

## AIMS FORMAL RESPONSE TO

### External review of the Quality and Impact of AIMS science (2007-011)

#### Introduction

The Australian Institute of Marine Science is Australia's tropical marine research agency delivering planned outcomes for tropical marine biodiversity, marine ecosystem health, climate change, and marine microbiology.

The Institute's work program is planned through consultation with key stakeholders and research users in blocks of 3-4 years matching our funding agreements with the Australian Government. Our intentions are described in public documents of which the most recent is the 2007-11 Research Plan.

At the conclusion of each Research Plan, we review our performance and re-test our stakeholder relationships as part of developing the next Plan. In 2005-06, matching developments in the tertiary sector then anticipating the Research Quality Framework, AIMS commissioned a series of independent external reviews of its entire research portfolio.

The advice from these reviews was one source of information contributing to the mix of science that we chose to include in the AIMS Research Plan (2007-11). In December 2010, AIMS invited six scientists of international standing to review the quality and impact of the outputs from that quadrennium.

The reviewers were selected to achieve a spread of disciplinary knowledge equal to the breadth of the AIMS science portfolio. All had experience of managing large research programs, some of a multi-disciplinary nature, and some had experience in policy-relevant areas of science such as coastal water quality, climate change, and conservation planning.

The 2010 review panel consisted of:

- **Prof Roger Bradbury** (Chairman), College of Asia and the Pacific, Australian National University, Canberra
- **Prof Russell Hill**, Institute of Marine and Environmental Technology, University of Maryland Center for Environmental Science, Baltimore MD
- **Dr Nancy Knowlton**, National Museum of Natural History, Smithsonian Institution, Washington DC
- **Prof Hugh Possingham**, The Ecology Centre, University of Queensland, Brisbane
- **Dr Roger Shaw**, Former CEO of the Coastal CRC, Brisbane
- **Prof Sandy Tudhope**, School of GeoSciences, University of Edinburgh, Edinburgh

The review was conducted in Townsville over five days (29 November to 2 December 2010). Prior to arrival, the Panel was supplied with Terms of Reference (Appendix 1) and a comprehensive evidence portfolio (Appendix 2) that contained information from the Research Directorate, the Research Team Leaders, and individual scientists. During the week, the Panel conducted a number of interviews to complement the documentary material. The Panel also had group discussions with the postdoctoral fellows and postgraduate students working at the Institute at that time.

## Review Outcomes

The Executive summary of the Panel's review is reproduced (in italics):

*The Institute has much to be proud of in the current quadrennium. The quality and broader impact of its science have both improved significantly. It has consolidated the earlier gains it made in the previous quadrennium. It has reinforced its national standing as a research institute, and this even in the face of an absolute decline registered for some other national institutes.*

*In some (but not all) areas the Institute is now at international benchmark and further gains are within its grasp.*

*We think that many of the settings — scientific, technical and organisational — are now in place for the Institute to strive uncompromisingly in the next quadrennium to reach international benchmark across most of its areas of operation.*

*To achieve this, we feel that the Institute needs a bolder strategy. The key elements of such a strategy would be:*

*Address Grand Challenge questions to lead in the provision of policy-relevant science for managing Anthropocene changes in tropical marine ecosystems.*

*Develop a world-class capability in synthesis, modelling, analysis and prediction to add value to the good process work being undertaken.*

*Provide leadership internationally for tropical marine ecosystems broadly — but particularly in the Coral Triangle, the global biodiversity hotspot for coral reefs that lies just north of the GBR and is the focus of considerable international conservation efforts.*

*We recognise that this requires a more programmatic approach, with KRAs more tightly organised against fewer, larger questions to capture the synergies of diverse skills. In order to capture creative ideas from staff that may lead to future breakthroughs, we suggest that this should be offset by a significant component of scientific flexibility and incentives by adopting the Google model (20% of time for exploration of non-managed research) for all research staff.*

