

Centre for Ecosystem Management

2005 Annual Report

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Director's Report



Congratulations to the Centre for Ecosystem Management which celebrated its tenth birthday in 2005. The event was marked by the University Research Committee requesting the second of the five year reviews that are required for all Centres at ECU. To add to the occasion the University asked that we trial the forthcoming Australian Research Quality Framework.

Thus a major activity for much of 2005 was

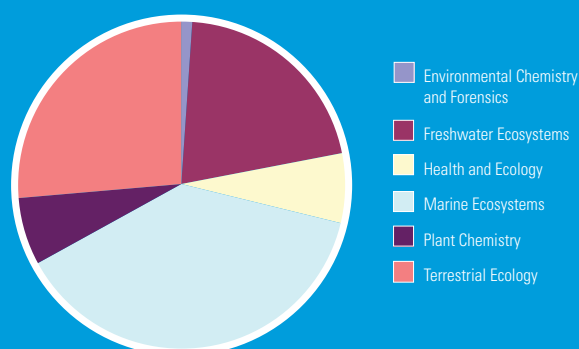
the gathering of data and indicators of performance. The review took place in November and a more detailed account is given in the highlights section of this report. I would like to thank the panel for their hard work and constructive comments. The review reaffirmed the contribution that the CEM makes to research and scholarship in Western Australia, across the nation and internationally. We have a growing number of outstanding researchers who are producing the next generation of outstanding researchers.

The structure of the CEM underwent major change in 2005. After many discussions, members decided to formalize a number of research specializations by having them recognized by the University as level one research groups. In addition to the existing Consortium for Health and Ecology, there are now a further six groups making up the Centre. The new groups are Freshwater Ecosystems, Environmental Chemistry and Forensics, Marine Ecosystems, Terrestrial Ecology, Plant Chemistry and the research group for Science Teaching and Learning. Congratulations to all these groups and I look forward to seeing them grow and become the power houses of the CEM.

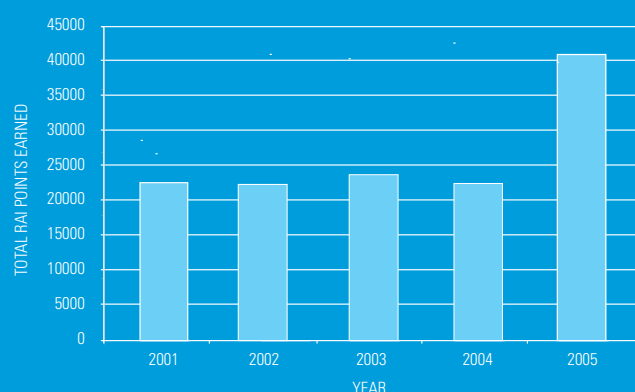
Performance indicators for 2005 are even more impressive than those of the five year review period (2000 to 2004). Research grants are up to record levels (\$1.2 mil), research activity measured through the RAI is up by 70 % on 2004 values and six members of the Centre are in the top twenty RAI earners for the University as a whole. In 2005 members were involved in over 24 funded projects. The main funding bodies included Water and Rivers Commission, Water Corporation, Australian Research Council, Conservation and Land Management, WA Department of

Statistics 2005

2005 Research Income - Grants/Consultancies



Total RAI Points Earned 2001 - 2005



Fisheries, the Strategic Research Fund for the Marine Environment and a number of industrial partners. The range of funding bodies supporting our research is varied and wide and we are grateful for their support. The strong partnerships between the CEM, government and industry were highlighted in the recent Centre review and are the result of our focus on applied research on environmental issues in Western Australia.

During 2005 the CEM produced a range of high quality outputs in the form of book chapters, refereed papers, reports and conference proceedings. Members were responsible for 3 book chapters, over 45 refereed papers, 17 conference proceedings and 7 technical reports. A highlight of this year's publications is the completion of the last volume of 'Ecosystems of the World'. David Goodall has spent more than thirty years as Editor-in Chief of this 30 volume series. Congratulations to David on this fine achievement and I wonder what your next project is going to be? A special volume of the Journal of the Royal Society of Western Australia that appeared in 2005 included the outcomes of a workshop looking at 'Fire and wetlands on the Swan Coastal Plain'. This meeting was convened by Pierre Horwitz of the CEM together with Ralph Smith from FESA. The eight papers in the volume provide a fascinating account of how human activities are impacting the wetlands in and around Perth. Well done, Pierre and Ralph. I look forward to seeing the outcomes of research stimulated by the meeting and the special volume.

Centre members also maintained a strong contribution to professional and community activities outside ECU. A particular highlight was the appointment of Andrea Hinwood as the Deputy Chair of the Environmental Protection Agency of WA. During 2005 members were invited to referee over 50 papers for national and international journals, were editors of 5 journals, sat on 5 editorial boards and contributed to 35 professional or advisory boards or committees. Senior office bearers for 2005 were Will Stock who served on the Council of the Royal Society for Western Australia and Eddie van Etten as Regional Councillor for the Ecological Society of Australia. Will Stock and Eddie van Etten served as members of the Minerals and Energy Research Advisory Committee of Western Australia. During 2005, Will Stock was invited to contribute to the ALCOA WA Mining Environmental Improvement Plan Steering Committee. This Mining EIP is among the first of such plans for Western

Australia and highlights the desire of industry to achieve outcomes well beyond the targets set by regulatory bodies, to engage communities and to seek a more sustainable future.

A major function of the Centre is to provide support for postgraduate student activities and in 2005 some 54 PhD, MSc and Honours students were members of the CEM. Financial support enabled 7 students to attend international or national conferences. Students performed well at these meetings. The centre also provided equipment and fieldwork grants to 14 postgraduate students. Items ranged from digital video cameras to specialist field sampling equipment.

I would like to congratulate all the members of the CEM on their outstanding contributions and achievements during 2005. I believe the CEM review has helped us focus on what we do well and I am sure we will see a continued growth in research in the Centre. The appointment of three post-doctoral fellows during 2005 has added excitement and stimulation to our research.

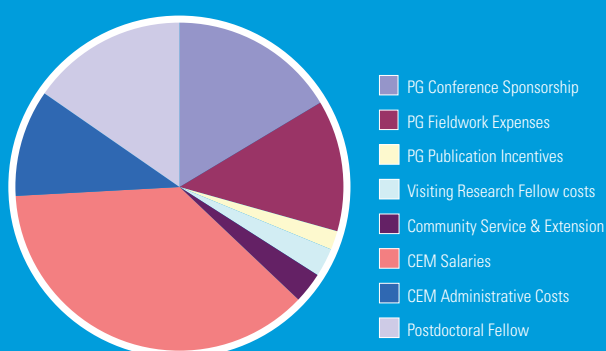
Congratulations to Paul Lavery on his promotion to Professor of Marine Ecology. This recognition of research excellence amongst members of the CEM is appreciated and we look forward to other members being recognised in the future.

I would like to conclude my report by thanking Lynn Barton who did a fantastic job getting documents ready and organizing venues and programmes for the review panel. Lynn's calm and efficient style will be missed in the CEM and we all wish her well in her retirement.

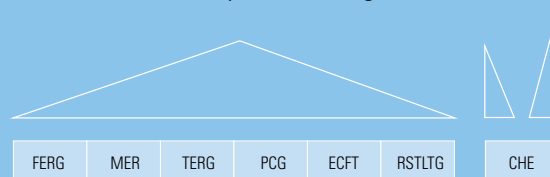
Will Stock

Director, Centre for Ecosystem Management

2005 Total Expenditure



Centre For Ecosystem Management



Level 1 Groups Established 2005

Freshwater Ecosystem Research Group
 Terrestrial Ecology Research Group
 Environmental Chemistry and Forensics Toxicology
 Research in Science Teaching and Learning Group

Marine Ecosystem Research
 Plant Chemistry Group
 Plant Chemistry Group
 Consortium for Health and Ecology

Highlights 2005



Members of the review panel with representatives of the Office of Research and Innovation, Faculty and the CEM.

Tenth Birthday and Second Review for the CEM

During November 2005 a panel comprising Professor David Hamilton (University of Waikato), Professor Graeme Robertson (Curtin University) and Dr David Luketina (Watercorp) undertook a review of the Centre for Ecosystem Management. This review was unusual in that it was used to test aspects of the proposed Australian Research Quality Framework. The panel was asked to act as discipline assessors in addition to providing the second review of the Centre, which was founded in 1995.

CEM members were asked to complete research portfolios, nominate their top publications and provide information about the impact that their research has had. Almost all staff filled in the portfolios despite the lack of clarity on the exact requirements of the future RQF. Finding evidence to substantiate the impact of one's research was a challenge and one that has now alerted staff to the need to keep good records of how stakeholders and the community perceive the value of their research.

