MID-TERM REVIEW
2006-2009

Dr Beverley Ronalds
Independent reviewer
Chief of CSIRO Petroleum and
Group Executive, Energy

western australian
marine science institution

better science better decisions

western australian
marine science institution

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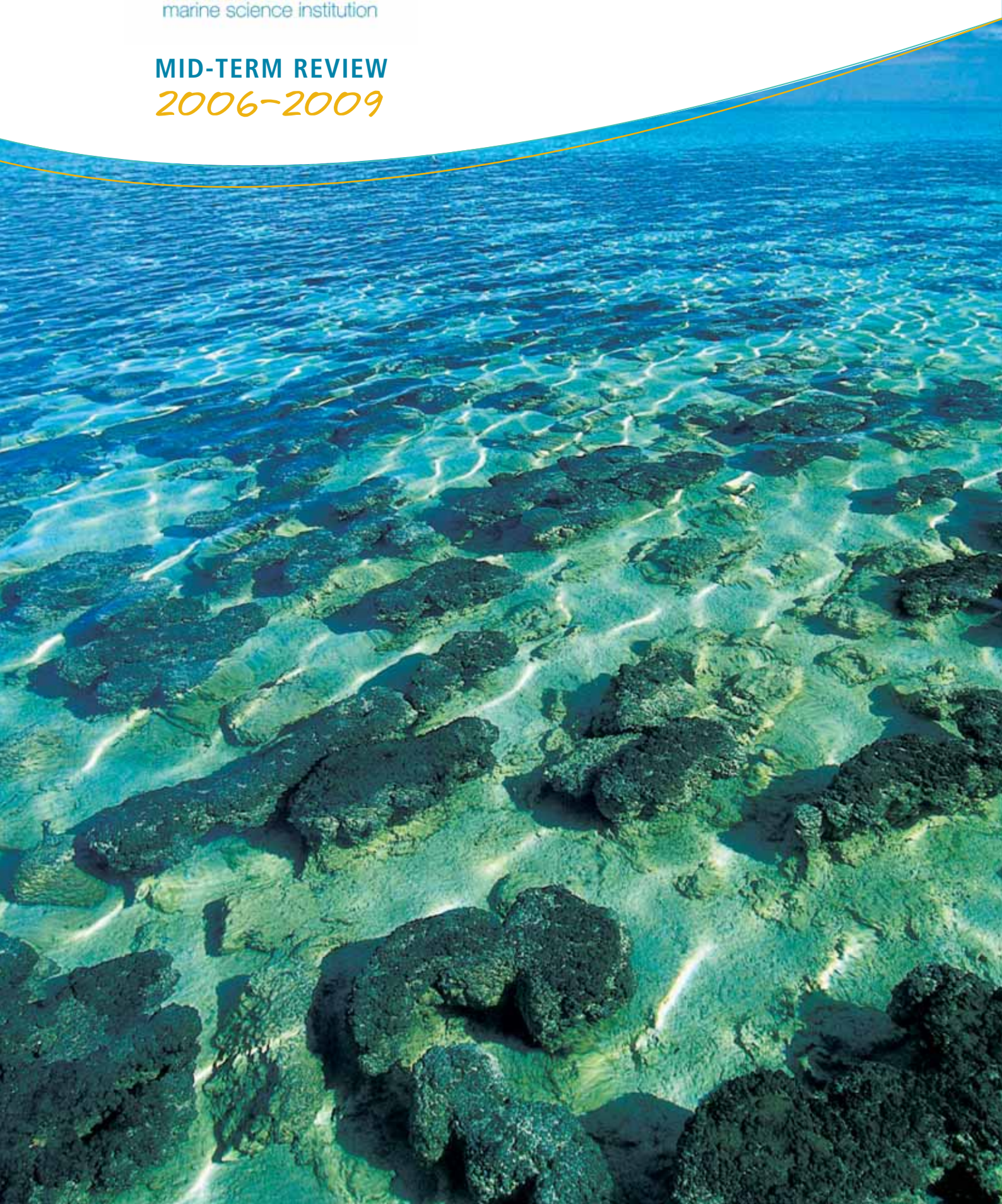


Reviewer's executive summary

Our marine environment holds enormous value for Western Australians. The Western Australian Marine Science Institution (WAMSI) thus has the opportunity to create a special, enduring place in the State's innovation framework. Many of the necessary success factors are already in place:

- $21m funding received from the WA Government under the Major Research Facilities (MRF) program,
- partnership between the majority of organisations with marine research capability in WA,
- exceptionally strong governance representation, and
- development of a well thought-through research program.

First conceived in 2003, WAMSI was officially launched in 2007 with a five-year research program. It was decided to conduct a mid-term review of the joint venture (JV), which took place on 5 June 2009. The Board Chair, CEO and staff were extremely helpful in providing detailed preparatory data and insights on the day. In addition, the reviewer was able to speak with several Governors, Board members, the Chair of the Research and Development Committee, Node Leaders, researchers and stakeholders.

All of those involved were highly positive about the WAMSI operation: WA's marine leaders enjoy putting in considerable effort to help ensure WAMSI is a success. The Headquarters management is also very dedicated and hard-working. The scale of research being conducted, attraction of new marine science capability and degree of interaction of State Departments, Federal research agencies, universities and other organisations would not have been possible without the WA MRF grant.

WAMSI has already made very strong progress towards achieving its target outcomes.

Dr Beverley Ronalds
Independent reviewer

Cover image courtesy of Professor Malcolm McCulloch, The University of Western Australia.

From the Chairman

I am pleased to be able to present you with the results of an independent review into the operational success of the Western Australian Marine Science Institution (WAMSI).

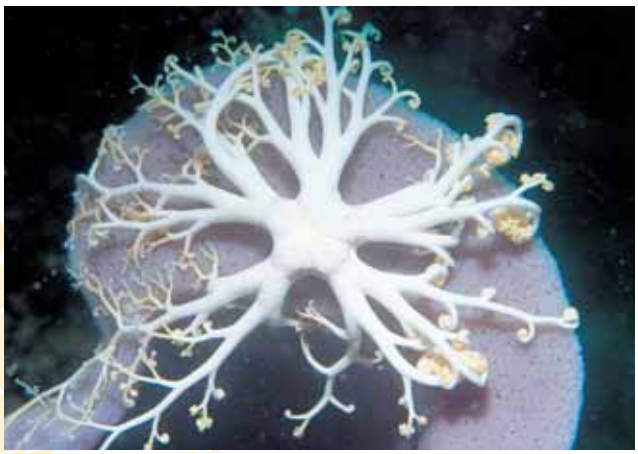
The mid-term review of the entire program was undertaken as part of a best-practice approach to ensure governance and science delivery are on track. I am pleased to provide a copy of that independent review as part of this report. The report was highly favourable and I am pleased to say the report reinforced the key value adding role that WAMSI is now playing, both in Western Australia and nationally in marine science as well as demonstrating a highly effective and transparent 'best practice' governance mechanism.