*Such a strategy will build on the Institute's key comparative advantages:*

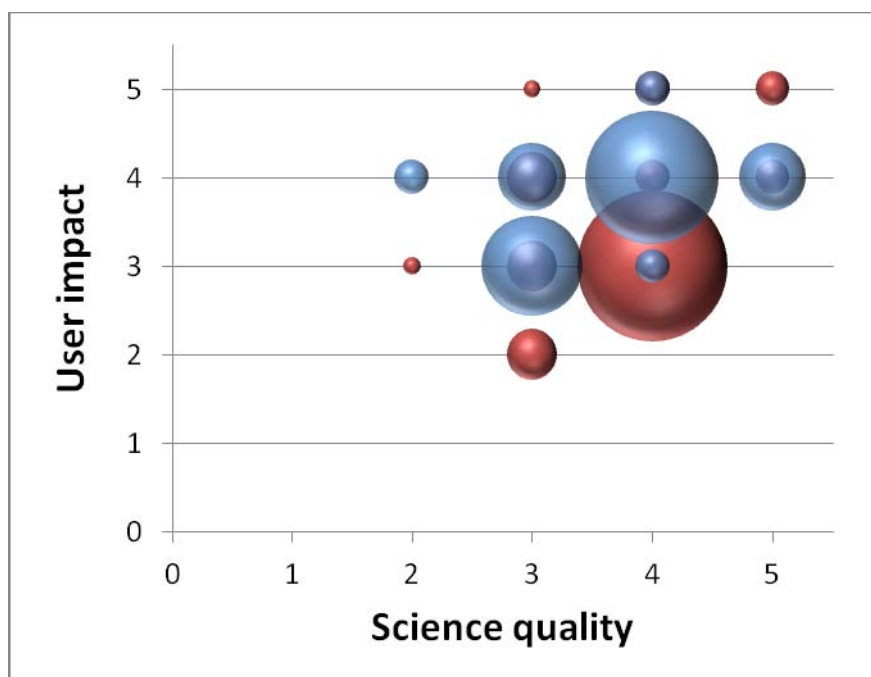
*A capacity for integrated field and laboratory work.*

*First class technical resources, such as the new ATOS facility, the research fleet, and historical and ongoing databases.*

*An ability to plan and commit to long-term research programs.*

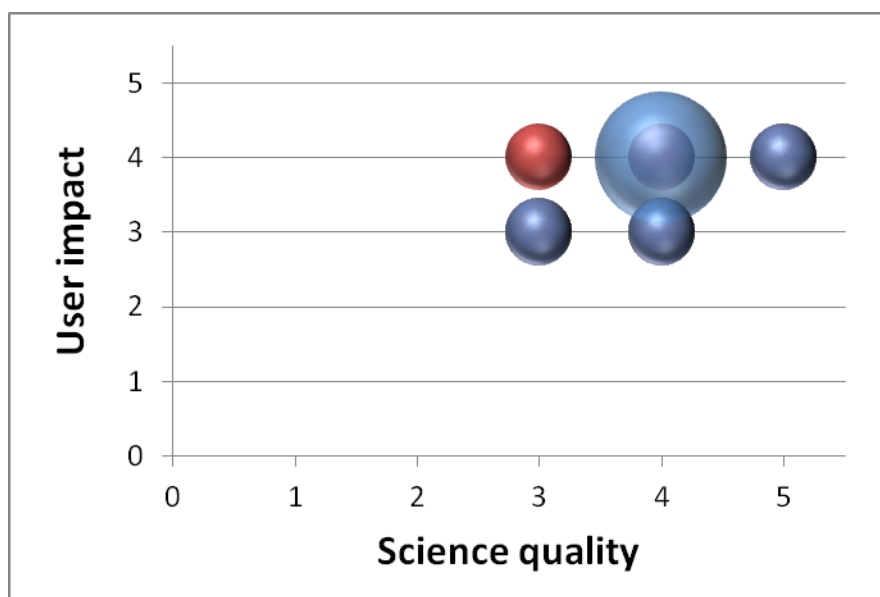
*We believe that such a strategy will help the Institute move up a level in the international arena as the world's most important research centre on tropical marine ecosystems.*

As part of the assessment, the Panel scored each team and Key Result Area on a scale of 1-5 for science quality and user impact (see Appendix 3 for score criteria). The same criteria were used in 2006-07 which allows historical comparison and shows overall improvement in the impact of AIMS research (Figure 1).



**Fig 1. Scores assigned to Key Result Areas for science quality and impact. Bubble size corresponds to the number of KRAs with that combination of scores. Red bubbles are scores from the 2006-07 reviews while blue bubbles indicate scores for the 2010 review.**

At the team level, scores ranged from three to five for science quality and either three or four for science impact (Figure 2). Compared with KRA, team scores were more stable between reviews but the failure of any team to achieve the maximum score for user impact is noted and sets a challenge for the next review.



**Fig 2. Scores assigned to Research Teams for science quality and impact. Bubble size corresponds to the number of Teams with that combination of scores. Red bubbles are scores from the 2006-07 reviews while blue bubbles indicate scores for the 2010 review.**

## AIMS response to Review recommendations

***Review recommendation 1: Develop Grand Challenge questions to lead in the provision of policy-relevant science for managing Anthropocene changes in the tropics (e.g. climate change, acidification, water quality, and issues yet to be recognised).***

**Institute response:** AIMS **SUPPORTS** the recommendation and points to three relevant examples in the 2011-15 Research Plan.