The panel used a review process similar to the research quality assessments operating in the UK and New Zealand. Individual portfolios were assessed and the results fed back as a group result. It was, however, very clear that the outcome was strongly influenced by the

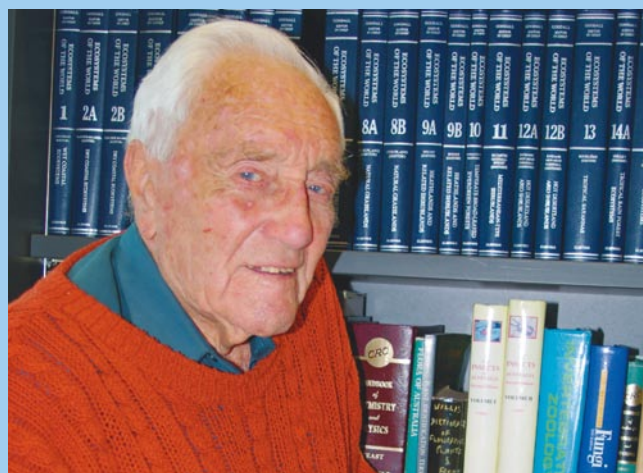
Impact Factor ranking of the journals used by staff to publish their research. This will no doubt have a strong effect on future behaviours as staff might try to optimise RQF outcomes by selecting highly ranking journals that tend to be generalist or review type publications rather than the often more poorly ranked discipline specific journals. Pleasing to note was the conclusion from the panel that there are a significant number of staff who are already 'RQF ready' and another group that with one or two additions to their portfolios will enter this category.

The panel's review of the CEM's activities complimented us on the high contribution members make to the research standing and outputs of the University, the very strong links we have with industry and government stakeholders and the excellent support structure we have in place to support research students. Stakeholders interviewed by the panel were enthusiastic about the quality of research undertaken by CEM members and see us as a valuable contributor to environmental management in the state.

The members of the Centre for Ecosystem Management would like to thank the panel members for the time given to the review and the expert feedback received. With the RQF rapidly approaching we feel better prepared and look forward to the next CEM review in five years time.

"Ecosystems of the World" Complete

The series of volumes 'Ecosystems of the World', conceived in 1972, of which the first volume was published in 1977, has now in 2005 been completed. David Goodall, of the CEM, has acted as Editor-in Chief throughout. David is a remarkable gentleman who at 92 years of age is to be found almost every day in his office at his computer working on numerical classification methods. He travels extensively and still attends vegetation classification conferences. The thirty volumes he edited cover every type of ecosystem, from the ocean depths and caves to mountain tops, from those initiated by man, like greenhouses and fish-ponds, to those with only minimal human influence. Work on the series has involved forty-six editors from fourteen different countries, and several hundred authors. Volumes have been numbered logically, rather than chronologically, so it happens that the last volume to appear is Volume 6, covering Coniferous Forests. Congratulations David on this remarkable achievement.



David Goodall holding the final volume in the Ecosystems of the World series.

CEM participates in WAMSI and SRFME

The CEM is a key player in two of the State's major marine research initiatives, the Strategic Research Fund for the Marine Environment (SRFME) and the Western Australian Marine Science Institute (WAMSI). With our collaborating partners, the CSIRO and Geraldton Port Authority, much of our recent research has focused on the Jurien Bay region, examining how marine systems function and how human activities threaten them.

Managing Human Impacts...

One major research programme investigates the impacts of reduced water clarity on our marine ecosystems. Reductions in water clarity result from many human activities, including dredging and nutrient pollution. The CEM is quantifying those effects and identifying early warning indicators that are being applied in the State Government's annual marine monitoring programmes. A related project examines the impacts of global climate change on our reef ecosystems. These changes are predicted to have highly negative consequences for our kelp-dominated reefs, which other research in the CEM is showing to be crucial in fuelling foodwebs throughout the coastal environment.



CMER researchers establish a scale shading experiment at Jurien Bay to test the effects of light reduction on seagrass ecosystems.

...and Understanding Marine Linkages

A related suite of research projects examines the connections among our coastal marine ecosystems. Through the use of biomarkers we have revealed the significant role of drifting marine plants in our coastal ecosystems. Particularly important are the large masses of the kelp *Ecklonia radiata* that accumulate on sandy beaches and drive invertebrate and fish production in the adjacent surf zones. These kelps are potentially threatened by climate change, neatly demonstrating the need to understand both linkages and responses to disturbance if we are to manage our marine ecosystems.



*Research undertaken in the CEM has demonstrated the profoundly important role of the kelp *Ecklonia radiata* in supporting marine foodwebs - drifting masses of the kelp detached from reefs support invertebrate and fish production in distant ecosystems.*

As the SRFME programme draws to a close, the State Government, Universities and industry have established the WAMSI. This will see the evolution of SRFME into a far more expansive range of research in which the CEM is a key player, building on its research capabilities in applied benthic marine ecology and extending the research programmes described above.



The Western Rocklobster is the target of a \$400 million per year fishery in Western Australia. Research at ECU is revealing the habitat use and movement patterns of this ecologically and economically important species.

Highlights 2005



The bioreactor installed on the island at the Spoonbill Lakes reserve.

Working with the Community

Urban development around the City of Stirling's Spoonbill Reserve has lead to exposure of Acid Sulfate Soils (ASS). These ASS have caused contamination of the groundwater of the surrounding area through acidification and by heavy metals and arsenic. This acidic and toxic groundwater flows through the Spoonbill Lakes causing environmental and human health risks. The treatment of groundwater in an urban context poses a new and challenging problem to environmental managers.

To treat this problem, researchers at Edith Cowan University have been supported by the City of Stirling to construct a pilot-scale modular treatment system located on the northern side of island in the south Spoonbill Reserve lake. The treatment system uses a combination of a new liming technology developed by researchers at Curtin University of Technology, in combination with biological remediation technologies developed at Edith Cowan University for similar water quality problems in the mining industry. This treatment system is being evaluated by collaborators at Curtin University of Technology, and funding from the School of Population Health at the University of Western Australia is facilitating research into human health aspects of this treatment system. This project will produce a design for a permanent treatment system at the Lake, and other similar situations.

The treatment system uses liming technology to deal with the acidity problem, and then novel bioremediation technology to remove heavy metal and arsenic contamination. Located entirely on the northern side of island in the south Spoonbill Reserve lake, the treatment system treats South Lake water and uses the North Lakes as a reference point against which to measure treatment achievement. The first stage is the liming system which feeds neutralised water into Bioreactor 1. Here, rotting potatoes lower the dissolved oxygen levels of the neutralised water. Sulfate Reducing Bacteria (SRBs) growing on the woodchips in Bioreactor 2 then take over. These naturally occurring bacteria turn the heavy metals and arsenic back into the minerals they were before they were disturbed by urban development. Finally, the wetland area in the north end of the south lake gives a final polish by reaerating and filtering the treated water.





CEM Members 2005

The Centre is comprised of a Director, a 5 member Management Committee, Academic Staff Members, Postdoctoral Fellows, Research Staff, Honorary Research Associates and 54 Postgraduate and Honours students. Members have a wide range of research interests which can be seen in their profiles below.

Director

Professor Will Stock

Management Committee

Dr Ian Bennett

Professor Paul Lavery

Dr Glenn Hyndes

Dr Kristina Lemson

Dr Andrea Hinwood

Academic Staff Members

Dr Mary Boyce

Dr Mark Lund

Dr Ray Froend

Associate Professor Pierre Horwitz

Associate Professor Adrienne Kinnear

Dr Annette Koenders

Dr Monica Leggett

Dr Alan Needham

Mr Tim Perkins

Emeritus Professor Harry Recher

Dr Graham Thompson

Dr Eddie van Etten

Dr Magda Wajrak

Postdoctoral Fellows

Dr Christine Hanson

Mr Clint McCullough

Dr Kathryn McMahon

Dr Thomas Wernberg

Dr Fernando Tuya

Research Staff

Ms Robyn Loomes

Ms Muriel Bertuch

Honorary Research Associates

Dr Mat Vanderklift

Dr David Goodall

Dr Nick Gales

Dr Russ Babcock

Specialist Research Areas: Staff Achievements and Activities

The members of the Centre for Ecosystem Management are conducting research in the following specialist groups. In each group there is a wide variety of research expertise, links and activities as summarized below.

HEALTH & ECOLOGY



**Associate Professor
Pierre Horwitz**

CURRENT RESEARCH

- The inter-relationships between human health, community well-being and ecological integrity. Developing participatory approaches for the management of aquatic systems, and natural resources in general. Sustainability and health; social and ecological resilience; poverty and health inequalities.

- Freshwater, inland saline and estuarine fauna and flora as indicators of environmental change. The effects of fire, forestry, agriculture and urbanisation on inland aquatic systems; acidification and salinisation as aquatic processes.
- Taxonomy, biogeography and conservation status of aquatic invertebrates.
- The contribution of flagships, keystones and other icon species to biodiversity conservation and the well-being of human communities.

