

Data and Information Management Fisheries Research and Development Corporation

5 October 2005

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Data and Information Management
Fisheries Research and Development Corporation
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CONTENTS

| | | |
|----------|---|-----------|
| 1 | CONTEXT | 1 |
| 2 | INTRODUCTION | 1 |
| 3 | DATA AND INFORMATION MANAGEMENT | 2 |
| | 3.1 Life cycle of an FRDC project..... | 2 |
| | 3.2 Data management at FRDC..... | 2 |
| 4 | NATIONAL MARINE DATA MANAGEMENT | 3 |
| | 4.1 Oceans Policy Science Advisory Group (OPSAG) | 3 |
| | 4.2 Australian Ocean Data Centre Joint facility..... | 5 |
| | 4.3 Oceans Portal Project | 5 |
| 5 | COMMONWEALTH MARINE ORGANISATIONS | 6 |
| | 5.1 CSIRO Marine and Atmospheric Research | 6 |
| | 5.1.1 Marine Data Centre..... | 6 |
| | 5.2 Geoscience Australia – Marine and Coastal | 7 |
| | 5.2.1 Australian Marine Spatial Information System (AM SIS) | 7 |
| | 5.3 Australian Institute of Marine Science | 8 |
| | 5.4 Bureau of Meteorology | 8 |
| | 5.5 Australian Museum..... | 9 |
| | 5.5.1 Online Zoological Collections of Australian Museums (OZCAM)..... | 9 |
| | 5.5.2 OzFishNet | 9 |
| | 5.6 Defence Navy Meteorology and Oceanography (METOC)..... | 10 |
| | 5.6.1 Defence Oceanographic Data Centre..... | 10 |
| | 5.7 Great Barrier Reef Marine Park Authority | 11 |
| | 5.8 Cooperative Research Centre for the Great Barrier Reef World Heritage Area | 11 |
| | 5.9 Department of Environment and Heritage..... | 12 |
| | 5.9.1 Antarctic Division..... | 12 |
| | 5.9.2 National Oceans Office | 13 |
| | 5.9.3 Australian Biodiversity Information Facility | 13 |
| 6 | COMMONWEALTH FISHERIES ORGANISATIONS | 14 |
| | 6.1 Australian Fisheries Management Authority | 14 |
| | 6.1.1 Fishery Assessment Groups..... | 15 |
| | 6.1.2 Management Advisory Committees | 15 |
| | 6.2 Department of Agriculture, Fisheries & Forestry / Bureau of Rural Sciences..... | 16 |
| 7 | STATE AND TERRITORY FISHERIES ORGANISATIONS | 16 |
| | 7.1 Australian Capital Territory..... | 17 |
| | 7.1.1 Environment ACT | 17 |

| | | |
|-----------|--|-----------|
| 7.2 | Tasmania..... | 17 |
| 7.2.1 | Inland Fisheries Service..... | 17 |
| 7.2.2 | Tasmanian Aquaculture and Fisheries Institute..... | 17 |
| 7.2.3 | Department of Primary Industries, Water and Environment..... | 18 |
| 7.3 | South Australia | 18 |
| 7.3.1 | South Australian Research and Development Institute | 18 |
| 7.4 | Northern Territory | 18 |
| 7.4.1 | Department of Primary Industries, Fisheries and Mines..... | 18 |
| 7.5 | New South Wales | 19 |
| 7.5.1 | Department of Primary Industries | 19 |
| 7.6 | Queensland | 19 |
| 7.6.1 | Department of Primary Industries and Fisheries | 19 |
| 7.7 | Victoria..... | 19 |
| 7.7.1 | Department of Primary Industries | 19 |
| 7.8 | Western Australia | 20 |
| 7.8.1 | Department of Fisheries..... | 20 |
| 8 | PEAK INDUSTRY BODIES..... | 20 |
| 8.1 | Australian Seafood Industry Council | 20 |
| 8.2 | RecFish Australia | 20 |
| 8.3 | National Aquaculture Council | 21 |
| 9 | INTERNATIONAL INFORMATION SYSTEMS..... | 22 |
| 9.1 | Secretariat of the Pacific Community, Oceanic Fisheries Programme..... | 22 |
| 9.2 | Census of Marine Life..... | 22 |
| 9.2.1 | Ocean Biogeographic Information System | 22 |
| 9.3 | Global Biodiversity Information Facility (GBIF) | 23 |
| 9.4 | FishBase..... | 23 |
| 10 | DATA AND INFORMATION MANAGEMENT OPTIONS FOR FRDC | 24 |
| 10.1 | Risks..... | 26 |

1 CONTEXT

This project is phase one of four distinct phases initiated by Fisheries Research and Development Corporation (FRDC) and ANZLIC - *the Spatial Information Council*. Phase one investigates the current state of FRDC data and information management processes and procedures and where FRDC is positioned in and adds value to the marine and fisheries data and information space. The deliverable of phase one is an internal document, which is a Data and Information Management Strategy Executive Review.

Phase two will develop a *Marine Community of Practice Toolkit*. Phase two will rely somewhat on input from phase one to engage key stakeholders to produce a standard guide for the capture and publishing of marine data content into national systems based on best practice in marine data/information management.

Phase three will customise the Toolkit for use by FRDC and will focus on the business processes that will best deliver improved data and information management for FRDC. This will involve an analysis of the project lifecycle including recommended changes to contract clauses, a procedure for managing data and information funded by FRDC including collecting metadata, and ensuring FRDC engages with the marine community effectively. This could involve high-level agreements with key stakeholders in the marine community.

The fourth and final phase will be a series of workshops with clients to ensure the new procedures and changes in philosophy are well communicated and adhered to. This stage will also be an opportunity for FRDC to lead the discussion within the marine community on coordinated data management.

2 INTRODUCTION

The first phase has the following objectives:

1. To describe FRDC's internal data and information management processes
2. Undertake a brief audit of current data holdings in the FRDC
3. Map the key players and national initiatives in fisheries and marine data and information space

This document captures all of the research conducted by the consultant under the three objectives, from which a short executive review will be developed separately.

This document is structured to firstly discuss FRDC's internal data and information management processes and the types of data collected and managed. Subsequent sections contain the national players in the fisheries and marine space, State and Territory players, and international players, and the linkages between them. For each key player, a summary is presented (sourced from the website and from interviews with a person from the organisation) on the organisation's purpose and the types of data they collect and disseminate, including any national portal-type initiatives they lead or contribute to.

3 DATA AND INFORMATION MANAGEMENT

Generally, data refers to the actual measurements or facts produced by a research project, which are the raw sets of information used to analyse or compare with other data. Measurements are collated and stored in a dataset. Data can be analysed and presented as a map or tool - referred to as data products. Data can be spatial and non-spatial or a mix of both.

Information refers to the knowledge or intelligence obtained from data. Information can be presented in reports, guidelines, summaries, abstracts, web sites, or CD-ROMs, which can be called information products.

FRDC-funded research projects generally produce both data and information. There are various types of FRDC projects; some produce data and information products, some produce only information products. Coordinated data management will allow FRDC to collect data for multiple purposes, making them accessible and compatible. A structured approach will result in minimal problems with duplication, incompatibility and inefficiency.

