

Centre for Marine Ecosystems Research 2008 Annual Report





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Principals' Report

The inaugural year for the Centre for Marine Ecosystems Research (CMER) has been both exciting and productive. After being a strong research group within the Centre for Ecosystem Management for several years, we considered it was time the group formed a research centre in its own right. The centre was officially recognized in 2008, and in its first year, CMER comprised three teaching/research staff, eight Postdoctoral Research Fellows, three Adjunct Researchers, two Research Assistants, an Administrative Assistant, four PhD students and four Masters by Research students. We welcomed Drs Adriana Vergés, Britta Munkes and Pippa Moore, as well as Mrs Wendy Mills, and said our farewells to Drs Fernando Tuya and Mads Thomsen. We wish both Fernando and Mads the best in their current positions in Portugal and New Zealand. We also congratulate Dr Rebekah Kenna who successfully completed her PhD in 2008, a fantastic achievement.

It was pleasing to see the centre recognized nationally and internationally through visits by researchers. Dr Fernando Tuya spent two years on a Spanish Postdoctoral Fellowship, while Dr Mads Thomsen from Denmark spent 2 years in CMER and Dr Britta Munkes joined us towards the end of the year in a two-year Postdoctoral Fellowship from

Germany. We also hosted Professor Ken Heck, Ms Carly Steeves and Ms Kelly McKay from the USA in January and February, and Associate Professor Michelle Waycott from James Cook University, Queensland. Our national and international recognition is also highlighted by the large number of invitations to review manuscripts submitted to journals. CMER members reviewed 85 manuscripts from 46 national and international journals, which not only indicates their strong research profiles, but their commitment to the peer-review process.

CMER members are commended for their high level of productivity during 2008. Members were responsible for the publication of one book, 16 papers in peer-reviewed journals, 4 papers in refereed conference proceedings and eight technical reports. The centre received nearly \$1 million in research income, with the vast majority coming from external sources. The centre, through ECU's strong support, has become a significant player in the Western Australian Marine Science Institute, with two large projects being funded through the State Government's initiative. The centre also gained significant funding from the Department of Planning and Infrastructure. Members also attended nine local, national or international conferences or workshops.

Centre members are committed to engaging with the scientific and broader community. Glenn Hyndes became chair of the Marine Reference Group of the Perth Region NRM and board member of that NRM organisation. Paul Lavery chaired a workshop on potential dredging effects on coral reefs and a session on dredging in the Coast to Coast Conference in Darwin. Several members have participated on advisory committees, including the WA Integrated Marine Observing System (C. Hanson), WA Fisheries Advisory Board for the Fisheries Research and Development Corporation (G. Hyndes) and the Seagrass Working Group for the Department of Water (T. Wernberg and K. McMahon).

CMER is being recognized as an outstanding research centre at Edith Cowan University, and we believe that its reputation is increasingly being recognized at the local, national and international level. We would like to congratulate members in their sterling efforts during 2008, and hope that 2009 is equally exciting and productive.

Glenn Hyndes and Paul Lavery

Co-Principals, Centre for Marine Ecosystems Research





Highlights in Habitat Connectivity and Trophic Interactions

SEAGRASS WRACK DYNAMICS

During 2008 Paul Lavery and Kathryn McMahon began a two year collaborative project with colleagues from UWA (Chari Pattiaratchi and Carolyn Oldham) and DHI consulting (Tony Chiffings, Morten Rugbjerg) to investigate the dynamics of seagrass wrack in Geographe Bay. Detached macrophytes (seagrass and macroalgae) are transported from offshore areas and accumulate in substantial volumes on beaches, commonly called wrack. Wrack is an important feature of coastlines as it can play a major role in subsidising terrestrial production and supporting marine food webs. However, with human alteration of beaches such as groynes, the build-up of wrack can create management issues. At present, large accumulations of wrack up to 2km long and 2 m high next to Port structures in Geographe Bay create public amenity issues and pose potential human health effects due to the release of hydrogen sulfide from decomposition of the wrack.

This study aims to improve understanding of the natural wrack dynamics and with this information provide recommendations on how to manage large accumulations. During 2008, a hydrodynamic and particle transport model was developed for Geographe Bay and the amount and type of wrack accumulating on beaches quantified. When wrack accumulated in piles greater than 0.5 m high, the sediment conditions immediately under the wrack altered to an anoxic, negative redox state where hydrogen sulfide was produced. Experiments are underway to determine what are the key drivers of hydrogen sulfide production in wrack banks, either an organic carbon supply which fuels the heterotrophic bacteria or as a diffusive barrier to reduce oxygen transport into the sediments.

ALGAL-HERBIVORE INTERACTIONS IN NINGALOO REEF

In recent years, the iconic Ningaloo Reef has been the focus of a multi-million-dollar research effort aimed at addressing critical information gaps needed to better understand and manage the Ningaloo Marine Park. This research has been led by the Western Australian Marine Science Institution (WAMSI), the CSIRO Wealth from Oceans Flagships' Ningaloo Collaboration Cluster, and the Department of Environment and Conservation. Funded through WAMSI and ECU, CMER joined the large research programme in 2008 by leading a three-year project focused on the process of herbivory in Ningaloo Reef. Herbivores play a particularly important role in coral-reef benthic communities by reducing the cover of macroalgae, which can otherwise outcompete corals.