CURRENT PROJECTS

- Developing curriculum materials for systems thinking
- Relationships between nature reserves and human well-being
- Relationships between water, drought and mental health
- Long term trends in monitoring data for wetlands on the Swan Coastal Plain
- Acidification: relationships between fire, organic-rich soil and acid waters
- Freshwater crustacean taxonomy

RESEARCH LINKS

Department of Environment - Water & Rivers Commission of WA

- Worldwide Fund for Nature (WWF)
- Department of Fisheries (WA)
- Dept. of Conservation and Land Management (CALM)
- University of Hawaii
- University of British Columbia
- Consortium for Conservation Medicine
- Maastricht University, Netherlands
- Centre for Social Research, ECU
- Combined Universities Centre for Rural Health, Geraldton
- University of Sunshine Coast, Queensland
- Murdoch University
- Curtin University
- WA Museum
- The Wilderness Society
- Gondwana Link, Greening Australia (WA), Friends of Fitzgerald River National Park
- University of Tasmania
- Deakin University

COMMUNITY ENTERPRISE

- Invited Keynote presentations:
 - First International Conference on Biodiversity and Health, Galway, Ireland.
- Guest Speaker at:
 - Attendance and invited presentation ('*Systems thinking for infectious diseases*') at an international workshop: *Emerging infectious diseases and social ecological systems: integrating social science methods and ecosystem approaches to improve infectious diseases research in the Asia Pacific*. East West Centre, University of Hawaii, March 9-11 2005
 - Attendance and Invited presentation VicHealth forum (*Contribution of Ecological thought to health promotion*). Melbourne, July 2005.
 - Attendance and Invited presentation ('*Qualitative approaches to drought and suicide*') Drought and Suicide workshop ANU, Canberra, November 2005
- State NRM Conference in Denmark, October 2005. Paper presented.
- Australian Society for Limnology, Hobart, Tasmania, December 2005. Paper presented:
 - University of the Third Age - Groundwater dependent ecosystems of the Swan Coastal Plain.
 - *Talk at Public Meeting at City of Wanneroo Council - Acid Sulphate Soils and East Wanneroo Planning Strategy*
 - Co-Convenor of the *Interim Secretariat for International Ecohealth Association*
- Invited to examine theses from:
 - University Sunshine Coast (Hons),
 - University of Tasmania (M.Env. Man),
 - Murdoch University (PhD),
 - RMIT (PhD),
 - Southern Cross University (PhD)
- Invited to review grant applications including:
 - *ARC Discovery*
 - *ARC Fellowship*
 - *NHMRC*
- Invited to review papers for the following journals:
 - *Ecohealth*
 - *Marine and Freshwater Research*
 - *Pacific Conservation Biology*
 - *Hydrobiologia*
- Co-editor of 'Ecohealth'
- A member of the Aquatic Ecosystem Health & Management Journal Editorial Board
- A member of the following professional panels/committees:
 - WA Threatened Species Scientific Committee
 - Minister's Environmental Sustainability Forum
 - Dept. of Environment State of the Environment Working Group (Fundamental Pressures)
 - Gondwana Link Council
 - Rottnest Island Environment Advisory Committee
 - Australasian Collaboration for Equity Focused Health Impact Assessment
 - Conservation Council's Biodiversity Steering Committee
 - Rottnest Island Environment Advisory Committee

ENVIRONMENTAL CHEMISTRY AND FORENSICS



Dr Andrea Hinwood

RESEARCH INTERESTS

There has been little work in Australian on exploring the relationships between environmental contaminants and human health. One of the major impediments is our ability to determine how much individuals are actually exposed to and how this information can be used to improve current health studies. Specific areas of interest relate to:

- The assessment of biomarkers for use in health studies
- Development and application of methods to estimate traffic emissions and other air pollutants
- Investigation of the health risks associated with contaminants in soil, specifically heavy metals

Andrea is actively involved in several projects to investigate the relationship between air pollution and health in Australia. Other areas include the investigation of the health effects of heavy metal contaminated soil and drinking water.

Andrea is interested in the role of community perception and engagement in the EIA process as well as the development of methods to assess environmental and human health risks associated with multi media exposure and complex mixtures and the role of health impact assessment.

CURRENT PROJECTS

- Air pollution and health effects
- Acid sulphate soil disturbance, environmental heavy metal concentrations and human exposure
- Estimation of traffic emissions for use in health studies
- Estimation of air quality and greenhouse emission improvements associated with the introduction of a new mobile air conditioner
- Development of a biomarker for wood smoke exposure studies
- A novel approach to air pollution monitoring combining time integrated sampling.

RESEARCH LINKS

Department of the Environment
Chemistry Centre
National Research Centre Environmental Toxicology
United States Environmental Protection Agency
National Measurement Institute
Flinders University

COMMUNITY ENTERPRISE

Invitations to join the following Professional/Advisory Boards:

- Environmental Protection Authority, WA (Deputy Chair)
- Health Research Working Group, Air Quality Coordinating Committee
- Air Monitoring Working Group, Air Quality Coordinating Committee
- State of the Environment Steering and Working Group - Air

FRESHWATER ECOSYSTEMS



Dr Mark Lund

RESEARCH INTERESTS

Wetland ecology covers the ecology of inland water bodies (rivers, lakes and swamps). Mark's particular interests are in how wetlands work and how this knowledge can be used to conserve and rehabilitate wetlands.

CURRENT PROJECTS

- Controlling acidity in mine lakes (flooded mine pits) using biological approaches
- Controlling nuisance midges in urban wetlands through exploiting aspects of their life cycle
- Developing and using ecological risk assessment techniques for aquatic problems
- Understanding and managing the impact of urban storm water drainage
- Understanding and managing the impacts of irrigation on tropical rivers

RESEARCH LINKS

- Curtin University of Technology
- Murdoch University
- Centre for Water Research
- Midge Research Group (City of Cockburn)
- Griffin and Wesfarmers Coal (CSML)
- Ord Irrigation Cooperative
- Department of Environment
- Water Studies Centre, Monash University
- Land & Water Australia (NPIRD Program)
- Department of Conservation and Land Management
- Cities of Joondalup, Wanneroo and Gosnells

COMMUNITY ENTERPRISE

- Member of Conference Organising Committee of the Tropical Rivers Forum, Darwin, NT
- Invitation to mark an Masters thesis, University of Cape Town
- Review of two papers for the 4th Stream Management Conference in Launceston



Clint McCullough

RESEARCH INTERESTS

- Aquatic ecology
- Ecotoxicology
- Acid mine lake ecology, chemistry and remediation
- Acid sulfate soil assessment and treatment.

CURRENT PROJECTS

- Fluidised reactor liming and nutrient enrichment to remediate Collie mine lakes through enhanced primary production as phytoremediation
- Environmental limitations to the marron fishery in acid pit lakes of Collie, south-west Western Australia
- Environmental remediation of low-sulfate pit lakes of Collie, south-west Western Australia
- Remediation of a south-west Australian acid pit lake waters with oxic liming and an aerobic wetland
- Remediation of an arid tropical Australian acid coal pit lake with municipal sewage and green waste
- Biological remediation of acid mine waters in a sewage evaporation pond
- Development of an innovative treatment system for acidity problems in an urban lake (Spoonbill Lakes) resulting from Acid Sulfate Soils.

RESEARCH LINKS

- Aquatic Eco-technology, Hogeschool Zeeland Netherlands
- UFZ - Centre for Environmental Research, Germany
- eriss (Environmental Research Institute of the Supervising Scientist)
- Centre of Excellence for Sustainable Mine Lakes
- Centre for Water Research, University of Western Australia
- Curtin University of Technology
- Colorado School of Mines.

COMMUNITY ENTERPRISE

Presented talks at International Conference on Acid rock drainage (ICARD), Goldfield's Environmental Management Group (GEMG), Australasian Institute of Minerals and Mining (AUSIMM) conferences and Western Australia Conservation Commission "Environment Matters" seminar series. Reviewed a paper for the journal "EcoHealth".



Dr Ray Froend

RESEARCH INTERESTS

- Ecological water requirements - water regimes required to maintain and enhance conservation values of terrestrial, aquatic and riparian ecosystems
- Management of aquatic and groundwater dependent ecosystems - Allocation planning of water resources to meet environmental requirements.

Development of monitoring strategies and programmes for assessing effectiveness of environmental water provisions

- Groundwater dependent vegetation - Impact of altered groundwater regimes on native plants. Ecophysiology of phreatophytic vegetation. Population dynamics of phreatophytic species and response to long-term changes in groundwater regime and climate
- Ecology and biology of wetland plants - Recruitment biology of wetland tree, shrub and emergent species. Species response to altered water quantity and quality

CURRENT PROJECTS

Ecological water requirements and ecosystem management:

- Ecological water requirements of groundwater dependent ecosystems of the Swan Coastal Plain
- Ecological water requirements of terrestrial and wetland vegetation of the Southwest Yarragadee aquifer region
- Dendro-ecological investigation of water use by pines of the Gngangara Mound
- Environmental flows of the Lower Ord River
- Methods for determining interim EWRs for groundwater dependent ecosystems of Western Australia
- Groundwater dependent vegetation:
- Role of water stress in Tuart tree decline in the southwest
- Modelling of ecohydrogeological response in the Gngangara Groundwater Mound region
- Response of Banksia to experimental drawdown in the Pinjar region
- Predicting end of summer condition of wetland and terrestrial vegetation on the Gngangara and Jandakot Groundwater Mounds
- Drought stress of Tuart trees in the Ludlow National Park
- Ecology and biology of wetland plants:
- Wetland vegetation dynamics on the Gngangara Groundwater Mound
- Yate Swamp (Lake Bryde Recovery Catchment) vegetation response to altered water regimes

RESEARCH LINKS

- Cable Sands (WA) Pty Ltd
- CSIRO
- Murdoch University
- The University of Western Australia
- University of Technology, Sydney
- Water & Rivers Commission
- Water Corporation
- Tiwest Joint Venture
- Welker Environmental Consultancy
- Department of Conservation & Land Management
- Department of Environment

COMMUNITY ENTERPRISE

- Member, Advisory Committee for the Institute for Water and Environmental Resource Management, University of Technology, Sydney
- Appointed to Western Australian EPA Reference Panel on Natural Resource Management
- Member, Western Australian EPA State of the Environment Working Group on Inland Waters
- Member, Western Australian EPA State of the Environment Working Group on Water Industry
- Examined PhD theses from Flinders University, South Australia
- Refereed papers for the following scientific journals/organizations:
 - Austral Ecology
 - Restoration Ecology
 - Australian Journal of Botany
 - Plant Ecology

MARINE ECOSYSTEMS



Professor Paul Lavery

RESEARCH INTERESTS

- The ecology and management of benthic marine ecosystems.