3.1 Life cycle of an FRDC project

All FRDC funded projects follow the same procedures from inception to completion. The steps are:

- Application (including pre-proposal, approval by Board and post-approval)
- Preparation and signing of agreement
- Collection of data and milestones
- Final reporting (including acceptance of report and communication of results)

3.2 Data management at FRDC

The *Draft Data Management Discussion Paper* prepared for FRDC in January 2000 by Kim Finney presents common data management issues and some options to better manage FRDC partnered research. The options are still relevant and sensible, although some of the detail has changed since 2000. FRDC did not act on the suggestions in the discussion paper and it was most likely not presented to the FRDC Board for discussion.

In summary the discussion paper suggests that:

- data management obligations could be exercised through FRDC funding contracts in an effort to provide incentive for research organisations to improve their in-house data management practices and foster a culture change;
- evaluation of proposals could include criteria on the quality of data management;
- contracts could specify that ANZLIC compliant metadata records that are submitted to a node of the Australian Spatial Data Directory are a contract deliverable; and
- on-going data storage, maintenance and distribution issues should be sorted out before the contract with FRDC is signed so that the data is ensured of a life beyond the FRDC project lifetime.

The details of how to proceed with these suggestions will be the focus of Phase three. Implementation will involve changes to the standard FRDC legal agreements, changes to the

application form and criteria for assessing proposals and final products, and perhaps changes to the contract management processes.

In the contract, a custodian would be specified to manage the data after the life of the project and who would be responsible for its dissemination. The custodian could be the research provider (organisation signing the contract) if they have sufficient data management processes in place. Alternatively, the custodian may be sought by the organisation signing the contract as being suitable to manage that type of data. A third option is that FRDC has a prior arrangement with an organisation to manage FRDC funded datasets for a fee.

Metadata would be required in the FRDC-research provider agreement. The metadata would be received by FRDC as part of the final data and information products, checked for completeness, and submitted to the Australian Spatial Data Directory (possibly to an FRDC node).

The types of data collected by projects will determine the most suitable options for data management. Options are discussed in further detail in the final section.

4 NATIONAL MARINE DATA MANAGEMENT

There have been significant developments in national marine data management in the past two or three years. Progress by six key Commonwealth marine agencies in particular (as part of the Australian Ocean Data Centre Joint Facility) has been rapid recently and will culminate with the launch of the Oceans Portal at the end of 2005.

The Australian National Marine Data Group, led by Geoscience Australia, has been superseded in the past 6-12 months by the AODCJF. Geoscience Australia formally requested that the AODCJF take over its role. The National Oceans Office is leading the Oceans Portal Project, which is developing a distributed online network of marine data.

As historical background, in June 1997, the Australian Marine Sciences Association published *Toward a Marine Science Policy for Australia: Recommendations for a National Marine Science Policy for Australia* [available online: <http://www.amsa.asn.au/pubs/NMSP/NMSP-Contents.html>]. It recommended that a National Marine Information System be established, based on the principle of a distributed network with nodes in various existing institutions and agencies. The Australian Oceanographic Data Centre (AODC) was mentioned as a suitable lead agency. In a submission to the National Research Priorities Process 2002, the Australian Marine Sciences Association identified an urgent need for a nationally accessible Portal-type website, to house and provide links to national-level data on all types of marine related information, including the marine biodiversity, habitat, and oceanographic information of the proposed National Oceans Blueprint.

4.1 Oceans Policy Science Advisory Group (OPSAG)

Australia's Oceans Policy established the National Oceans Ministerial Board (NOMB) to provide high-level capacity to deal with difficult and complex policy and management issues for the oceans. The NOMB receives advice from the National Oceans Advisory Group (NOAG), which is made up of non-government stakeholders. It is also advised by the Oceans Board of Management (OBOM), established in 2003, comprising the heads of relevant Australian Government departments.

The Oceans Policy Science Advisory Group (OPSAG) was established in 2003 to provide scientific advice and support to the OBOM and through it to the NOMB. OPSAG provides a forum for setting priorities and sharing information for marine science. OPSAG has replaced the former Heads of Marine Agencies (HOMA); its membership consists of senior representatives of

all Australian Government agencies with strong interests in marine science and marine matters and also includes representatives from State/Territory and non-government organisations with marine-science related interests.

Members of OPSAG are:

- Department of Education, Science and Training
- Australian Antarctic Division
- Australian Fisheries Management Authority
- Australian Institute of Marine Science
- Australian Maritime Safety Authority
- Bureau of Meteorology
- Bureau of Rural Sciences and Department of Agriculture, Fisheries and Forestry
- CSIRO Marine and Atmospheric Research
- Defence Science and Technology Organisation
- Department of Environment and Heritage
- Fisheries Research and Development Corporation
- Geoscience Australia
- Great Barrier Reef Marine Park Authority
- National Oceans Advisory Group
- Royal Australian Navy
- Marine Gas and Petroleum Industries
- State Government / Marine and Coastal Committee (of the Natural Resource Management Ministerial Council)
- Universities
- Australian Marine Sciences Association

4.2 Australian Ocean Data Centre Joint facility

The Australian Ocean Data Centre Joint Facility (AODCJF) is a whole-of-government approach to ocean data management. It aims to develop a national multi-agency data management system for the ocean data resources of the partner agencies. The AODCJF is a joint venture between six Australian Government marine agencies with support from the National Oceans Office:

- Australian Institute of Marine Science
- Australian Antarctic Division
- Bureau of Meteorology
- CSIRO Marine and Atmospheric Research
- Geoscience Australia
- RAN Directorate of Oceanography & Meteorology

The objectives are to:

- manage ocean data to meet national and international obligations
- act as an operational facility rather than an advisory group or coordinating body
- be a distributed network as data will reside on agency servers

A Technical Committee has been established to develop and implement technologies to create a distributed national data centre and to establish standards for ocean data management and exchange. Technical working groups have also been established to investigate metadata catalogues, interoperability and web feature services.

4.3 Oceans Portal Project

The National Oceans Office is developing the Oceans Portal that will allow users of marine research to access information from a number of participating Australian Government science and information agencies and museums through a distributed system. The Portal also provides an online tool to allow users to create products, such as maps.

It is expected that the Oceans Portal will initially be constructed to provide a view into the bioregionalisation and socio-economic datasets that have been produced as part of the National Oceans Office's National Science Work Program. Later, the Portal application will be expanded to cover other aspects of national activity associated with Australia's Oceans Policy and Regional Marine Planning.

Importantly, this project is one of the first steps towards developing true on-line interoperability between government agencies. The Oceans Portal consists of three distinct and physically separate components: a web-based portal, a marine catalogue and a network of interoperable service and content providers.

The Oceans Portal will be an interface through which end-users search for marine information, data and services and will access data and information from the Marine Catalogue.

Partners of the project include:

- Australian Antarctic Division
- Australian Institute of Marine Science
- Australian Museum community (via the OZCAM project)
- Bureau of Rural Sciences
- Commonwealth Bureau of Meteorology
- CSIRO Marine and Atmospheric Research
- Department of Defence
- Geoscience Australia
- Hydrographic Office, Department of Defence

CSIRO Marine and Atmospheric Research has agreed to host the Marine Catalogue.

5 COMMONWEALTH MARINE ORGANISATIONS

5.1 CSIRO Marine and Atmospheric Research

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|------------------|---|
| Web site address | http://www.cmar.csiro.au/ |
| Contact | Paul Tidelsley |

CSIRO Marine and Atmospheric Research (CMAR) was formed on 1 July 2005 with the merger of CSIRO Marine Research and CSIRO Atmospheric Research. The new division's work encompasses the assessment of atmospheric and earth systems and the prediction of climate, weather and ocean processes; and research to integrate coastal management and ensure marine resources and industries are sustainable.