AIMS Strategic Directions are:

- Understanding tropical marine ecosystems and processes
- Forecasting the response of tropical marine systems to global changes
- Supporting the sustainable development of tropical, marine-based industries

In the new 2011-15 Research Plan, we have identified three grand challenges from the Great Barrier Reef, consistent with our Strategic Directions, which have time horizons of 5-10 years:

- To defend the biodiversity and resilience of coral reefs in the GBR Marine Park
- To create a decision support system for managing cumulative impacts
- To monitor ecosystem health at lower cost per observation

The first GBR Outlook Report recognised the potential threat of future climate change to coral reefs. It affirmed GBRMPA policy that the best way to prepare for this uncertain impact is to reserve as much as possible of the natural resilience of the Great Barrier Reef. Currently this means management arrangements to reduce human impacts upon coastal water quality and fish stocks. While fully supporting these actions, AIMS will research additional interventions to defend and/or restore coral cover across a range of spatial scales on the basis that a large and diverse reservoir of spawning corals is the key to resilience. This is likely to require direct action to reduce the impact of crown-of-thorns starfish on the GBR.

In 2012, AIMS will collaborate with others (Bureau of Meteorology, CSIRO, GBRF, GBRMPA, and the Queensland Government) on a four-year project to build a complex modelling suite (eReefs) that will link actions in terrestrial catchments with impacts on water quality and ecosystem health in the coastal receiving waters of north Queensland. AIMS historical large-scale and long-term data sets will provide essential calibration and validation of the model. The new national Sea Simulator will be used to measure unknown rates and interactions between key variables to improve the model. When operational, the model will assimilate real-time data streams from *in situ* monitoring systems to provide services similar to weather forecasting and a platform for modelling alternative management scenarios.

To accompany the development of a holistic modelling system supporting adaptive management of the Marine Park, AIMS will develop and deploy new technologies for smart environmental monitoring. Tools such as wireless sensor networks, autonomous samplers, and rapid genomic assessments will provide richer streams of environmental data to constrain the model and provide early warning of change. Part of the challenge will be to do this at lower cost per observation, making it feasible to extend this type of surveillance to other coastal regions as part of Australia's Integrated Marine Observing System (IMOS): see <http://www.imos.org.au>.

***Review recommendation 2: Develop a world-class capability in synthesis, modelling, analysis and prediction by hiring and enabling international leaders and forging meaningful partnerships with other international groups. This process should lead to the next big investment.***

**Institute response:** AIMS **SUPPORTS** the recommendation and notes recent progress.

The Review Panel observed that AIMS is the national custodian of rich and diverse data collected from 30 years of systematic research on tropical marine systems. The Panel came to the opinion that more value could be extracted from these data if the Institute made a greater investment in data mining and synthesis either by hiring appropriate expertise or by opening its data archives to others.

AIMS stands alone among Australian research agencies for the proportion of its resources devoted to monitoring spatial and temporal change in the environment. The flagship data set is the monitoring of the condition of the Great Barrier Reef through >25 years of systematic surveys covering a large portion of the Marine Park. This time-series is unique for any reef system in the World and a valuable resource for understanding disturbance, recovery and resilience of coral reefs across multiple scales. Results from the AIMS LTMP coral surveys have been adopted by GBRMPA as one of its KPIs and AIMS large-scale, long-term observations were used extensively in the first GBR Outlook Report, which will be continued as a five-year report to the Australian Government by the key managing agency.

In addition, AIMS has collected a unique time-series (almost two decades) from Scott Reef in the Indian Ocean, and has other valuable long-term data sets (water quality in the GBR Lagoon, variations in the East Australian Current). Historically, the Institute employed a small number of statisticians and modellers (spatial/process) to enable primary data collectors to analyse and report these time series. Over the last decade, the number of staff dedicated to "analysis and synthesis" has increased and reflects our recognition of the increasing value of these lengthening data sets.

AIMS has been attempting to implement this recommendation for at least five years. Our experience is the job market for skilled staff is very competitive. Many vacancies take a long time to fill and we have experienced a relatively high turnover as the best analysts are lured elsewhere. To date, we have had limited success in recruiting a critical mass of analysts but we are proud that our leading staff in this area are of world-class standard.

The Panel suggested that a perennial internal skills shortage in the quantitative sciences could be overcome by collaboration, which again follows a strategy that is already in place. AIMS policy on science data is that all results should be widely and freely available after a short period of quarantine (1-2 years) giving staff first right to publicise the Institute's work.