Paul's research attempts to bring together the biology, chemistry and physics of systems to understand how they function, the ecosystem services they provide and how they might be affected by a variety of disturbances such as eutrophication

and dredging-related impacts. Much of his research is applied to developing appropriate monitoring and management approaches.

CURRENT PROJECTS

- Effects of dredging-related light reductions on benthic marine ecosystems
- The eco-physiology of seagrasses under reduced light conditions
- Trophic linkages between benthic marine ecosystems
- Carbon and nitrogen inputs to island and beach ecosystems
- Developing indicators of algal growth potential under nutrient enriched conditions

RESEARCH LINKS

- Strategic Research Fund for the Marine Environment (SRFME)
- Geraldton Port Authority
- Department of Conservation and Environment
- CSIRO (Marine Research)
- Department of Defence (Navy)
- The University of Technology, Sydney
- Stockholm Marine Research Centre

COMMUNITY ENTERPRISE

- Board Member of the Western Australian Institute of Chemical Sciences
- Invited Ph.D. examiner at Stockholm University, Sweden
- Refereed papers for the following scientific publications:
 - Estuarine & Coastal Shelf Science
 - Marine Ecology Progress Series
 - Aquatic Botany
 - Journal of Environmental Management



Dr Glenn Hyndes

RESEARCH INTERESTS

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. Therefore it is crucial to develop a high level of understanding of the complex ecological processes in these coastal environments.

Glenn's research interests are broad, with a focus on:

- Marine ecology
- Biology of fish in coastal environments
- Examination of the importance of different coastal habitats to fish communities

- Trophic links among the mosaic of habitats in our coastal environments, through the migration of fauna, particularly fish, and the transport of detrital macrophytes among habitats. Emphasis has been placed on tracking biomarkers, such as stable isotopes, through the food web.

CURRENT PROJECTS

- Ecological interactions in coastal marine ecosystems: Trophodynamics.
- Ecological interactions in coastal marine ecosystems: Rock Lobster.
- Conservation genetics of humpback whales off Western Australia: Implications for the management of the Antarctic Group IV population
- The role of detached macrophytes for fish production and biodiversity in coastal ecosystems
- Assessment of the importance of different near-shore marine habitats to important fishery species in Victoria using standardized survey methods, and in temperate and sub-tropical Australia using stable isotope analyses.
- Examining coral trout *Plectropomus leopardus* at the Houtman Abrolhos Islands, mid-west region of Western Australia

RESEARCH LINKS

- Victoria's Department of Natural Resources and Environment
- Griffith University
- Fisheries Research & Development Corporation
- University of Queensland
- CSIRO Cleveland
- DA Lord Science and Engineering
- Department of Fisheries WA
- CSIRO, Floreat
- Albany Senior High School

COMMUNITY ENTERPRISE

- Reviewed manuscripts for:
 - Estuarine, Coastal and Shelf Sciences
 - Japanese Journal of Oceanography
 - Journal of Fish Biology
 - Marine Biology
 - Marine Ecology Progress Series
- International reviewer for ARC Discovery grant proposals
- Technical Advisory Committee, WA Fisheries Research Advisory Board for Fisheries Research and Development Corporation
- Presented at:
 - The Seagrass 2004 Conference, Townsville
 - Seagrass Rehabilitation and Revegetation Program (SRRP) Workshop, Perth
 - Walpole-Nornalup Focus Group, Walpole
- Participated in:
 - ISBW6 Workshop, Townsville
 - Walpole-Nornalup Focus Group, Walpole
 - Marine Reserve Planning Workshop, Perth
 - Strategic Research Funds for the Marine Environment Symposium
 - Freshwater Fish and Environment Research Committee
- Invited to review PhD thesis from the University of Tasmania



Dr Mat Vanderklift

RESEARCH INTERESTS

- Ecological linkages between habitats in marine ecosystems
- Trophic ecology in marine ecosystems
- Factors influencing the abundance of flora and fauna in marine ecosystems
- Design and analysis of biological surveys
- The effects of species loss on marine ecosystems

- Using stable isotopes to study trophic ecology

CURRENT PROJECTS

- Quantification of ecological linkages between reef and seagrass habitats in Australia and North America
- Effects of consumers on ecological processes and the effects of removing consumers (e.g. by fishing)
- Importance of grazing and predation as processes structuring reef and seagrass communities
- Importance of spatial subsidies in supporting populations of herbivores
- Honing the effectiveness of stable isotopes as a tool in trophic ecology

RESEARCH LINKS

- CSIRO Marine Research
- Université de Nice, France
- University of Adelaide
- University of Western Australia
- University of South Alabama, USA
- Dauphin Island Sea Lab, USA
- Université P. Sabatier - Toulouse III, France

COMMUNITY ENTERPRISE

- Reviewed manuscripts for the journals Aquatic Ecology, Fishery Bulletin US, Marine Ecology Progress Series, Phycologia, Journal of the Marine Biological Association UK
- Reviewed international research proposal - National Science Foundation (USA), Netherlands Foundation for the Advancement of Tropical Research (WOTRO).



Dr Kathryn McMahon

RESEARCH INTERESTS

My main research area is coastal marine ecology, specifically focusing on seagrasses in both tropical and temperate environments and includes the following topics:

- Seagrass health in respect to human impacts and natural disturbance
- Seagrass recovery processes and growth strategies

- Grazing interactions
- Population genetics and phylogenetics

CURRENT PROJECTS

- Effects of dredging-related light reductions on seagrass ecosystems
- The eco-physiology of seagrasses under reduced light conditions
- Species diversity in the Posidonia genus
- Long-term monitoring of seagrass health

RESEARCH LINKS

- Strategic Research Fund for the Marine Environment (SRFME)
- Geraldton Port Authority
- Department of Environment & Conservation
- Cockburn Sound Management Council
- CSIRO (Marine Research)
- Department of Defence (Navy)
- James Cook University
- University of Queensland
- Great Barrier Reef Marine Park Authority

COMMUNITY ENTERPRISE

- Refereed papers for Marine and Freshwater Research
- Presented at Australian Marine Science Association Conference & Strategic Research Fund for the Marine Environment (SRFME) workshop.



Dr Christine Hanson

RESEARCH INTERESTS

- Marine food web dynamics
- Biophysical oceanography
- Benthic-pelagic coupling

CURRENT PROJECTS

- Ecological interactions in coastal marine ecosystems: Trophodynamics

- Assessing the spatial extent of reef production on the epifauna inhabiting adjacent seagrass meadows in southwest Australia
- Temporal and spatial dynamics in phytoplankton community composition off southwestern Australia
- Benthic-pelagic coupling in an oligotrophic coastal marine system: examining the role of suspension feeders

RESEARCH LINKS

- CSIRO Marine and Atmospheric Research (Floreat, Hobart)
- Strategic Research Fund for the Marine Environment (SRFME)
- University of Western Australia

COMMUNITY ENTERPRISE

- Invited to referee papers for:
 - Estuarine, Coastal and Shelf Science
 - Geophysical Research Letters
 - Deep Sea Research
- Committee member, Australian Marine Sciences Association (WA Branch)
- Presentation at CSIRO SRFME Collaborative & Core Science Projects Symposium 2005



Dr Thomas Wernberg

RESEARCH INTERESTS

- The influence of scale, extent and environmental stressors on trajectories of recovery following physical disturbances to canopy habitats.
- Morphological variation and architecture in canopy-forming algae and its consequences for the ecology of the understory.

- Trophic linkages between kelp beds and adjacent habitats in the form of detached reef algae.
- Biomechanical properties of canopy-formers and the prediction of physical disturbances.
- The ecology of invasive macroalgae and their impacts on native algal assemblages.

CURRENT PROJECTS

- Effects of ocean climate and eutrophication on the resilience of kelp beds to physical disturbances.
- Latitudinal variation in temperate reef communities and ecological processes
- The invasiveness and potential impacts of different species of *Caulerpa* from WA.

RESEARCH LINKS

- University of Western Australia
- CSIRO Marine Research
- University of Adelaide
- University of Copenhagen (Denmark)
- National Environmental Research Institute (Denmark)

COMMUNITY ENTERPRISE

- Member of the WA branch committee for the Australian Marine Science Association.
- Reviewed manuscripts for the Journal of Experimental Marine Biology and Ecology, European Journal of Phycology, Estuaries, Aquatic Botany, Journal of Sea Research, Aquatic Ecology, New Zealand Journal of Marine and Freshwater Research.

PLANT CHEMISTRY



Dr Ian Bennett

RESEARCH INTERESTS

Dr Bennett's areas of interest and expertise are:

- The physiology of Australian plants
- Plant tissue culture
- Genetics of Australian plants
- Horticulture and floriculture of Australian plants
- Propagation and growth of plantation trees

CURRENT PROJECTS

- Tissue culture of seagrasses
- Micro propagation and clonal variation of teak (*Tectona grandis*)
- Influence of phenolics on micro propagation of Myrtaceous plants
- Tissue culture and cutting propagation of *Casuarina*

RESEARCH LINKS

- Ornamental Plant and Orchid Center, Maejo University, Chiang Mai, Thailand
- Dept. of Horticulture, King Mongkut Institute of Technology Ladkrabang, Bangkok, Thailand
- Alcoa of Australia Ltd.
- Murdoch University
- Dept. of Conservation and Land Management
- Rewards Group Ltd.
- The Wine and Truffle Co.