CMAR focuses on strategic science to meet national needs and to ensure long-term benefits to Australia.

The research priority areas are:

- Healthy marine ecosystems
- Sustainable fisheries
- Sustainable aquaculture production
- Understanding the ocean's role in climate
- Marine environment prediction
- Managing multiple uses

5.1.1 Marine Data Centre

The Marine Data Centre is a central assembly and management point for much of the Division's vessel-collected (ship) data collected over the past 25+ years, plus related datasets such as those collected via moored instrument arrays (moorings) in the Australasian region. The Marine Data Centre also administers and maintains a range of data management systems and tools which include:

- a central "Data Warehouse", accessed via a custom Data Trawler application;

- "MarLIN" (Marine Laboratories Information Network), the Divisional data directory (metadatabase), which contains descriptions of many of the Division's datasets (not just those held by the Data Centre);
- "CAAB" (Codes for Australian Aquatic Biota), a master species database which provides names and codes for some 25,000 marine species which occur in Australian waters; and
- the "C-squares" Concise Spatial Query and Representation System, used within data Centre applications and also accessible as a data indexing system and web mapping service to external users.

The Data Centre also curates marine datasets collected by the (former) *Franklin* and (current) *Southern Surveyor* National Facility research vessels, which are integrated with Divisional holdings for the purpose of data description, curation, access, and dissemination. These data streams comprise the underway data suite, and CTD, Hydrology (water chemistry), and ADCP data, as available from National Facility research voyages from 1985 to current, including public access to all National Facility data that is more than 2 years old (younger datasets are available to the relevant Principal Investigators only).

5.2 Geoscience Australia – Marine and Coastal

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|------------------|---|
| Web site address | http://www.ga.gov.au/ |
| Contact | Alister Nairn |

Geoscience Australia's Marine and Coastal activities provide data, technical information, advice and research for maritime boundary definition, regional marine planning, and environmental management. Their diversity reflects Australia's long coastline (almost 60,000km in length) and large offshore jurisdiction.

Geoscience Australia's Maritime Boundaries Unit has developed and maintains the Australian Maritime Boundaries (AMB), a geographic information system encompassing maritime boundaries of interest to all levels of Australian government. AMB is used to facilitate the meeting of specific international obligations as set out in the United Nations Convention on the Law of the Sea (UNCLOS).

Online databases held include:

- MARine Sediments (MARS) Database - The MARS database contains detailed information on seabed sediment characteristics for samples collected from Australia's marine jurisdiction, including the Australian Antarctic Territory.
- Ozestuaries - The Ozestuaries database assists the management of estuaries as a natural resource. Application includes conceptual models of the biophysical processes that operate in a wide range of estuaries and coastal waterways found around Australia.

5.2.1 Australian Marine Spatial Information System (AMSIS)

The Australian Marine Spatial Information System presents Commonwealth marine boundary data in an online GIS and will be publicly available in March 2006. The type of data held will include Australian jurisdictional boundaries, marine parks, fisheries, oil and gas exploration, customs and legislated boundaries. There are plans for the Oceans Portal to link to AMSIS.

Department of Environment and Heritage will contribute the AMSIS with Marine Park Area Boundaries, IMCRA boundaries and national bioregions.

5.3 Australian Institute of Marine Science

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|------------------|---|
| Web site address | http://www.aims.gov.au |
| Contact | Scott Bainbridge |

AIMS researchers collect and analyse data to improve our understanding of the marine world, and to find science-based management practices that ensure long-term sustainable use and development of marine resources, particularly the reefs.

Data collected includes long term monitoring of:

- Water quality parameters
- River runoff from catchments
- Reef fish recruitment
- Oceanographic data
- Biological and coastal studies
- Sediment analysis
- Mangrove carbon and nutrient recycling
- 3D oceanographic modelling

All data is managed internally by AIMS. Publicly available information is made accessible via the internet on the Reef Monitoring website. Sensitive commercial data is provided to clients directly and is usually password protected. Initially, AIMS will contribute oceanographic data to the Oceans Portal, and in the future would like to contribute biological data.

5.4 Bureau of Meteorology

| | |
|------------------|---|
| Web site address | David Thomas |
| Contact | http://opendap.org/ |

BOM uses and contributes to the Distributed Oceanographic Data System (DODS), which enables oceanographers to interactively access distributed, online science data using the one interface that a researcher is already familiar with. The types of information that BOM collects include sea surface temperature, wave observations, and the effects of the ocean on the atmosphere.

The Bureau of Meteorology, Royal Australian Navy and CSIRO initiated *BLUElink Ocean forecasting Australia*, a \$15m project to deliver ocean forecasts for the Australian region. The forecasts will provide information on coastal and ocean currents and eddies, surface and subsurface ocean properties, that impact and are linked to maritime and commercial operations, defence applications, safety-at-sea, ecological sustainability, regional and global climate. In future, BLUElink will be used as a portal to deliver smaller datasets to the public.

BOM is a key player in the web services and portal technology area and bring this expertise to the NOO Oceans Portal Project.

5.5 Australian Museum

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| Web site address | http://www.austmus.gov.au/fishes/fishfacts/sydney.htm |
| Contact | Mark McGrouther |

The Australian Museum holds a large collection of marine fish specimens (called the Australian Museum of Fish Collections). Information in the collection includes family name, taxon (genus, species, subspecies), locality (country, state or ocean), habitat, year of collection, specimen form, capture depth range (in m), size range (in mm) and specimen fixation in formalin or alcohol (F/A). The locations of where the specimens were collected is available in map form through Fish Maps. The fish collection contains approximately 1,600,000 specimens.

The museums in Australia seem to be well organised in terms of collaborating on online databases. There are Australian information systems that link to global systems, such as the Online Zoological Collections of Australian Museums and OZFishNet (further described below).

5.5.1 Online Zoological Collections of Australian Museums (OZCAM)

| | |
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| Web site address | http://www.ozcam.gov.au |
| Contact | Doug Hoese |

OZCAM is an alliance of major state museums and CSIRO Marine and Atmospheric Research. Their animal collections contain an estimated 36 million records, 25% of which have been incorporated into a database. The OZCAM website provides access to datasets around Australia via a single portal. Currently, queries can be made on mammals, reptiles, amphibians, fishes, dung beetles and molluscs. An extensive query screen allows the user to query by taxon name, by place, by time or by a combination of these. The user can also nominate which museums are to be queried. Data returned from sites around Australia can be displayed either as dots on a map or as a list. From either of these displays it is possible to mine the data further and view the raw dataset for any single specimen. The integration of information will also enable the museum scientific community to conduct innovative and collaborative research beyond previous limitations.

Extensive use has been made of museum databases by Great Barrier Reef Marine Park Authority and NSW Fisheries in Marine Bioregional Planning and the selection of candidates for marine and estuarine protected areas.

There are talks currently regarding the link between OZCAM and ABIF and OBIS. The decision to link these information systems apparently lies with Council of Heads of Australian Faunal Collections, a body formed from representatives of every Australian museum that holds significant faunal collections.

5.5.2 OzFishNet

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| Web site address | http://www.amonline.net.au/fishes/ozfishnet/ |
| Contact | |

OzFishNet is a consortium of collection-based Australian ichthyologists formed to promote research, data access and other issues of mutual interest.

This group comprises the leading ichthyologists of Australia based in each of the state museums and CSIRO. In essence OzFishNet is the virtual national fish museum of Australia.

