# Research Priorities for the Management of the Great Barrier Reef Marine Park and the World Heritage Area 2001

Great Barrier Reef Marine Park Authority

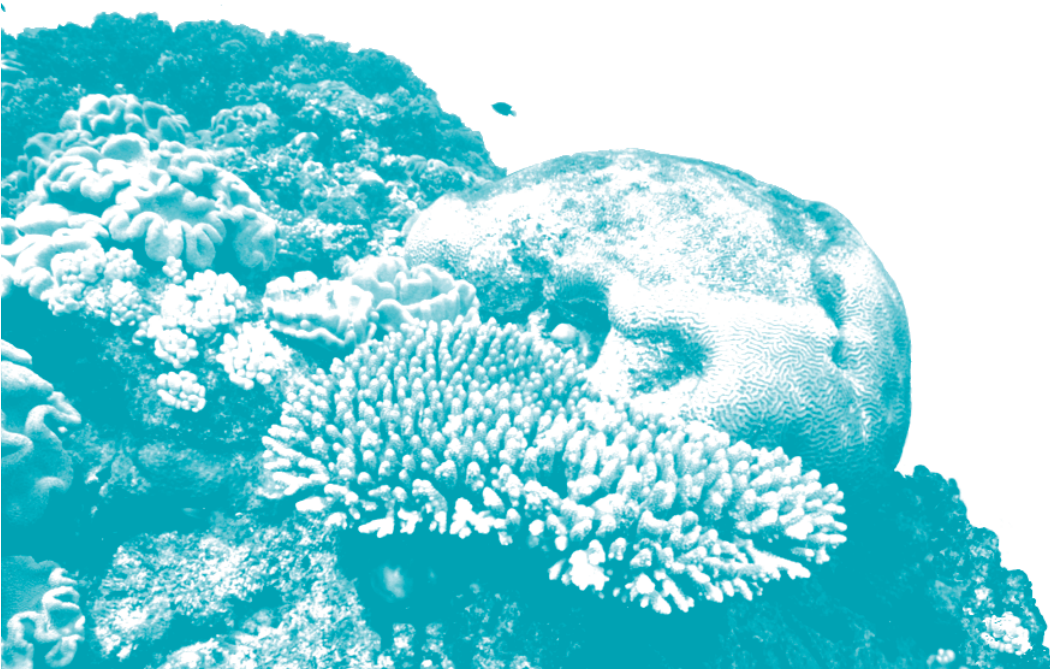*let's keep it great*

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# Research Priorities for the Management of the Great Barrier Reef Marine Park and the World Heritage Area 2001

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Great Barrier Reef Marine Park Authority

**GREAT BARRIER REEF**
MARINE PARK AUTHORITY

**FOREWORD**

Australia is fortunate in having one of the natural wonders of the world along its eastern seaboard – the Great Barrier Reef. The value and importance of this area is demonstrated by the fact that it is not only a Marine Park but also a World Heritage Area. As the principal adviser to the Commonwealth Government on the care and development of the Marine Park, the Great Barrier Reef Marine Park Authority is responsible for managing this, the world's largest coral reef ecosystem, on behalf of the people of Australia and the world.

This is a challenging and often difficult task, given the wide range of uses and values associated with this special place. Management of a natural resource ranked among the most valuable in the world demands that management decisions are based upon the best scientific information available. But how are we, a management agency, to ensure that we receive this information?

This document represents a major contribution to ensuring that we receive the information we require by providing a comprehensive list of our research priorities for the management of the Marine Park and World Heritage Area. The document also describes how we plan to use this information to take a proactive approach to setting the research agenda to address our management needs.

The next step will be to continue to work closely with our research providers so together we can provide the best possible scientific basis for the management of the Marine Park and World Heritage Area.

Hon. Virginia Chadwick
Chair
Great Barrier Reef Marine Park Authority

January 2002

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## ACKNOWLEDGMENTS

GBRMPA wishes to acknowledge the large number of staff who contributed to the production of this report from the following groups:

- Executive
- Conservation, Biodiversity and World Heritage
- Fisheries Issues
- Tourism and Recreation
- Water Quality and Coastal Development
- Day to Day Management
- Program Delivery
- Communication and Education, and
- Information Support.

The Authority also wishes to thank the external research providers who assisted us with this process. They included scientists from the Co-operative Research Centre for the Great Barrier Reef World Heritage Area, Australian Institute of Marine Science, Commonwealth Scientific and Industrial Research Organisation, Queensland Department of Primary Industries, Australian Maritime College, and the Tourism and Recreation Reef Advisory Committee.

The process of identifying GBRMPA's research priorities was facilitated by a consultant, Econnect 2000, which was funded by the Co-operative Research Centre for the Great Barrier Reef World Heritage Area.

**THE GREAT BARRIER REEF AND ITS MANAGEMENT**

The Great Barrier Reef (GBR) is the world's largest coral reef ecosystem, comprising a huge complex of approximately 2900 reefs, 900 islands and other ecosystems (including estuaries, seagrass beds, and soft bottom communities). The GBR supports a high degree of biological diversity due to the variety of ecosystems present and the huge size of the area (>343 500km2). Due to its national and international importance, the Great Barrier Reef is also the world's largest Marine Park and World Heritage Area.