COMMUNITY ENTERPRISE

- Invitations to referee papers for the following scientific publications
 - Australian Journal of Botany
 - Canadian Journal of Botany
 - Plant Cell Reports



Dr Mary Boyce

RESEARCH INTERESTS

Analytical chemistry is Mary's principal area of research. In particular, she has been active in the development and application of emerging analytical technologies including capillary electrophoresis and solid-phase micro extraction.

Her work involves fundamental chemical research to better understand the chemical processes involved in isolating and separating target compounds. As an analytical chemist, she also gets the opportunity to collaborate with scientists from a number of fields.

CURRENT PROJECTS

- Solid phase micro-extraction gas chromatography for characterization of Australian Truffles
- Role of secondary metabolites in plant disease resistance
- Use of light emitting diodes for sensitive detection in capillary electrophoresis
- Sensitive detection of amino acids and sugars from biological matrices
- Micro emulsion capillary electrophoresis and its applications
- Role of solid phase micro-extraction in authenticating sandalwood
- Problem orientated learning in the chemistry classroom.

RESEARCH LINKS

- University of Tasmania.
- Advanced Manufacturing College, TAFE, Perth
- Worsley Alumina
- Rewards Group
- The Wine and Truffle Company
- Dublin City University

RESEARCH IN SCIENCE TEACHING AND LEARNING



Associate Professor Adrienne Kinnear

RESEARCH INTERESTS

- The biodiversity and community structures of Western Australia's soil and litter fauna, and the impact of our land-use practices on these communities
- Western Australia's soil mite (Acari)

fauna: Adding to our rudimentary knowledge of the distribution, taxonomy and community structure of these little-known, but biodiverse soil and litter dwellers

- Teaching and Learning: Assessment strategies to improve students' learning in science; student skill development

CURRENT PROJECTS

- Soil mites as indicators of soil health: Validation of molecular tools for the monitoring of disturbance effects on soil mite communities.
- Impact of revegetation on soil mite communities in Mulga woodlands, Leonora
- Evaluating the efficacy of reflective teaching strategies in science for pre-service primary teachers

RESEARCH LINKS

- GHG-SSCP Research Group, Ministry of the Environment, Government of Japan.
- Charles Darwin University
- Macauley Land Use Research Institute, Aberdeen, Scotland
- School of Education, Edith Cowan University

COMMUNITY ENTERPRISE

- Community member, Yellagonga Regional Park Advisory Committee
- ECU representative, Sustainability Sub-committee, City of Joondalup
- Contributor to FCHS Cool Scientist Program
- Science Ambassador, Scitech WA



Dr Magda Wajrak

RESEARCH INTERESTS

Heavy metal contamination of the ground water is a serious environmental problem. A number of techniques which can be used to detect parts per billion (ppb) of arsenic in water are expensive and do not allow for field testing. A less expensive and simpler method is anodic stripping voltammetry.

Magda's voltammetry research looks at the development of detection methods for heavy metals, in particular arsenic,

that is reliable, relatively easy to implement in the field, capable of detecting below 5 ppb, allow for speciation and overcome interference from other species found in ground water.

Multimedia has progressively become an important teaching tool in science disciplines, including chemistry. Chemistry is a 'visual' subject and its understanding can be greatly enhanced through the use of appropriate images and interactive computer simulations.

To aid students in their understanding, a multimedia 'Acid-Base Titration Tutor's package has been developed, which includes animated molecular models depicting reactions occurring at the microscopic level using a number of common acid-base combination reactions.

More recently, as part of the 'Australian Chemistry Enhanced Laboratory Learning' (ACELL) project, novel chemistry experiments have been designed which enhance students' learning, probe their deeper understanding, and are more stimulating and industry relevant. Four experiments have been developed and implemented in the undergraduate chemistry degree:

- 'Analysis of silver in water samples using anodic stripping voltammetry (ASV)'
- 'Finding best separating conditions for a mixture of polar and non-polar preservatives using High Performance Liquid Chromatography and DryLab program'
- 'Absorption Spectrum of Ascorbic Acid'
- 'Investigating factors that affect corrosion'

CURRENT PROJECTS

- Validation of the ASV method for the detection of arsenic using ground water samples from various sites in WA, such as Spoonbill Reserve, Cedric Street - Ikea Site and Gwelup
- Analysis of ground water from Bangladesh, India and Nepal using ASV method (collaboration with Lab21 in Cambridge)
- Investigating electrode surface - this is fundamental research which uses Scanning Electrode Microscopy to understand the what happens at the surface of the working electrode

RESEARCH LINKS

- Department of Environment
- Lab21 - Cambridge, UK
- ENV Australia
- University of Western Sydney
- Macquarie University, Sydney

COMMUNITY ENTERPRISE

- NTEU representative on the Board of Federation of Australian Scientific and Technological Societies (FASTS)
- Chair of the Chemical Education Group of the WA Branch of the Royal Australian Chemical Institute (RACI)
- Chair of the Radiochemistry Education Committee, Australian Institute of Radiochemical Engineering (AIRE)
- Organiser of the annual Bayliss Youth Lecture
- Involved in supervising Year 12 students through CSIRO: Student Research Scheme (2002-2005)
- Invited Speaker 'Local Science, Global Impact' - National Science Week 2005
- Siemens Science Experience (1992-2005)
- 'Cool Scientist' - School Visits
- ECU Live and Labrats - 'Magic of Chemistry' Show
- TEE Physical Chemistry Panel (2003-2005)
- Member of the Australian Enhanced Laboratory Learning Project (ACELL)
- Member of HERDSA

TERRESTRIAL ECOLOGY



Professor William Stock

Professor Stock's research is focused on understanding the structure and functioning of natural and human impacted terrestrial ecosystems in order to improve our ability to manage such systems. He has particular interests in biogeochemical cycling, ecological applications of stable isotopes, nitrogen pollution, ecosystem impacts of

invasive species and global change biology.

Will has worked in systems ranging from heathlands, savannas, warm deserts, cold deserts (Antarctica) to commercial forestry plantations and agricultural plant selection.

CURRENT PROJECTS

- Bottom up vs top down control of grassland states in a southern African savanna reserve at Hluhluwe Umfolozi
- Ecosystem effects of growing Acacia and Eucalyptus in mixed plantations
- Functional significance of leaf shape in Australian and South African members of the Proteaceae
- Ecosystem impacts of atmospheric nitrogen enrichment in conserved bushland fragments of the Swan Coastal Plain
- A dendro-ecological investigation of water use by pines of the Gnarra Mound
- Impacts of fire on geophyte richness and abundance in Jarrah forests

RESEARCH LINKS

- University of Cape Town, South Africa
- Australian National University
- University of Stellenbosch, South Africa
- South African National Biodiversity Institute
- Range & Forest Institute, University of Western Cape, South Africa
- Forest Science Centre, Melbourne
- University of Zambia
- ALCOA
- Water Corporation
- Department of Conservation and Land Management

COMMUNITY ENTERPRISE

- Refereed manuscripts for the following scientific journals:
 - Functional Plant Biology
 - Plant and Soil
 - Journal of Arid Environments
 - Plant Ecology
 - Journal of Applied Ecology
 - African Journal of Range & Forage Science
 - Plant Ecology
 - South African Journal of Science
- A member of the following Editorial Boards:
 - Austral Ecology
 - African Journal of Range & Forage Science
- Co-supervisor of students from Universities other than ECU:
 - PhD students - 2 from Cape Town, South Africa, 1 from the Australian National University (ANU)
 - 2 MSc students from Cape Town

- Minerals and Energy Research Advisory Committee (MRAC)
- Chair of the General Subcommittee of MRAC
- Council of the Royal Society of Western Australia
- Member of the ALCOA Mining Environmental Improvement Plan (2006-2007) Working Group.
- Invited to undertake individual research assessments (x3) on behalf of the National Research Foundation of South Africa.
- Honorary Research Associate, Department of Botany, University of Cape Town



Emeritus Professor Harry Recher

RESEARCH INTERESTS

His interests lie in the structure of vertebrate communities, avian foraging ecology, the effects of fire on vertebrate populations, habitat fragmentation and the restoration of degraded landscapes, and the management and conservation of forest ecosystems. He

has worked extensively with birds, mammals and forest invertebrates, but is primarily an avian ecologist. All projects are designed to provide guidelines for the management of natural ecosystems.

CURRENT PROJECTS

The eucalypt woodlands, particularly the Goldfields of Western Australia, focusing on avian communities, foraging habits, nesting and movement cycles, and habitat requirements.

RESEARCH LINKS

- Australian Wilderness Society (WildCountry Project)
- Australian National University
- Boston University
- Curtin University of Technology

COMMUNITY ENTERPRISE

- Editor, Pacific Conservation Biology
- Adjunct Professor, Environmental Biology at Curtin University of Technology
- Public lecturers and workshops on ecology, environment, environmental ethics, biodiversity, landcare and conservation policy
- Advice to individuals, community groups, industry, local and state governments and the Commonwealth on environmental issues



Dr Annette Koenders

RESEARCH INTERESTS

- Molecular genetics and systematics.
- Conservation and systematics of freshwater crayfish in the south-west of Western Australia.
- Growth and regeneration of muscle tissue in crustaceans. Exploring the molecular processes underpinning the amazing regenerative capacity of crustacean muscle.