Research by Adriana Vergés, Glenn Hyndes and Mat Vanderklift aims to quantify the magnitude of herbivory and to characterise the patterns of plant-herbivore interactions in Ningaloo Reef. Natural dietary markers (carbon and nitrogen stable isotopes and fatty acids) were used to determine the ultimate source of primary productivity and to characterise the grazing pathway in a range of habitats and regions. A combination of short-term algal tethering and longer-term algal transplant



Highlights in Stress and Disturbance Ecology

DRIFT ALGAE AND INTRODUCED SPECIES IN THE SWAN RIVER ESTUARY

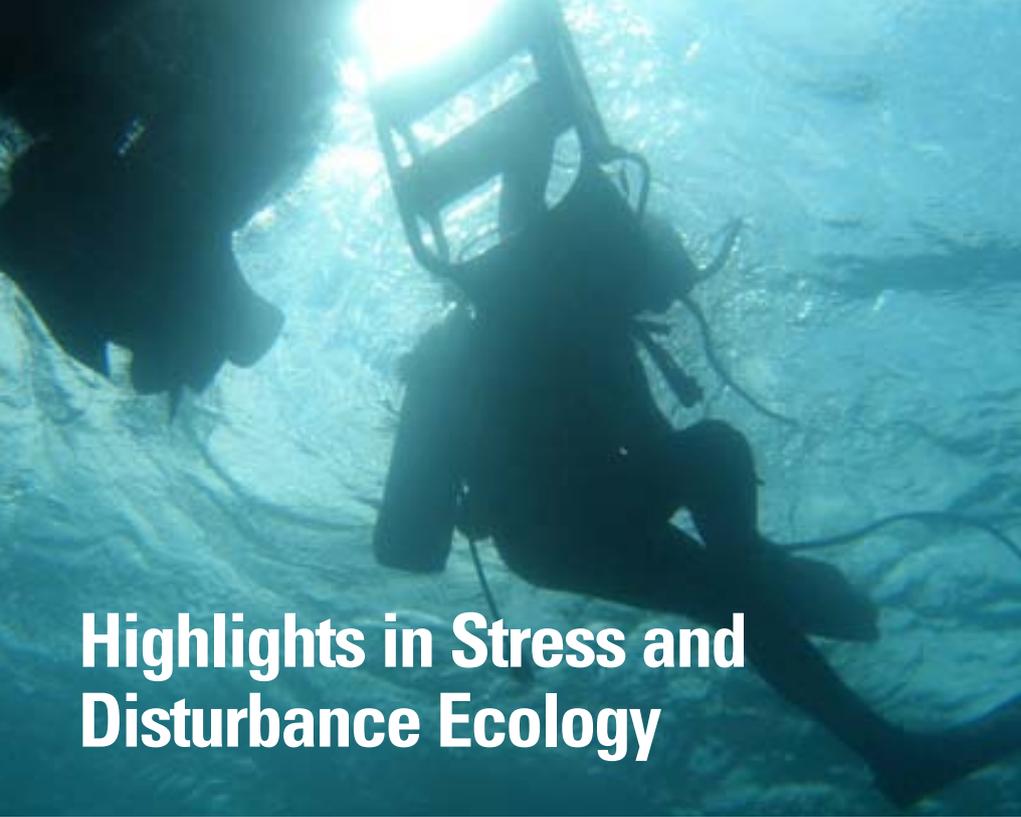
experiments were used to determine the broad relative differences in herbivory among a cross section of the reef (lagoon, reef flat and outer reef habitats) and between different regions of Ningaloo. Differences in herbivory between habitats or regions were correlated with herbivore abundance, benthic community structure, algal biomass and habitat rugosity.

Towards the end of 2008, a trans-continental comparison of herbivory between Ningaloo and the southern Great Barrier Reef was undertaken in collaboration with Prof David Bellwood and Mr Scott Bennett from James Cook University, Queensland. Outcomes from this project will provide detailed functional knowledge of the process of herbivory in Ningaloo Reef, including information on the distribution, abundance and ecosystem impact of individual species of herbivorous fish. Since these are key players that are able to prevent degradation in coral reefs, this information will be crucial in the development of management plans for the Ningaloo Marine Park.

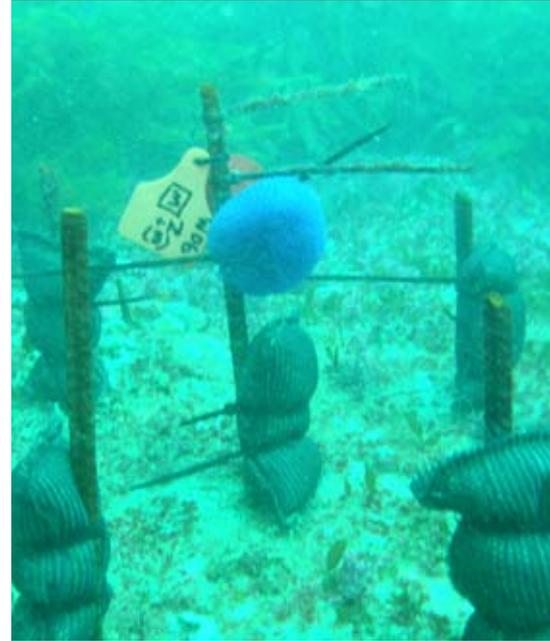
In 2008, Thomas Wernberg and Mads Thomsen received funding from The Swan River Trust to study the macroalgal communities in the Swan River Estuary. Thomas and Mads investigated if and how these algae interact with the local seagrass *Halophila ovalis*. During their investigations Thomas and Mads discovered very large populations of the mud snail *Batillaria australis* in the seagrass beds, and immediately took on the additional task of investigating the ecological role of this species which, they discovered by looking back at old fauna surveys, was likely to have been introduced to the Swan River in the 1940's. Ongoing work with *Batillaria* has shown that it is now by far the most common marine snail in the estuary, where it functions as a mobile 'mini-reef' where algae grow and fragment to feed the large populations of drift algae. Also, the empty shells provide an enormous amount of 'housing' for millions of hermit crabs. Laboratory