5.6 Defence Navy Meteorology and Oceanography (METOC)

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| Web site address | http://www.metoc.gov.au/ |
| Contact | Martin Rutherford |

The mission of the Directorate of Oceanography & Meteorology is to acquire, manage, produce and distribute meteorological and oceanographic information to:

- support the Defence Force and national infrastructure,
- contribute to the preservation of the marine environment,
- enable the Defence Force to utilise the above and below water physical operating environments for strategic, operational and tactical advantage
- to satisfy national and international obligations to manage oceanographic data

Some of the information presented for public use is reformatted data sourced from the World Oceans Atlas and the USA.

5.6.1 Defence Oceanographic Data Centre

The METOC website makes the following datasets available:

Global Bathymetry

One minute gridded global bathymetry derived from the GEBCO Digital Atlas published by the British Oceanographic Data Centre. Includes depth contours, spot depths and a shaded relief view.

Near Real-Time SST

View optimum interpolation analysis of global sea surface temperatures to within + or - 0.7°C. The data is received from two NOAA polar orbiting satellites on a weekly basis and represents a four day average SST. This service is updated every Monday.

Significant Wave Height Climatology

Observe global mean and maximum monthly wave heights processed from data collected by the Topex/Poseidon satellite. Tabular data including number of observations is also available.

World Ocean Atlas 2001 Online

Online access to monthly climatological layers of temperature, salinity and sound speed at standard depths from the World Ocean Atlas 2001 are presently available including seasonal comparisons.

SEAFARER® GeoTIFF IMS

This demonstration IMS allows users to interact with a limited set of Australian Hydrographic Office produced SEAFARER® GeoTIFF's. Users can also plot routes on the map and save or print the resulting map. NOT TO BE USED FOR NAVIGATION.

RAN auSEABED Data Server

Download the latest auSEABED data for your area of interest, direct from our Geodatabase in compressed shapefile format.

Oceanographic Analysis Charts

Historical weekly oceanographic analysis of East Australian Current and the Leeuwin Current including annual animations. This service has been replaced by the near real-time sea surface temperature IMS found above.

Coastal Sea Surface Temperature

Online access to sea surface temperature data for selected locations around the Australia coastline. This statistical data provides monthly and annual average temperatures. Find the average temperatures for your local area.

Coastal Sea Surface Salinity

Online access to sea surface salinity data for selected locations around the Australia coastline. This dataset covers the same locations as the coastal sea surface temperature dataset.

This information will eventually be made available through the Oceans Portal, at which time the METOC site will be terminated.

5.7 Great Barrier Reef Marine Park Authority

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| Web site address | http://www.gbrmpa.gov.au/ |
| Contact | Phil Cadwallader |

The Great Barrier Reef Marine Park Authority (GBRMPA) is the principal adviser to the Commonwealth Government on the care and development of the Great Barrier Reef Marine Park.

The Authority is a Registered Research Agency under the Australian Industry Research and Development Board and can conduct and manage research. However, as the Authority is a management agency, the majority of research is carried out by research institutions such as the CRC Reef Research Centre and the Australian Institute of Marine Science. The research data is made available through these organisations.

5.8 Cooperative Research Centre for the Great Barrier Reef World Heritage Area

| | |
|------------------|---|
| Web site address | http://www.reef.crc.org.au/ |
| Contact | Gavin Begg |

CRC Reef Research Centre is a knowledge-based partnership of coral reef ecosystem managers, researchers and industry. Its mission is to plan, fund and manage world-leading science for the sustainable use of the Great Barrier Reef World Heritage Area.

CRC Reef Research Centre provides research solutions to protect, conserve and restore the world's coral reefs by ensuring that industries and management are sustainable and that ecosystem quality is maintained.

Research priorities include water quality, coral bleaching, crown-of-thorns starfish, biodiversity (use & conservation), sustainable fisheries (commercial, recreational & traditional), environmental sustainability of ports and shipping, and sustainable tourism.

CRC Reef partners are:

- Association of Marine Park Tourism Operators (AMPTO)
- Australian Institute of Marine Science (AIMS)
- Great Barrier Reef Marine Park Authority (GBRMPA)
- Great Barrier Reef Research Foundation (GBRRF)

- James Cook University (JCU)
- Queensland Seafood Industry Association (QSIA)
- The State of Queensland through its Department of Primary Industries and Fisheries (DPI&F)
- SUNFISH Queensland Inc.

The University of Queensland is an associate member.

In terms of data management, the CRC Reef shares IP and custodian responsibilities with its partners. There is not a central information system where all CRC data is accessible. Each partner agency makes the data collected available to the stakeholders who are the end users of the data for research and management.

5.9 Department of Environment and Heritage

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| Web site address | http://www.deh.gov.au |
| Contact | Craig Richardson (ERIN) and Emma Campbell |

The Sustainable Fisheries Section (SFS) is responsible for the assessment of fisheries managed under Commonwealth legislation and state export fisheries in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The primary role is to evaluate the environmental performance of fisheries, including:

- the strategic assessment of fisheries under Part 10 of the EPBC Act;
- assessments relating to impacts on protected marine species under Part 13; and
- assessments for the purpose of export approval under Part 13A.

Information on conservation values and marine environment use of Marine Protected Areas is needed for the Marine Protected Area process. DEH also holds information on the areas once they are established and uses the information to assess performance of the process.

5.9.1 Antarctic Division

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|------------------|---|
| Web site address | http://aadc-maps.aad.gov.au/aadc/portal/index.cfm |
| Contact | Kim Finney |

Australia's Antarctic Program is tasked to promote the value of the Antarctic and sub-Antarctic regions for the benefit of human kind, to protect the integrity of their unique wildlife, ecosystems and pristine environments, and to understand how these regions influence the physical processes that drive the climate and the ecology of our planet. Science is central to the achievement of these aims.

The Australian Antarctic Data Centre Portal contains scientific and environmental information on terrestrial impacts, geology, biology and marine science, fisheries and oceanography for the Antarctic region. The ADCP lets users search for datasets, metadata and maps. The Australian Antarctic Division Atlas is a collection of online static maps of Antarctica.

The Antarctic Data Centre is a key player in the Oceans Portal Project and will contribute marine data.

5.9.2 National Oceans Office

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|------------------|---|
| Web site address | http://www.oceans.gov.au/home.jsp |
| Contact | Alicja Mosbauer |

The National Oceans Office was formed in December 1999 as an Executive Agency under the *Commonwealth Public Service Act 1999*. The functions of the National Oceans Office are to:

- provide secretariat and technical support to the National Oceans Ministerial Board, the National Oceans Advisory Group and Regional Marine Plan Steering Committees;
- coordinate the development of Regional Marine Plans;
- coordinate the overall implementation and further development of Australia's Oceans Policy;
- act as the main administrative coordination point between the Commonwealth, States and Territories on oceans policy issues.
- coordinate and distribute information to all stakeholders on oceans policy and regional marine planning matters; and
- provide advice to the National Oceans Ministerial Board on marine research priorities related to Australia's Oceans Policy.

Australia's Oceans Policy was launched in December 1998 to manage 16 million square kilometres of oceans between 3 and 200 nautical miles from the coast - Australia's Exclusive Economic Zone.

The Policy recognises the need to maintain the oceans ecosystem health. It also recognises that the promotion of strong, diverse and internationally competitive marine industries so important to national and regional economies depends on the long-term ecological sustainability of a wide range of ocean uses.

Neptune is an on-line data directory containing 712 metadata records. NOO is the custodian for map products but not for any dataset because it doesn't collect data but rather funds data collection.