The Great Barrier Reef Marine Park Authority (GBRMPA) is the principle adviser to the Commonwealth Government on the care and development of the Marine Park and on World Heritage issues. GBRMPA's goal is to: *Provide for the protection, wise use, understanding and enjoyment of the Great Barrier Reef in perpetuity through the care and development of the Great Barrier Reef Marine Park.*

GBRMPA has identified several issues as critical to the successful management of this important area. They are:
- Maintaining the conservation, biodiversity and World Heritage Values of the site;
- Ensuring that major industries are ecologically sustainable (particularly fishing and tourism); and
- Reducing land based impacts on water quality.

In order to address these critical issues more effectively, GBRMPA is structured around four groups that provide a strategic, policy-based approach to these issues. They are:
- Conservation, Biodiversity and World Heritage
- Fisheries Issues
- Tourism and Recreation
- Water Quality and Coastal Development.

Policies are implemented through the Program Delivery Group (planning, environmental impact management and indigenous liaison), and compliance and enforcement programs are implemented through a Day to Day Management Unit jointly funded by GBRMPA and the Queensland State Government. Other groups provide support services for these initiatives including the Research and Monitoring Co-ordination Unit, which is responsible for the overall co-ordination of the Authority's research and monitoring needs. The Communication and Education Group develops and delivers community and stakeholder education programs (including the aquarium, Reef HQ) as well as managing the Authority's public communication programs.

## SCIENCE AND MANAGEMENT

Science plays and important role in the management of the Marine Park and World Heritage Area, since GBRMPA is committed to ensuring that management decisions are based on the best scientific information available.

The Marine Park Authority, as a matter of policy, has chosen to obtain this information primarily from external research agencies, consultants and institutions, and has restricted its role to management, co-ordination and identification of specific research and information needs. Therefore, it is essential that managers maintain strong links with scientists, and provide a clear indication of our information needs for management.

In 1999/2000, GBRMPA undertook a detailed process aimed at clearly identifying and prioritising our information needs. This document provides the first comprehensive report on the strategic research priorities of the Authority across all of its critical issue and major support groups.

This is of great benefit to GBRMPA, because it provides us with a strategic framework to make informed decisions regarding the research projects we wish to support (both financially and in principle). This information can then be used to actively co-ordinate high priority research tasks, and to assess proposals submitted to us for our support.

It also represents a new direction in management driven research where the Authority has for the first time taken the initiative of proactively informing researchers of our information requirements. This is beneficial to scientists who wish to provide a scientific basis for management of the Great Barrier Reef or are looking for GBRMPA's support for their research, because it will assist them in developing research proposals that specifically address our needs. For example, this information has already played an important role in finalising the research program for the CRC for the Great Barrier Reef World Heritage Area (CRC Reef Research Centre). This information will also inform other granting agencies of the key areas of interest for this internationally valuable resource.

### Setting the research agenda for management

The identification of research priorities for such a large and complex area is not a trivial task and has not previously been attempted by the Authority in such a comprehensive manner. To assist us in this process we invited representatives from other government agencies and scientists who have extensive knowledge of the Great Barrier Reef, its management issues, and relevant scientific fields. Substantial support was provided by the CRC Reef Research Centre.

Research priorities were determined through an interactive series of workshops aimed at determining our high priority management issues, and the information needs required to address those issues. We then took this one step further by identifying specific research tasks that would address those needs. When the list of high priority research tasks was complete, the highest priority tasks were identified.

During this process, we focused on identifying research tasks for critical issues management of the Marine Park and World Heritage Area. This involved focusing on the needs of the Authority's four critical issue groups:

- Conservation, Biodiversity and World Heritage
- Fisheries Issues
- Tourism and Recreation
- Water Quality and Coastal Development

and four support groups:

- Day to Day Management
- Program Delivery
- Research and Monitoring Co-ordination
- Communication and Education

**COMPREHENSIVE LIST OF RESEARCH PRIORITIES**


In excess of 300 research tasks were identified as a high priority for the management of the Great Barrier Reef Marine Park and World Heritage Area. Tasks are listed by the Authority group that nominated them. **Tasks are not listed in order of priority, but those identified as of particular importance to each group (Director's choice), or parts thereof, are shown in bold.**

An electronic version of this list is also available on the GBRMPA's website (www.gbrmpa.gov.au) which enables an interactive key word search to be performed on the research priorities.

**Conservation, Biodiversity and World Heritage**
**C01    To gather basic information on the status of Dugongs especially:**
(a) Anatomy and physiology (eg physiological and auditory acuity in species adversely affected by vessels and aircraft);
**(b) Distribution and abundance (including long term monitoring);**
(c) Migratory/behavioural patterns;
(d) Life history parameters; and
(e) Historic information on population fluctuations.

C02    To gather basic information on the status of Turtles especially:
(a) Anatomy and physiology (eg physiological and auditory acuity in species adversely affected by vessels and aircraft);
(b) Distribution and abundance (including long term monitoring);
(c) Migratory/behavioural patterns; and
(d) Life history parameters.

C03    To gather basic information on the status of whales and inshore Dolphins especially:
(a) Distribution and abundance (including long term monitoring);
(b) Genetic structure of populations;
(c) Migratory/behavioural patterns; and
(d) Historic information on population fluctuations.

C04    To gather basic information on the status of Seabirds especially:
(a) Distribution and abundance (including long term monitoring);
(b) Genetic structure of populations;
(c) Migratory/behavioural patterns; and
(d) Historic information on population fluctuations.

C05    To identify at risk species and/or populations not currently identified.

