National Atlas of Marine Fishing and Coastal Communities

Final Report to DEH and FRDC

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Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

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Bureau of Rural Sciences, January 2007

The Marine Division of the Department of the Environment and Heritage undertakes programs and advises on marine species conservation, marine protected areas, regional marine planning, national integrated oceans management, marine science research and the promotion and development of Australia's international oceans environmental objectives.

The Fisheries Research and Development Corporation plans, invests in and manages fisheries research and development throughout Australia. It is a statutory authority within the portfolio of the federal Minister for Agriculture, Fisheries and Forestry, jointly funded by the Australian Government and the fishing industry.

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OBJECTIVES:

- Develop a strategy for the management of national fisheries data. The strategy will focus on partnership arrangements and agreements with custodian agencies, scheduled data maintenance and updating and systems of data distribution. The strategy will refer to marine and estuarine commercial fishing and aquaculture specifically but will also consider recreational and Indigenous fishing.
- Undertake a one off national fisheries data collection, within the context of the National Fisheries Data Strategy development. These data will focus on catch, effort, method, location and port of landing collected from logbooks and fishery returns.
- Derive social, demographic and economic profiles of coastal communities from existing data (1991, 1996 and 2001 ABS census data; BRS, AFMA and ABARE data; State and Local Government and other data sources such as consultants reports etc.)
- Relate mapped fisheries resource usage to coastal communities.
- Develop a strategy for collection and collation of social data on an ongoing basis for future resource management use.

Non-technical Summary

Outcomes:
A National Fisheries Data Strategy was developed by the Fisheries Statistics Working Group, and is under consideration by the Australian Fisheries Management Forum. The strategy has renewed the focus of fisheries directors and managers on the fundamental value of good data and information. The strategy has also prompted development of a business case for an Australian Fisheries Information System.

A National collection of fisheries data has been compiled and been used to generate maps and analyses that form the first complete picture of where fishing occurs around Australia and the value of that fishing. To date, the results have resulted in very tangible benefits to the fishing industry and to governments in marine planning, Marine Protected Area development and assessment as well as contributing to a number of other research areas.

Detailed socio-economic and demographic profiles for eight marine regions around Australia provide marine resource decision makers with a better and deeper understanding of the social climate in the adjacent coastal communities. Fishing related employment within coastal communities and "community resilience" are key facts that have been used in MPA planning processes and in assessing the socioeconomic consequences of MPAs. The project's results give governments (at all levels) and planners a much better understanding of the dependence of coastal communities on fishing.

Need

In recent years, there has been an increasing focus on spatial management as a tool for ensuring sustainable utilisation of the marine environment and marine resources. In practice, for fisheries, spatial management refers to limiting the areas in which fishing may occur. In Australia at the present time, the primary reasons for using spatial management relate to biodiversity conservation (e.g. Marine Protected Areas - MPA) and fisheries management (e.g. allocation, effort control, bycatch mitigation).

Spatial management has the potential to alter access rights for Australia's marine industry sectors. It is therefore important that any spatial management planning commences and proceeds from a position of full knowledge of both the current status and potential impacts of changes on users through time, to ensure that the interests of fisheries are appropriately understood and represented. Similarly, understanding the socio-economic characteristics of coastal communities and their degree of dependence on fisheries is important.

Results

The results of the National Atlas of Marine Fishing and Coastal Communities are contained in an online system at www.brs.gov.au/fishcoast and in the publication *Marine Matters National*. The Atlas focuses on mapping and analysis of Australian wild capture commercial, recreational and Indigenous fisheries and their adjacent coastal communities. It is the first Australia-wide, comprehensive and authoritative mapping of fishing activities and their related coastal communities and provides decision makers with a credible scientific resource for informing current and future marine and coastal planning initiatives.