Our Annual Reports record a healthy output of scientific publications in the peer-reviewed literature of which more than half are co-authored with scientists from other institutions. This applies no less to the most valuable long-term data sets (e.g. LTMP surveys, coral core records), which have been supplied many times at no cost to other science groups.

In the last 12 months, AIMS has co-invested with the Queensland University of Technology in a research training scheme for early career researcher to enhance the quantitative skills base available to tropical marine science.

***Review recommendation 3: Grow and empower the Team Leader role so that they are more clearly engaged in and responsible for identifying and developing science initiatives (e.g. Grand Challenges) for the institution as a whole. This should encourage ambition and lead to bottom-up innovation from the best researchers***

**Institute response:** AIMS **SUPPORTS** the recommendation and believes that the current science management structure is based upon this model.

AIMS science is organised around Key Result Areas that are delivered by thematically based research teams in the core areas of tropical marine biodiversity, marine ecosystem health, marine climate change, and marine microbiology. Each of these teams is managed by a lead scientist who has achieved an international reputation in an appropriate discipline but has been chosen for a combination of skills from science vision to strong interpersonal skills and managerial competence. This small group of leading scientists is supported by a Research Directorate of two (Research Director, Research Manager) operating as a Research Management Team to set the scientific directions of AIMS, procure and allocate resources.

The Position Descriptions for Research Team Leaders describes a broad range of authority and responsibilities, especially around leadership. Team Leaders are rewarded as Principal or Senior Principal Research Scientists. By the end of 2012, the Research Directorate and all Team Leaders will be recent or re-confirmed appointments who have been selected based on their potential to implement this vision.

***Review recommendation 4: Provide leadership not only in Australia, but also for tropical marine ecosystems broadly – particularly in the Coral Triangle***

**Institute response:** AIMS **SUPPORTS** the recommendation noting that our scientific knowledge is transferable and relevant to countries in the Coral Triangle.

Over the last 40 years, AIMS has operated on a global stage because the majority of coral reef ecosystems are located in other countries. AIMS first became an international centre of excellence in coral reef science through comparative studies, especially with the Caribbean.

Over the last 25 years, AIMS has been shared its knowledge with Asia through actions like the multilateral Australia-ASEAN Project, which spawned the decadal COREMAP Project for Indonesia and established the protocols for the Global Coral Reef Monitoring Network.

The most recent expression of this regional engagement is the Arafura and Timor Seas Experts Forum (ATSEF) which supports the Arafura and Timor Seas Ecosystem Action (ATSEA) program that has so far involved two international joint cruises on Indonesian and AIMS research vessels. At the same time, we recognise that there are many more players in this space now and that our expertise in biophysical science needs to be complemented by other disciplinary knowledge (e.g. legal, socio-economic) more strongly represented in other organisations.

***Review recommendation 5: Use the Institute's field capability – a significant comparative advantage – to conduct large-scale, long-term field experiments to identify and evaluate interventions to address threats to marine ecosystem health***

**Institute response:** AIMS **SUPPORTS** the recommendation and points to adaptive management of the GBRMP through re-zoning as a leading example.

In 2004, the GBR Marine Park was rezoned comprehensively so that marine protected areas increased from <10% to >30% for all bioregions and habitat types. In 2006, after analysing the consequences for its existing program, AIMS diverted half the effort of its Long-term Monitoring Team from broad scale surveys of reef health (condition and trend) to a new sampling design (implemented in alternate years) to evaluate the impact of this experiment in adaptive management.

With three successive surveys (2006, 08, 10), AIMS LTMP demonstrated the effectiveness of the 'no take areas' upon rebuilding stocks of the major fish (Coral Trout) targeted by shallow water commercial fisheries. In years to come, the sampling design of 26 matched pairs of reefs in both states (fished/unfished) will provide strong evidence of the role of predatory fishes upon suppression (or not) of outbreaks of the Crown-of-thorns starfish that is now known to be the major agent of coral loss from the Great Barrier Reef.

***Review recommendation 6: Implement a science advisory panel to advise the CEO and Council about emerging questions and the quality of science effort, balance and relevance.***

**Institute response:** AIMS **DOES NOT SUPPORT** this recommendation because it believes that the recommended action (external input) is already in place at an appropriate and useful interval.

As evidenced by this review, the Institute solicits independent advice every 3-4 years from external experts to evaluate our performance at delivering on one Research Plan and inviting input to the next one. At this time, we are not convinced that continuous review and advice on a shorter cycle (e.g. annual) would deliver additional benefits that could justify the additional costs (time and money).