**C06** **To assess and monitor potential, direct, indirect and cumulative impacts on Dugongs of impacts such as:**
(a) Pollutants/bioaccumulation in water;
**(b) Disease (especially cause of death);**
(c) Coastal development/habitat degradation;
(d) Indigenous hunting;
(e) Vessel/aircraft traffic (eg. boats, planes, helicopters, jet skis and ski races);
(f) Underwater explosions;
(g) Tourism and recreational activities;
(h) Incidental catch in fisheries; and
(i) Noise.

**C07** To assess and monitor potential, direct, indirect and cumulative impacts on Turtles of impacts such as:
(a) Pollutants/bioaccumulation in water;
(b) Disease;
(c) Coastal development;
(d) Indigenous hunting;
(e) Vessel/aircraft traffic (eg. boats, planes, helicopters, jet skis and ski races);
(f) Underwater explosions;
(g) Tourism and recreational activities;
(h) Incidental catch in fisheries; and
(i) Noise.

**C08** To assess and monitor potential, direct, indirect and cumulative impacts on Whales of impacts such as:
(a) Vessel/aircraft traffic (eg. boats, planes, helicopters, jet skis and ski races);
**(b)** Underwater explosions;
(c) Tourism and recreational activities ;
(d) Incidental catch in fisheries; and
(e) Noise.

**C09** **To assess and monitor potential, direct, indirect and cumulative impacts on Dolphins (especially in-shore) of impacts such as:**
(a) Pollutants/bioaccumulation in water;
(b) Disease;
(c) Coastal development;
**(d) Vessel/aircraft traffic (eg. boats, planes, helicopters, jet skis and ski races);**
(e) Underwater explosions;
(f) Tourism and recreational activities;
**(g) Incidental catch in fisheries; and**
**(h) Noise.**

C10    To assess and monitor potential, direct, indirect and cumulative impacts on Seabirds of impacts such as:
(a) Pollutants/bioaccumulation in water;
(b) Disease;
(c) Coastal development (including Island);
(d) Indigenous hunting (egg collecting);
(e) Vessel/aircraft traffic (eg. boats, planes, helicopters, jet skis and ski races);
(f) Tourism and recreational activities;
(g) Incidental catch in fisheries; and
(h) Noise.

C11    To gather information and understanding on all aspects (ecological, social, economic) of the effects of natural perturbations:
(a) Cyclones;
(b) Crown of thorns starfish;
(c) Bleaching and climate change; and
(d) Floods.

**C12    To develop and implement performance indicators for assessing the effectiveness of management actions for conservation of:**
(a) **Dugong;**
(b) Turtle;
(c) Whales;
(d) Inshore dolphins; and
(e) Seabirds.

C13    To assess the impacts of conservation strategies (eg. dugong protection areas, representative areas program) on the:
(a) Economic;
(b) Social; and
(c) Cultural
values of the World Heritage Areas.

**C14    To develop an information meta-database for locating, retrieving and collating data sets (including information on legislation, environmental research projects and existing data), with data hubs in relevant locations.**

C15    To gather information that enables:
(a) Better understanding of public perceptions of issues and threats;
(b) Better understanding of public concerns, motivations, personal habits and lifestyles;
(c) Development of approaches and materials for improving public attitudes and behaviour in protecting the World Heritage Area; and
(d) Ongoing evaluation of communication and consultation processes.

C16    To gather information (base-line data) on:
(a) Social and cultural values; and

(b)Patterns of human use.

C17 To develop new techniques for management (eg test for stress in species, community or ecosystem using photosynthetic efficiency; remote sensing; early warning systems) and technology to reduce impacts from current activities.

C18 To develop standard protocols for the establishment of limits for acceptable change.

**C19** **To examine the issues relating to indigenous hunting/fishing with regards its:**
**(a)Extent and economics; and**
**(b)Social context and cultural values.**

**C20** **Long term monitoring of major community types in the Great Barrier Reef World Heritage Area (eg. seagrass, soft bottom, benthic, reefs).**

**C21** **To assess economic and social impacts of implementation options for representative area management:**
**(a)Economic; and**
**(b)Social.**

C22 To evaluate the accuracy of the current bioregionalisation.

C24 To gather information on the secondary ecological and social effects of management decisions (eg. displacement of species, displacement of human use, etc).

**C25** **To assess the effectiveness of the representative area network (against principles of comprehensiveness, adequacy and representativeness).**

**C26** **To determine the best location for transit lanes to protect key habitat areas (eg. Dugong Protection Areas) for dugongs, dolphins and turtles.**

C27 To examine current methods and processes for managing cultural heritage in the Marine Park in accordance with GBRMPA responsibilities under the GBRMP Act.

**Fisheries Issues**

F01    To gain a better understanding of trawling's spatial and temporal distribution, its environmental impacts on specific habitats and recovery dynamics of trawled habitats by:
(a) Otter trawling;
(b) Beam trawling;
(c) Midwater trawling;
(d) Deepwater trawling for prawns; and
(e) Deepwater trawling for fish.

F02    To develop alternative trawl and post harvest methods to reduce impacts of prawn harvesting on:
(a) Physical environment; and
(b) Bycatch.

F03    To determine ecologically sustainable levels of trawling in specific habitats.

F04    To gather information on the status of species affected directly and indirectly by trawling from both fishery and fishery-independent information sources:
Target Species
(a) Otter trawling;
(b) Beam trawling;
(c) Mid-water trawling;
(d) Deep-water trawling for prawns; and
(e) Deep-water trawling for fish;
Non Target Species
(f) Otter trawling;
(g) Beam trawling;
(h) Mid-water trawling;
(i) Deep-water trawling for prawns; and
(j) Deep-water trawling for fish.