5.9.3 Australian Biodiversity Information Facility

| | |
|------------------|---|
| Web site address | http://www.deh.gov.au/biodiversity/digir/index.html |
| Contact | |

The Australian Biodiversity Information Facility (ABIF) is the Australian participant node of the Global Biodiversity Information Facility (GBIF). ABIF is a collaborative project of the Australian biological research community to provide readily accessible information on biodiversity Australia, its surrounding oceans and external territories including, amongst others, the Australian Antarctic Territory. ABIF is coordinated and hosted by the Australian Biological Resources Study (ABRS), a program within the Department of the Environment and Heritage.

6 COMMONWEALTH FISHERIES ORGANISATIONS

6.1 Australian Fisheries Management Authority

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| Web site address | http://www.afma.gov.au/ |
| Contact | Geoff Hill |

The Australian Fisheries Management Authority (AFMA) is the statutory authority responsible for the efficient management of Commonwealth fishery resources on behalf of the Australian community. AFMA manages fisheries on the high seas, within the 200 nautical mile Australian Fishing Zone (AFZ) and, in some cases, by agreement with the States to the low water mark. In doing so, AFMA provides management, advisory, compliance and licensing services and implements appropriate fisheries management arrangements.

The data collected by AFMA's data collection programs is used for assessment and monitoring of fishery impacts on fish stocks (both target and bycatch species) and the marine environment in which the vessels operate. The stock assessment process provides information for management decision-making. Although stock assessment is the primary use of AFMA data, the data is also used by other agencies to assess and monitor AFMA's performance in managing fisheries.

The main data collection programs conducted by AFMA include:

- catch and effort logbooks;
- independent observers;
- catch disposal records;
- vessel monitoring systems; and
- licencing information.

The quality of data management within this organisation does not seem to be high and the reason for not making any of the data available is that it is all confidential.

Fishery researchers engaged in stock assessments (through Fishery Assessment Groups, supported by fisheries management and Management Advisory Committees (MAC)) are the main users of the data. Logbook data is the major component used for most stock assessments. Independent observers, independent data collection programs and catch disposal records provide information which is also used for input into stock assessments. The independent data can be used directly in the assessment or for data verification purposes.

The AFMA Compliance Section use and manage several data collection programs. Catch disposal records are generally used by AFMA's Compliance Section for the monitoring and deduction of catch quota from operator's quota holdings. Data collection programs such as vessel monitoring systems, and prior reporting are primarily used by AFMA's Compliance section to monitor vessel activities to ensure compliance with regulations.

External agencies and organisations also utilise AFMA's data. Government agencies such as the Australian Bureau of Agricultural and Resource Economics (ABARE), the Department of Agriculture, Fisheries and Forestry (DAFF), Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Bureau of Resource Science (BRS), state fishery agencies and international agencies are all regular users of AFMA data.

Certain AFMA collected data is also available to the general public and key stakeholders. AFMA's Logbook Program and Data Management Section provide public catch information such as data summaries and fishing area maps. Summarised data is also available on a cost recovery basis.

AFMA is required to keep all individual logbook data confidential. Catch and effort statistics released by AFMA are generally in an aggregated form to protect the data provided by individual operators.

AFMA can make catch record data available on the Oceans Portal. Fisheries and marine park boundary information can be made available to AMSIS, which in turn will be made available on the Portal.

6.1.1 Fishery Assessment Groups

FAGs comprise fishery scientists, industry members, fishery economists, management and other interest groups. The wide membership ensures that, in addition to scientific information on each fish stock, industry knowledge and developments in management strategies, market prices and the costs of harvesting are also taken into account.

The FAGs synthesise biological, ecosystem and economic information on Commonwealth fisheries to provide advice to AFMA and coordinate, evaluate and regularly undertake fishery assessment activity in each fishery. They report their recommendations through the individual fishery MACs to the AFMA Board on issues such as the setting of total allowable catches (TACs), stock rebuilding targets, biological reference points etc. In effect, the FAGs provide advice taking account of uncertainty and seek to identify the risks associated with the alternatives (risk assessment). The MACs consider this advice and provide recommendations to the Board based on how the alternatives will contribute to meeting overall objectives for the particular fishery (risk management) and, ultimately, to the pursuit of AFMA's legislative objectives.

6.1.2 Management Advisory Committees

The following Management Advisory Committees (MACs) are currently in operation:

- Eastern TunaMAC - Eastern Tuna & Billfish
- GABMAC - Great Australian Bight Trawl
- GHATMAC - Gillnet Hook and Trap
- NORMAC - Northern Prawn
- SBTMAC - Southern Bluefin Tuna
- ScallopMAC - Bass Strait Central Zone Scallop
- SETMAC - South East Trawl
- SouthMAC - Heard Island and McDonald Islands & Macquarie Island
- Southern & Western Tuna MAC - Southern & Western Tuna and Billfish
- SquidMAC - Southern Squid Jig
- WESTMAC - Western Deepwater Trawl & North West Slope

Central to AFMA's partnership approach is the establishment and operation of MACs for each major fishery managed by AFMA.

MACs are AFMA's main point of contact with client groups in each fishery and play a vital role in helping AFMA to fulfil its legislative functions and effectively pursue its objectives by acting as a key liaison body between AFMA and those with an interest in the fishery.

6.2 Department of Agriculture, Fisheries & Forestry / Bureau of Rural Sciences

| | |
|------------------|--|
| Web site address | http:// www.brs.gov.au/fisheries_marine |
| Contact | Richard McLoughlin |

DAFF works closely with AFMA, industry, other Federal departments, state fisheries agencies, the recreational fishing sector, environment and indigenous groups to progress legislative amendments and provide advice to the Minister. A broad range of fishing industry matters including resource use policies, resource access and budgetary matters are addressed to ensure Australia's fishing and aquaculture industries are internationally competitive and environmentally sustainable.

BRS is the custodian of some recreational fishing data collected through the National Recreational Fishing Survey. Data management is not a priority and the Data Library may be considered to house marine data but the discussions have not been started.

The Fisheries and Marine Sciences Program provides scientific advice on Australia's marine ecosystems and the sustainable harvesting of fish stocks. Activities include the publication of reports on the status of Commonwealth fisheries and marine resources; collaboration with regional agencies in managing high seas fisheries; research into target and bycatch species; assessments of fish stocks and fisheries management; analysis of human interactions with the marine environment; and management of national fisheries information systems. The Program also covers modelling and Geographic Information System (GIS) applications, impacts from other industries, and international fisheries issues.

7 STATE AND TERRITORY FISHERIES ORGANISATIONS

The primary industries agencies within each state and territory tend to be responsible for the commercial and recreational fish resources and regulation. They all collect data on the fisheries, mainly catch and effort logging.

Once the Oceans Portal infrastructure is in place, there is a plan to invite state and territory agencies to contribute to the AODCJF and Portal by registering data with the Marine Catalogue and web services. By linking into the national system they will then have access to data from other state/territory and Commonwealth datasets for use with their own data. Some State representatives voiced concerns that they do not feel they have been sufficiently engaged in the process, which is seen to be yet another Commonwealth program that will prescribe to them how they should participate.

7.1 Australian Capital Territory

7.1.1 Environment ACT

| | |
|------------------|---|
| Web site address | http://www.environment.act.gov.au/ |
| Contact | Mark Lintermans |

The ACT does not have any marine waters in its jurisdiction, so the Environment ACT Fisheries Department looks after small scale recreational fishing, stocking man-made lakes and monitoring of rivers and lakes.