***Review recommendation 7: Make better use of opportunities to sell the Institute to policy makers and the public***

**Institute response:** AIMS **SUPPORTS** the recommendation but notes current effort.

The Institute acknowledges the importance of being visible to key stakeholders and being valued for relevance by funding agencies and end users of our research. AIMS invests substantial effort in building profile and engagement, including:

- CEO engagement with Ministers, Department Secretaries, industry leaders
- Membership on JV Boards, R&D subcommittees
- Provision of expert advice through submissions and working groups
- Participation and co-investment in tactical partnerships
- Science communications (website, publications, Newsletter, media)
- The creation of innovative tools (e-Atlas) for serving spatial data

Our strong focus on the quality and impact of our science outputs is tested by regular review including a review of the effectiveness of the AIMS Science Communications Group conducted in 2011 by Professor Durant of Questacon.

***Review recommendation 8: Maintain and expand the Institute's capacity in molecular approaches, microbiology, symbiosis and related disciplines including a crucially needed bioinformatics capability.***

**Institute response:** AIMS **SUPPORTS** this recommendation and notes recent actions.

At the last external review, AIMS determined to shift its focus in marine biotechnology to focus on marine symbioses and to become a centre of excellence for marine microbiology. The elements of previous teams were reassembled around these themes and followed by significant investments in capability and capacity, including:

- Creation of the Centre for Marine Microbiology and Genetics (with Smart State funding)
- New co-investment in marine viruses (Tier 1 Future Fellowship to AIMS scientist)
- New project in chemical ecology to locate molecules inducing coral metamorphosis
- Co-investment with JCU in a postdoctoral Fellow with strong bioinformatics skills



***Review recommendation 9: Continue to grow the number of doctoral students and postdoctoral fellows (e.g. invest money in student top-ups for salary, training and travel) drawing on a more diverse array of partners (not just JCU).***

**Institute response:** AIMS **SUPPORTS** the recommendation but notes recent actions and the limits to growth that are possible through co-investment.

AIMS relationship with JCU is valued highly. The University has long been a source of quality students who have received the majority of their research training at AIMS and this was formalised some years ago through the AIMS@JCU Program. During the last quadrennium, Research Collaboration agreements have been concluded with four other entities: AIMS-ARC CoE for Reef Studies in Townsville; AIMS-CSIRO-UWA in Perth; AIMS-ANU-CDU-NTG in Darwin; AIMS-QUT in Brisbane. All of these schemes provide support for early career researchers and the Institute's co-investment in early career researchers has been reflected in annual increases in scientific productivity (see latest Annual Report for 5-year trend).

Despite the acknowledged benefit, AIMS has reached the point (20-25 Fellows) where no further expansion of similar scale is possible within current budget parameters.

***Review recommendation 10: Use the next two years to plan efforts in experimental ecology that take immediate advantage of the Sea Simulator upon completion in ways that build the Institute's science and collaborations.***

**Institute response:** AIMS **SUPPORTS** the recommendation and notes recent progress.

The \$35 million build of a national Sea Simulator in Townsville, funded by the Australian Government, will provide flagship infrastructure for experimental marine science in the tropics. The development phase to prepare for such a large investment has taken 18 months to get to the commissioning phase and began with foresighting of likely demand (i.e. detailed experimental designs for experiments on multiple and interactive stressors). The foresighting exercise involved multiple workshops of invited experts (Australian and international) to plan the science experiments, visits to international facilities to import the best ideas on technology, and the creation of a pilot-scale facility at Cape Ferguson to determine the most cost-effective and feasible technology solutions.

As one example, the National Sea Simulator will be used to provide future researchers with coral spawning "on demand", which will release them from a natural bottleneck in supply and accelerate scientific learning about key processes like the colonisation of reef surfaces by coral larvae and the establishment of the symbiosis between coral host and zooxanthellae that underpins reef construction. We'll invest in this science and technology with an expectation that it will attract other researchers to the Institute.

***Review recommendation 11: Continue to focus aquaculture and natural products activities in ways that exploit the Institute's science excellence and scale (e.g. enhance synergies between microbiology and aquaculture diseases).***

**Institute response:** AIMS **SUPPORTS** the recommendation with a qualification.

With the commissioning of the national Sea Simulator, internal expertise in aquaculture and husbandry systems is likely to be redeployed to the domestication of reef corals (see above). In a similar way, the expertise in natural products (biologically-active molecules) is likely to be harnessed for improved understanding of chemical ecology especially in biofilms and microbial communities in ways that support this new direction.

