz-Motta JJ Collins JD (2004) Impacts of dredged material disposal on a tropical soft-bottom benthic assemblage. *Maine Pollution Bulletin* 48, 270-280.

Dartnall AJ Byrne M Collins JD Hart MW (2003) A new viviparous species of asterinid (Echinodermata, Asteroidea, Asterinidae) and a new genus to accommodate the species of pantropical exiguoid sea stars. *Zootaxa* 359, 1-14.

Brodie GD Willan RC Collins JD (1997) Taxonomy and occurrence of *Dendrodoris nigra* and *Dendrodoris fumata* (Nudibranchia: Dendrodorididae) in the Indo-west Pacific. *Malacol. Soc. London* 63, 407-423.

Crossland MR Collins JD Alford RA (1993) Host selection and distribution of *Hypermastus placenta* (Eulimidae), an ectoparasitic gastropod on the sand dollar *Arachnoides placenta* (Echinoidea). *Aust. J. Mar. Freshwater Res.* 44, pp.834-844.

Clayton PD Collins JD (1992) Reproductive and feeding ethology of a tropical, intertidal sand-dwelling anemone (*Actinoporus elongatus*, Carlgren 1900). *Hydrobiologia*. 237. pp.31-38.

Crossland MR Alford RA Collins JD (1991) Population dynamics of *Hypermastus placenta* (Gastropoda, Eulimidae), an ectoparasite on the sand dollar *Arachnoides placenta* (Echinoidea). *Aust. J. Mar. Freshwater Res.* 42. pp.69-76.

Harrison PL Collins JD Alexander CG Harrison BA (1990). The effects of fuel oil and dispersant on the tissues of a staghorn coral *Acropora formosa*: A pilot study. Paper 9: Scientific Input to Oil Spill Response: Proceedings of 2nd National Workshop on Role of Scientific Support Coordinator, HMAS Cerebrus (Hastings, Vic.) ed. Ian Dutton & Nick Holmes. pp. 51-6 1.

- Heyward A Collins JD (1985). Fragmentation in *Montipora ramosa* the genet and ramet concept applied to a reef coral. *Coral Reefs*. 4. pp.; 35-40).
- Heyward A Collins JD (1985). Growth and sexual reproduction in the scleractinian coral *Montipora ramosa*. *Aust. J. Mar. Freshwater Res.* 36. pp.441-446
- Walker TA Collins JD (1985). Surface circulation of the central region of the Great Barrier Reef lagoon. *Proc. 5th Int. Coral Reef Cong. Tahiti* 3. pp399-403
- Walker TA Collins JD (1982). Great Barrier Reef surface drift. *Australian Fisheries*. 41. pp 7-9.
- Walker TA Collins JD (1980) Surface currents of the central Great Barrier Reef. *Australian Fisheries*. 39. pp.8-9.
- Cheng L Collins JD (1985) Observations on behavior, emergence and reproduction of the marine midges *Pontomyia* (Diptera: Chironomidae). *Marine Biology*. 58. pp. 1-5.
- Hildemann WHH Dix T Collins JD (1974). Tissue transplantation in diverse marine invertebrates. In: *Contemporary Topics in Immunobiology*. Vol. 4. Chap 12. pp. 141-149.
- Segar DA Riley JP Collins JD (1971). The distribution of the major and some minor elements in marine animals: Molluscs. *J. mar. Biol. Ass. UK*. 51. pp. 131-136.
- Segar DA Collins JD (1969). Some minor and major elements in certain marine invertebrates. *Proceedings Challenger Soc.* 4. pp.30-31.

Published Books and Chapters:

- Collins JD.et al (1996). *Oceanography and Plankton and Caring for the Sea Teachers Guide 3*. Marine science curriculum materials for the South Pacific region. Published UNESCO. Townsville. 227 pp.ISBN 0864436033
- Collins JD.in Hopley et al (1995). *Pacific Island and Tropical Shorelines Teachers Guide 1*. Marine science curriculum materials for the South Pacific region. Published UNESCO. Townsville. 264 pp.ISBN 0864435584
- Collins JD & Wallace C (1994). Chapter 12. Coral Reefs. in *Austrian Marine Biology*. ed L.S.Hammond and R.N.Synnot. Published Longman-Cheshire
- Collins JD (1994). *Tropical Shorelines: Biology and Ecology*. Marine science curriculum materials for the South Pacific region. Published UNESCO. Townsville. 75pp. ISBN 0 86443 518 5.
- Collins JD (1992). *Sandy Shores*. Marine science curriculum materials for the South Pacific region (Pilot Version). Published UNESCO. Townsville. 52pp. ISBN 0 86443 4413.