F05    Gather information on impacts of line fishing on target and non target fish species and reef communities, and identification of vulnerable species:
Fishery dependent data
(a) Target species;
(b) Non target species;
Fishery independent data
(c) Target species;
(d) Non target species; and
(e) Reef communities.

**F06**    **To gather better information on the spatial and temporal distribution of catch and effort data, and the relationship of this data to markets, development of fisheries and status of fish stocks for:**
**(a)Commercial line fishing; and**
(b)Recreational line fishing.

F07    To develop mesh netting practices that minimise incidental bycatch (including evaluation of alternative harvest methods) of
(a)Fish; and
(b)Megafauna.

**F08**    **To obtain information on the status of target and non-target species affected by netting from both fishery and fishery-independent sources for:**
**(a)Saleable fish species;**
**(b)Non-saleable fish species; and**
**(c)Megafauna.**

**F09**    **To obtain information on the status (distribution and abundance; localised depletion) of the target species of harvest fisheries from:**
<u>Fishery Dependent Sources for</u>
**(a)Sea cucumber (especially black and white teat fish);**
**(b)Trochus;**
**(c)Marine aquarium fish;**
(d)Coral;
**(e)Tropical rock lobster (commercial species);**
(f) Specimen shells;
<u>Fishery Independent Sources for</u>
**(g)Sea cucumber (especially black and white teat fish);**
**(h)Trochus;**
**(i) Marine aquarium fish;**
(j) Coral;
**(k)Tropical rock lobster (commercial species); and**
(l) Specimen shells.

**F10**    **To obtain information on the population biology (growth, reproduction, recruitment) of harvest fishery target species for:**
**(a)Sea cucumber (especially black and white teat fish);**
**(b)Trochus;**
**(c)Marine aquarium fish;**
(d)Coral;
**(e)Tropical rock lobster; and**
(f) Specimen shells.

**F11**      **To obtain information on the status (distribution and abundance; localised depletion) of target crab fishery species:**
**Fishery Dependent Sources**
**(a)Mudcrab;**
(b)**Sandcrab;**
(c) Spanner crab;
**Fishery Independent Sources**
**(d)Mudcrab;**
**(e)Sandcrab;** and
(f) Spanner crab.

**F13**      **Obtain information on population biology (growth, reproduction, recruitment) of target crab fishery species:**
**(a)Mudcrab;**
**(b)Sandcrab;** and
(c)Spanner.

**F14**      **To develop clear, specific quantifiable objectives for conservation management of fisheries that are supported by ecological sustainability indicators and can be cost-effectively measured by performance indicators.**

**F15**      **To develop new and improved surveillance technologies for enforcement that are of benefit to both fishers and management (commercial fisheries).**

**F16**      **To develop new and improved commercial fishery monitoring technologies, including improved quality and utility of logbook records and Vessel Monitoring System data.**

F17      To gather information on indigenous fisheries (including Native Title) and their interaction with other fisheries.

F18      To determine the impacts of aquaculture and other forms of translocation and fish stocking on natural fish stocks and their ecosystems (including disease).

**F19**      **To evaluate marine protected areas as a management strategy to contribute to ecological sustainability of:**
**(a)Linefishing;**
**(b)Trawling;**
**(c)Net fishing; and**
**(d)Harvest fishing.**

**F20**      **To determine historical and future changes in effective fishing effort.**

**F21**      **To map fisheries habitat in the World Heritage Area.**

F22      To gain a better understanding of the impact on fish stocks of displacement of effort from one fishery or fishing area to others.

F23 To identify species that are likely to be targeted by new or developing fisheries through market research.

**F24 To gain a better understanding of the social and economic impacts of alternative management strategies.**

**F25 To gain a better understanding of the natural, spatial and temporal dynamics of fish stocks and populations to reduce uncertainties in stock assessment of key fish stocks.**

**F26 To gain an understanding of population biology and ecology of stocks impacted by fishing (highly variable depending on the adequacy of existing knowledge on the species and its management significance).**

**F27 To evaluate current communication and consultation activities.**

F28 To gain an understanding of the limitations of current legislation and legislative options with regard to the conservation of fisheries in the Marine Park.

**F29 To:**
**(a)Evaluate the level of compliance with current fisheries management strategies; and**
**(b)Assess compliance issues associated with future management options.**

**Tourism and Recreation**

**T01** **To gain better information regarding the levels of use by identified user groups and their interactions, perceptions and motivations including:**
**(a)Tourists;**
**(b)Recreational users (eg fishers, yachties, etc);**
**(c)Others (eg indigenous); and**
(d)**Non-users (eg general community).**

**T02** **To gain a better understanding of information and interpretive needs of tourism operators.**

**T03** **To develop measurable 'triggers' which will indicate when:**
**(a)Social values;**
**(b)Cultural values;**
**(c)Environmental values; and**
**(d)Economic values**
**are at a high risk of impact from tourism and recreation activities.**

T04 Establish acceptable (and transparent) limits of acceptable change from tourism including infrastructure development) and recreation.

**T05** **Develop and implement monitoring techniques to assess:**
**(a)Social;**
**(b)Cultural;**
**(c)Environmental; and**
**(d)Economic**
**status both regionally and at specific sites to produce a better understanding of the impacts of tourism and recreational activities on the Marine Park.**

T06 To gain an improved understanding of the economics of tourism and recreational use through:
(a)An assessment of economic values; and
(b)Modeling economic impacts of management.