***Review recommendation 12: Build interactions and collaborations via Institute-sponsored NCEAS-style think tanks***

**Institute response:** AIMS **SUPPORTS** the recommendation and notes recent progress.

In 2010, AIMS sponsored two international workshops designed to capture "state of the art" knowledge on a topical science question in order to plan and propose new research agendas. The first of these was on the impact of ocean acidification upon calcification in marine systems; a topic that has since become a focus for the AIMS climate change team in the next quadrennium. The second was on the development of new cost-effective methods for monitoring reef health through the application of advanced technology to monitor biological diversity. In 2012, we have invited international experts to a workshop to consider the feasibility (and desirability) of direct action against crown-of-thorns starfish as an adaptation to defend coral cover on the GBR. All workshops are expected to produce peer-reviewed outputs in the style of NCEAS.

***Review recommendation 13: Explore additional mechanisms for interaction with a broader group of universities (e.g. expand science visitor program) based around world-class facilities and field capabilities to fill gaps and highlight emerging opportunities.***

**Institute response:** AIMS **SUPPORTS** the recommendation and notes recent progress.

The creation of the national Sea Simulator in Townsville is expected to attract international visitors to AIMS by providing unique access to the early life history stages of corals.

While AIMS currently offers subsidised opportunities for collaborative research at the Institute and will continue to do so, the Sea Simulator is expected to increase the number of self-funded visits.

***Review recommendation 14: Continue Data Centre efforts to streamline forms and reporting (much work still needed)***

**Institute response:** AIMS **SUPPORTS** the recommendation but notes that the Data Centre is merely the vehicle to administrative efficiencies.

In the last 5-10 years, the Institute has invested significant resources into IT systems including the AIMS website and AIMS Data Centre. The latter has performed a dual role: to make science data discoverable and to improve internal systems for storing and retrieving the large amount of administrative data (Finance, payroll, HR, records. etc). The vast majority of paper based systems (Performance assessments, job queues, approvals, etc) have been converted to web-based tools with automatic routing. Recently, we have purchased software for an integrated solution to OHSE incident reporting and response. Currently, we are implementing a significant systems enhancement project that includes electronic document records management. When these tools are embedded, we expect additional efficiencies to accrue.

***Review recommendation 15: Develop a more effective strategy for the recruitment of emerging world leaders in tropical marine science.***

**Institute response:** AIMS **DOES NOT SUPPORT** the recommendation because it is unclear that current recruitment procedures can be made more effective.

The Institute accepts that its staff should be of high quality and that all of its science staff, especially those in leadership positions, should be of international calibre. Since turnover among the tenured scientific staff is low, the ability of the recruitment process to generate quality candidates is paramount. The majority of Research Scientists are recruited from international pools, which are accessed through multiple strategies including standard advertisements in high profile journals, electronic bulletin boards, and peer networks. Recent searches have yielded some outstanding staff although it is acknowledged above that there are skills shortages in the quantitative disciplines and such positions can take considerable time to refill.

If the intent of this recommendation is more towards attracting and nurturing early career researchers to become the next generation of science leaders, the Institute is proud of the quality of applicants for its postdoctoral program and the quality of the learning opportunities made available to them. If this recommendation is mainly about training the next generation of leaders from developing nations in the tropics, the Institute believes that its partnership in ATSEF/ATSEA and the Coral Triangle Initiative will provide renewed opportunities to engage our regional neighbours which have diminished since the completion of the ASEAN-Australia program and several large projects funded by ACIAR.

***Review recommendation 16: Reduce the load of routine administrative tasks on Team Leaders (to no more than 25% of time), e.g. by assigning dedicated time of specific personal assistants and streamlining reporting requirements.***

**Institute response:** AIMS **DOES NOT SUPPORT** the recommendation based on a job needs analysis.

The Research Directorate has assessed the current levels of support provided to Research Team Leaders and considers that it is manageable without appointing additional staff. Team Leaders are supported by the Directorate and other Support Service Groups with travel bookings, meeting logistics, finances, recruitment and visa applications, purchasing, freight, permits and document preparation including proposals and client reports. Most of the administrative tasks are transacted through electronic systems, which are continually reviewed and improved where possible. Matters such as career guidance, performance management, resource planning and corporate reporting cannot be delegated.

Each RTL is expected to provide science leadership and competent management of a large team (minimum 20FTE). The dual roles create a complex and demanding job but these are senior and responsible appointments rewarded with matching remuneration. The proportion of time spent on administration varies among individuals but with the benchmark set at somewhere between 25-50%.