The *Marine Matters National* publication provides a summary of the collected data and analysis. It contains 24 presentations, each comprising of a map showing the extent and intensity of fishing operations, usually a text description, comments and analysis, as well as a graph of total wild-catch and GVP over recent years. The publication is organised as follows:

- Map 1 portrays water depths and marine regions around Australia.
- Maps 2–6 summarise and map catches of commercial, recreational and Indigenous sectors, as well as an overview of the aquaculture sector.
- Maps 7–11 show the commercial wild-catch of a selection of species.
- Maps 12–16 show the commercial wild-catch by a range of fishing methods.
- Maps 17–24 focus on each of the marine regions around Australia.

The online system provides information in the form of regional assessments, reports, maps and information on commercial species/families. Users can view reports, regional summaries and pre-prepared maps. Users can also make their own maps containing commercial fishing and coastal community themes by using the Mapper. There is also a facility to find and map commercial catch of particular species or groups of commercial fish.

A selection of results from the Atlas:

- Wild-capture fisheries GVP hotspots within a half-degree area (2000-02) were:
  - Central Great Australian Bight (up to $44m/year/half degree cell) associated with the southern bluefin tuna (*Thunnus maccoyii*) fishery.
  - Western Australian west coast (up to $38m/year/half degree cell) associated with the rock lobster (*Panulirus cygnus*) fishery.
  - South-western Tasmania (up to $20m/year/half degree cell) associated with the abalone (Haliotidae) fishery.
  - Prawn (Penaeidae) fisheries of the South Australian gulfs, along the eastern seaboard, Torres Straits and the Gulf of Carpentaria (up to $20m/year/half degree cell)
- Across coastal Australia, in 2001, there were some 14,500 persons employed in the consolidated fish industry (wild-catch, aquaculture, wholesaling and processing). The highest employment by total numbers being in the South Eastern, Eastern Central and South Western Marine Regions. The highest employment as a percentage of total employment was in the North Western Region and on Norfolk Island.
- Aquaculture employment hotspots with greater than three percent employment in the aquaculture sector (2001) were in south-eastern Tasmania (Tasman, Sorell and Huon Valley) and in South Australia (Ceduna, Lower Eyre Peninsula, Port Lincoln and Franklin Harbor).
- Recreational fishing hotspots (2000-01, National Recreational and Indigenous Fishing Survey) are centered very close to the southern capitals of Perth, Adelaide and Melbourne and along the Australian south-eastern seaboard. Together these areas account for well over half the non-bait recreational surveyed catch of fish by numbers.

Conclusions and Outcomes

A draft National Fisheries Data Strategy was developed through a strategy development group and the Fisheries Statistics Working Group, and given in-principle approval by the Australian Fisheries Management Forum. In late 2006 there were two meetings of the Fisheries Statistics Working Group that resulted in a complete rewrite of the strategy reflecting the desires of the group. The strategy was passed on to the

Australian Fisheries Managers Forum who endorsed it in February 2007. The strategy gives fisheries directors and managers an opportunity to understand the current issues with fisheries data nationally, agree on some aspirational objectives and select some of the recommendations to implement that will give the greatest benefit for cost. The focus is now on implementation of elements within the strategy. The recommendations include development of standards and guidelines, national reporting requirements and mechanisms for information sharing and delivery (including online systems).

A National collection of fisheries data has been compiled that comprises some 750 fish taxa (species a higher groups), across seven fishing method classes, spanning three complete years (more for some jurisdictions) from eight jurisdictions (six states, Northern Territory and Australian Government) at a half-degree scale. These data have been used to generate maps for online and hardcopy publication and form one component of the online interactive mapping system. They form the first complete picture of where fishing occurs around Australia and the value of that fishing. To date, the results have been used in marine planning, Marine Protected Area planning and assessment as well as contributing to a number of other research areas.

Detailed socio-economic and demographic profiles have been developed for eight marine regions around Australia. Each profile provides a summary and detailed analysis in the themes of Population and Demography, Households, Income and Education, Labour Force and Employment and Commercial Fishing Employment and Value. These socio-economic data have been used to generate maps for online and hardcopy publication and form a component of the online interactive mapping system. The social profiles provide marine resource decision makers with a better and deeper understanding of the social climate in the adjacent coastal communities.