**T07** **To collate existing information that addresses the issues of:**
**(a)Use and perceptions of the Marine Park;**
**(b)Limits of acceptable change;**
**(c)Performance/environmental indicators;**
**(d)Trigger mechanisms/thresholds;**
**(e)Allocation of access; and**
(f) **Accreditation and training programs and processes.**

T08 To gain a better understanding of future directions in the tourism industry including:
(a)Technology;
(b)Geographical spread, demography, national and global trends; and

(c) Industry structure and infrastructure.

T09    To develop performance monitoring techniques to assess the effectiveness of management regimes (particularly Plans of Management).

**T10    To assess whether management objectives have been achieved.**

**Water Quality and Coastal Development**

**W01**   To quantify sediment, nutrient and pesticide discharges from major GBR rivers under both baseflow and flood conditions from lands under a range of rainfall intensities, geographic locations and agricultural activities.

**W02**   To develop robust models for sediment and nutrient loss from GBR catchments and coastal areas under different land development regimes.

**W03**   To quantify the impact of grazing on the loss of nutrients and sediments from GBR catchments.

**W04**   To review and document the status of wetland and riparian vegetation loss adjacent to the GBR.

**W05**   To investigate the sources and movement of historically and currently used pesticides (including organochlorines and dioxins) from GBR catchments.

**W06**   To collate and further quantify (as necessary) the impact of sugar cane on the loss of nutrients and sediments from GBR catchments.

**W07**   To collate and further quantify (as necessary) the impact of cotton production on the loss of nutrients and sediments from GBR catchments.

**W08**   To investigate the sources and treatment of stormwater for establishment of best practice guidelines for minimising impacts on the GBR with outputs suitable for incorporation in local government Stormwater Management Plans.

**W09**   To investigate:
(a) Temporal and spatial dynamics of GBR flood plumes (includes physical and chemical processes of changes in salinity, sediments and nutrient status); and
(b) Remobilisation of sediments and nutrients via wave re-suspension.

**W10**   To monitor spatial variability of GBR coastal and offshore sediment pollutants nutrients, metals and pesticide) concentrations with respect to exports from adjacent catchments.

W11   To investigate the use of coral and sediment cores as a record of environmental change.

**W12**   To investigate the inshore impact of terrestrial runoff on:
(a) Coral reefs;
(b) Seagrass;
(c) Soft bottom benthos; and
(d) Water column.

**W13**   To determine the usefulness of Pulse Amplitude Modulation (PAM) technology to

**provide a robust and rapid measure of coral stress.**

**W14** **To investigate spatial variability (GBR, Torres Strait, Northern Territory, Western Australia) of pesticides and heavy metal concentrations in dugong and green turtles with respect to adjacent catchment use.**

**W15** **To use biomarkers to quantify pesticide input and impact to GBR biota.**

**W16** **To investigate the impact of the herbicide (diuron) on local seagrass species.**

**W17** **To document the historical perceptions of environmental change to river, estuarine and inshore marine communities in the GBR.**

W18 To investigate the impact of chronic discharges (particularly aquaculture and sewage), including impacts on mortality, reproduction and growth of species, on inshore marine communities (seagrass, coral, soft bottom sediments, water column).

**W19** **To document and upkeep a database of current and potential coastal developments, and compilation of data on existing coastal vegetation, wetlands and land classification.**

**W20** **To investigate mechanisms (policy, legislation and processes) for influencing local government to include coastal values (particularly World Heritage values) in planning processes.**

W21 To review urban pollutants to the GBR which identifies and tracks sources and quantities, and estimates future trends.

W22 To investigate the effects of dredging and sea dumping on mortality, reproduction and growth of species, and habitats in inshore areas.

**W23** **To gather better information on shipping in the GBR including numbers and types of ships and where they move, and the types, quantities and impacts of pollutants discharged, as well as their economic value.**

**W24** **To develop best management practices for prevention and clean up of maritime oil and chemical spills.**

W25 To investigate the toxicity of dispersants to local species.

W26 To review the investigation of ballast water treatment technology and its application to GBR ports.

W27 To investigate the toxicity of antifoulants (copper, tributyl-tin, diuron) to local non-target species.

W28 To review current knowledge of environmental management of dredging and sea dumping.

W29    Risk assessment of the scale and impact of the introduction of exotic ballast and fouling water species in:
(a)Inshore areas; and
(b)Open waters.

W30    To investigate the effect and impact of oil spills on local species and ecosystems.

**W31    To perform long term monitoring and assessment of seawater temperature.**

**W32    To perform long term monitoring and assessment of nearshore coral reefs.**

**W33    To perform long term monitoring and assessment of chlorophyll a (nutrient) concentrations.**

**W34    To perform long term monitoring and assessment of pesticide concentrations in marine megafauna (dugongs, turtles, cetaceans).**

**W35    To perform long term monitoring and assessment of seagrass beds.**

W36    To perform long term monitoring and assessment of land use change in GBR catchments.

**W37    To perform long term monitoring and assessment of pesticide concentrations in marine sediments.**

W38    To perform long term monitoring and assessment of nutrient concentrations in marine sediments (where and how much?).

**W39    To identify cost-effective management practices for improved prevention of runoff of pollutants from each type of agricultural land use (sugar, cotton, horticultural, grazing, etc) in the GBR catchment.**

**W40    To audit land management practices (codes of practice) and management systems (voluntary vs mandatory).**

W41    To investigate the synergistic effects of global warming on water quality and the health of the GBR (desktop modelling of cumulative impacts).