and field experiments were used to show that large amounts of algae can have negative effects on the seagrasses, and that increased temperature, nutrients and snails may exacerbate these negative effects by causing low oxygen levels in the water column and sediments. These results provide information on how stressors from increasing temperatures, nutrient loads and an invasive species, may combine to negatively affect the ecological function of a key habitat (*Halophila* seagrass beds) in the Swan River Estuary.





Highlights in Stress and Disturbance Ecology



BIOGEOGRAPHY OF TEMPERATE MARINE MACROALGAE

The marine flora of temperate Australia is the most species rich and diverse on earth. Understanding the vulnerability of this natural resource to human impacts and global change requires information on the patterns of regional species diversity and the processes that underpin these patterns. In 2008, Mads Thomsen and Thomas Wernberg were invited to participate in a working group under the auspices of the ARC NZ Research Network for Vegetation Function (<http://www.vegfunction.net/>). With the aim of providing an up-to-date account of the bioregionalisation and phylogeography of Australia's temperate marine flora, the working group charged nine researchers from Australia and New Zealand with the task of revising and analysing a database of all specimens of temperate marine macroalgae lodged in Australia's main herbaria - almost 80,000 individual

records counting nearly 1,500 different species! Their analyses provided good quantitative support for the classical Flindersian, Maugean and Peronian biogeographic provinces, and generally pointed to vicariance and environmental gradients (temperature) as drivers of species distributions. However, the work also highlighted the importance of contemporary processes (dispersal) and oceanographic connectivity in maintaining regional patterns of species turn-over and assemblage heterogeneity. To follow up, the network has approved funding for Thomas to convene a similar working group in 2009, where the focus will be to use this unique data set to model potential impacts of climate change on the southern marine flora.

INTERACTIONS BETWEEN GLOBAL AND LOCAL STRESSORS

Understanding local impacts of human activities within a context of global change is one of the great challenges of preparing for environmental management in the future. Global warming is a threat to the ecological function of many marine habitats; particularly because it may change the vulnerability to local stressors such as eutrophication (increased nutrient loads). 2008 saw the end to a large field experiment testing the effects of ocean temperature and nutrient addition on the recovery of reef biota following simulated storm damage. Funded by an ARC Discovery grant, Mads Thomsen, Fernando Tuya and Thomas Wernberg travelled between locations of different ocean temperature along WA's southwest coast to maintain experimental plots of elevated and ambient nutrient levels for two years. Sample processing is still ongoing, but preliminary results indicate that both timing of disturbance and nutrient addition can exacerbate the effects of elevated temperature on the recovery of temperate reef communities.



Highlights in Management of Human Impacts

LIGHT REDUCTIONS LEADS TO LOSS OF MACROINVERTEBRATE FAUNA IN SEAGRASS SYSTEMS

Seagrass meadows are an important habitat for many marine fauna, providing invaluable food resources, a nursery, protection from predation and numerous other resources to higher order consumers. Light reduction perturbations in marine systems are naturally occurring events (e.g. from storms). However, light reductions associated with many anthropogenic activities (e.g. dredging, eutrophication) can be much longer lasting and have far greater consequences than those caused by naturally occurring events. CMER research has indicated that sustained and high intensity light reductions can lead to significant declines in seagrasses.

By inducing disturbances in a seagrass meadow, Adam Gartner, Kathryn McMahon and Paul Lavery experimentally investigated how light reductions affect the fauna (macroinvertebrates) inhabiting these systems. Specifically we investigated how the duration, intensity and timing of light reductions affect faunal density, biomass and assemblage structure. They also investigated the capacity of the fauna to recover following the removal of light reduction stresses.

This research highlighted some significant and concerning trends. Declines in the order of 80% of fauna or higher were found in shaded seagrass systems. However, different fauna within the seagrass canopy responded differently and not all fauna declined. Effects on fauna were dependent on the time of the year that shading occurred, duration and the intensity of light reductions. Where declines did occur, these were largely related to the loss of seagrass leaves and algal epiphytes, which provide food and living space for the seagrass fauna. There were also declines in the number of fauna following light reductions, indicating that light reductions can negatively affect the structure of these assemblages. On a positive note, following ten months after the removal of shading, the fauna recovered to population sizes consistent with undisturbed seagrass.





Highlights in Conservation and Fisheries Biology

CORAL TROUT AT THE ABROLHOS ISLANDS

Jason How, together with Glenn Hyndes (ECU), Jill St John and Michael Mackie (Department of Fisheries) are investigating the biology, movement, and spawning aggregation dynamics of coral trout, an iconic species at the Abrolhos Islands as part of an Australian Research Council Linkage Project. With the research nearing completion, they have discovered that this population has several unique characteristics not seen in its con-specific Great Barrier Reef population. Spawning aggregations form over new and full moons, as is common for a number of coral reef Serranids. However, these aggregations are showing peak abundances in the morning rather than the evening, contrary to most other aggregate spawners. Peak morning abundances were confirmed through both visual surveys and acoustic tracking of fish to spawning aggregations.