One of the main challenges of a program such as WAMSI is to bring all of the various outputs from the project and sub project research together in ways to further extend and inform our knowledge base of the marine and coastal environment. This is not an easy task. However through WAMSI and its 16 partners, various science integration and communication approaches have been undertaken with a series of focused science communication messages and deliverables being produced for a range of different audiences. The WAMSI node symposia remain a popular and effective method of communication of the science being undertaken. The science quality reviews provide the main independent assessment tool of the WAMSI Board to ensure that the science being undertaken is best practice. The ongoing delivery of public presentations, seminars, workshops, industry briefings and peer reviewed science publications remain a fundamental part of the Board's efforts to ensure that the science being undertaken reaches a broad audience and remains relevant.

Major improvements are now clearly being made in the marine data and information management space with the successful partnering of the hub of advanced computing in Western Australia, iVEC, the Western Australian Satellite Technology and Applications Consortium (WASTAC) and the Integrated Marine Observing System (IMOS) to ensure that data and meta data will be accessible in perpetuity. This will remain one of WAMSI's most important legacies.

The economic downturn that all nations have recently faced has had an effect on the volume of new projects and discretionary income from industry. However, because WAMSI 1 is a strategic five year marine science investment made by the State Government in 2006, along with a co-investment from industry and the Commonwealth to commence a strategic marine science program, this has assisted our sector to maintain a critical mass of expertise undertaking public-good strategic marine science in WA. We are optimistic that economic conditions will improve in the coming years and that WAMSI will further demonstrate its value and receive ongoing funding beyond 2011.

One of the most significant new strategic initiatives undertaken in the first part of WAMSI's existence was the production of the coupled science case/business case *A Turning of the Tide – science for decisions in the Kimberley-Browse Marine region* released in October 2008. This document effectively provides the blue print for the collection requirements for a co-funded regional marine science program in the Kimberley Browse marine region over the coming years. The report has been well received by Governments, industry, non-government organisations (NGOs) and the research community and we remain optimistic that the case



Photograph courtesy of C.Bryce, WA Museum.

Photograph courtesy of UWA.

made in the document hits a chord with all stakeholders who have ongoing interests and investments in this remarkable region, earmarked to be one of the power houses of the Australian economy over the coming decades. Better science will undoubtedly mean better decisions which in an area as unique and unexplored as the Kimberley offshore regions would seem to be a fundamental requirement. The business case for new investment into WAMSI for marine science beyond 2011 is actively being presented to governments, industry and academia.

The combined capabilities of WAMSI, through its partners, are possibly unequalled anywhere in the world and spearhead the coordination of collaborative marine science research at regional scale within Western Australia. Perth is fast becoming a major marine science hub in Australia.

WAMSI research is continuously peer reviewed to ensure the information coming back from each of its 85 research projects is not simply a single research project but is part of a collective integrated series of key findings of policy and management relevance.

WAMSI's first stage of research will end in 2011 when it will have tackled many of the most important marine strategic challenges WA society faces: the effects of climate change on marine life – fish populations, extinctions, marine life 'recruitment' for breeding, the effect on coral reefs, altered currents, changed water flows, rising ocean temperatures and storm surges.

It will have assisted with the future of aquaculture industries, the prospect of harvesting medical and pharmaceutical compounds, the effect of increasing populations along the coastline, the impact of tourism and industrial developments and the scientific naming of thousands of new species. It will also add substantially to the knowledge required for the management of the Ningaloo and Jurien marine parks, coastal and deepwater engineering, ecosystem based fisheries management and to broader oceanography and marine ecosystem processes.

The scale of human activity and use of the environment coupled with climate change means the impacts on the marine environment need to be known and understood. These are the drivers behind the matrix of information WAMSI is establishing: information on ocean forecasting, biochemical compounds, new marine species, estuarine dynamics, sustainable fisheries, marine biodiversity, conservation best-practice, the effects of ocean currents on oil and gas rigs, coastal infrastructure and the future impacts of climate change.

On behalf of the WAMSI Board of Directors, I commend this independent mid-term review to all interested stakeholders and the general public.

Dr Peter Rogers
WAMSI Chairman

Mid-term review

WAMSI purpose and strategy

VISION

- WAMSI will establish a world leading research capability to underpin the conservation and sustainable development of the marine environment and resources for the economic, social and environmental benefit of the State of Western Australia

MISSION

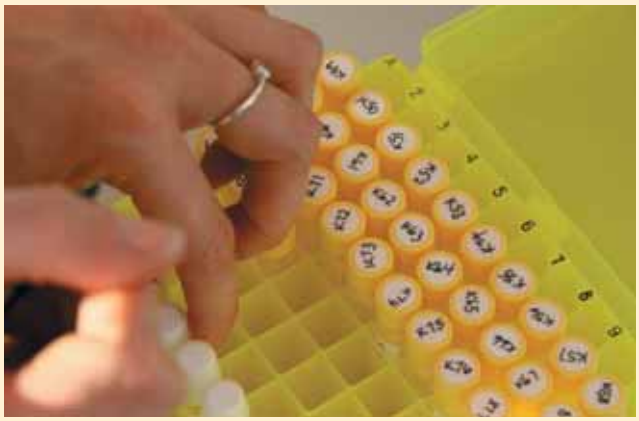
- To improve knowledge and understanding of WA's marine environment for better resource development, management and conservation outcomes

TARGET OUTCOMES

- To strengthen the coordination and capacity of marine research in WA
- To enhance the transfer of research outputs into outcomes of benefit to WA

REVIEW TERMS OF REFERENCE

- To review and comment on the quality of governance arrangements to ensure delivery of outcomes to the State
- To review and comment on the quality of the research plan



Photograph courtesy of WA Museum.

REVIEW COMMENTS

Specific comments directed to the Review terms of reference and WAMSI's purpose and strategy are offered below.

GOVERNANCE

All stakeholders commented at the outset on the strong, tight governance of the Joint Venture. Several partners expressed the view that administration overheads might be overly heavy relative to the scale of MRF investment, particularly at the level of project monitoring. Not unexpectedly, greater value is seen in these 'top-down' processes by the Board than by researchers.

WAMSI Headquarters expenses were explained to constitute 17 per cent of the MRF grant value, supplemented by in-kind contributions from the Centre Agent and other partners. The reviewer was advised that management services around 80 governance, planning and management-related meetings per year. There are in addition an increasing number of research symposia and other diffusion and communication fora. Comments made would suggest that the workload now being taken on by Headquarters staff is unsustainable.