**W42    To obtain a socio-economic understanding of land users and managers in terms of their knowledge of impacts and their intentions regarding these impacts, including an understanding of the trade-offs between incentives and enforcement by:
(a)Profiling; and
(b)Economic modelling.**

**W43    To investigate the effects of increased carbon dioxide on:
(a)Temperature; and
(b)Alkalinity**

**on coral reefs.**

**W44**   **To develop appropriate technologies and management guidelines for aquaculture adjacent to the Great Barrier Reef to ensure protection and conservation of World Heritage values.**

**Day to Day Management**

**D01**   **To monitor the condition of key inshore and island fringing reef benthic and fish communities (with GBRMPA monitoring program).**

D02   To determine the effectiveness of compliance to reef protection systems (eg no anchoring areas and moorings).

D03   To monitor impacts and changes at high use dive sites.

D04   To monitor recovery at sites subject to incidents such as oil spills, ship strandings, cyclones and coral bleaching.

**D05**   **To determine the impacts of humans on nesting and roosting seabirds at specific sites including on foot and boats. eg critical approach distances. Priority on threatened species, key breeding sites and high use sites.**

**D06**   **Seabird monitoring of:**
**(a)Indicator and threatened species; and**
**(b)Threatening processes.**

**D07**   **Monitoring of:**
**(a)Turtle population levels and breeding success;**
**(b)Threatening processes for turtles including impacts of hunting and other mortalities leading to regional estimations of sustainable take;**
**(c)Dugong population levels and breeding success;**
**(d)Threatening processes for dugongs including impacts of hunting and other mortalities leading to regional estimations of sustainable take**
**(e)Population status assessment of inshore dolphins.**

**D08**   **To carry out autopsy work to determine causes of death of dugongs, threatened inshore dolphins and turtles, including pathology.**

D09   To evaluate management options for the protection and recovery of threatened species eg Little Tern, Beach Stone-curlew, and Sooty Oystercatcher.

**D10**   **To determine the effectiveness of existing management actions aimed at improving seabird and turtle breeding including vegetation restoration, fencing, exclusion, invasive species control.**

D11   To gather information on southern GBR Roseate Terns, Brown Boobies and other potentially threatened seabird populations regarding:
(a)Population dynamics and genetic integrity; and
(b)Risk assessment to determine priority for action.

**D12**   **To carry out a risk assessment of weeds, feral animals and problem native animals on islands including consequences of lack of action and priorities for control work.**

D13 To carry out a resource assessment to determine natural and cultural values particularly of newly proclaimed island National Parks.

**D14** **To monitor vegetation change and effectiveness of island fire management.**

D15 To gather information regarding the ecology of *Pisonia* forests of the Capricorn/Bunker Group including their interactions with scale insects:
(a)Monitoring; and
(b)Causes of death (including an investigation into the death of the Tryon Island forest).

**D16** **To monitor the effectiveness of high use site management (eg camp sites) on soils and vegetation.**

D17 To determine the most effective techniques of weed and feral animal control on island settings.

**D18** **To integrate existing research institution and management agency databases to produce an easily accessible spatially based summary of biological, cultural and use data, including critical site identification (to aid incidence response, management priority setting and monitoring resource condition).**

D19 To identify threats and threatened areas by performing:
(a)Value assessment; and
(b)Risk assessment
(including social and cultural aspects) of sites, particularly inshore areas (eg fringing reefs, seagrass beds, and mangroves).

**D20** **To determine:**
**(a)Threshold levels of acceptable change to the resource;**
**(b)Acceptable levels of use; and**
**(c)Appropriate management response levels (eg acceptable compliance levels) for Marine Park management.**

**D21** **Develop practical performance indicators for use by Day to Day Management staff to gauge the success of the program eg regulation compliance levels and public awareness of the Marine Park and World Heritage Area.**

D22 To analyse existing data on use trends in the Marine Park and World Heritage Area (ie to determine what people are doing where) and develop simple recording and analysis systems for monitoring use trends.

D23 To evaluate the cost effectiveness of management including enforcement and surveillance techniques.

D24 To determine the motivations of people who infringe Marine Park regulations (ie are

they unaware of the regulations, or don't they care?).

D25    To produce profiles of recreational fishers and boaters for public education work (eg what are their motivations and information needs, and where do they get their information?).

D26    To evaluate the effectiveness of current or planned public education activities.

**Program Delivery**
**(Planning, Environmental Impact Management and Indigenous Liaison)**

**P01**      **To develop and measure clearly defined performance indicators for evaluation of:**
             **(a)Plans of Management;**
             **(b)Reef-wide Planning;**
             **(c) Permits; and**
             **(d)Compliance and Enforcement.**

**P02**      **To develop more effective communication with stakeholders through:**
             (a)A better understanding of their perceptions, concerns and needs;
             **(b)Monitoring the effectiveness of information products developed; and**
             (c)Development of effective communication mechanisms.

**P03**      **To identify levels of change acceptable to stakeholders.**

P04          To develop processes for achieving co-management with identified stakeholders:
             (a)Indigenous Groups; and
             (b)Others.

P05          To produce engineering standards for structures in the Marine Park and World
             Heritage Area.

P06          To develop an electronic retrieval system for easily accessing existing summarised base-
             line data on habitats and existing/planned developments/use (eg. permits and actual
             use data).