***Review recommendation 17: Empower the Team Leaders, prioritise roles and consider incentives to ensure that substantial time is dedicated to science leadership (identification, development and promotion of good ideas) and synthesis of results across the Institute in preference to administrative details. This opportunity to help shape the future of the Institute may assist in the recruitment of leaders (earlier point).***

**Institute response:** AIMS **SUPPORTS** the recommendation on the basis that science leadership and empowered decision making is expected from its Research Team Leaders.

Research Team Leaders meet monthly as the AIMS Research Management Team with support from the Research Directorate. This is a key forum for information exchange and decision. The RMT allocates appropriation resources (capital, variable, visitors, ships, space) annually and monitors performance (external earnings, contract milestones, etc) on a monthly basis. Between meetings, RTL operate with a high degree of autonomy and without need to refer most decisions upwards including all financial matters that are within budget.

As a small agency, the AIMS Senior Management Group (CEO, GM, CFO, Research Director, and Research Manager) approves enduring appointments and external contracts but these are among the few powers not delegated to Team Leaders.

***Review recommendation 18: Provide scientific flexibility and incentives by adopting Google model (20% of time for exploration of non-managed research) for all research staff. Although requiring initial investment, we anticipate that this will pay for itself in the medium (and long) term by making the Institute more attractive to the best researchers, and more likely to identify emerging and tractable key research areas ahead of the competition.***

**Institute response:** AIMS **DOES NOT SUPPORT** this recommendation because of its funding model.

AIMS is a publicly-funded research agency that receives core funding from the Australian Government to deliver strategic basic research in the tropical marine sciences. By accepting external contracts, the Institute ensures that its research is relevant to end-users and effectively doubles its science portfolio by requiring matching co-investment from those who employ its services (noting that we are prohibited by legislation from competing with the private sector for income from consulting).

The proportion of time spent on contracted research varies among teams and individuals, which is inevitable in an organisation that has to balance the breadth and depth of its capability and capacity with a changing external environment. AIMS staff time is allocated by contract and centrally managed to avoid personal over-commitment and maintain a balance across the science portfolio. Each annual planning cycle involves the competitive allocation of a modest cash pool to the best proposals generated by the Research Teams for underpinning science. The allocation of these resources to fundamental knowledge generation quarantines time by successful applicants, which is considered when new external requests are tendered. The Institute makes no demand on early career researchers other than research quality and general alignment with the AIMS Research Plan. In short, one size (as recommended) does not fit all situations and could be deleterious to an organisation that survives through co-invested science.

***Review recommendation 19: Assign enduring and important core service activities (e.g. GBROOS) to science support rather than science teams (to avoid forcing these activities into science evaluation mode), with regular Team Leader input to science support activities to maintain linkages.***

**Institute response:** AIMS **SUPPORTS** the recommendation on the basis that a useful distinction can be drawn between generating high-quality data streams (e.g. oceanography and earth observations) for others and generating new scientific knowledge from same.

In the 2011-15 AIMS Research Plan, major research infrastructure such as permanent oceanographic mooring arrays and satellite receivers will be managed by the Research Manager rather than by a Research Team Leader. The latter will remain responsible for translating these outputs into new knowledge.

***Review recommendation 20: Ensure that Framework Surveys, such as the Scott Reef surveys, are clearly profitable to the Institute and do not result in its scientists spending their time in creating low-value data.***

**Institute response:** AIMS **SUPPORTS** the recommendation but does not accept that its work at Scott Reef has generated low-value data.

The condition and trend surveys of the Great Barrier Reef over almost three decades by the AIMS Long-Term Monitoring Project are foundational data in the GBR Outlook Report series; now to be produced every five years and tabled in the Australian Parliament.

Scott Reef in the Indian Ocean has been monitored by AIMS for almost 20 years; a period that encompassed the mass bleaching event in 1998 and subsequent recovery of biodiversity. AIMS research across the surrounding bioregion has shown that the deep coral communities in the South Scott Lagoon are a significant proportion of this biotope that is vulnerable to another deep thermocline event.

Scott Reef is also significant as a large coral reef complex located above a significant hydrocarbon reservoir. At the time of the Review, AIMS was nearing the conclusion of an intensive three year study of this reef system commissioned by the development consortium. This study produced new knowledge about the local physical and biological oceanography, genetic connectivity, and physiology of the deep benthic primary producers. The only part of this study that could be possibly categorised as routine was the three additional years of surveying fish and coral communities on the shallow water reef slopes. While these data are not novel, the value of long-term monitoring is revealed by changes (whether chronic or acute decline) and the Scott Reef time series is still measuring the recovery of this ecosystem from a major disturbance (mass coral bleaching) that happened 13 years ago. Such data, while hard won, are essential to proper risk assessments.