Consultancies and reports

- Sheaves M Collins JD Houston W Dale P Reville A Johnston R Abrantes K (2006) The contribution of wetland pools to the ecological functioning of the Fitzroy River estuary. 282 pp. CRC Coastal Zone, Estuary and Waterway Management Technical report 77.

Kettle B Dalla-Pozza R Collins JD (2001) *New Directions*. A review of the impacts of dredging in Cleveland Bay, and research priorities for the next decade. 118pp. Report for Townsville Port Authority's Dredge Spoil Disposal Technical Advisory and Consultative Committee.

Collins JD (1993). A report to the CCNT on the fringing reefs in the proposed Beagle Gulf Marine Park. 13 pp. For Conservation Commission of the Northern Territory

Milward NE Collins JD (1989). Report on effects of dredging on fish and benthos at "HMAS Cairns" naval base in Trinity Inlet. 19 pp. For Dept. of Administrative Services.

Collins JD (1989). Expert witness for Linkon (Magnetic Quays Development) in Administrative Affairs Tribunal hearing. Briefing notes on corals, salinity and sediment.

Collins JD (1989). Expert witness for Linkon (Magnetic Quays Development) in Local Government Appeal. Briefing notes on corals, salinity and sediment.

Collins JD (1988). Coral communities section. Pages 4-14 in Public Environmental Report - Magnetic Quays Development, Magnetic Island. 93 pp. prepared by McIntyre and Associates Pty. Ltd. Townsville.

Collins JD (1987). Fringing Reefs of Magnetic Island. Fringing Reef Workshop. Workshop Series No. 9 GBRMPA. pp.44-49.

Collins JD (1986). Coral communities section. (17pp). Environmental Impact Assessment for Bright Point Marina proposal, Magnetic Island. For McIntyre and Associates Pty. Ltd. Townsville.

Harrison PL Collins JD Alexander CG Harrison BA (19xvi). The effects of lowered salinity and oil pollution upon the tissue of a staghorn coral *Acropora formosa*. 21 pp. GBRMPA.

Duff G Collins JD (1986). Report on flora and fauna for proposed Woodwark Bay development. 5pp. For Saunders Ellick and Associates. Mackay.

Collins JD Walker TA (1985) A drift card study of the Great Barrier Reef Final report. 240 pp. GBRMPA.

Collins JD Walker TA (1981). A drift card study in the central region of the Great Barrier Reef lagoon. 64 pp. GBRMPA

Undergraduate teaching:

Course coordinator for:

MB2050 Marine Science for Biologists

MB2080 Marine Invertebrate Diversity

MB 3170 Benthic Ecology

MB3270 Coastal and Estuarine Ecology

Lecturing on:

MB2050 lectures on benthic and coastal ecology

MB2080 lectures on all invertebrate groups of marine significance

MB3170 lectures on all aspects of benthic ecology

MB1110 lectures on coral reefs

MB3270 lectures on physical nature of estuaries and trophodynamics.

In the more distant past I have given a number of lectures, been subject coordinator, and set up subjects on a variety of marine topics including descriptive physical oceanography, chemical oceanography, oceanographic techniques, phytoplankton and primary productivity, annelids, coral reef ecology and taxonomy, coral geomorphology, estuarine ecology, fouling studies and coastal navigation. I have also had involvement with numerous field trips in ecological subjects to rainforests, mangroves and savannahs mainly covering terrestrial invertebrate fauna

In my lectures and subjects I have always organized numerous practicals, field trips and tutorials as I strongly believe that biology must have a relevant practical component to effectively consolidate the often diffuse theoretical approach of lectures. This is particularly so for students working in the tropics, where the application of theories and dogmas derived from temperate systems often have to be modified. For undergraduates there are few textbooks that address tropical biology making the field and practical work even more important.

Post graduate/ Honours supervision:

I have successfully supervised, or co-supervised, 64 post graduate and honours students (26 honours, 9 masters, 15 doctorate and 4 misc).

Scientific Conferences

I have been on the organising committee for two large conferences, AMSA 2001 (Townsville) and International Seagrass Conference 2004 (Townsville)

Curriculum vitae

Janine Sheaves

James Cook University

Email: Janine.Sheaves@jcu.edu.au

Tertiary Education:

- PhD commenced. James Cook University. 2002.
- Masters Qualifying. Project, seminar and literature review. 1998.
- Graduate Certificate of Education (Tertiary teaching). 1997.
- BSc in Marine Biology. James Cook University, Townsville, Australia, 1996.
- PhD. Near completion.