**P07**      **To track and measure cumulative impacts on the environment and stakeholder**
             **groups to provide information for more informed decision-making regarding new**
             **developments (eg. aquaculture, marinas, research stations/activities, volume of boats,**
             **indigenous hunting, whale watching etc):**
             **(a)Tracking; and**
             (b)Measuring.

P08          To develop research protocols for engagement with indigenous communities through
             an understanding of indigenous perceptions, concerns and needs.

**P09**      **To develop protocols for effective incorporation of information on indigenous values**
             **and practices into management decisions.**

**P10**      **To find out more about examples of existing displacement impacts in the Great**
             **Barrier Reef.**

**P11**      **To produce accurate resource maps that include base-level data (ie. digital maps of**
             **reefs).**

P12          To design more effective methods for defining and describing geopolitical boundaries.

**P13** **To collect long term baseline data on the biophysical environment (eg fish aggregations, sea grass beds, etc).**

**P14** **To ensure capacity to engage in short-term targeted research on new:**
**(a)Environmental;**
**(b)Social; and**
**(c) Economic**
**issues as they arise.**

P15 To develop protocols for GBRMPA input into State projects impacting on the World Heritage Area.

**Research and Monitoring Co-ordination**

R1       Develop and implement performance indicators for State of Reef Reporting ie state, pressure and response.

R2       To develop a comprehensive overview of social, cultural and economic information on reef related issues by:
(a)Synthesising and evaluating existing information;
(b)Identifying appropriate social indicators to monitor perceptions, attitudes and demographic trends; and
(c)Establishing long term monitoring of social, cultural and economic parameters.

R3       To develop a system to allow easy access to existing information by:
(a)Developing and implementing or maintaining databases on relevant information; and
(b)Developing a electronic hub that provides an interface and search engine for accessing all information relevant to the Marine Park and World Heritage Area.

R4       To provide information on the natural variability of the biological, chemical and physical environment via long term monitoring of critical habitats, species and environmental parameters.

R5       To maintain the flexibility to develop new research programs, or instigate reactive research or monitoring as needed in response to unpredictable events or management needs (eg oil spill, ship grounding, cyclone, coral bleaching, crown of thorns starfish, proposed change to regulations etc ).

R6       To improve our understanding of large scale processes relevant to management eg document verified patterns of reef connectivity for use in the design of marine protected areas.

R7       Develop appropriate processes and methods for obtaining and using cultural heritage information.

**Communication and Education**

CE1      Experimental investigation of environmental factors affecting recruitment and survival of captive coral reef species.

CE2      Refinement and development of technological life-support systems for captive maintenance of coral reef communities.

CE3      Broad-scale survey of community knowledge and its relationship to Reef HQ's (the aquarium) programs.

CE4      Assessment of knowledge of and attitudes to the Marine Park among students from Kindergarten to Year 12.

CE5      Evaluation of effectiveness of Reef HQ's (the aquarium) information products and programs.

CE6      Broad-scale survey of community knowledge to identify critical knowledge gaps.

## GREAT BARRIER REEF MARINE PARK AUTHORITY'S RESEARCH PRIORITIES
## HIGHEST PRIORITIES

Of the tasks identified as of particular importance to each group (Comprehensive List), the Executive identified GBRMPA's highest priorities. Codes in parenthesis refer to specific tasks listed in the comprehensive list.

### Conservation Biodiversity & World Heritage
- To assess the effectiveness of the representative areas network against CAR principles (comprehensiveness, adequacy and representativeness: *C25).*
- Determining the causes of death of dugongs in the Marine Park & World Heritage Area (C06b, D08).
- Monitoring breeding success and threatening processes for turtles, dugong and seabirds *(D06b, D07a,b,c,d).* In particular, assessing the impacts of hunting and other causes of mortality on turtle and dugong populations leading to regional estimates of sustainable take *(D07b, D07d).*
- Examining the issues relating to indigenous hunting and fishing regarding its extent and economics *(C19a),* social context and cultural values *(C19b).*

### Fisheries Issues
- To gain a better understanding of the spatial and temporal distribution of otter trawling, its environmental impacts on specific habitats and the recovery dynamics of trawled habitats *(F01a).*
- To gather improved information on impacts of line fishing on target and non target fish species and reef communities, and the identification of vulnerable species, using both fishery dependent and independent sources *(F5).*
- To gather better information on the spatial and temporal distribution of catch and effort in the line fishery, its relationship to market demands, development of fisheries and status of fish stocks *(F6).*
- To gather improved information on the status of species targeted by harvest fisheries using both fishery dependant and independent sources. Species of particular importance are sea cucumber (especially black and white teat fish), trochus, marine aquarium fish, and tropical rock lobster species *(F9a-c, e, g-i, k).*

### Tourism and Recreation
- To gain better information about the levels of use by identified user groups and about the interaction, perceptions and motivations of these users *(T1),* particularly tourists, recreational users, others users, and non-users. This will assist us in understanding the issues leading to displacement of users in the Marine Park.
- Collation of existing information that addresses the issues of *(T7):*
  - Use and perceptions of the Marine Park
  - Limits of acceptable change
  - Performance/environmental indicators
  - Trigger mechanisms/thresholds
  - Allocation of access
  - Accreditation and training programs and processes

- To gain a better understanding of information and interpretive needs of tourism operators *(T2)*.