Fisheries resource usage was related to coastal communities mainly through the socio-economic and demographic profiling. Privacy legislation and confidentiality requirements prevented direct linking of catches to port of landing in most jurisdictions. Unless a very specific and sufficiently urgent need exists, it is likely that some jurisdictions would be unable to provide this sort of information in future. A potential specific need could be for assessment of candidate MPAs. Notwithstanding, the project's results give governments and planners a much better understanding of the dependence of coastal communities on fishing. The results show the important interrelationship between fishing resource dependency and familiar socio-economic indicators of resilience such as unemployment, age and population growth.

The current state of social data collection and collation from a strategic perspective is discussed, particularly with respect to the fisheries sector. The themes of existing opportunities to collect data, improved collation of existing data and greater co-ordination of social data are discussed.

KEYWORDS: Coastal communities, fisheries catch data, national, recreational, social, social data, strategy.

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Background

Australia's Oceans Policy, launched in 1998, is a whole-of government initiative aimed at achieving integrated, multiple-use management of Australia's EEZ and protecting Australia's marine ecosystems from the cumulative impacts of human activities. These objectives will be addressed through the development of Regional Marine Plans (RMPs) across sections of Australia's ocean territory. The development of these plans is the responsibility of the Marine Division of the Department of the Environment and Heritage.

The South East Regional Marine Plan was the first plan developed under Australia's Oceans Policy, and was released on 21 May 2004. Plans are currently under development for the four remaining regions of Australia's marine jurisdiction. In the southeast, the RMP process commenced with a comprehensive review of the many industrial, recreational, scientific, defence and heritage activities in the Region and by compiling other types of information such as biophysical and social data. Exhaustive, qualitative descriptions of sectoral interests in the Region were supplemented by detailed quantitative spatial datasets and maps produced by BRS and published in *Marine Matters – an atlas of marine activities and coastal communities in Australia's South East Marine Region*.

The information, statistics and maps presented in Marine Matters proved enormously informative to a broad audience of stakeholders and the general public. It showed for the first time the range and distribution of different human uses of the South East Region, and highlighted the focal areas where sectoral activities overlap – as occurs, for example, on the Gippsland Shelf, where the petroleum, shipping, tourism and fishing industries make heavy use of the area. It also identified those coastal communities that depend most heavily on commercial fishing, and explored the implications of changing resource access to those communities most likely to be affected by regional marine planning.

Apart from its value to the Marine Division of the Department of the Environment and Heritage, and to all sectors with a stake in regional marine planning, the Atlas has been used for:

- The Ecologically Sustainable Development (ESD) reporting and assessment processes for fisheries.
- Maritime safety and collision avoidance (Australian Maritime Safety Authority).
- Marine mammal niche overlap studies fur seals and sea lions (La Trobe University, CSIRO).
- Blue whale breeding ground overlap (Deakin University).
- Fisheries policy (Agriculture Fisheries and Forestry Australia).
- Bycatch action plans (Australian Fisheries Management Authority).
- Community/Resource relationships (BRS).
- Fish community bioregionalisation (BRS).
- Analyses of vector pathways for marine pest control (AFFA).
- Training MBA students at the Australian Maritime College – Tasmania.

It was recognised both during and following the production of Marine Matters that this kind of information is necessary for the development of all future RMPs and that there is great benefit, as well as economies of scale, in compiling these datasets for the whole of Australia's EEZ, rather than progressing in a piecemeal fashion. This formed the rationale for producing the *National Atlas of Marine Fishing and Coastal Communities*.

Need

Marine Protected Areas and Marine Planning

The development of regional marine plans across Australia and the concurrent rollout of the Commonwealth National System of Representative Marine Protected Areas, requires detailed quantitative information on the nature and extent of marine activities. Regional marine planning has the potential to alter access rights for Australia's marine industry sectors. It is therefore vital that these planning processes commence and proceed from a position of full knowledge of both the current status and potential impacts of changes in uses through time, to ensure that the interests of marine users are appropriately represented in the planning process. Similarly, understanding the socio-economic characteristics of coastal communities and their degree of dependence on marine resources is vital in helping to identify the potential impacts of proposed changes to management arrangements, and in developing strategies to account for the social component of ESD. This project has sought to provide some of the data and knowledge necessary to assist in defining planning issues and developing appropriate management responses, through the provision of key indicators of social "hotspots" in relation to marine management.