- Authentic assessment in Biological Sciences.

CURRENT PROJECTS

- Crayfish burrowing activity in the Yarragadee discharge zone.
- Replacement mechanisms of Margaret River marron by the widespread, introduced marron.
- Systematics and conservation of burrowing crayfish in south west Australia.
- Differential expression of alternate transcripts of Cdpax in the yabby, *Cherax destructor*.
- Authentic laboratory assessment in undergraduate molecular biology units.

RESEARCH LINKS

- Department of Environment and Conservation (WA)
- Department of Water (WA)
- Department of Fisheries (WA)
- Colorado State University, Ft Collins, CO, USA
- Deakin University, Victoria
- Charles Darwin University, NT
- The Norwegian University of Science and Technology, Trondheim, Norway

COMMUNITY ENTERPRISE

- Member Curriculum Council WA
- Reviewer for the New Zealand Journal of Marine & Freshwater Research and Higher Education Research & Development Society of Australasia.



Dr Kristina Lemson

RESEARCH INTERESTS

Dr Lemson, a botanist, focuses her research on the evolving diversity of flowering plants in the south-west of Western Australia. This area is one of 34 global 'biodiversity hotspots', recognized for its diverse and unique biota. Almost 80% of the plant species found here are found nowhere else.

This diversity is attributed to a combination of

millions of years of isolation and specialization in response to extremes of climate and poor soils. The organisms present today have evolved as the earth's climate has changed over millions of years, and these will be the source of new organisms that evolve as future change occurs.

CURRENT PROJECTS

Systematics and evolution:

- Systematics of epacrids (Ericaceae, subfam. Styphelioideae)
- Biogeography of epacrids
- Plant architecture and inflorescence structure
- Systematics and evolution of Ericaceae subfamily Styphelioideae (Epacrids), with an emphasis on the structure and evolution of inflorescences, floral morphology, pollination and reproduction strategies, biogeographical patterns between Australia, New Zealand, Malaysia and the Pacific
- The interface between systematics and conservation biology, through the evolution and assessment of patterns in plant diversity and endemism in the south-west of Australia, and the conservation of rare members of Ericaceae subfam. Epacridoideae
- Interactions between phylogeny, evolutionary theory and conservation practice.
- Integration of morphological and molecular approaches to phylogeny reconstruction

Conservation:

- Breeding biology of selected Western Australian epacrids
- Narrow endemism and the evolution and conservation of the south-west flora

RESEARCH LINKS

- Western Australian Herbarium
- Western Australian Department of Conservation and Land Management
- The University of Western Australia
- Royal Botanic Gardens Sydney
- Manaaki Whenua Landcare Research New Zealand

COMMUNITY ENTERPRISE

Plant Biodiversity and Conservation Curator, The Robert Brown Herbarium (ECU)

Visiting Scientist, local primary schools



Dr Graham Thompson

RESEARCH INTERESTS

Australian native vertebrate fauna has developed a unique series of adaptations to survive and flourish in a diverse range of habitats that are very often harsh, unpredictable and undernourished. Graham has a broad range of interests in terrestrial vertebrate ecology and ecophysiology, particularly reptiles and frogs. This has

lead to an interest in the effects of body size and shape on the ecology and physiology of vertebrates. His interest in the ecology of reptiles is currently being applied in the development of mine site rehabilitation completion criteria using reptile fauna as the bio-indicator and the assessment of developments on terrestrial vertebrate fauna in the context of EIA.

CURRENT PROJECTS

- Developing an 'Integrated terrestrial vertebrate fauna survey database' for Western Australia
- Mine site Rehabilitation Index and temporal changes in small vertebrate diversity near Ora Banda
- Improved quality and interpretation of terrestrial fauna surveys for environmental impact assessments in the mining industry
- Ecophysiology of water-holding frogs in the Australian arid-zone
- Water management in reptiles, and its effect on fitness and species survival
- Terrestrial fauna surveys in the preparation of EIAs
- Effects of size and shape on ecology and performance traits of dragon lizards and goannas
- Spatial ecology of reptiles
- Diversity of Australian reptile fauna

RESEARCH LINKS

- University of Western Australia, Zoology Department
- Environmental Protection Authority
- Department of Conservation and Land Management
- Chamber of Minerals and Energy, Western Australia
- OMG Nickel Pty Ltd.
- Placer Dome Asia Pacific Ltd.

COMMUNITY ENTERPRISE

- Member of CALM Pet Herpetofauna Consultative Committee
- Immediate past-president Royal Society of Western Australia
- Supervisor of the 5 PhD students 1 from ECU and 4 from UWA



Dr Eddie Van Etten

RESEARCH INTERESTS

Eddie is interested in terrestrial plant ecology and management in arid zones, urban areas and forested ecosystems. His research interests also include fire ecology and restoration of terrestrial ecosystems.

CURRENT PROJECTS

- Vegetation patterns and conservation assessments of the arid and semi-arid zones
- Vegetation modelling and mapping using GIS
- Fire-weed cycle of urban remnant bushlands
- Salt-marsh vegetation and salt lake ecology
- Mine site, roadside and other disturbed land revegetation / restoration
- Jarrah forest ecology and management, including regeneration following logging.

RESEARCH LINKS

- Forest Products Commission
- Mulga Research Centre, Curtin University of Technology
- Department of Environment & Conservation (formerly CALM)
- Botanic Gardens and Parks Authority
- Australian Bush Heritage Fund
- Barrick Gold (formerly Placer Dome)
- Fortescue Metals Group
- ALCOA
- Main Roads W.A.

COMMUNITY ENTERPRISE

- Invitations to join the following Professional/Advisory Boards:
- Gravity Discovery Centre Environment & Education Committee
- Regional Councillor, Council for Ecological Society of Australia
- Minerals Research Advisory Committee - Deputy member

Current Research Projects

The current research projects are listed giving the name of the project, the funding body and the principal researcher(s).

ENVIRONMENTAL CHEMISTRY AND FORENSICS

Estimation of air quality and greenhouse benefits from the introduction of HFC152A to mobile air conditioning technology. **WA DOE**, Hinwood A.

FRESHWATER ECOSYSTEMS

Ecological risk assessment and the impact of irrigation return on biodiversity in the Lower Ord River. **WRC**, Lund M and Froend RH.

Study of ecological water requirements on the Gngangara and Jandakot Mounds under Section 46 of the Environment Protection Act. **WRC**, Froend RH.

Remediation of acid coalmine lakes using biological processes and organic matter. **Australian Coal Association**, Lund M and McCulloch C.

Midge research at Lake Joondalup. **City of Wanneroo**, Lund M.

Investigation of Yate Swamp Hydroperiod requirements within the Lake Bryde recovery catchment. **CALM**, Froend RH and Loomes R.

Crayfish burrowing activity in the region of the Yarragadee Discharge Zone, Blackwood River. **With Murdoch University. DoW & SWCC**, Koenders A and Horwitz P.

*Assisting recovery actions for the Margaret River Marron (*Cherax tenuimanus*).* **WA Department of Fisheries** funded by **SWCC**, Bunn J.

*Systematics of the reducta complex of *Engaewa*.* **CALM**, Burnham, Q.

Fish and crayfish migration patterns, Yarragadee discharge zone southwestern Australia. **SouthWest Catchments Council and Department of Water**, Horwitz P and Koenders, A.

Recovery of Margaret River Marron. **SouthWest Catchments Council and Department of Fisheries**, Horwitz P and Koenders, A.

Stygofauna research monitoring. **NRS**, Horwitz P.

Gngangara Mound Monitoring - macroinvertebrates. **WRC**, Horwitz P.

HEALTH AND ECOLOGY

Indicators of ecosystem health in Western Australian recovery catchments. **ARC**, Horwitz P.

Acid sulphate soils, groundwater bore use and home grown produce. **Department of Environment**. Hinwood, A and Horwitz, P.

MARINE ECOSYSTEMS

Seagrass health survey (Becher Point to Fremantle Region). **EPA and Cockburn Cement**, Lavery PS

Evaluating the influence of trophic connections between marine habitats on the effectiveness of Marine Protected Areas. **ARC**, Lavery PS and Vanderklift M.

Conservation genetics of humpback whales off Western Australia: Implications for the management of the Antarctic Group IV population. **Apache Energy and ARC**, Hyndes G and Brasseur M.

Assessing the benefits of closed fishing areas for spawning aggregations and egg production for coral trout. **WA Fisheries and ARC**, Hyndes G.

Ecophysiology of benthic primary producers. **Geraldton Port and SRFME**, Lavery PS.

Ecological interactions in coastal marine ecosystems: Rock lobster. **SRFME**, Hyndes G, Vanderklift M and Babcock R.

Ecological interactions in coastal marine ecosystems: Trophodynamics. **SRFME**, Hyndes G and Vanderklift M.

Evaluation of the return of ecological function in transplanted meadows. **SRRP**, Hyndes, G, Lavery, PS, and Kenna R.

Effects of physical disturbance on kelp-dominated reef communities across a broad temperate-tropical transition zone. **ARC**, Wernberg, T, Kendrick, GA (UWA), and Babcock, RC (CSIRO).

PLANT CHEMISTRY

*Micropropagation and clonal variation of Teak (*Tectona grandis*).* **Rewards Group**, Bennett I and Boyce M.