Management effort is currently focussed largely on delivery of the agreed research plan. An important new initiative in data management has also been supported. In addition, a consultancy was commissioned to develop a Kimberley science and business case, in which a seven-year $110 million research program was proposed. This was described by several Board members as the key initiative towards creating a 'WAMSI 2' such that the Joint Venture continues beyond 2011. Various challenges in achieving new funding were outlined, including management effort and maintaining alignment of 16 partners. One approach proffered was for specific organisation(s) to lead future business development efforts on behalf of all, or a subset of, the partners.

The reviewer believes it might be possible to streamline governance processes at this stage of the program. This would have the advantage of freeing up management time to allow additional focus on strategic matters for the future of the institute.

RESEARCH PROGRAM

The research program review is considered in four elements, borrowing CSIRO's success measures framework.

Impact

Node 3 is the furthest advanced, assisted by the 2006 launch of the CSIRO Wealth from Oceans Ningaloo Collaboration Cluster, which is external to, but collaborates with, WAMSI. The Node's activities illustrate the delivery of outputs, including at the very recent and successful Third Annual Ningaloo Research Symposium (May 2009). DEC staff were strongly supportive of the research, describing that it had improved baseline knowledge, which would assist in future management decisions. Elements of the WAMSI model by which

- end-user CEOs are active Board members,
- the Node Leader is both a scientist and an end-user employee and can thus bring together management and research questions, and
- periodic symposia are held in which stakeholders are updated on science results

seem a powerful way to increase the take-up of research outputs in collaborations such as WAMSI where the adoption partners are not the principal project funders.

The reviewer had anticipated a risk of possible dilution in impact of the research outputs given the considerable gestation (up to seven years) between conceiving the research plan and final delivery.

However, end-user partners to whom the reviewer spoke did not express any such concern. This is believed to illustrate the underpinning rather than 'big issue' nature of the research – a point touched on again later.

Nonetheless, climate was noted as an example where externalities have changed significantly since the program was designed. Efforts to interlink activities across the nodes relevant to climate change include a recent symposium (March 2009) and further integration mechanisms are under consideration across the program. Experienced stakeholders such as Board members can play a valuable role in seeing the key messages in and across major bodies of research – another advantage of their ongoing close involvement with the Joint Venture.

All conference and general publicity materials viewed by the reviewer were of very high quality. The beautiful images in the documents of themselves generate a sense of the importance and value of marine research.

Science

The research program was developed thoroughly by the research partners over a period of several years and all elements have now been reviewed by the Research and Development Committee and approved by the Board. The program is supporting 24 research students and four post-doctoral fellows across the 6 nodes. Node 2 is an example of an area where strong publication outputs are being delivered. Further comments on science quality are given below.

Left: Photograph courtesy of M. Rousseaux, UWA. Centre: Photograph courtesy of iVEC. RIght: Photograph courtesy of WA Museum.

Mid-term review

WAMSI purpose and strategy (continued)

Relationships

Node 4 appears to be an example of a well-integrated program with the budget indicating that the majority of projects involve more than one organisation. The reviewer heard that this was achieved through a careful planning process combining researcher and end-user perspectives.

The budget shows some other nodes to involve only a single research organisation. General comments regarding broader national and international research links are made below.

In contrast with the close relationships of end-user partners within WAMSI, the reviewer heard that the Joint Venture is not as well connected to broader political and strategic decision makers; this would appear to present an opportunity to achieve greater impact.

Relationships with industry have also been limited for various reasons. It might be possible to develop synergies with WA:ERA (another MRF) which has strategic relationships with Chevron and Woodside.

Resources

As is often the case in Australia, 'co-investment' principles appear to be a significant driver of program design, with the connected risk of WAMSI being seen by researchers more as a supplemental funding body than a strategically valuable entity.

The reviewer did not ascertain the MRF funding split across the partners. Participation appeared to be quite uneven, however, with CSIRO and UWA being the largest in-kind contributors in the budget (and hence benefactors?) and several research partners playing minor roles. The strong leadership role of AIMS was also acknowledged.

The reviewer heard that new 'cash' contributions (rather than in-kind) have been attracted by WAMSI to augment the MRF funding, but that these are not large in value.

WAMSI POSITIONING IN RELATION TO VISION

The Reviewer understands the essence of WAMSI to be:

1. a best-practice operation for a specific multi-institutional research program comprising:
   - a valuable grouping of State and Federal Government entities, Universities and Industry which is developing a critical mass of marine science capability in WA, and
   - delivering strategic, regional-scale, peer-reviewed, independent, public-good WA marine research

Reflecting on the descriptor 'world leading' in the vision statement, WAMSI is certainly the leader in achieving the above for WA marine science. Some other world leading aspects are less apparent:

- International benchmarks of science quality do not appear to be a priority in WAMSI Science Reviews. The reviewer heard that the 'D' of Research and Development is often more valuable and that it is important to simplify science models to facilitate take-up by management in State agencies.
- Linkages with similar research conducted by partner organisations for jurisdictions outside WA does not seem to be priority for some WAMSI research leaders.
- National and international leadership and profile for WAMSI itself does not seem to be a high priority; individual partners probably prefer to have this profile themselves.
- Partly because of the above, WAMSI is not yet world leading in scale or reach.

Photograph courtesy of WA Museum.

The reviewer's view is that this WA-centric positioning has the potential to be a risk to quality, which would need to be managed. Assuming the Governors/Board continue to endorse the WA and specific-program focus, future opportunities for the institution are also comparably limited.

For organisations such as WAMSI, there can be a tension between the desires to focus on delivery of agreed outputs, and for responsiveness to the changing external environment. WAMSI could arguably enhance its visibility in some quarters, and longer-term sustainability, by attracting and channelling resources towards addressing iconic WA marine issues and opportunities of the day to help generate material impact in the shorter-term.

RECOMMENDATIONS FOR THE WAMSI BOARD

1. The reviewer recommends consideration is given to whether governance processes can be streamlined at this stage of the program to fully recognise:
   - the trust that has built between partners,
   - detailed project plans in place and familiarity of researchers with what WAMSI expects in delivery,
   - natural desire of good scientists to do good science, and
   - existing QA processes within partner organisations (ensuring supplementation rather than any duplication).
2. The reviewer suggests that there might be value in reviewing the strategic positioning of WAMSI at this stage of the Joint Venture's term, considering such aspects as:
   - future roles relative to those of partners,
   - mechanisms to support the development of any future roles, and
   - strategic relationships with key stakeholders required to achieve these new directions.

Mid-term review

DR BEVERLEY RONALDS

Dr Ronalds' career has spanned teaching, research and the application of research to solve industry problems.

She manages CSIRO's energy research with an annual budget of $140 million.