The data is held in Excel, with a view to converting eventually into Access database format. Raw data is not made available to the public, however aggregated information is published in technical reports.

No commercial fishing or oceans data is held and therefore the opportunities for contributing to a national information system such as the Oceans Portal are limited.

7.2 Tasmania

7.2.1 Inland Fisheries Service

| | |
|------------------|---|
| Web site address | http://www.ifc.tas.gov.au/ |
| Contact | |

The responsibilities of the Service include the regulation and promotion of commercial freshwater fisheries and the protection of native freshwater fauna. The IFS has a responsibility to the State as a whole to manage Tasmania's freshwater resources in a sustainable manner and in doing so, to make sure that the best use is made of these resources while ensuring that Tasmania's freshwater fauna and its habitat are protected for the benefit of future generations.

The formal objectives of the Inland Fisheries Service are:

- To manage, regulate and protect recreational trout fisheries
- To manage, regulate and develop commercial and recreational fisheries in fresh water
- To regulate and develop fish farms in fresh water
- To regulate, manage and conserve all freshwater fauna throughout the State.

FishOnline is an online recreational fishing guide including maps and up to date weather reports.

7.2.2 Tasmanian Aquaculture and Fisheries Institute

| | |
|------------------|--------------|
| Web site address | |
| Contact | Colin Buxton |

The Tasmanian Aquaculture and Fisheries Institute (TAFI) was established as a centre of excellence in applied marine research. TAFI supports the development and sustainable management of Tasmania's living marine resources.

TAFI has three main Research Programs:

- Aquaculture,
- Marine Environment, and,
- Wild Fisheries.

Many attempts were made to contact Colin Buxton; however, contact was not made. Technical reports are available from the TAFI website, but there is no link to data products.

7.2.3 Department of Primary Industries, Water and Environment

| | |
|------------------|---|
| Web site address | http://www.dpiwe.tas.gov.au/inter.nsf/ThemeNodes/DREN-4VH86L?open |
| Contact | |

Department of Primary Industries, Water and Environment is responsible for the management of Tasmania's sea fisheries and has a strong focus on education and promoting public awareness. Marine farming, which is also regulated by the Department, has expanded rapidly in Tasmania in the past decade to become one of Tasmania's major industries.

7.3 South Australia

7.3.1 South Australian Research and Development Institute

| | |
|------------------|---|
| Web site address | http://www.sardi.sa.gov.au |
| Contact | Malcolm Knight |

The South Australian Research and Development Institute Aquatic Sciences Strategic Research Area conducts scientific research and development activities on the aquatic resources of South Australia. This research yields knowledge about the status of fish populations, the impact of fishing practices, and aquaculture, and leads to the development of new commercial opportunities.

The data is stored in a system called SARDIP, which is accessible internally only. Metadata is not used as the data is not published. Aggregated information is provided to ABARE and published in annual reports.

7.4 Northern Territory

7.4.1 Department of Primary Industries, Fisheries and Mines

| | |
|------------------|---|
| Web site address | http://www.fisheries.nt.gov.au/ |
| Contact | Rik Buckworth |

The Department of Primary Industries, Fisheries and Mines collects logbook data from NT commercial fisheries. The main data is held in an Oracle database, however historical data has not been captured in modern systems and is likely to be lost. The data is accessible to external users and there are no resources to contribute to national information systems.

7.5 New South Wales

7.5.1 Department of Primary Industries

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|------------------|---|
| Web site address | http://www.fisheries.nsw.gov.au/ |
| Contact | Peter Brown |

From July 2004, NSW Fisheries was incorporated into the NSW Department of Primary Industries. The Department of Primary Industries is responsible for the administration of the *Fisheries Management Act 1994*, which provides a comprehensive framework for the protection of living aquatic resources.

Data collected includes licensing information for wild caught fisheries (both recreational and commercial), permits for aquaculture, habitat and conservation data and seagrasses. The NSW government as a whole is moving towards an Enterprise Data Model, which would standardise regions, codes, metadata, etc and they would like to see all their information in a GIS system. There are no plans to contribute to the Oceans Portal.

7.6 Queensland

7.6.1 Department of Primary Industries and Fisheries

| | |
|------------------|---|
| Web site address | http://chrisweb.dpi.qld.gov.au/chris/ |
| Contact | Malcolm Dunning |

The Coastal Habitat Resources Information System (CHRIS) is a resource centre for Queensland coastal fish habitat, fisheries resources and environmental datasets (layers) developed by the Department of Primary Industries and Fisheries and other agencies. The integration of these layers in CHRIS facilitates monitoring of the condition and trend of coastal fisheries habitats.

Types of data collected include long-term assessment and monitoring of commercial fisheries, log books and recreational fishing surveys.

There are issues with accessing archived data that are in formats no longer used by today's systems. They feel that the only way to attract the resources to manage data in the long term is if there is a need for the data to be maintained. Also, a cultural change is required, especially at the researcher level where the data is initially collected so that the need for rigorous data management is appreciated.

7.7 Victoria

7.7.1 Department of Primary Industries

| | |
|------------------|---|
| Web site address | http://www.dpi.vic.gov.au/ |
| Contact | Leanne Gunthorpe |

Types of data collected include recreational fishing, commercial fishing and aquaculture, stock assessment, fish habitat, and monitoring information. Data is collected for clients such as AFMA, private industry, EPA and other Victorian departments. DPI usually shares IP

arrangements with clients. For long-term projects, there are dedicated groups for managing the data collected (e.g. AFMA data). In many cases the client controls access to the data.

7.8 Western Australia

7.8.1 Department of Fisheries

| | |
|------------------|---|
| Web site address | http://www.fish.wa.gov.au/index.php |
| Contact | Rick Fletcher |

The Department of Fisheries, Western Australia is responsible for the sustainable development of the State's fisheries. The Department holds data on licences, catch and effort, log books, capture of protected species, recreational fishing surveys, biological information for key indicator species and others. These datasets are separate and there is no documentation system in place. The Department has identified an internal need to establish a metadata system and to integrate the disparate datasets into one system.

Annual State of Fisheries Reports summarise the data collected and raw data is available only by request. There are no plans to contribute to the Oceans Portal because the Department would find it difficult to contribute without systems in place and establishing such systems in order to link to a national initiative is not a priority.

8 PEAK INDUSTRY BODIES

8.1 Australian Seafood Industry Council

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|------------------|---|
| Web site address | http://www.asic.org.au/ |
| Contact | Russ Neal |

The Australian Seafood Industry Council (ASIC) is the peak industry body at the national level representing the commercial fishing, aquaculture and post-harvest seafood industries. ASIC is funded by the State fishing industry councils, which are in turn funded by fishermen in each State. The Council is actively involved through participation in the selection of members to the AFMA Board and membership of fishery Management Advisory Committees which report to AFMA.

ASIC can see the need to better managed FRDC data and use tools such as the magazine, annual report and website to disseminate information to members and workers in the fishing industries.

8.2 RecFish Australia

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|------------------|---|
| Web site address | http://www.recfishoz.com/ |
| Contact | John Harrison |

Recfish Australia is the peak national body for recreational and sport fishing in Australia. As the 'umbrella' group Recfish Australia has as its members the following peak state/territory

organisations:- Amateur Fishermen's Association of Northern Territory (AFANT), New South Wales Advisory Council on Recreational Fishing (NSWACoRF), Recfishwest, (Western Australian Recreational & Sportfishing Council), Sunfish (Queensland Sport & Recreational Fishing Council) Tasmanian Marine Recreational Fishing Council, VRFish (Victorian Recreational Fishing Peak Body). We also have the following national parent organisations as members Australian National Sportfishing Association, Native Fish Australia, Australian Fresh Water Fishermen's Assembly and the WA branch of the Australian Anglers Association. Recreational fishing interests are also represented on several Management Advisory Committees of AFMA.