TERRESTRIAL ECOLOGY

Phreatophytic vegetation and groundwater studies on the Gngangara Mound. **Watercorp**, Froend RH.

Wetland vegetation monitoring: Environmental monitoring and investigations for Gngangara Mound. **WRC**, Froend RH.

Ludlow leaf water potential studies. **Cable Sands**, Froend RH and Drake P.

Determination of ecological water requirements for groundwater-dependent ecosystems - Southern Blackwood and Eastern Scott Coastal Plain. **WA DOE**, Froend RH.

End of summer assessment of condition of Gngangara & Jandakot GDEs. **WA DOE**, Froend RH, Loomes, R and Bertuch M.

Vegetation studies of eastern goldfields - Kalgoorlie. **Placer Dome**, van Etten E.

Postgraduate Research Students

The following PhD, Masters and Honours students were supervised by members of the Centre -

PhD

Muriel Brasseur - G Hyndes

'Population Structure and Management of the Humpback Whale (*Megaptera novaeangliae*) in Western Australia.'

John Bunn - P Horwitz / A Koenders

Investigating the displacement of Margaret River Marron *Cherax tenuimanus* Smith 1912 with the introduced widespread marron *Cherax* sp.nov. Decapoda: Parastacidae

Zoe Car - P Horwitz

Seeing with other eyes: Exploring western scientific and indigenous environmental knowledge.

May Carter - P Horwitz

Urban design, contact with nature and population health.

Catherine Collier - P Lavery

Seagrass responses to light availability.

Karen Crawley - G Hyndes

The role of detached macrophyte accumulations for fish production and biodiversity in coastal ecosystems.

Suzanne Cumming - M. Lund/H Recher

Ecology and behaviour of an urban corvid: the Australian Raven.

Paul Drake - R Froend

Plant water relations and xylem hydraulic properties of *Eucalyptus gomphocephala* D.C. (tuart).

Beatrice Franke - P Horwitz

Indicators of ecosystem health in a Western Australian recovery catchment.

Graham Fulton - H. Recher/W Stock/P Horwitz/ T Perkins

The nesting ecology of an endangered woodland avifauna.

Nan Hewitt - P Horwitz

Education interventions for irrigators on the Gngangara Mound

Peter Hood - E Van Etten

Population genetics and conservation biology of *Grevillea*.

Ute Goefft - R Froend/P Horwitz

Identification of Social Water Requirements (SWR's) for water resource planning.

Pat Karatna - P Horwitz

Mangrove forest communities in southeastern Thailand.

Rebekah Kenna - G Hyndes/P Lavery

Ecological function of seagrasses.

S. (Pao) Khwanboonbumpen - M Lund

Developing cost-effective catchment management strategies for established residential suburbs to reduce nutrient discharge.

Lachlan MacArthur - G Hyndes

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

Phillip Mayes - H. Recher/G Thompson

Ecological study of Mertens Water Monitor within the Ord River System.

Rory McAuley - G Hyndes

Biology and stock assessment of the thick skin shark *Carcharhinus plumbeus* in Western Australia, and further refinement of the stock assessment for dusky shark *Carcharhinus obscurus*.

Sumitra Moopayak - A Kinnear

Biofertilisers: The biotechnology and soil conditioning properties of polysaccharide-producing soil algae.

Stephen O'Dwyer - W Stock

Nitrogen deposition impacts on the flora of the Swan Coastal Plain and the Burrup Peninsula.

Gary Ogden - R Froend

Population dynamics of wetland tree species in south west Australia.

Craig Pentland - A Kinnear

Behaviour and population dynamics of translocated populations of the black-flanked rock wallaby, *Petrogale lateralis lateralis*.

Chongdee Srinoparatwatana - G Hyndes

Population dynamics and stock assessment of Notopteridae and Nandidae in the trap fishery of Beung Borapet, Thailand.

Bea Sommer - P Horwitz/M Lund/M Boyce

Factors controlling wetland sediment response to alternate drying and wetting and how this affects water quality.

Derek Swarts - A Kinnear

The impact of effluent irrigation upon selected soil biota, leaf litter decomposition and the nitrogen cycle in a *Eucalyptus globulus* plantation communities as an indicator.

Alexander Watson - H Recher/M Lund

Attributes of old growth jarrah *Eucalyptus marginata* forest.

Julia Wilson - I Bennett

Tissue culture of Western Australian seagrasses for restoration.

John Bunn - P Horwitz and A Koenders

Mechanisms affecting the replacement of *Cherax tenuimanus* (Smith 1912) by *C. cainii* Austin 2002 from the Margaret River.

MSc

Christie Atkinson - M Lund

The ecology of the Australian Water Rat, *Hydromys chrysogaster*, in the Perth metropolitan area.

Janelle Atkinson - I Bennett

The osmolyte production and physiological responses of selected Myrtaceae species exposed to salt and water stress.

Muriel Bertuch - E. van Etten

Mulga (*Acacia aneura* F. Muell. Ex Benth.) death adjacent to haul roads in the northern Goldfields.

Rob Campbell - P Horwitz

Perceptions of soil health in the Bremer River Catchment

Yu-Ting Chang - A. Hinwood

Assessment of human health risks associated with Polycyclic Aromatic Hydrocarbons (PAH's) in contaminated soils.

Jarrad Clark - P Horwitz

The mosquito fauna of the Margaret River region: possible impacts of surface water and climatic changes.

Todd Edwards - E van Etten/R Froend

Environmental correlates and associations of Tuart decline.

John Eyres - P Lavery/G Hyndes

Effect of mussel-line aquaculture on a seagrass ecosystem.

Sandra Hall - M Lund

The contribution of industry and commercial activity to nutrient loads discharge from the Bannister Creek Catchment area.

Blair Hardman - D Moro /W Stock

Response to translocation of the endangered rufous hare wallaby, or mala *Lagorchestes fasciatus*, reintroduced to the arid Peron Peninsula, Shark Bay, WA.

Sofie Harrison - P Lavery

Do marine resources subsidise island ecosystems?

Mark Hewitt - M Lund

A process orientated approach in rehabilitating mine-damaged arid rangeland.

David Holley - P Lavery

Monitoring Dugong movements at Shark Bay.

Caroline McCormick - P Horwitz

Vulnerability of organic soils to fire on the Swan Coastal Plain.

Lea McQuillan - P Lavery/J Alder

Effect of sewage pollution on sponge communities.

Michael Mulligan - P Lavery

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.

Amanda Spooner - K Lemson

Systematics and conservation of *Lambertia*. (Proteaceae)

Steve Wellman - E van Etten

The impact of recreational trampling on vegetation and soil of the jarrah forest Western Australia.

Joyleen Unno - A Kinnear

Population ecology and life histories of soldier crabs in the Dampier Archipelago.

Yuden - M Lund

Managing the acidity of coal mine lakes in the Collie Region (WA) using phosphorus and organic matter.

Honours.

*David Blake - P Horwitz/A Hinwood

Predicting the spatial distribution of organic rich sediments on the Swan Coastal Plain, Western Australia

*Quinton Burnham - A Koenders/P Horwitz

The systematics of the reducta complex of the burrowing freshwater crayfish Engaewa Riek.

*Jeffrey Cargill - W Stock/E van Etten

Impact of fire on geophyte abundance, diversity and composition in the jarrah forests of south-west Western Australia.

*Melissa York - A Needham

A study of the effects of probait on chuditch, *Dasyurus geoffroyi*, within the Julimar Conservation Park with notes on the general ecology.

*Lucca Zappia - P Horwitz

Biofilms: Their use in water treatment and their control in the water industry.

*Graduated 2005



Conference Attendance & Presentations

Each Semester students are invited to apply to the Centre of Ecosystem Management for financial assistance to attend national and international conferences. Funding is provided for one conference/year/student provided the conference is relevant to the student's research, with a maximum allocation of \$2,000 for international conferences. In 2005, \$10461 was allocated to postgraduate conference expenses. Listed below are conferences at which our postgraduate students presented papers and posters.

- Combio 2005, Adelaide
- Australasian Ornithological Conference, New Zealand
- Australian Entomological Society Conference, Canberra
- Australian Systematic Biologists and Invertebrate Biodiversity and Conservation Conference, Canberra
- LARVI 2005, Belgium
- Australian Society of Limnology Congress, Hobart
- Ecological Society of Australia, Brisbane

CEM Fieldwork Equipment/ Expenses Postgraduate Support Scheme

In 2005, \$7980 was allocated to postgraduate research students who applied for fieldwork equipment and expenses. Preference was given to applications for equipment which directly benefit a number of CEM members and postgraduate students. To this end, joint applications are encouraged. In 2005 funds were used to purchase a digital video camera, electrophoresis equipment, field guides, custom made animal traps, maps, tags and fieldwork travel costs.

CEM Publications 2005

Book Chapters

Boyce, M. (in press). Analysis of Food and Beverages. In *Electrokinetic Chromatography: Theory, Instrumentation and Applications*. U Pyell, Ed: Wiley & Sons, Chichester UK

Borowitzka M A, Lavery P S and van Kuelen M (in press). Epiphytes of Seagrasses. In: AWD Larkum et al (eds), *Seagrass Biology*. Springer, Netherlands.