PhD Topic

The response of tropical intertidal macro-benthos to a short-term intense freshwater event

Research skills

- Extensive knowledge of MSEXcell, MSWord, Sigmaplot, SPSS, Powerpoint and Pimer5.
- Collecting samples and data from aquatic locations, using specialized equipment and techniques
- Analyzing samples using sophisticated instruments and techniques
- Conducting research aboard vessels
- Analyzing life forms and constituents present in the water
- Analyzing data through statistical and numerical models.
- Analyzing and interpreting data

Teaching experience:

- **Extensive experience is teaching undergraduate and postgraduate students in subjects within the science facility at James Cook University.**

Course coordinator at James Cook University

- Course coordinator - SC1001. (1999, 2001) - Basic Science for Primary School Teachers
- Course coordinator - MB2080. (2004) - Marine Invertebrate Biology
- Practical coordinator - MB2080. (2003) - Marine Invertebrate Biology
- Practical coordinator - ZL1001. (2006) - The Diversity of Animal Life
- Practical coordinator - BT1001. (2006) - Introduction to Plant Science
- Practical coordinator - BZ1001. (2007) - Fundamentals of Biology

Environmental monitoring experience:

- In 1999, Darwin harbour was infested with the introduced Zebra striped mussel (*Mytilopsis adamsi*), as a result, Darwin harbour was closed, and an eradication program was implemented. As a follow up to this, an environmental monitoring program was implemented to monitor other Ports in North Queensland for the occurrence of the mussel. Monitoring was conducted from June to December 1999. I was given the task of receiving and examining all the monitoring devices for the occurrence of the mussel and collating data and report writing.
- JCU in association with CRC Reef were involved in a number of Baseline surveys examining the presence of introduced marine pests in a number of Ports in North

Queensland. I was involved in these projects from 2000 to 2002. Ports sampled were Gove, Weipa, Cairns, Karumba Townsville and Cape Flattery.

- In May 1999, I was asked to take part in a Biological and Ecological Assessment of the Condition of Mangrove and Invertebrate communities in the areas adjacent to the Ross Island Barracks (Ten Terminal regiment).
- Environmental impact assessment at Half-Moon Creek in Cairns. First assessment carried out in August 2003, second assessment due August 2004.
- Rapid biological assessment mangrove invertebrates in Kimbe Bay in New Britain.

Scholarship:

- In 2002 successfully gained a Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management (CRC) scholarship.

Boating / diving qualifications:

- Recreational Ship Master's Licence.
- Open water diving.

Publications

Reports

- Sheaves, M., Aumend, J., Fisher, R., Johnston, R. & Sheaves, J. 1999. A Biological and Ecological Assessment of the Condition of Mangrove and Invertebrate Communities in Areas Adjacent to the Ross Island Barracks (Ten Terminal Regiment), Townsville. A report to Maunsell McIntyre Pty. Ltd. Environmental Consultants.
- Neil, K.M., Hoedt, F.H., Sheaves, J, Cruz, J.J. and Choat, J.H. 2001. Survey of the port of Karumba; Port baseline for introduced marine pests. CRC Reef Research Centre and JCU to Ports Corporation of Queensland.
- Neil, K.M., Sheaves, J, Cruz, J.J., Hoedt, F.H., and Choat, J.H. 2001. Port Baseline Surveys for introduced Marine Pests: the Port of Townsville. CRC Reef Research Centre and JCU to Townsville Port Authority.
- Neil, K.M., Sheaves. J., Weibkin, A. 2002. Port Baseline Surveys for introduced Marine Pests: the Port of Cape Flattery. CRC Reef Research Centre and JCU to Ports Corporation of Queensland.
- Neil, K.M., Hilliard, R.W., Stafford, H. Sheaves, J and Wiebkin, A. 2003. Port baseline survey for introduced marine pests: the Port of Gove. CRC Reef Research Centre, JCU and URS Australia, Pty Ltd, report to Alcan Gove Pty Ltd Limited.

Article in Book:

- Sheaves, J.1999. University Education: Interaction Between Motivation and Learning Style. Tertiary Teaching. Book 3. (McGinty S. Ed.). James Cook University.

Paper submitted:

- A preliminary investigation of the occurrence of Leaf-taking alpheid shrimps in two north Queensland mangrove Creeks.

Presentations:

- August 2003: Seminar presented for CRC for Coastal Zone, Estuary and Waterway Management members to CRC stakeholders.
- August 2003: Seminar presented to the Environmental protection agency and the general public at Indooroopilly Science Centre Brisbane.
- September 2005 and 2006: Seminar presentation at CRC yearly workshop at Noosa.
- Appeared on the ABC television series Quantum 23/1/99 this program examined the recycling of nutrients in mangrove ecosystems by sesarmid crabs.