Coral trout at the Alborhos Islands are showing a small-scale geographic separation in reproductive development. Generally, fish from the central lagoonal areas of at least two archipelagos are showing no reproductive development despite being of a mature size and being captured within the spawning season. The mechanisms behind this are being investigated, but fishing pressure and site specific water motion appear to be important factors.

This research shows the importance of site-specific examinations of fish biology and behaviour. This type of information is becoming particularly important for spatial management, which is becoming increasingly used to manage the effects of fishing and other human disturbances through the gazetting of Marine Protected Areas



THE ROLE OF THE WESTERN ROCK LOBSTER, *PANULIRIUS CYGNUS*, IN STRUCTURING SHALLOW WATER BENTHIC ASSEMBLAGES

Pippa Moore, Glenn Hyndes, and Paul Lavery, began the WAMSI and ECU funded project examining the effects of the Western rock lobster, *Panulirus cygnus*, on shallow benthic communities in late 2008. The Western rock lobster forms the basis of Australia's largest single species fishery valued at approximately \$AUS300 million per year. Although much is known about the biology and life history of *P. cygnus*, much less is known about the effects of lobster removal on benthic communities. The aim of this project is to understand the role, if any, of *P. cygnus* in structuring shallow water seagrass assemblages. Starting in Sept 2008 and running until April 2011, this project will follow three approaches: an initial broadscale correlative phase identifying patterns in the system; quantification of *P. cygnus* foraging behaviour





Highlights in Research Training

ESTABLISHMENT OF ECOLOGICAL FUNCTIONS IN TRANSPLANTED MEADOWS OF THE SEAGRASS *POSIDONIA AUSTRALIS*

using a VRAP – radio acoustic high resolution positioning system; and a suite of manipulative experiments to quantify lobster impacts on benthic assemblages.

Initial broadscale surveys of lobster abundance indicate that sanctuary zones such as Kingston Reef, Green Island (both at Rottnest Island) and Boyinaboat (Marmion) have significantly higher abundances of lobsters compared to non-sanctuary zones. In addition, non-sanctuary zones in Marmion Marine Park appear to have fewer lobsters than non-sanctuary zones at Shoalwater Islands Marine Park. Following this initial work, sites with high, medium and low lobster densities were identified to investigate the effects of lobster density and proximity to reef on benthic assemblages. It is hypothesised that lobsters will have a greater impact on benthic assemblages closer to reefs and when lobsters are in higher abundances. Outcomes of this research will inform the design of manipulative experiments which will begin later in 2009.

Rebekah Kenna came from Queensland to Western Australia to carry out her PhD studies at ECU on an ECU-Industry scholarship partly funded by DA Lord & Associates. She embarked on a study that culminated in her thesis entitled “Establishment of ecological functions in transplanted meadows of the seagrass *Posidonia australis*” which was supervised by Glenn Hyndes and Paul Lavery. The purpose of her research was to determine how ecological functions establish in transplanted *Posidonia australis* meadows of Oyster Harbour, Western Australia, and to determine how transplanting factors (e.g. planting density, patch size and patch shape) may influence these processes. The study also determined whether monitoring the return of structural variables of seagrass represents the establishment of ecological functions, or whether monitoring ecological functions is required in determining the overall success of a restoration programme.

Rebekah had access to plots of seagrass, which had been transplanted in Oyster Harbour by Geoff Bastyan and were four and five years old when the study was initiated. The success of these plots allowed Rebekah to transplant more plots for later parts of her project, which resulted in the successful completion of an extensive field programme, despite having to deal with some extreme conditions on the southern coast of Western Australia. Working in the region provided some unexpected risks in the field. Rebekah has the unfortunate reputation in the centre as being the only person being struck by lightning! Fortunately, it did not result in long-term damage, and she maintained her enthusiasm to continue working in the region.

Congratulations to Rebekah for her successful completion of her thesis. We wish her the best for her career wherever it leads her.

CMER Members

ECU Staff



Mr Chris Doropoulos

Christopher's research has focused on the grazing pathway in the food webs of temperate seagrass and tropical-reef systems. In temperate systems, he has been focusing on connectivity pathways between reef and seagrass habitats through examining the role of grazing gastropods in utilizing kelp that has been transported into seagrass from algal-dominated reefs. In the tropical system, he has been examining spatial patterns in herbivory on algae in coral reefs.



Dr Christine Hanson

Christine has broad interests in marine ecological research, especially interdisciplinary studies that seek to provide a holistic understanding of marine community dynamics in relation to their environment and/or habitat. Her work in pelagic ecology has examined oceanographic (physical and chemical) forcing of phytoplankton biomass, production and species composition in the coastal eastern Indian Ocean, on both spatial and temporal scales. More recently, her research has focused on ecological interactions in shallow coastal waters, and more specifically on energy and nutrient flow within and between different habitats (reef, seagrass and sand-dominated regions) using new biomarker techniques (primarily stable isotopes and fatty acids).



Mr Dave Holley

Dave's main focus of research is on the foraging ecology and habitat utilisation of marine mammals, in particular species such as the dugong, seals and sea lions. He is interested in understanding the movements of these species and the forcing factors behind them through the use of technology such as satellite and GPS tags and time depth recorders. In Dave's work with dugongs, he also works closely with local Indigenous communities throughout NW WA. Collaborating with these communities is an important component of any dugong related research activity given the importance of dugongs to coastal Aboriginal groups. Working together also provides for a meeting point of traditional knowledge with modern science.



Mrs Wendy Mills

Wendy joined the CMER group in October 2008 on a part-time basis. She provides administrative support to the group.