Integrated Management

A guiding principle of ecologically sustainable development (ESD) is that 'decision making processes should effectively integrate both long-term and short-term economic, environmental, social and equity considerations' (National Strategy for ESD, 1992). The project's results provide a simple, yet powerful, method of linking of marine resource use with local and regional economies and communities.

Policy and Planning

Planners can examine a stretch of ocean using the Atlas data sets, and gauge its importance to the fishing industry along with its importance to local communities. This will help identify communities particularly sensitive to changing patterns in resource use and resource access - essential information if our coastal and marine planners are to get their decision making right.

Baseline Fisheries Data Sets

Detailed data on fishing catch and effort across Australia's oceans has not been systematically assembled. The task of assembling seamless catch records for species or methods presents a persistent difficulty to the fundamental fish 'unit stock' approach to the assessment of commercial species. The lack of these data is also an impediment to a more ecosystem based approach to the management of Australia's marine resources in general. As well as developing national, spatial fisheries datasets the project has sought to develop a long-term National Fisheries Data Strategy, to improve data quality and the ability to share data.

FRDC and DEH Work Programs

The project addresses a number of specific needs, as expressed in the FRDC research and development plan:

- Effects of fishing activities on fish and their ecosystems (Program 1, Strategy 3) - information on the spatial distribution and intensity of catch of species and effort is fundamental to assessing the effects of fishing on the environment. It is also very useful in assessment of individual stocks.

- Access to fisheries resources (Program 1, Strategy 8) - the distribution and value of fishing, as well as the potential social and economic impacts, is a vital consideration in multiple use planning (e.g. Marine Protected Areas).
- Fisheries and ecosystems management (Program 1, Strategy 10) - the projects results make a significant contribution to ecosystem based and multiple-use planning under the Regional Marine Planning process.
- Economic and social values of the industry and its impacts (Program 2, Strategy 2) - the proposal specifically aimed to investigate socio-economic aspects of fisheries and connect these to marine resources. This may also assist in fulfilling ESD requirements.
- Community education (Program 3, Strategy 4) - the two major outputs (hard copy Atlas and online mapping application) are widely available and comprise a valuable information resource for all interested parties.

Objectives

1. Develop a strategy for the management of national fisheries data. The strategy will focus on partnership arrangements and agreements with custodian agencies, scheduled data maintenance and updating and systems of data distribution. The strategy will refer to marine and estuarine commercial fishing and aquaculture specifically but will also consider recreational and Indigenous fishing.

2. Undertake a one off national fisheries data collection, within the context of the National Fisheries Data Strategy development. These data will focus on catch, effort, method, location and port of landing collected from logbooks and fishery returns.

3. Derive social, demographic and economic profiles of coastal communities from existing data (1991, 1996 and 2001 ABS census data; BRS, AFMA and ABARE data; State and Local Government and other data sources such as consultants reports etc.)

4. Relate mapped fisheries resource usage to coastal communities.

5. Develop a strategy for collection and collation of social data on an ongoing basis for future resource management use.

Methods

The essential methods are described here with additional material available in the appendices and online (www.brs.gov.au/fishcoast).

National Fisheries Data Collection and Processing

Fisheries agencies in each of the States, Northern Territory and the Commonwealth collect information from commercial fishers in the form of logbooks or catch returns. Basic information usually includes some measure of the amount of fishing effort, the species composition of the catch and where the fishing took place. These records contributed by each jurisdiction were the foundation of the National database described here.

Scope

Each jurisdiction contributed data that addressed the following questions:

How much **catch** was taken?
Where was the **catch** taken?
What **species** were taken?
What **gear** was used?
In what **year**.