## Water Quality and Coastal Development
- To investigate the inshore impact of terrestrial runoff on coral reefs *(W12a)*, seagrass beds *(W12b)*, soft bottom communities *(W12c)*, and the water column *(W12d)*.
- To review and document the impact of wetland and riparian vegetation loss adjacent to the GBR *(W04)*.
- To develop appropriate technologies and management guidelines for aquaculture adjacent to the GBR to ensure protection of World Heritage values. (W44).
- To develop best management practices for prevention and clean up of maritime oil and chemical spills *(W24)* in the World Heritage Area.
- To monitor spatial variability of GBR coastal and offshore sediment pollutant (nutrients, metals and pesticides) concentrations with respect to exports from adjacent catchments *(W10)*.


## Authority Wide (tasks important to all or most groups)

### *Performance Indicators*
Develop and implement performance indicators, which will allow GBRMPA to assess *(R1):*
- The state of the Marine Park & World Heritage Area;
- The pressures on the area; and
- Success of management responses.

Of particular interest for measuring the success of management responses are the development and implementation of practical performance indicators to measure effectiveness of:
- Planning and environmental impact management tools, particularly Plans of Management, Permits and Reef-wide Planning *(P01a, T10);*
- Specific management actions aimed at the conservation of threatened or endangered species, especially dugong *(C12a)*, turtle *(D10)* and seabirds *(D10);*
- Marine protected areas as a management strategy to contribute to ecological sustainablity of line, trawl, net, and harvest fisheries *(F19a-d)*. This will require the development of clear, specific quantifiable objectives for conservation management of fisheries, supported by indicators of ecological sustainability that can be measured cost-effectively (F14).
- Day to Day Management particularly compliance and enforcement *(P01d, D21, F29a)*, public awareness of GBRMPA & World Heritage Area *(D21)* and the condition of key sites *(D21)*; and
- Communication with stakeholders eg by assessing public understanding and awareness of marine park management regimes and issues. Of particular interest are the effectiveness of:
  - communication and consultation methods used with respect to planning, permitting and fisheries issues *(P02b, F27);* and
  - Reef HQ's (the aquarium) products and programs *(CE5)*.

### Monitoring natural variability and long-term trends (P13) of:

- Critical *(R4)* or major *(C20)* habitat types, especially reefs, seagrasses *(C20, W35, P13)*, soft bottom and other benthic habitat types *(C20)*.
- Critical species (*R4*) particularly dugong *(C01b), D07c)*, seabirds (indicator and threatened species: *D06a*) and turtles *(D07a)*.
- Key fisheries species (*F25*).
- Environmental parameters especially:
  - water quality, particularly chlorophyll a (nutrient) concentrations *(W33)*;
  - seawater temperatures *(R4, W31)*; and
  - pesticide concentrations in marine sediments *(W37)*.
  - social, economic and cultural parameters *(R2)*.

Existing monitoring programs may require review. In particular, the Authority's preference would be for an increase in long term monitoring of nearshore *(W32, D01)* and island fringing reefs *(D01)*, since they are at most at risk from human activities.

### Production of High Accuracy Digital Maps of the GBR

Production of more detailed and accurate resource maps for planning and enforcement that include base-level data, especially digital maps of:

- Reefs and other major habitat types *(P11)*; and
- Important management areas (eg management zones & areas; tourism areas: *P11*) or resources (eg fisheries habitats: *F21*).

### Development of a metadatabase (C14, R3)

This is a two part process that will require:

- Development, implementation or maintenance of databases of information relevant to the management of the GBRMP & World Heritage Area; and
- Development of a metadatabase or electronic hub that will provide an interface and search engine capable of accessing information from all these databases.

### Determining Limits of Acceptable Change, Use and Management Response

Establish protocols and methods to determine threshold limits of acceptable change on a site specific basis for marine park management *(P03, D20a)* based on a consideration of social, cultural, economic, and environmental values *(D20a)*.

In particular, establish acceptable levels of use *(D20b)* by tourism including infrastructure development *(T04)*, recreation *(T04)*, and fisheries.

**HOW WILL THESE PRIORITIES BE USED?**

**What research is GBRMPA interested in supporting?**

These research priorities will be used as the basis for deciding which research tasks GBRMPA will and won't support (either financially or in principle). It is important to stress that in this process we have focused on our high priority needs only. We recognise that there are many more tasks that could be of value for the management of the Marine Park and World Heritage Area. However, the Authority has limited resources to support research tasks, both in terms of funding and staff time. Therefore, we will only support those tasks that are considered to be of a high priority for the management of the Marine Park and World Heritage Area, and which will produce results that are directly relevant to management within the appropriate timeframe (ie in time to support the relevant management decisions). Given that this information may be used as the basis for management decisions, the research will also need to be of high quality and able to withstand rigorous peer review.

**Are you interested in doing research for GBRMPA?**

If you are a scientist interested in addressing our research priorities, what should you do? Send an expression of interest to the Manager of the Research and Monitoring Co-ordination Unit at GBRMPA (email: research_monitoring@gbrmpa.gov.au). This should comprise a brief (one page) statement of your research proposal and how it specifically addresses our priorities.

However, you should be aware that the Authority's main research provider is the CRC Reef Research Centre. Our principle position is that our research needs should be met by the CRC where possible, and that we will only directly support research where it cannot be accommodated by the CRC.

**Where to from here?**

Given the fundamental role that the research priorities will play in setting GBRMPA's research agenda, this list will be a living document that is updated and reviewed on a regular basis to ensure that the priorities remain current and relevant to our management needs. Updated research priorities will be available on the GBRMPA's website at www.gbrmpa.gov.au in the future.