RecFish does not collect data, however, AUSTAG is a 25 year record of catch and recapture data, managed by the Australian National Sportfishing Association.

8.3 National Aquaculture Council

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|------------------|---|
| Web site address | http://www.australian-aquacultureportal.com/ |
| Contact | Simon Bennison |

The National Aquaculture Council does not collect or manage data. The website contains an Australian Aquaculture Portal, which is a collection of links to relevant Australian and overseas aquaculture websites. It does not provide access to datasets.

9 INTERNATIONAL INFORMATION SYSTEMS

9.1 Secretariat of the Pacific Community, Oceanic Fisheries Programme

| | |
|------------------|---|
| Web site address | http://www.spc.int/OceanFish/ |
| Contact | |

The OFP mission, as drafted by the Fourth Standing Committee on Tuna and Billfish (SCTB) and endorsed by the Twenty-third Regional Technical Meeting on Fisheries, is "to provide member countries with the scientific information and advice necessary to rationally manage fisheries exploiting the region's resources of tuna, billfish and related species".

Statistics and monitoring has been a core activity of the OFP since its inception in 1981. In the early 1980s, the main priority of the OFP was the establishment of a regional catch and effort database based primarily on catch and effort logsheets provided to SPC by member countries and territories. The Oceanic Fisheries Programme (OFP) of the Secretariat of the Pacific Community (SPC) is responsible for compiling regional tuna fisheries data. The main database maintained by the OFP comprises all catch and effort data received and processed by the Statistics Section. Extensive holdings of length frequency data, unloadings data, data from tagging programmes and data collected during observer trips are also maintained

The Tuna Ecology and Biology (TEB) section of the OFP undertakes analyses to understand the biological parameters and the environmental processes that influence the productivity of tuna and billfish populations and that are fundamental for stocks assessment and modelling.

Stock assessment and population modelling continue to be major components of the OFP's work, culminating in scientific advice on the status of the stocks that is provided regularly at both national and regional levels.

9.2 Census of Marine Life

| | |
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| Web site address | http://www.coml.org/ |
| Contact | |

The Census of Marine Life is a growing global network of researchers in more than 70 nations engaged in a ten-year initiative to assess and explain the diversity, distribution, and abundance of marine life in the oceans -- past, present, and future.

9.2.1 Ocean Biogeographic Information System

| | |
|------------------|---|
| Web site address | http://www.iobis.org |
| Contact | |

OBIS is a project of the Census of Marine Life. OBIS is a web-based provider of global geo-referenced information on marine species. It is an open-ended, international, coordinated information system set up to advance technical and scientific efforts to develop a global information facility for digitized marine biodiversity data. There are 10 Regional OBIS Nodes with the purpose to create a network in partnership with the International OBIS portal to promote the sharing and use of the world's marine biodiversity data. The Australian OBIS node is hosted by NOO and CSIRO Marine and Atmospheric Research.

9.3 Global Biodiversity Information Facility (GBIF)

| | |
|------------------|---|
| Web site address | http://www.gbif.org/ |
| Contact | |

The Global Biodiversity Information Facility (GBIF) is an international organisation that is working to make the world's biodiversity data accessible anywhere in the world.

GBIF's members include countries and international organisations who have signed a Memorandum of Understanding that they will share biodiversity data and contribute to the development of increasingly effective mechanisms for making those data available via the Internet.

The Antarctic Data Centre, FishBase and the Australian Biodiversity Information System make data available to GBIF.

9.4 FishBase

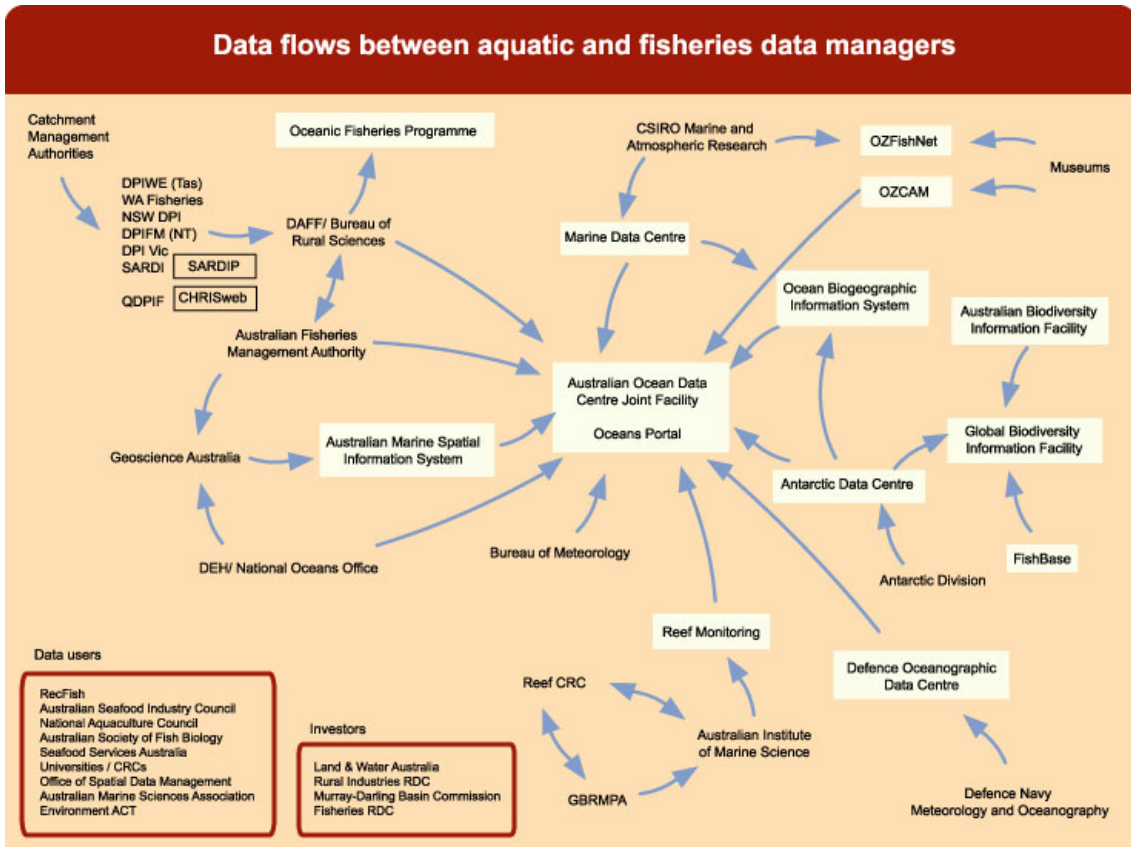
| | |
|------------------|---|
| Web site address | http://www.fishbase.org/home.htm |
| Contact | |

FishBase is a global information system on fishes. It is a relational database with information for research scientists, fisheries managers, and zoologists. The database contains nearly all fish species known. FishBase was developed at the WorldFish Center in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and many other partners, and with support from the European Commission (EC). Since 2001 FishBase is supported by a consortium of seven research institutions, including FRDC. FishBase contributes data on fish to the Global Biodiversity Information System.