Former Foundation Director and also the Woodside Chair with The University of Western Australia's School of Oil and Gas Engineering, Dr Ronalds' research interests include:

- *offshore structural reliability and*
- *production facilities selection.*

Dr Ronalds also has industry experience in design, installation and operations support for fixed and floating offshore platforms, in the Australian North West Shelf, the North Sea and the Gulf of Mexico. She has worked at Hardcastle and Richards in Melbourne, Victoria, Ove Arup in London, and Kvaerner Earl and Wright in London and San Francisco.

She is a member of the:

- *the Western Australian Energy Research Alliance (WA:ERA) - a joint venture between:*
  1. *CSIRO,*
  2. *The University of Western Australia and*
  3. *Curtin University of Technology;*
- *the National Low Emissions Coal Council (NLECC) , and*
- *the Australian National Low Emissions Coal Research and Development Limited Board (ANLEC Research and Development).*

In 2000 she was made a Fellow of the Australian Academy of Technological Sciences and Engineering. She is also a fellow of the:

- *Institution of Civil Engineers*
- *Institution of Engineers Australia.*

In 2003 she was awarded the Prime Minister's Centenary Medal for service to Australian society in Civil Engineering. She has been included in Engineers Australia's list of 100 most influential engineers three times since 2004.

Research summary

WAMSI's research was originally planned to address three main cross-cutting themes – ocean forecasting, biodiversity conservation and natural resource management.

Under these themes there are six areas (nodes) of research.

Node 1: Marine ecosystems science

Node 2: Climate processes, predictability and impacts

Node 3: Conserving marine biodiversity

Node 4: Sustainable marine ecosystems

Node 5: Biodiversity, biotechnology and aquaculture

Node 6: Ocean predictions for the offshore and coastal industry

The initial findings of each of these areas of research are listed in this report.

Photograph courtesy of C.Bryce, WA Museum.

Node 1

Marine ecosystems science

WA's marine ecosystems are facing unprecedented pressure from multiple industrial, extractive, recreational and aesthetic uses that must increasingly compete for limited space and resources.

Governments everywhere need to make bigger decisions that affect the marine environment – decisions that now need to be made more often and more quickly.

Research into biodiversity has looked at the Leeuwin Current, its effect on the movement of particles, the energy of eddies, the importance of wind in lagoon circulation and identified hotspots for larval retention.

Initial findings have discovered that kelp, a critical part of the marine food web and fisheries ecosystems, is under threat from climate change because increased wave energy is dislodging them.

In other areas of research, new marine species are being discovered in isolated areas and on Perth's doorstep.

Although uncertainty surrounds how marine ecosystems respond to intensified uses, particularly in the context of global climate change, WAMSI has dramatically increased the ability to predict future trends for confident decision-making in a developmentally expansive period for WA.

Results so far have brought a greater understanding of the structure and function of coastal marine ecosystems, including how their interaction and interdependency responds to human and natural changes.

This has been done at large and small scales. For example the recycling of nutrients between the sediment and marine plants, combined with seasonal cycles of storms and waves, sustains the productivity of the coastal ecosystem. This cycling plays out over scales of millimetres and drives changes in production over annual scales, and nourishes Leeuwin Current eddies that sustain the larvae of the western rock lobster.

Understanding these processes has allowed WAMSI to construct a nutrient budget for WA coastal ecosystems that will enable us to assess the cumulative impacts of changes in coastal development, population growth, and climate change.

Research has been carried out in the open ocean, the continental shelf and inshore lagoons.

WAMSI has built an enduring human and research infrastructure capacity and strong collaborative linkages across all its nodes. Research in this area has led to the development of a world class science capacity in marine ecosystem understanding and prediction for natural resource management and conservation.

Seven PhD scientists have been employed and trained in this area of research. In addition, WAMSI's success has provided the impetus and certainty needed to attract and secure a WA-based CSIRO research capability of 35 marine scientists and support staff, and the commissioning of a $1 million research vessel the RV Linnaeus. These developments enable WAMSI and its member agencies to respond rapidly to key research needs and deliver research findings on shorter timeframes.

NODE 1 LEADER

Dr John Keesing
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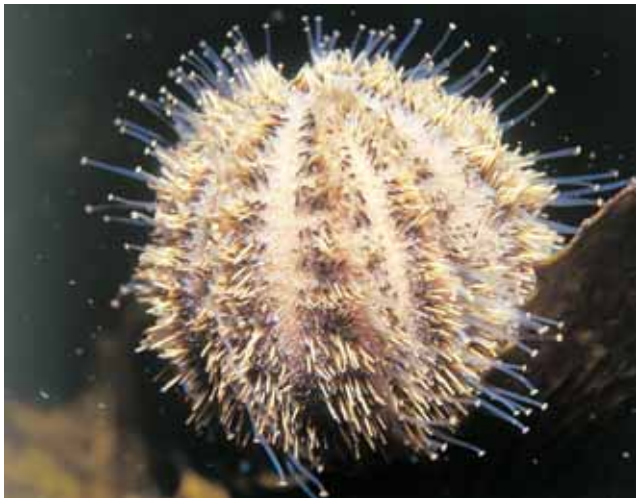
Dr Keesing heads 10 WAMSI projects and leads the Maritime Uses and Impacts research in CSIRO's Wealth from Ocean Flagship. He also manages the WA Coasts Research Group in CSIRO's Marine and Atmospheric Research Division.

He has led multidisciplinary project teams researching physical and biological oceanography, marine biogeochemistry, biology, physiology, ecology and modelling.

His background is in marine ecology and fisheries science. Previous positions were as Research Director for the Strategic Research Fund for the Marine Environment (SRFME), Murdoch University's Director of Research and Development, and the South Australian Research and Development Institute's Chief Scientist (Aquatic Sciences).

He has a PhD from James Cook University, an honours degree from Murdoch University and a bachelor's degree from the WA Institute of Technology (now Curtin University of Technology). He has also completed a Graduate Diploma in Applied Finance from the Securities Institute of Australia.

Dr Keesing was part of an international team that discovered the cause of the world's largest algal bloom in China, which threatened to disrupt the 2008 Olympic Games sailing events, was the massive expansion of coastal aquaculture.



Photographs courtesy of C.Bryce, WA Museum.

Node 2

Climate processes, predictability and impacts

This area of WAMSI research (Node 2) focussed on the large-scale variations and changes in Pacific and Indian Ocean currents – the Indonesian Throughflow and the Leeuwin Current – as well as the Indian Ocean dipole.

It studied their potential impacts on WA marine environments, especially those closely linked to western rock lobster recruitments and Ningaloo Reef protection.

The research has built on WA's climate research capability and attracted national and international climate researchers. Projects have covered the Leeuwin Current dynamics, regional warming off the coast and future changes to marine productivity. Monitoring the long term changes in the shelf systems off WA has been a key driver of a number of IMOS projects off WA.