Dr Pippa Moore

Pippa's research focuses on the effects of anthropogenic impacts on shallow water marine community dynamics and ecosystem functioning. In particular she is interested in the role of fisheries in altering key ecosystem processes (e.g. predation) and how this affects benthic assemblages. She is also interested in the effects of climate change on marine biodiversity and more particularly how changes in biotic interactions may affect the structure and functioning of marine systems.



Dr Britta Munkes

Britta is a benthic ecologist, interested in community processes. Her research focuses on the impact of human-induced environmental stressors (nutrient pollution and altered food webs) as well as interacting physical factors on benthic communities. Britta is particularly interested in the effects of these stressors on the resilience and biodiversity in seagrass communities. Her goal is to understand about processes leading to changes in competition strength between seagrasses and algae, between top-down (grazers) and bottom-up (nutrient enrichment) effects



Associate Professor Glenn Hyndes

Coastal marine and estuarine environments are highly complex systems prone to high levels of human disturbance resulting from the concentration of Australia's population along the coastal regions. It is, therefore, crucial to develop a high level of understanding of the complex ecological processes in these coastal environments. The movement of animal and plant material from one habitat to another forms an important process of habitat connectivity in the coastal, marine landscape. This forms the focus of Glenn's research activities. His studies have examined the trophic links among habitats using a combination of experimental and biomarker (stable isotopes and fatty acids) approaches to trace key food sources through the food web. Glenn's work has also examined the importance of different coastal habitats, particularly seagrasses, to fish communities, the ecosystem effects of consumers on shallow coastal biodiversity.



Professor Paul Lavery

The ecology and management of benthic marine ecosystems. Paul's research is aimed at improving our understanding of how coastal marine ecosystems respond to pressures and how the functions and ecosystem services they provide might be affected. Much of his research has focused on seagrass ecosystems and is applied to developing appropriate means of assessing impacts and the development appropriate monitoring and management approaches. A second major research theme is the mechanisms and magnitude of connectivity and trophic subsidies among coastal marine ecosystems. Much of this work has relied on stable isotope and other biomarker techniques to understand the role of materials transported from one habitat in supporting productivity in adjacent habitats.



Dr Kathryn McMahon

Kathryn's main research area is coastal marine ecology, specifically focusing on seagrasses in both tropical and temperate environments. Topics of particular interest include seagrass health in respect to human impacts and natural disturbance, seagrass recovery processes and growth strategies, grazing interactions, seagrass population genetics and phylogenetics.



Ms Michelle Newport

Michelle's research activities focus on understanding anthropogenic impacts on marine systems and the ability of marine systems to respond to disturbances. Michelle is currently examining the lifecycle and transport of seagrass wrack and its ecological importance in coastal marine environments. The outcomes of this research aim to assist in providing informative strategies for wrack management in Geographie Bay.



Dr Mads Solgaard Thomsen

Mads's research focuses on how anthropogenic stressors, in particular bio-invasions, nutrient pollution and climate change, impact the structure, productivity and biodiversity of aquatic communities. Mads combines manipulative experiments, analysis of long-term monitoring data and literature-based meta-analysis to test how patterns in biological communities are generated and maintained. This research provides predictions on how coastal habitats will respond to anthropogenic stressors and recommendations for conservation strategies needed to ameliorate their impacts.



Dr Fernando Tuya

Fernando's research is driven by the need to develop rules and models to explain the patterns of organization of marine populations and communities from local to macroecological (biogeographical) scales. From this general interest, Fernando is particularly interested in ecological processes shaping temperate reefs from small to large geographical scales, trophic linkages between reefs and adjacent seagrass meadows, effects of human perturbations on natural communities and the role of Marine Protected Areas in preserving marine biodiversity and fishery resources. As a tool to improve the public perception and awareness of marine biodiversity, he has contributed to the dissemination of the marine flora and fauna of the Atlantic Ocean through books and open-access monographs.

...CMER Members ECU Staff



Associate Professor Ute Mueller

Geostatistical techniques were developed for the estimation and simulation of the spatial distribution of mineral reserves, but are equally applicable to other natural resources. Ute's research interests include the development and application of simulation and estimation of fisheries data.



Dr Adriana Vergés

Adriana's research focuses on the ecology and evolution of marine trophic interactions, i.e. who eats who in the sea, and why. The main bulk of her current research focuses on the topic of fish herbivory in the Ningaloo Reef Marine Park. Other particular topics of interest are seagrass ecology and physiology and the effectiveness of marine protection areas to protect biodiversity and ecosystem functions.



Dr Thomas Wernberg

Thomas has a range of research interests including: the effects of climate change on temperate reef communities; the influence of scale, extent and environmental stressors on trajectories of recovery following physical disturbances to algal habitats; the morphological variation and architecture in canopy-forming algae and its consequences for the ecology of the understory; the trophic linkages between kelp beds and adjacent habitats in the form of detached reef algae; the biomechanical properties of macroalgae and the prediction of physical disturbances; and the ecology of invasive macroalgae and their impacts on native algal assemblages.

Adjunct Staff



Dr Russ Babcock

Russ is based at CSIRO Marine and Atmospheric Research, and leads research to better understand how human activities influence coastal ecosystems such as kelp forests and coral reefs. Research programmes focus on issues such as fishing impacts and the effectiveness of marine reserves as conservation tools. Other projects have focused on the impacts of sedimentation on both temperate and coral reef ecosystems.