10 DATA AND INFORMATION MANAGEMENT OPTIONS FOR FRDC

The organisations and information systems discussed in the above sections are linked together in a network of data flows (Figure1).

Figure 1: The key aquatic, marine and fisheries players and the data flows between them



At the time of writing, the AODCJF is clearly leading the way in terms of marine and fisheries data management and establishing the infrastructure for the marine science community to use and contribute to its development. The proposed future of the AODCJF and Oceans Portal is that they will become more decentralised over time as partner agencies develop their own portals. The common link between the data centres and agencies will be the Marine Data Catalogue and the infrastructure such as web services, standards, software that has been developed and shared between agencies within the AODCJF.

A possible way forward for FRDC is to seek agreement with the AODCJF Governing Board to establish a relationship for hosting FRDC-funded data. The AODCJF is considering making a data hosting service available to universities. The same arrangement could be made with FRDC research providers if agreed at the contract initiation / negotiation stage. This arrangement would suit smaller organisations, consultants or agencies without the organisational capacity to manage data.

Those research providers that do not agree to contribute project data to the AODCJF would have the option of making the data available using their own infrastructure, provided they meet certain standards and registered the data on the Marine Catalogue.

The agreement with AODCJF would include a schedule matching FRDC research themes / data types with data centres willing to host that type of information. This could be a high level

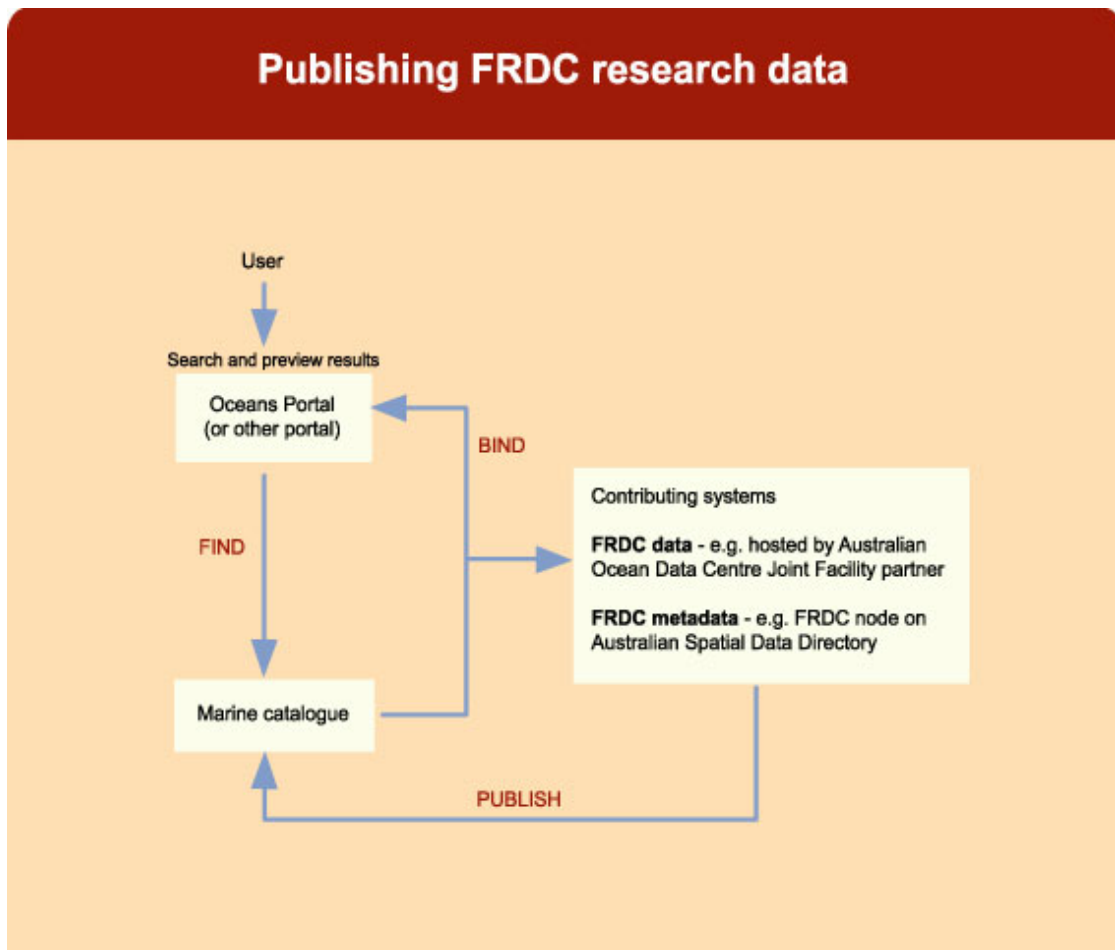
agreement that would be referred to at the contract negotiation stage of FRDC data gathering projects.

The schedule may resemble the following (without detailed discussions with agencies mentioned):

| AODCJF partner | Data themes | Data Centre |
|--|---|--|
| CSIRO Marine and Atmospheric Research | Oceanography, catch, biological | Marine Data Centre |
| Defence Navy | Sea Surface temperature, sediment type, bioluminescence, turbidity, noise | Defence Oceanographic Data Centre |
| Antarctic Division | Marine, biology, oceanography, fisheries | Antarctic Data Centre |
| Geoscience Australia | Marine boundaries | Australian Marine Spatial Information System |
| Australian Institute of Marine Science | Oceanography | Reef Monitoring Information System |
| Bureau of Meteorology | Atmospheric and oceanography | Distributed Oceanographic Data Centre / Bluelink |
| National Oceans Office and CSIRO Marine and Atmospheric Research | Biodiversity | Ocean Biogeographic Information System |

Figure 2 illustrates how a user can search the Oceans Portal and retrieve data and information from any of the contributing systems, including FRDC-funded data that has been hosted by an AODCJF partner. Metadata collected from FRDC projects will be available on a node of the Australian Spatial Data Directory.

Figure 2: How FRDC could make its research data available using the AODCJF and Oceans Portal networks



10.1 Risks

FRDC wants to know that the adopted data management strategy will be viable in the long term and be accessible to the greatest number of partners. The following risks have been identified, along with a discussion on possible mitigation measures.

Data Centres in the network go offline

Over time, the various information centres and web portals that are a part of the developing network may cease to function or be maintained. There is little risk to the viability of the rest of the network, and in particular to FRDC, if this happens. The underlying infrastructure (i.e. the marine catalogue) is the hub of the network, and since the system is distributed, the parts do not rely on each other to make data available.

The Oceans Portal is pulled down

If the National Oceans Office discontinues support of the Oceans Portal, this should not affect FRDC because the Oceans Portal is only one of many ways to access the information stored in the Marine Catalogue. FRDC would continue using its partner agencies as data hosts or could develop its own portal as a way to provide access to the data.

The Marine Catalogue is discontinued

The Marine Catalogue is a registry of data services available from potential service providers and is the mechanism by which national marine spatial data service providers can link to each other, access and integrate their data. It will require long-term hosting and regular enhancement. If this service is no longer available, the situation reverts back to the current one, where FRDC would be responsible for finding a way to make its research data accessible. Alternatives include using other data and information centres as data hosts.

States and territories are not actively engaged

The Commonwealth partners of the AODCJF have made a commitment to make the Oceans Portal initiative accessible and useful to the States; however, the States will not be required to participate. Some States do not have the capacity to contribute in the near future and this could be an opportunity for FRDC to be involved in enhancing data management practices in these States.