Numerical tools have been developed to predict the Leeuwin Current and Indian Ocean Dipole on a seasonal time scale. These have potential applications in fisheries management and maritime operation planning.

Research projects have also developed a suite of numerical models to project the impact of future climate changes from the Indian Ocean and the Leeuwin Current on Ningaloo Reef. This will provide WA's marine park managers and decision-makers with information to assist their management and adapt to the impacts of climate change.

Its research findings were presented at two symposia during the year – *Climate processes, predictability and impacts in a warming Indian Ocean* at CSIRO's Floreat headquarters in Perth in September 2008 and a series of presentations at a co-sponsored climate change symposium, *A changing climate: focus on Western Australia at The University of Western Australia* Club in March 2009.

Photo courtesy of Bureau of Meteorology.

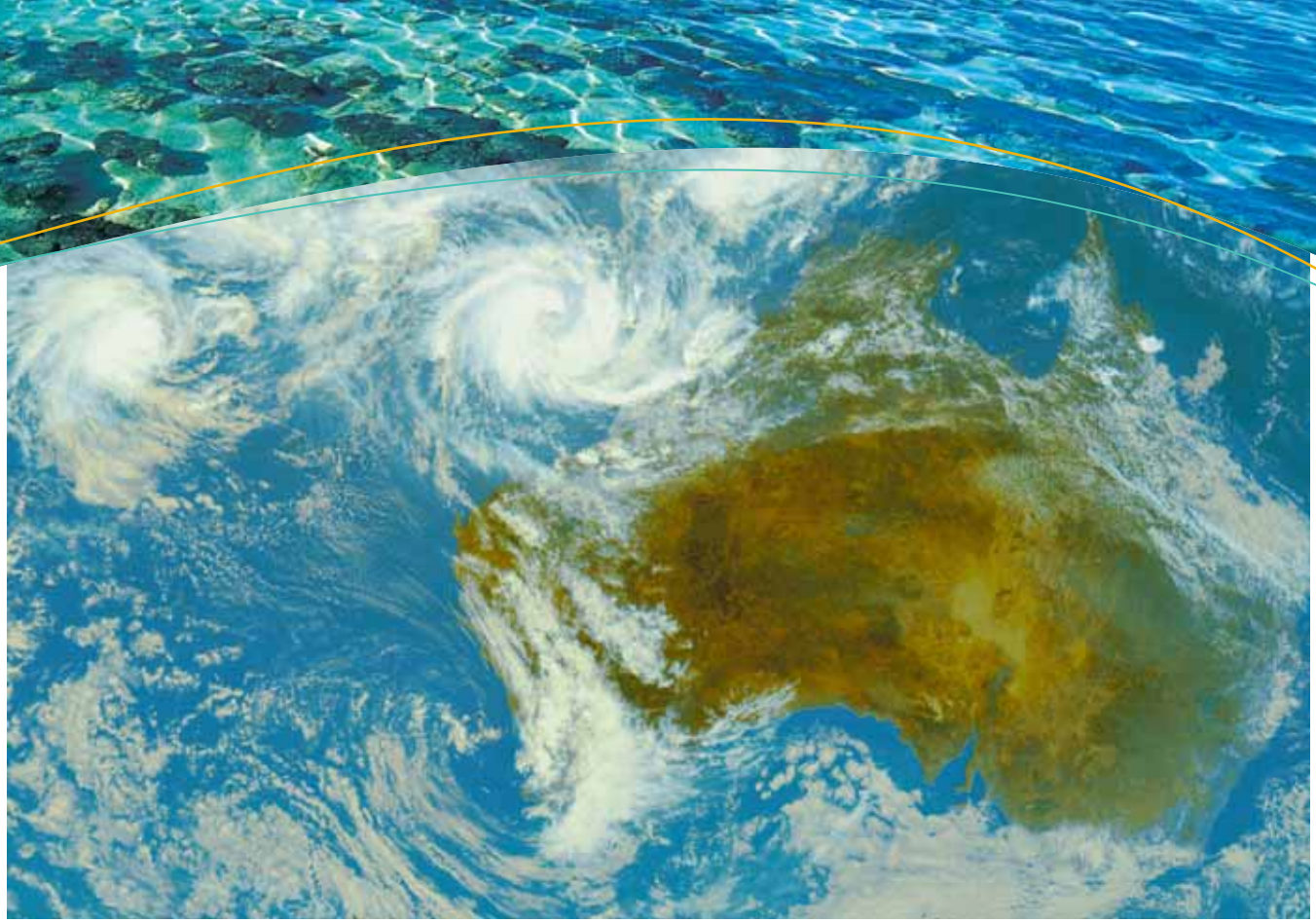


Photo courtesy of Bureau of Meteorology.

NODE 2 LEADER

Dr Ming Feng (Node 2 Leader)
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Dr Feng's research activities cover the long-term trends of the Leeuwin Current, its eddies, fish and crustacean larvae recruitment (including the iconic western rock lobster), and how nutrients and other particles are transported along a changing current.

He and his team provide crucial conceptual and logistic information for field trips and Integrated Marine Observing System (IMOS) activities in the south-east Indian Ocean off WA.

Dr Feng joined the CSIRO's WA headquarters in 2001. His projects were to research climate and ocean currents in the Pacific and Indian oceans, including the Leeuwin Current which travels down the WA coastline and across to Tasmania, and report on trends.

He graduated with a Bachelor of Mathematics and Engineering degree from Beijing University followed by a PhD in Physical Oceanography from the Chinese Academy of Sciences and the University of Hawaii.

He has published more than 30 journal articles and won three national CSIRO academic awards.

Photos courtesy of Bureau of Meteorology.

Node 3

Managing and conserving the marine state

The scientific knowledge base for conservation of marine biodiversity and management of human use of the coral reef ecosystems of the Ningaloo Marine Park by Government has improved, at least, 20 to 30 fold.

An improved knowledge base promotes more informed decision-making and management of Ningaloo Marine Park by Government thereby using existing resources for management, more effectively and efficiently.

More informed decision-making by Government provides a more strategic, sustainable and equitable basis (i.e. less contentious) for the sustainable development of the Ningaloo Marine Park, a main focus of economic development in the Gascoyne region.

Much of the knowledge base gained by the Ningaloo Research Program will be transferable to other coral reefs in WA (e.g. Pilbara and Kimberley coral reefs) and internationally resulting in more effective conservation of marine biodiversity and more efficient management of human use in these areas.

The vastly improved understanding of the functioning of the coral reef ecosystems of the Ningaloo Marine Park will be critical in identifying changes and adaptation strategies necessary to minimise the impacts of climate change (and other future threats) to the marine park and other coral reefs in WA.