Dr Ray Masini

Ray is based at the Department of Environment and Conservation. His research has focused on Western Australian marine ecosystems generally, with particular emphasis on the tropical arid ecosystems of the central west and north-west coasts. More recently this focus has moved north to the tropical Kimberley coast. His research interests include nutrient-effects ecological modelling and environmental management strategy and policy formulation. Ray has been centrally involved in the planning and management of a range of multidisciplinary marine environmental studies around the State's 13,000 km coastline. Ray's interests also include knowledge transfer and application, particularly as they relate to the three-way interaction between research, environmental policy formulation and environmental management.



Dr Mat Vanderklift

Mat is a marine ecologist based at CSIRO Marine & Atmospheric Research. His research interests include ecological linkages between habitats, the use of stable isotopes to study trophic ecology, factors influencing the abundance of flora and fauna, the ecological importance of consumers (herbivores and carnivores) and the effects of human use of marine ecosystems.

CMER Members

Postgraduate Research Students



Adam Gartner (PhD)

Trophic implications of seagrass habitat disturbance from reduced light



Jason How (PhD)

Assessing the potential benefits of marine protected areas to adjacent fished areas



Rebekah Kenna (PhD)

Return of ecological function of transplanted seagrasses meadows



Lachlan MacArthur (PhD)

Habitat use, movements and trophic linkages of the western rock lobster *Panulirus cygnus*, within the inshore coastal waters of Western Australia.



Rob Czarnik (MSc)

The magnitude of fish grazing on temperate seagrasses: Western Australia



Carli Johnson (MSc)

The Western Australian charter industry: Working towards long-term sustainability



Michael Mulligan (MSc)

The effect of light reduction on *Amphibolis griffithii* meadows by activities such as dredging and land reclamation where turbidity causes a light reduction at the seafloor through increased light attenuation by suspended particles.



Ainslie Denham (PhD)

Ainslie's research concerns the spatiotemporal modelling of the king prawn catchrate in Shark Bay. She is applying a combination of time series analysis and geostatistics to develop novel tools to gain an understanding of the characteristics of the catch rates.

Justin King (MSc)

Factors affecting *Artemia franciscana* culture and comparison between feeds and strains

Current Research Projects

PROJECT	Funding Source	Investigators	2008 Actual External & Internal Income	Total income for grant
Biodiversity assessment, ecosystem impacts of human usage and management strategy evaluation Node 3.2	WAMS; ECU	Hyndes, Vanderklift, Verges	\$216,603	\$405,650
Research Study into Seagrass Wrack Movement at Geographe Bay	Dept Planning & infrastructure	Lavery, McMahon	\$178,818	\$369,000
Ecophysiology of Benthic primary producers (Consequences of reduced light availability in seagrass meadows for fauna and fisheries)	DEC	Lavery, McMahon	\$97,175	\$534,000
Trophic Interaction and Ecosystem Modelling - WAMSI Node 4.3	WAMSI; ECU	Hyndes, Lavery, Moore	\$95,895	\$381,378
Impact of Dredging on Coral Communities	Woodside Burrup P/L	McMahon, Lavery,	\$74,849	\$112,273
North West Dugong Population Movement and Habitat Use	Department of Environment and Conservation	Lavery, Holley	\$48,185	\$48,185
Synergistic Impacts of Drift Algae, Invasive Species and Environmental Stressors on Seagrass Health and Ecological Interactions	Swan River Trust, ECU	Wernberg, Thomsen	\$46,430	\$46,430
Seagrass health survey (Becher Point to Fremantle Region)	Cockburn Sound Management Council	Lavery	\$45,023	\$45,023
Ecological interactions in coastal marine ecosystems: Rock lobster	SRFME	Hyndes, Babcock, Vanderklift	\$34,691	\$252,396
Development of dugong (Dugong dugon) research capacity through use of innovative tracking technology	Australian Centre for Marine Mammal Research	Holley	\$33,000	\$33,833
Transport and the Importance of Seaweed Wrack - Project 6	WAMSI	Lavery, Hyndes, Wernberg	\$26,000	\$78,000
Scholarship (Singh)-WAMSI Reef-Seagrass Connectivity - Role of Wrack in Marine Foodwebs-Project 7	WAMSI	Lavery, Hyndes, Wernberg	\$26,000	\$78,000
Latitudinal Gradients in Tolerance to Multiple Stressors of a Temperate Seagrass	ECU	Verges, Hyndes, Lavery, McMahon	\$24,966	\$24,966
Species Diversity and Distribution in the Seagrass Genus, Posidonia using morphological and molecular characters	ECU	McMahon	\$14,625	\$14,625
Seagrass TIME - Trophic Cascades in Marine Ecosystems	European Union Marie Curie Fellowship	Munkes, Lavery	\$13,250	\$26,500
Determining Seagrass Distribution in the Swan-Canning River - Testing Methods	Dept. of Water	Wernberg, Thomsen, McMahon	\$10,195	\$10,195
Latitudinal Variation in Marine Plant - Herbivore Interactions	ECU	Verges, Vanderklift, Wernberg	\$5,000	\$5,000
Interactions Between Halophila Ovalis and Caulerpa Racemosa in the Swan River	Ernest Hodgkins Trust	Wernberg	Nil	\$2,400
Ecological interactions in coastal marine ecosystems: Trophodynamics	SRFME	Hyndes/Hanson	Nil	\$56,459
Assessing the benefits of closed fishing areas for spawning aggregations and egg production for coral trout	ARC; Fisheries WA	Hyndes	\$12,682	\$85,668

Publications

BOOKS

Boyra A, Espino F, **Tuya F**, Freitas M, Haroun RJ, Biscoito M, Gonzalez JA Field Guide of 365 Atlantic Species. Ediciones Oceanográfica, Telda, Islas Canarias 124pp

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Collier CJ, Lavery PS, Masini RJ, Ralph PJ (2008) Physiological characteristics of the seagrass *Posidonia sinuosa* along a depth-related gradient of light availability. *Marine Ecology Progress Series* 353:65-79.