***Review recommendation 21: Minimise high frequency and duplicative reporting and seek single reporting for multiple outcomes and make sure that authors of reports get substantive feedback. In order to identify reporting for elimination, solicit input from all staff scientists about what reporting requirement seem least valuable and most onerous.***

**Institute response:** AIMS **SUPPORTS** the recommendation **PARTIALLY** on the basis that a healthy flow of information is essential but counters that the current system is explicitly designed to avoid duplicative reporting.

The Research Directorate is required to inform the AIMS Management Group (monthly) and the AIMS Council (quarterly) on the Institute's progress and performance. All science staff have direct access to a web-based Science Diary where they record events, outputs and problems as they occur. Every month, the Research Directorate sweeps the Diary for new information and produces a draft report that only requires minor editing by the RTL. Every three months, the Diary is swept for information in a similar way that is synthesised for Council by the Research Director. Consequently, information is provided once by the scientists and reused for multiple reports that are then made available to all (feedback).

***Review recommendation 22: Ensure that expensive data sets become valuable data sets by providing time and expertise for synthesis and analysis.***

**Institute response:** AIMS **SUPPORTS** the recommendation and notes recent progress.

See responses to Recommendations 2 & 18.

## **Appendix 1. Terms of Reference for the 2010 Review Panel**

1. Review the quality and impact of outcomes from the 12 Key Result Areas (KRAs)
2. Review the effectiveness of the five Research Teams in terms of:
  - 2.1. Portfolio balance (e.g. strategic vs. demand-driven)
  - 2.2. Capture and utilisation of resources
  - 2.3. Project management
  - 2.4. Stakeholder engagement & knowledge transfer
  - 2.5. Collaborations
3. Review the performance of AIMS PhD scientists with focus on:
  - 3.1. Publications
  - 3.2. Impact of top three outputs during the review period
  - 3.3. Research training
  - 3.4. Collaborations and networks
4. Comment on the alignment of AIMS science with
  - 4.1. International benchmarks
  - 4.2. National Research Priorities
  - 4.3. AIMS Strategic Directions
5. Identify under-performing investments (if any) in the AIMS science program
6. Comment on the performance of AIMS in exploiting its access to technology resources
7. Comment on Team strategy for the next Research Plan (2011-15) and suggest new directions (as appropriate)



## **Appendix 2. Documentary evidence supplied to the 2010 Review Panel**

### **From the Research Directorate**

A written portfolio covering aspects of AIMS Science Program (2007-11) including:

1. Organisational structure
2. Financial overview
3. FTE and skills areas
4. Publication metrics
5. Collaborations and stakeholder engagement
6. Project management and milestone performance.

### **From the Research Team Leaders**

A written portfolio covering aspects of Team operations (2007-11) including:

1. Research directions
2. Resource investments
3. Collaborators and stakeholders
4. Research training
5. Outputs and outcomes
6. Knowledge transfer
7. Future plans

### **From the Researchers**

Curriculum vitae and track records from:

1. Research scientists;
2. Research-active Experimental Scientists (above Level 5)
3. Postdoctoral Fellows (voluntary)

### Appendix 3. Description of rankings used to score teams, key result areas and individuals based upon science quality and user impact

#### Science Quality

Score	Explanation	
5	Benchmark	Sustained scientific leader – well recognised in the international research community for this.
4	Strong	Able to set and sustain new scientific/technical directions within the international research community.
3	Favourable	Able to maintain a good position in the international research community “pack”; not a scientific leader except in developing niches (not mainstream areas).
2	Tenable	Not able to set or sustain independent scientific/technical directions – a sense of being continually a follower.
1	Poor	Inferior quality of scientific/technical output compared with other research groups.

#### User Impact

Score	Explanation	
5	Benchmark	Research results are used as the foundation of a scientifically-based commercial, management, planning, community or policy framework and acknowledged through active researcher-stakeholder interactions
4	Strong	Research results are incorporated into activities and strategies of organisations and used in decision making or optimisation of plans and activities generally facilitated by researcher-stakeholder interaction
3	Favourable	Research results are relevant to and used by organisations facilitated by researcher-stakeholder interaction
2	Tenable	Research results are able to be used by organisations involved in management, policy, planning or commercial initiatives to maintain, and improve their activities. The results are not used but could be adopted with some researcher-stakeholder interaction.
1	Weak	Research results are not in a form relevant to, or able to be used by organisations involved in management, policy, planning or commercial initiatives.