International recognition of the Ningaloo Research Program has enhanced WA's reputation as a centre of excellence for training in marine science and management in the developing nations bordering the Indian Ocean, thereby making WA more attractive to international marine science students.

Photograph courtesy of WA Department of Environment and Conservation.

Photograph courtesy of Tourism WA.

This year a successful student research day was held in April to focus on the value of postgraduate education in the marine area. A winner from the speakers was chosen to represent students at the Third Annual Ningaloo Research Symposium in Exmouth in May. More than 80 delegates attended the symposium which was sponsored by WAMSI, CSIRO's Wealth from Oceans Flagship, the Ningaloo Research Coordinating Committee and the Department of Environment and Conservation, WA.

It was opened by WA's Chief Scientist, Professor Lyn Beazley. Topics included coral reefs, tourism, social studies, fish surveys, fish movements, mapping, oceanography, biodiversity, fishing, invertebrates, lagoon studies and the Leeuwin Current.

The symposium generated news articles in the West Australian newspaper (front page) and local media outlets. Researchers also took part in radio interviews, while the node leader spoke to ABC radio about the research in a more extensive 'big picture' interview to highlight the importance of Ningaloo research.

At other times during the year, Ningaloo research attracted publicity and media interest via WAMSI. Television, radio and newspaper coverage was excellent and involved staff from DEC, the Department of Fisheries, AIMS and CSIRO's Wealth from Oceans Flagship.

NODE 3 LEADER

Dr Chris Simpson (Node 3 Leader)
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Dr Simpson is the Program Leader, Marine Science Program at the WA Department of Environment and Conservation's Science Division and the Leader of Node 3 of the Western Australian Marine Science Institution (WAMSI). Chris has worked in the marine conservation area for more than 30 years and has a particular interest in the conservation of WA's coral reefs, particularly the Ningaloo Reef and the coral reefs off the Pilbara and Kimberley coastlines.

He currently leads a team of scientists that undertakes marine research and monitoring in WA's tropical and temperate coastal waters with a particular focus on providing the scientific basis for the conservation and management of the statewide system of marine protected areas, threatened marine fauna and marine biodiversity generally. The Marine Science Program is also overseeing a major research program in the Ningaloo Marine Park as part of WAMSI.

Twenty seven WAMSI projects under Dr Simpson's supervision are now bringing results and will be used for the better understanding of issues such as the effect of climate change, fisheries, tourism, coastal development and industry on the marine biodiversity and social values of the Ningaloo Marine Park.

Node 4

Sustainable ecosystems for sustainable fisheries

Research in this area has resulted in the development of a bioregional framework to assist with the holistic management of marine resources.

The project teams have generated a comprehensive Ecosystem Based Fisheries Management framework for the West Coast Bioregion from Geraldton to Esperance.

The framework covers the cumulative impacts on ecosystems, habitats and target species from both fisheries and other external sources. An agreement has been reached by State Government agencies on the 13 key marine ecosystems within the West Coast bioregion.

In conjunction with the WA Department of Fisheries and key stakeholders, a risk assessment of each of the key ecological, economic, social and governance elements in the bioregion was carried out. The high level elements within each of the components are now being used to assist restructure the department's risk register and also to assist the alignment of the department's activities in dealing with the key risks.

The current status of the research has resulted in the successful compilation and assessment of numerous long term environmental datasets that were collected by different WA institutions. A long-term trend has been found for the increased sea temperatures off the lower west coast of WA and the increase in the frequency of ENSO events which may have affected the population dynamics of some species. This information has already been valuable for assisting in the determination of the cause of the recent low levels of western rock lobster recruitment.

A successful one-day research symposium was held in November 2008 to disseminate all findings of this research to a capacity audience.

Photograph courtesy of Tourism WA.

NODE 4 LEADER

Dr Rick Fletcher (Node 4 Leader)
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Dr Fletcher is the Director of Research at WA's Department of Fisheries, with periods of being Acting Director General. He was appointed to lead WAMSI's Node 4 research projects in 2007.

He graduated with a Bachelor of Science (with honours) from the University of Melbourne in 1980 and followed it with a PhD from the University of Sydney in 1984.

He is best known for his research into creating sustainable development in the fisheries and aquaculture areas. He has spent time in Vanuatu researching the population of the coconut crab with subsequent studies to reassess numbers. He devised a sustainable management strategy and trained local fisheries staff how to assess the populations. The venture is extremely successful. He has also been involved in research on oysters.

Dr Fletcher's previous positions were Director of Research at NSW Fisheries, Chair of the program committee for the World Aquaculture Society conference in Sydney and Chair of the Research Committee of the Standing Committee on Fisheries and Aquaculture.

Photographs courtesy of WA Department of Fisheries.

He joined the WA Department of Fisheries in 1988 to assess the abundance of commercially caught fish species using historical fishing information, biology studies, logbooks and monthly catch information from fishermen.

In his present position as Director of Research he manages 130 staff working on research projects on invertebrates, finfish, biodiversity, aquaculture and stock assessment across WA.

Dr Fletcher is a member of several consultative committees including the management advisory committees for major fisheries, interdepartmental committees and internal committees, and heads the national ecologically sustainable development subprogram for the Australia Fisheries Management Forum.

Node 5

Marine biodiscovery, biotechnology and aquaculture

An unprecedented focus on the WA marine estate for conservation, medical research and the development of the oil and gas industry is providing an unequalled opportunity for the exploration of marine biodiversity.

WA's pristine and biodiverse oceans – the blue farms – have the potential to offer a wealth of raw, genetic materials to develop pharmaceutical and other biotechnology products.

Already the marine biotechnology industry which is growing at 18 per cent a year is benefitting from the scientific evidence being discovered by the WAMSI's research partners. The partners include the Australian Institute of Marine Science (AIMS), the WA Museum and The University of Western Australia (UWA). The WA Institute of Medical Research is an external partner.

Many of WA's marine species are found nowhere else in the world. From the small number of samples collected on explorations to date, an extraordinarily high 'hit rate' was returned in medicinal areas. One of the samples may be used in screening programs for breast cancer.

Research has found species of WA's sponges and sea squirts have some of the world's highest rates of anti-tumour activity while compounds from marine filter feeders such as sponges are being used in cosmetics, medicine, sunscreens, anti foulants and industrial enzymes.

Microbes are at the basis of this research: more than a billion micro-organisms live in each litre of seawater and it is known that microbes dominate the abundance, diversity and metabolic activity of the ocean.

They comprise 98 per cent of the biomass of the world's oceans, supply more than half the world's oxygen, are the major processors of the world's greenhouse gases and have the potential to mitigate the effects of climate change.

They are the cause of diseases that are suspected to be spreading because of global warming yet paradoxically, the compounds they produce are potential cancer cures and solutions for combating human disease.

Scientists are only just beginning to understand the important environmental roles that microbes play in marine systems.