Specifically, the Atlas standards for data provision from each jurisdiction were for all marine and estuarine commercial fisheries as follows:

class variables
- LOCATION (to the best resolution available for mapping purposes)
- METHOD (fishing method as per agreed classes)
- YEAR (the years 1996 to 2003)
- TAXA (common name, species, Code for Australian Aquatic Biota)

variates
- VESSELS (count)
- CATCH (kg, unprocessed weight)
- GVP (Gross Value of Product in A$)

Location and Spatial Processing

A wide range of spatial systems are used throughout Australia to report commercial fishing activity.

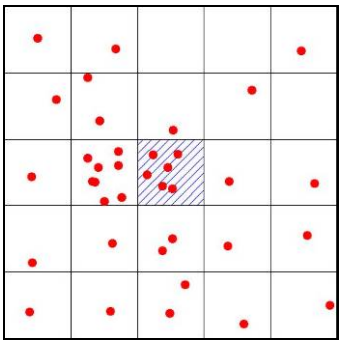
Spatial reporting falls into one of three classes:

1. Actual position of a fishing operation reported as a latitude longitude point.
2. Actual position of a fishing operation reported as a line made up of a start and a finish position.
3. Grid position reporting that refers to an area of ocean (e.g. a quarter-degree cell, or a segment of coastline).

The different spatial reporting systems were summarised or transposed onto a single half-degree (30-minute) spatial reporting system. This spatial scale was a compromise between some data that are reported at quite fine scale (eg individual operation position for Commonwealth fisheries) and other data that are reported at coarser scales (e.g. one-degree for NT and WA fisheries). The methods used depended on the class of spatial reporting and are elaborated below.

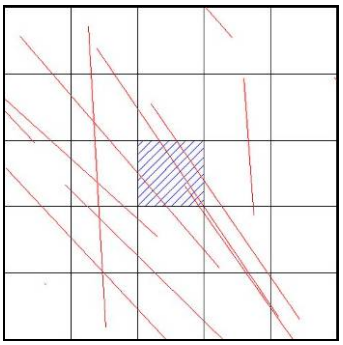
Spatial Processing Techniques:

1. *Reported as a latitude longitude point.*



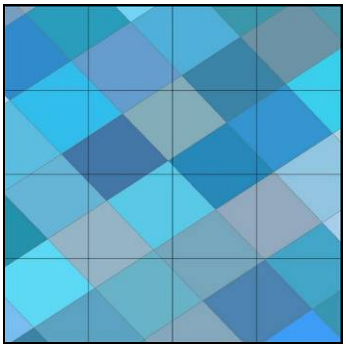
- Fishing operations are represented as points on the earth's surface.
- The half-degree square grid is overlaid.
- Catch and GVP are summed within each grid cell.
- Example: Commonwealth Northern Prawn Fishery.

2. Reported as a line made up of a start and a finish position.



- The positioning, or track, of a gear is approximated by a straight line between start and finish positions.
- Lines are dissected at the intersection of the half-degree grid to create numerous smaller line segments that lie fully within a grid cell.
- Catch and GVP are apportioned to segments using: *segment length/total length x quantity*.
- Segment statistics are summed for each cell.
- Examples: Most Commonwealth fisheries, including pelagic longline, trawl and gillnet fisheries.

3. Grid position reporting.



- Fishing operations are reported on a regular grid (such as quarter- or half-degree), or in some cases on an irregular spatial framework unique to a fishery or jurisdiction.
- This native reporting system is overlaid onto the common half-degree grid. Cells and statistics are assigned from the reported grid to the common half-degree grid using a demographic approach.
- Catch and GVP are assigned proportionally from the old framework to the new, based on the areas of intersection between the two: segment area/total area x quantity.
- Examples: All State/Territory managed fisheries.

Fishing Methods

Depending on the classification scheme used, there are potentially hundreds of different fishing methods in use around Australia. For simplicity the Atlas used a simple scheme of seven fishing method classes based on a scheme developed by the United Nations Food and Agriculture Organisation (FAO 2005). Membership of the fishing classes is outlined in Table 1, with additional information from each jurisdiction available online.

Table 1 National Atlas fishing method classes, with associated gears from the FAO International Standard Statistical Classification of Fishing Gear. Adapted from FAO (2005) *United Nations Atlas of the Oceans.* URL http://www.oceansatlas.org, October 2005.