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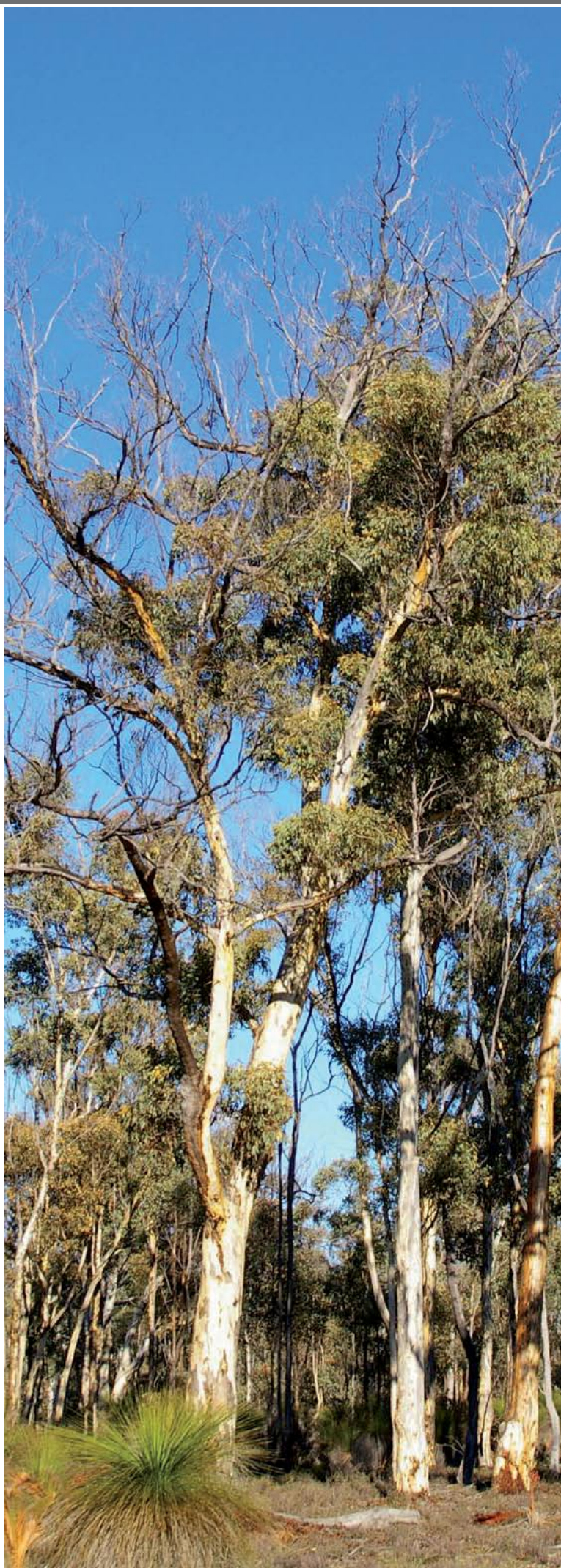
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Public Lectures & Seminars 2005

CEM seminars are in association with the School of Natural Sciences and the Consortium for Health and Ecology. All seminars are held on Fridays at 3 pm in Room 19.143 on the Joondalup Campus, unless otherwise stated.

Dr Ken L Heck Jr. Daupine Island Sea Lab and University of South Alabama. Plant-herbivore interactions in seagrass meadows.

Professor John Biggs, Professional Development Centre, NSW and author of "Teaching for Quality Learning at University." - Teaching and assessing effective learning

Paul Clark, Consultant Ecologist. Chile - biogeographical island.

Mauro Mocerino, Curtin University - Demonstrator Issues in Teaching and Learning

Mirek Macka, Visiting Research Fellow, Australian Centre for Research on Separation Science, University of Tasmania - Shining bright: light emitting diodes in Chemical Analysis.

Graham Thompson, Edith Cowan University. Better terrestrial vertebrate fauna survey protocols for the preparation of Environmental Impact Assessments (EIAs)

Andrea Hinwood, School of Natural Sciences – Children's health and air pollution - use of existing cohorts and Developing a biomarker for woodsmoke exposure.

Pierre Horwitz, Centre for Health and Ecology, Edith Cowan University. Four Pacific Islands - a study leave report including observations of island cultural ecology, University research and field stations.

Dr Peter Franklin, Research Fellow, School of Paediatrics and Child Health, UWA. Non-invasive markers of airway inflammation: are they useful for environmental exposure studies?

Dr Ian Ritchie, (Chemist and winner of the Premier's Scientist of the Year Award). Isn't Science Wonderful?

Dr Philip Hingston, School of Computer and Information Science, ECU. Computational Intelligence and Ecological Modelling.

Julian Fennessy, Conservation Partners Coordinator & **Richard MacNeill**, GIS Officer, Australian Bush Heritage Fund. The Bush Heritage Story - Private Conservation of Australia's Rich Ecological Diversity.

Dr Jon Hall, Varian. ICP and Environmental Analysis.

Dr Michael Lindsay, Medical Entomologist Mosquito-Borne Disease Control Branch, Department of Health. Management of Mosquito-borne Diseases in WA: Current and Emerging Challenges for Environment and Health Managers.

Beatrice Franke, Consortium for Health & Ecology, Edith Cowan University. Handling the Spectre of Qualitative Data.

Dr Magda Wajrak, School of Natural Sciences, ECU. Helping chemistry students bridge the gap between theory and laboratory work. 'Bridging to the Lab' project.

Dr Kathryn McMahon, Post-doctoral Research Fellow, School of Natural Sciences, ECU. Recovery of Subtropical Seagrasses from Disturbance.

Mike Grasby, Australian Government NRM Facilitator- Sustainable Resource Use. Natural Resource Management - the new regional process.

Dr Shane Lavery, Visiting Research Fellow, School of Natural Sciences, ECU and Molecular Ecology and Evolution Lab, University of Auckland. Tasty whales: surveys of whaling and its impact through genetic analysis of Japanese and Korean market products.

Student Seminars

David Blake - Predicting the Spatial Distribution of Organic Rich Sediments on the Swan Coastal Plain.

Jeffry Cargill - Impact of Fire Frequency and Season on Geophyte Abundance, Diversity and Composition in the Jarrah Forests of south-west, Western Australia.

Luke Zappia - Biofilms: their use in water treatment and their control in the water industry.

Melissa York - A study of the Chuditch, *Dasyurus geoffroii*, within the Julimar Conservation Park: an investigation of the effects of Pro bait and notes on the general ecology.

Quinton Burnham - The systematics of the *reducta* complex of the freshwater burrowing crayfish *Engaewa* Riek.

Nan Hewitt - Assessing the effectiveness of a customised educational intervention in promoting sustainability and enhancing resilience in a ground water dependent social ecological system in Western Australia.

May Carter - The nature of Urban Communities: An exploration of relationships between environmental connection, urban green space, health and wellbeing.

Julia Wilson - *In vitro* Propagation of some WA Seagrasses.

Jason How - Marine Protected Area (MPA) benefits to adjacent reef fisheries.

Steve O'Dwyer - Urban Biodiversity Threats from Nitrogen Deposition.

John Bunn - Mechanisms affecting the replacement of *Cherax tenuimanus* (Smith 1912) by *C. cainii* (Austin 2002) from the Margaret River.

Professional and Scientific Societies

Members of the Centre are affiliated with many professional and scientific societies. These include:

Australian Society of Phycology and Aquatic Biology

Australian & New Guinea Fishes Association

Australian & New Zealand Society for Comparative Physiology and Biochemistry

Australian Institute of Radiochemical Engineering (AIRE) -

Australian Bush Heritage Fund

Australian Epidemiological Association

Australian Geographic Society

Australian Institute of Biology

Australian Marine Sciences Association

Australian Rangeland Society

Australian Society for Limnology (ASL)

Australian Society for Biochemistry and Molecular Biology

Australian Society of Ecotoxicology

Australian Society of Herpetologists

Australian Mammal Society

British Ecological Society

Clean Air Society for Australia & New Zealand

Ecohealth Network

Ecological Society of America

Ecological Society of Australia

- (E Van Etten - Regional Councillor)

Environmental Institute of Australia & New Zealand

Estuarine Research Federation

European Society of Comparative Endocrinologists

Freshwater Biological Association

Freshwater Fish Working Group of WA

Goldfields Environmental Management Group

Higher Education Research & Development Society of Australasia (HERDSA)

Institute of Australian Geographers

Institute of Foresters, Australia

International Association of Vegetation Science

International Association for Plant Tissue Culture and Biotechnology

International Association of Vegetation Science

International Plant Propagators Society

International Society for Horticultural Science

International Society of Tropical Ecology

International Society of Environmental Epidemiology

International Water Association

IUCN Reintroduction Specialists Group, Wildlife Disease Association

IUCN Invasive Species Specialist Group

Kimberley Society of Western Australia

Linnean Society of London

Minerals Research Advisory Committee

National Trusts Covenancing Committee

New Zealand Freshwater Sciences Society

North American Classification Society

North American Lake Management Society

Perth Epidemiology Group

Planning Institute of Australia

Rottneest Island Environmental Advisory Committee

Royal Australian Chemical Institute (RACI)

- (M Wajrak - Chair Chemical Education Group)

Royal Society of Chemistry

Royal Society of Western Australia

- (G Thompson - Immediate past President)

- (W D Stock Councillor)

SEEKS Naturalist Society

Societas Internationalis Limnologiae (SIL)

Society for Ecological Restoration

Society for Marine Mammalogy

Society for In-Vitro Biology

WA Threatened Species Scientific Committee

World Seagrass Association

Yellagonga Regional Park Advisory Committee



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