A WA Marine Bioresources Library (WAMBL) which will store thousands of samples of marine life was established in March 2009 using initial funding from WAMSI.

Most samples at WAMBL have been collected by the museum and AIMS, the latter transporting WA marine extracts stored in Townsville for the past 25 years. Access to the library will enable researchers to use samples to identify valuable compounds with the potential to be anti-cancer agents or other pharmaceutical products. In conjunction, a database was created to track frozen samples in and out of the library. Professional curation by the WA Museum will enable marine extracts to be used by State, national and international organisations.

WAMSI is also initiating and pursuing the introduction of WA biotechnology legislation to improve biodiscovery research investment and exploration prospects for WA.

In July 2008 WAMSI, AIMS, the Department of Fisheries WA and the USA National Cancer Institute sponsored the Chief of the United States National Cancer Institute's Natural Products Branch (in the Developmental Therapeutics Program) to visit Perth to speak to researchers.

Photograph courtesy of AIMS.

NODE 5 LEADER

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Jason is the Manager of the Strategic Fisheries Policy area in the WA Department of Fisheries.

He leads 14 staff and is responsible for developing, implementing and reviewing policies and strategies relating to fisheries and the aquatic industry.

His team provides reviews on fisheries economics, charter fishing, pearling and recreational fishing.

He has led the department's Pearling Sub-Program dealing with the regulation and management of the WA pearling industry.

Other roles within the department included the sustainable fisheries management of commercial and recreational fisheries from north of Bunbury to the South Australian border.

He has worked as the Principal Policy Advisor in the Department of Premier and Cabinet, providing strategic liaison between the department and the Minister, and provided high-level advice to senior decision-makers about fisheries policy, legislation, enforcement, compliance and research.

His career has been wide and included time spent in the educational and curatorial fields at aquatic organisations in Queensland and WA.

Photograph courtesy of C.Bryce, WA Museum.

Node 6

Marine science for offshore and coastal engineering

The high level outcome of this research is the ability to forecast ocean dynamics, particularly on the Australian North West Shelf, in support of the next generation of industry development. The methods and approaches are not geographically specific, but widely applicable.

To achieve this outcome, there has been an integration of ocean observations and ocean numerical modelling capability. The ocean observations have required the development and implementation of new technologies, such as the use of ocean glider technology and dedicated fixed instrument systems.

There has been a clear link with the Federally-funded IMOS program, as well as continuing ocean observations made by members of the oil and gas industry.

This is particularly true in the Kimberley marine region where future developments are in new previously unexplored waters on the Shelf and in waters more than 1000 metres deep. There are similarly active research programs near-shore sensitive in the Kimberleys with its sensitive reef and ecosystems.

The new generation of numerical models are hybrid models with the capacity to provide downscaling predictive capability from scales as large as 1000 kilometres down to scales as small as 10 metres. They integrate data-assimilating large scale models, such as Bluelink, with process-oriented smaller scale models. A very significant deliverable is the capacity training, represented by the growing numbers of PhD students (more than 10 in the UWA Engineering Faculty group alone), as well as the ability to attract high quality postdoctoral researchers to WA.

Photograph courtesy of Woodside Energy.

NODE 6 LEADER

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Professor Ivey is Winthrop Professor of Geophysical Fluid Dynamics at The University of Western Australia.

He graduated with a Bachelor of Engineering (hons) from UWA, a Masters in Engineering Science at UWA and a PhD at the University of California at Berkeley.

He worked as an engineer before following a research career which has taken him to research institutions in Canada, the USA, France and Australia.

He has been Head of UWA's Department of Environmental Engineering, a member of the Faculty of Engineering Advisory Board, a member of the Engineering and Mathematical Sciences Faculty Board, a board member of the Graduate Research School, a member of the Faculty Engineering, Computing and Mathematics Faculty Board and Chair of review boards.

In addition to his academic work he has carried out research for Alcoa, Woodside Engineering, Woodside Offshore Petroleum Pty Ltd, Worsley Alumina Pty Ltd, Shark Bay Resources, and Woodside Energy and Chevron Texaco's North West Shelf projects.

He has written scientific papers for 30 years, is a Fellow of the Institution of Engineers Australia, a member of the International Association of Hydraulic Research, the Australian Water and Wastewater Association and the American Geophysical Union.

He has been a visiting Fellow and visiting professor at Sandford University in the USA, and a visiting Fellow in France and Japan. His main interest is in geophysical fluid dynamics.

NODE 6 PROFESSOR

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Professor Pattiaratchi graduated from the University of Wales in 1976 with a Bachelor of Science in Oceanography and Applied Mathematics, following it with a Master of Science and a doctorate in oceanography. Between 1981 and 1985 he worked as a research assistant at the University of Wales before becoming an oceanographer. He returned to the University of Wales as a senior research assistant and later travelled to Western Australia.

He became a lecturer and senior lecturer at UWA's Department of Environmental Engineering between 1988 and 2000 interspersed with Visiting Professorship appointments at Hamburg University, the University of Southampton, and the Marine Sciences Research Centre at the State University of New York, POGO (Partnership for Observation of the Global Oceans) National Aquatic Resources Research and Development Agency.

From 2000 to 2002 he was appointed Associate Professor and later Professor at UWA's Department of Environmental Engineering and subsequently took visiting professorships at the Iranian National Centre for Oceanography (INCO) and the Baltic Sea Research Institute in Germany.

He has won the Eminent Sri Lankan scientist award, an engineering excellence award from the South Australian Institute of Engineers, and is a Fellow of the Institute of Marine Engineering, Science and Technology (IMarEST). He won the Rotary centennial service award for professional excellence and a postgraduate research supervision excellence in teaching award from UWA.

He holds positions on many committees and boards in academia and private industry.

Responses to the recommendations

WAMSI Chief Executive Officer

It is with great pleasure that we secured the services of Dr Bev Ronalds from the CSIRO Group Executive to undertake the independent, WAMSI mid-term review in mid 2009. While this was not a formal requirement of the WAMSI Major Research Facility Program, the WAMSI Board considered it a 'best practice' to undertake an independent mid-term review.

The review as submitted is an accurate reflection of the current status of the WAMSI Joint Venture Program. In particular, it is pleasing that the original vision of providing inter-institutional, multi-disciplinary research and developing a critical mass of marine science capability in Western Australia has largely been realised. It is also pleasing to see that the value of undertaking strategic, regional scale, peer reviewed, independent 'public good' marine research in WA has been recognised by a broad range of stakeholders.

The recommendations for the Board as presented are accepted in full and I now provide the following comments in response:

1. The reviewer recommends consideration is given to whether governance processes can be streamlined at this stage of the program.