Hook and Line	Handlines and pole-lines (hand operated) Handlines and pole-lines (mechanised) Set longlines Drifting (pelagic) longlines Longlines (not specified) Trolling lines Pole and lines Vertical (drop) lines Hooks and lines (not specified)
Net	
SURROUNDING NETS	Purse seines Lampara Ring nets
SEINE NETS	Beach seines Other seines Seine nets not specified
LIFT NETS	Portable hand lift nets Boat-operated lift nets Shore-operated stationary lift nets Lift nets not specified
FALLING GEARS	Cast nets Cover pots Falling gears not specified
GILLNETS AND ENTANGLING NETS	Set gillnets Driftnets Encircling gillnets Fixed gillnets (on stakes) Trammel nets Combined gillnets-trammel nets Gillnets and entangling nets not specified
OTHER NETS	Push nets Scoop nets
Trap	Pots Fyke nets Stow nets Stationary uncovered pound nets Barriers, fences, weirs, corrals etc Aerial traps Traps (not specified)
Trawl	Bottom trawls (fish and prawn) Midwater trawls Otter twin trawls Pair trawls Other trawls
Dive/Hand	Dive Harpoons Clamps Rakes Tongs Spears Wrenching gears Hand pump
Dredge	Boat dredges
Other	Not elsewhere specified or unknown

Year

The range of years provided by jurisdictions was variable, with complete overlap for the three years 2000-02 only. Consequently these years were used throughout the Atlas.

Taxonomy

The assignment of a reliable taxonomic classification to fisheries catches can be quite problematic. In logbooks and fisheries databases, catches may be identified to species, genus, family or higher level taxons, or in some cases to artificial "bucket" taxa that include several species reported under a single name or code for the purpose of convenience. This is the case with, for example, "king prawns" that includes the species *Melicertus latisulcatus, M. plebejus* and *M. longistylus*. The Atlas uses the taxonomy described by the CSIRO Codes for Australian Aquatic Biota (CAAB). As far as possible, all taxa at all levels were assigned a CAAB code and these assignments are detailed, by jurisdiction, online. In cases where the species is uncertain then it was assigned to a genus, family or higher taxonomic level, or to a miscellaneous fishes category.

The scientific names were sourced from CAAB and the common names were sourced from the Standard Fish Names in Australia in the first instance and then from CAAB.

Vessels and Confidentiality

The number of vessels participating within combinations of Location, Method, Year and Taxa were tallied, usually based on vessel code information within the jurisdictions databases. The boat counts can be useful to gauge participation levels but are primarily used to assess confidentiality against the "five boat rule".
Most fisheries management jurisdictions are required to maintain confidentiality of logbook and other data. In practice this is achieved by not reporting statistics where less than five fishing vessels are represented. In cases where less than five vessels are represented in a reporting cell, that cells is tagged to indicate confidentiality and no quantity is indicated.

Catch

Catch was reported in kilograms of whole, unprocessed, weight.

Gross Value of Production (GVP)

GVP is defined as the assessed value at the point of landing for the quantity produced and excludes transport and marketing costs. Statistics on the mean market value of major fished species are collected annually by each State/Territory in the case of their fisheries, and by the Australian Bureau of Agricultural and Resource Economics (ABARE) in the case of the Commonwealth. The mean market value of a species is used to convert the catch of that species, at a particular location and year, into a value.

Data Structure

Data were structured within a relatively simple, flat table following the format adopted by Queensland's Coastal Habitat Resources Information System (CHRIS[1]). Catch and GVP are summarized against combinations of the categorical variables LOCATION, METHOD, YEAR and TAXA. In addition, contained within the tables structure are "summary records" that sum all members of the METHOD and SPECIES classes into super classes ("all methods" and "all species"). The summary records thus give total catch of a species for all methods, total catch of a method for all species and total catch for all species and all methods. The data structure is exemplified in Table 2 . The

[1] http://chrisweb.dpi.qld.gov.au/CHRIS/

summary records tend to have significantly larger vessel counts and are less prone to confidentiality issues. Furthermore, the summary records are a means of facilitating fast and simple retrieval of detailed or summarised data during queries and online mapping. It should be noted that it is not possible to simply sum a variate field, such as catch, without multiple counting of catches because of the summary records. Simple filtering is required to undertake such summaries.