MacArthur L.D., Hyndes G.A., Babcock R.C. and **Vanderklift M.A.** (2008). Nocturnally active western rock lobsters, *Panulirus cygnus*, forage close to shallow coastal reefs. *Aquatic Biology* 4: 201-210

MacArthur LD, Babcock, G. A. **Hyndes GA** (2008) Movements of the western rock lobster (*Panulirus cygnus*) within shallow coastal waters using acoustic telemetry. *Marine and Freshwater Research* 59: 603–613

Prado P, **Collier CJ** and **Lavery PS** (2008) Within-shoot and among-shoot ¹³C and ¹⁵N translocation in two *Posidonia* species from Western Australia. *Marine Ecology Progress Series* 361: 69-82

Sanchez-Jerez P, Fernandez-Jover D, Bayle-Sempere J, Valle C, Dempster T, **Tuya F**, Juanes F (2008) Interactions between bluefish *Pomatomus saltatrix* (L.) and coastal sea-cage farms in the Mediterranean Sea. *Aquaculture* 282:61-67

Tuya F, Wernberg T. & Thomsen, M.S. (2008) Testing the 'abundant centre' hypothesis on endemic reef fishes in south-western Australia, *Marine Ecology Progress Series* 372:225-230

Tuya F, Wernberg T, Thomsen MS (2008) The spatial arrangement of reefs alters the ecological patterns of fauna between interspersed algal habitats. *Estuarine Coastal & Shelf Science* 78: 774-782

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Poloczanska, E.S., **Johnson C., Wernberg, T.** (2008) Approaches for Predicting Marine Climate Change. In Poloczanska, E.S., Hobday, A.J. and Richardson, A.J. (eds) 'In Hot Water: preparing for climate change in Australia's coastal marine systems', proceedings of conference held in Brisbane, 12-14 November 2007, CSIRO Marine and Atmospheric Research, Hobart, Tasmania, Australia. (June)

Denham, A.M. and Mueller, U. (2008), Space-time geostatistical analysis of King Prawn catch rate, *Geostats2008*, December 2008

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NON-REFEREED CONFERENCE PROCEEDINGS

Paul Lavery and Kathryn McMahon. Managing impacts of dredging on the marine environment – developing criteria.

REPORTS

Lavery, P. & Gartner, A. (2008), Monitoring of seagrasses on the eastern shore of Garden Island, Western Australia 2008. Report CMER 2008-3 to Defence Support Group, unpublished report to Commonwealth Dept of Defence.

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MacArthur, L, Hyndes, GA, Babcock, RC and **Vanderklift, MA** (2008). Ecological Interactions in Coastal Marine Ecosystems: Rock Lobster. Final Report to Strategic Research Funds for the Marine Environment.

McMahon, K.M., Lavery, P.S. (2008), Managing Impacts of Dredging on the Marine Environment - developing criteria

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Conference Attendance and Presentations

11th Int. IASWA Sediment Water Interactions Conference, Esperance WA, 17-22 Feb-08
Paul Lavery

Kimberley Coast Natural Values Workshop, Broome WA, 4-7 Feb-08
Kathryn McMahon

Australian Marine Science Association Conference, New Zealand, 5 July – 10 July 2008
Glenn Hyndes and Mads Thomsen

ARC-NZ working group on marine plant phytogeography, Sydney, 23-30 June 2008
Thomas Wernberg

Coast to Coast Conference, Darwin NT, 18-22 August 2008
Paul Lavery and Kathryn McMahon

Dredging and book writing workshop, Townsville QLD 10-15 November 2008
Kathryn McMahon and Paul Lavery

2nd Annual Ningaloo Symposium
Adriana Verges

WA Biodiversity and Climate Change Scientific Forum, Conservation Council, UWA June 2008
Thomas Wernberg

European Marine Biology Symposium, Portugal, Sept 08
Adam Gartner



Seminar Series

Dr Hector Lorenzo, CSIRO
'Using trophic flows and ecosystem structure to model the effects of fishing in the Jurien Bay Marine Park'

A/Prof. Glenn Hyndes,
School of Natural Sciences, Edith Cowan University.
'Pathways of spatial subsidies in the coastal landscape of south-western Western Australia'

Prof. Andrew Boulton,
University of New England, Armidale
Entitled: Getting published (successfully)

Dr Adriana Vergés,
School of Natural Sciences, Edith Cowan University
'Seagrass defences against herbivory: an overview of resistance and tolerance strategies'

Ms. Carli F. Johnson, Masters Student,
School of Natural Sciences, Edith Cowan University
'The Western Australian Charter Boat Industry: Working towards long term sustainability'

Mr Adam Gartner,
School of Natural Sciences, Edith Cowan University
'Trophic implications of seagrass habitat disturbance from reduced light'

Dr Frances D'Souza,
Department of Water, Level 4/ 256 Adelaide Terrace, Perth WA
'Contaminants in stormwater discharge at Perth's marine beaches'