This recommendation is supported as we are fully operational and the science providers are fully aware of the process/compliance expectations coming down from the Board. The major focus of the CEO in the remaining period of 2010 and 2011 will be on strategic positioning (four days a week) rather than the operational aspects of WAMSI 1 (one day a week). The WAMSI Executive Officer, in particular, has picked up a lot of the day to day running of the WAMSI Headquarters office and this has allowed the CEO to focus much more on the strategic relationships with the key stakeholders especially since October 2009.

Internal QA processes within some of the larger partner organisations are a safety net in this regard. However it is noted that many organisations have poor in-house data and information processes which still require a certain degree of intervention from the WAMSI Board to ensure that the legacy of WAMSI 1 will be data and metadata available for public access in perpetuity. Overall, recommendation 1 is fully supported with the ensuing knock-on requirement for the WAMSI partners to ensure that their science and data delivery compliance is undertaken in a 'best-practice' more voluntary sense.

While the processes for governance are in place and fully operational, there is an expectation by the Board of the maintenance, of what might be termed a 'level playing field' for all partners, to ensure that equity is maintained across the entire program. Even as late as early 2010 there are requests being received for milestone variations (often for good reasons) but this does require some focus on the maintenance of the processes around strong governance. Genuine independent science comes with the overhead of an increased governance and compliance regime, especially around the Science Quality Review process and the Research and Development Committee deliberations. However, overall the governance processes are in operation, have been successful and we can now rely on the goodwill of the partners to fully comply with the expectations of the Board.

Unincorporated joint ventures such as WAMSI are, by their very nature, high maintenance entities, especially with 15 partners. Whilst the quality and volume of scientific research being produced is not under any question, the timeliness of delivery requires a constant focus otherwise we end up holding funds in abeyance, while the time frame for delivery ever decreases. The WAMSI Headquarters, in particular, is at the interface between the Board's expectations and the scientific delivery. Projects have to be completed and written up no later than by the end of June 2011. The Node synthesis reports have to be completed by the end of September 2011 to allow the end of WAMSI 1 Conference and the Final Report being produced for a November 2011 deadline.

2. The reviewer suggests that there might be value in reviewing strategic positioning of WAMSI at this stage of the Joint Venture's term.

This has been fully recognised with the November 2009 Strategic Planning update session which positions WAMSI forward for the period 2010-2014. As a result of that strategic planning exercise involving the WAMSI partners, a *Strategic Directions* document is in the process of being released. Overall, we believe that WAMSI has a well recognised name both within WA and now nationally. However, the brand is less well understood and part of the responsibility of the WAMSI Board and CEO is to ensure that an increased understanding is gained around what WAMSI stands for and our 'modus operandi' as we hopefully move forward into the next phase, post 2011.

WAMSI Board also put into place in September 2007, a Strategic Programs Committee, that largely drives the strategic initiatives as directed by the Board on an ongoing sense. It would be true to state that the WAMSI CEO and Chairman, linking in with the members of the Strategic Programs Committee, work very closely on an ongoing basis to ensure the strategic positioning of WAMSI for the future.

In terms of mechanisms to support the development of future roles, WAMSI certainly has a "Plan A", namely the development of the Kimberley Browse Regional Science Program but we probably don't have a "Plan B" or a "Plan C" at this point in time. However, it is noted that we do not wish to compete with 1) our partners or 2) private SMEs and environmental consulting companies as the role of WAMSI is seen to be very different, namely to fill the strategic marine science role through the delivery of regional scale, multi-disciplinary research of a 'public good' nature.

Photograph by WAMSI.

Additional business models to ensure WAMSI continues past 2011 have been discussed on multiple occasions by the Board but it is still felt that 'public good' strategic research needs an up-front investment through governments (in particular), industry, academia and the NGO sector.

The reviewer's comment that the Joint Venture is not as well connected to broader political and strategic decision-makers is acknowledged in full. This requires a larger amount of travel by the CEO and Chairman in particular, to engage with many eastern states organisations, especially Federal Government based in Canberra. We have relied primarily to date on the Commonwealth partners within WAMSI to provide business intelligence for opportunities for the Joint Venture based on their national responsibilities.

It is important to note however, that the WAMSI Headquarters is a very small staff complement of 3.6 ASL trying to cover off a broad range of services, so any new business cases or business models will need to find commensurate funding to maintain an increased capacity within the Headquarters element. I make this point as it is not uncommon within CRC Headquarters to have between 10 and 12 headquarters staff undertaking the coordination.

Responses to the recommendations (continued)

General comments

The reviewer also noted that the international benchmarks for science quality have not appeared to have been the priority for the WAMSI Science Review process, the Research and Development Committee and the Board. The Board has acknowledged this and the Research and Development Committee has been charged with addressing this issue in 2010.

The comment that WAMSI is seen by researchers as more a supplemental funding body than a strategically valuable entity is probably correct, as we are three and a bit years into a five year program. It is hoped that by the end of the full five years most researchers will genuinely believe that WAMSI has delivered a more value-add proposition that simply supplemental funding. It is probably arguable that senior program leaders within the management agencies, Head of the EPA and certainly Director Generals see a more strategic role that WAMSI has played in delivering the hard-to-do multi-disciplinary, regional scale science and science that probably would not be undertaken, or could not be undertaken by a single agency alone. The general comment is made, that as always with most joint ventures, those agencies that put in the most effort and co-investment have reaped the largest reward from the WAMSI MRF and this continues to be true in an ongoing sense.

Summary

In summary, the mid-term review conducted by Dr Ronalds paints a very positive picture around the WAMSI Joint Venture Program and partnership undertaken to date. It clearly indicates the benefit of the initial State Government MRF investment and notes some 'best practices' undertaken within the individual programs and Nodes of the WAMSI portfolio. Clearly, there are many learnings, both positive and negative, as WAMSI moves forward into its next phase. The recommendations for the Board are fully acknowledged and accepted and operational activities are being put in place to ensure that these recommendations are clearly addressed. The focus of WAMSI remains primarily on two mutually supporting aspects:

1. the completion of the WAMSI 1 research to the highest possible standard in a timely fashion; and
2. growing WAMSI beyond the initial WAMSI 1 phase, primarily to have a focus on the North West, in particular the Kimberley and Browse Basin regions, and an understanding of the logistics around the science planning which will hopefully commence in 2010 for a mid-to-late 2011 commencement of research effort.

While WAMSI cannot be all things to all people – and clearly, we only pick up a component of the entire research being undertaken in the marine and coastal environment in WA and with a noted limited geographical focus at the current time – the WAMSI model has been picked up as 'best practice' governance both within WA and also nationally. For that I thank the continued support of the Board and would like to acknowledge the insightful and forward looking comments made by our independent reviewer, Dr Bev Ronalds, as part of the WAMSI Mid-term Review.

Steve Blake
Chief Executive Officer
WAMSI

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Australian Government

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