A/Prof. Michelle Waycott,
School of Marine and Tropical Biology, James Cook University, Townsville
'Genetics and populations; dynamics of plant and animal populations from deserts, coasts, rainforests, reefs, and riparian ecosystems'

Dr Thomas Wernberg,
School of Natural Sciences, Edith Cowan University
'Evidence for (limited) effects of ocean temperature on the biogenic habitat structure provided by algal canopies'

Dr Mads Thomsen,
School of Natural Sciences, Edith Cowan University
'Drivers of species invasions – Confronting theory with seaweed examples'



Research Links

- Adelaide University, Australia
- Albany Senior High School
- ARC-NZ Vegetation Function Network
- Australian Institute of Marine Sciences (AIMS)
- Australian Research Council Vegetation Workgroup 47/49 (Australasian Seaweed Biogeography) and 58 (Marine flora climate impacts)
- Bangor University (UK)
- Centre of Invasive Species (Denmark)
- Chevron
- CIIMAR, University of Porto (Portugal)
- Cockburn Sound Management Council
- Consejo Superior de Investigaciones Cientificas (Spain)
- CSIRO Marine and Atmospheric Research
- Danish Environmental Research Institute
- Dauphin Island Sea Lab, USA
- Department of Defence (Navy)
- Department of Environment and Conservation (WA)
- Department of Fisheries (WA)
- Department of Natural Resources and Environment, Victoria
- Department of Planning and Infrastructure (WA)
- Fisheries Research and Development Corporation
- Geraldton Port Authority
- Great Barrier Reef Marine Park Authority
- Griffith University
- James Cook University
- Marine Biological Association (UK)
- Murdoch University
- National Environmental Research Institute, Denmark
- Network on Aquatic Invaders (Denmark)
- Oceanica Consultancy
- Otago University (NZ)
- QLD EPA
- Stockholm Marine Research Centre
- Stockholm University
- Strategic Research Fund for the Marine Environment (SRFMe)
- Swan River Trust (WA)
- Tasmanian Aquaculture and Fisheries Institute
- University of Alicante (Spain)
- University of Copenhagen, Denmark
- University of Florida, USA
- University of Las Palmas de GC (Spain)
- Université de Nice, France
- University of New South Wales
- University of Plymouth (UK)
- Université P Sabatier – Toulouse III, France
- University of Queensland
- University of South Alabama, USA
- University of Southern Denmark
- University of Virginia
- University of Western Australia, Australia
- Wealth from Oceans Flagship
- Western Australian Marine Sciences Institute (WAMSI)
- Woodside Oil & Gas



Community Engagement



BODY/EVENT	ROLE	NAME
Department of Water (WA), Department of Environment and Conservation (WA), Rottneest Island Authority, WWF, EPA (WA)	Advice	Kathryn McMahon
Scientific Review Panel for the WA Marine Science Institute	Member	Paul Lavery
Review of the Environmental Protection Authority's marine policy settings	Member	
Assisted DEC in Kimberley Biodiversity Assessments		
Technical Workshop – Design of Offset research program for prediction of impacts to coral communities associated with dredging. Woodside Oil & Gas	Chair	
Special Symposium – Assessing Impacts of Dredging in Marine ecosystems. Coast to Coast Conference, Darwin, Aug 2008	Chair	
Technical Advisory Committee, WA Fisheries Research Advisory Board for Fisheries Research and Development Corporation	Member	Glenn Hyndes
Marine Reference Group for Perth Region NRM	Member	
Perth Region NRM Board	Member	
Seagrass working group, Department of Water, WA	Member	Thomas Wernberg
Wake-Up WA, breakfast TV	Interview	
Coastal Planning and Coordination Council	Member	Ray Masini
State Committee for Combating Marine Oil Pollution	Member	
Coast to Coast Conference, Darwin, August 2008 (Planning and environmental impact assessment of large scale marine infrastructure developments),	Invited Plenary speaker	
Scientific Advisory Committee, WA Integrated Marine Observing System (WAIMOS)	Member	Christine Hanson
Frequent writer of 'popular' Danish articles on bioinvasions	Author	Mads Thomsen

Reviewed Manuscripts



- Aquatic Biology
- Aquatic Botany
- Aquatic Ecology
- Australian Systematic Botany
- Austral Ecology
- Aquatic Invasions
- Ciencias Marinas
- Coasts & Estuaries
- Coral Reefs
- EcoHealth
- Ecological Engineering
- Ecology
- Ecosystems
- Environmental Biology of Fishes
- Environmental Conservation
- Estuarine, Coastal and Shelf Science,
- Estuaries & Coasts
- Global Change Biology
- Global Ecology & Biogeography
- Hydrobiologia
- ICES Journal of Marine Science
- Journal of Applied Ecology
- Journal of Applied Ichthyology
- Journal of Coastal Management
- Journal of Ecology
- Journal of Experimental Marine Biology and Ecology
- Journal of Fish Biology
- Journal of the Marine Biological Association
- Journal of Phycology
- Journal of Sea Research
- Journal of Shellfish Research
- Journal of the Royal Society of Western Australia
- Marine Biology
- Marine Biology Research
- Marine Ecology
- Marine Ecology Progress Series
- Marine Environmental Research
- Marine & Freshwater Research
- Marine Pollution Bulletin
- Oecologia
- Oikos
- Phycologia
- Restoration Ecology
- Vie et Milieu



Photos contained within this report by Thomas Werberg, Kathryn McMahon, Adriana Vergés, Estelle Crochelet, Glenn Hyndes, Paul Lavery, Jason How, Adam Gartner

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