Table 2 Illustration of the flat table data structure, including summary records, used by the Atlas.

YEAR	AREA	METHOD	TAXA
2000	A	Net	Species 1
2000	A	Net	Species 2
2000	A	Line	Species 1
2000	B	Net	Species 1
2000	B	Net	Species 4
2000	B	Line	Species 2
2000	B	Line	Species 3
2000	A	Net	All species
2000	A	Line	All species
2000	A	All methods	Species 1
2000	A	All methods	Species 2
2000	A	All methods	All species
2000	B	Net	All species
2000	B	Line	All species
2000	B	All methods	Species 1
2000	B	All methods	Species 2
2000	B	All methods	Species 3
2000	B	All methods	Species 4
2000	B	All methods	All species

National Fisheries Data Strategy Methods

The mission statement for the National Fisheries Data Strategy was, *"To provide efficient and effective collection, management, utilization and sharing of data for Australia's fisheries".*

The National Fisheries Data Strategy aims to improve the collection, management and sharing of fisheries data for the following uses:

- Effective management of fisheries and other marine resources.
- Catch and rights allocations.
- Assessment of fisheries.
- Compliance and quota management.
- Statutory reporting.
- Obligations under environmental legislation.
- Regional obligations.
- Communication between groups.

A National Fisheries Data Strategy was developed by a strategy development group, the Fisheries Statistics Working Group and a workshop in October 2003.

Social Science Data Sources and Methods

The aim of the social science analysis was to derive social, demographic and economic profiles of coastal communities and related fisheries resource usage to communities.

Topics and Variable Selection

The key socio-economic variables depicted in each Marine Region profile were decided in consultation with key clients and stakeholders (Marine Division of the Department of the Environment and Heritage, Fisheries Research and Development Corporation (FRDC)). The variables provide a wide range of demographic, social and economic information that characterise the population of each Marine Region. The variables were categorised into four broad sections:

- Population and demography;
- Households, Income and Education;
- Labour force and employment;
- Commercial fishing – employment and value.

Data sources

Socio-economic statistical data for the *National Atlas of Marine Fisheries and Coastal Communities* were sourced from:

- 1991, 1996 and 2001 *Population and Housing Census* (Australian Bureau of Statistics (ABS)). Censuses were conducted during a non-school holiday period. The Census data used in this project are based on place of enumeration.
- The Department of Family and Community Services (FACS) and Centrelink for government pension recipients during 2001.
- The Australian Bureau of Agriculture and Resource Economics (ABARE) and the Northern Territory Department of Business, Industry and Resource Development (DBIRD).

Data from previous *Population and Housing Censuses* were included for analysing trends in the following variables:

- Annual population growth, 1996-2001;
- Change in median age, 1996-2001;
- Change in the labour force participation rate, 1991-2001;
- Change in the unemployment rate, 1991-2001.

Information on spatial units

The ABS uses a hierarchical model known as the Australian Standard Geographical Classification (ASGC) to collect and present census information. Data presented in Marine Region social profiles are based on the ASGC geography level known as Statistical Local Area (SLA). Additional data are also presented using the Urban Centres/Locality (UC/L) geography, which although devised by the ABS, does not fit within the ASGC hierarchy.

Statistical Local Areas (SLAs)

SLAs are based on the boundaries of incorporated bodies of local government where these exist. These bodies are the Local Government Councils and the geographical areas which they administer are known as Local Government Areas (LGAs).[2]

For those parts of Australia which are not administered by incorporated local government bodies, an SLA is an unincorporated area. Unincorporated SLAs cover the following areas:

- unincorporated on-shore areas(s) and/or off-shore islands(s) in a Statistical Subdivision (SSD);
- Example: Unincorp. Pirie is an unincorporated SLA in the Pirie SSD in South Australia.
- that part of an unincorporated area which is considered of sufficient economic significance as to warrant the formation of a separate SLA;
  Example: Petermann and Tanami in Central NT SSD in the Northern Territory
- Off-Shore and Migratory SLAs, formed for census purposes for all States and Territories except for the Australian Capital Territory and Other Territories to encompass off-shore, shipping, and migratory Collection Districts (CDs)
- The entire area of the ACT. Each SLA is either a suburb, a locality or the non-urban area of an SSD;
- The unincorporated part of the Northern Territory. For the SSD Daly the entire area is covered by one unincorporated SLA. In other SSD's (e.g. East Arnhem), the unincorporated area is split into several SLAs to distinguish an economically significant town (e.g. Nhulunbuy), island (e.g. Groote Eylandt) or administrative region.[3]

The naming conventions for SLAs are as follows:

Ballina (A) - Area
Queenscliffe (B) - Borough
Liverpool (C) - City
Coomalie (CGC) - Community Government Council
Mid Murray (DC) - District Council
Roxby Downs (M) - Municipality
Murray Bridge (RC) - Rural City
Broome (S) - Shire
Roma (T) - Town

An SLA which is part of an LGA may adopt a hyphenated name, the first part of which is the name of the LGA. For example:

The LGA of Stirling (C) in Western Australia is split into three SLA:
Stirling (C) - Central
Stirling (C) - Coastal
Stirling (C) - South-Eastern

If the name includes - Pt A, - Pt B, or - Pt C, this indicates the SLA was formed by splitting an LGA between two or more SSDs. In this case, - Pt A usually denotes the more urban part of the split LGA For example: the LGA of the Municipality of Latrobe in Tasmania is split into two SLA:

[2] Australian Standard Geographical Classification (ASGC), Australian Bureau of Statistics, 2002, page 9
[3] Australian Standard Geographical Classification (ASGC), Australian Bureau of Statistics, 2002, page 10

Latrobe (M) - Pt A
Latrobe (M) - Pt B

Urban Centres/Localities

Urban Centre/Localities (UC/Ls) form defined areas according to population size criteria. In broad terms an Urban Centre is a population cluster of 1,000 or more people, while a Locality is a population cluster of between 200 and 999 people. For statistical purposes, people living in Urban Centres are classified as urban while those in Localities are classified as rural.

UC/Ls are redefined each Population Census on the basis of actual population counts. UC/Ls cover where settlements are of 200 people and so cover only parts of Australia.

Issues associated with Census data

Itinerant populations:
The transient nature of the population in some coastal areas driven by fly-in and fly-out mining-related employment and tourism-based activities might have impacted on the reliability of Census data for profiling purposes. This appears to undermine the ability of Census data to reflect the true socio-economic characteristics of transient populations.

Quality of Indigenous data:

Indigenous data based on Census data are heavily influenced by under-identification and undercounting. Although under-identification appears to be low across remote areas and high in large urban areas, under-counting seems to vary widely across rural and remote Indigenous communities[4].

Fishing employment data:

It is well-documented that Census data on employment in commercial fishing activities (both catch and downstream activities) are likely to understate a large number of unpaid family workers and casual workers engaged in fishing activities during high peak-season times[5]. The limitations of Census data on measuring employment within this sector are also reflected in the degree of underestimation in actual numbers of persons employed due to the timing of the Census in terms of seasonality of activity. Fluctuation in the level of employment in fishing activities is heavily affected by other seasonal factors (e.g. fisheries temporary closures, etc.), which are not captured in the Census collection.

Defining Coastal Australia

Coastal Australia as defined by this study stretches from the Cocos (Keeling) Islands and Christmas Island off Western Australia, to Lord Howe Island in the South Pacific Ocean (Figure 1). The Coastal Australia geography is **not** equivalent to the 'Populated coastal' geography used in *Country Matters: Social Atlas of rural and regional Australia,* BRS, 2004.
For the purpose of this study, the term Coastal Australia, when used to describe a total value, an average or a geographic region, is a reference to the selected SLAs adjoining the Australian coastline (including the remote islands above) based on the 2001 ASGC.

[4] See Martin et al. (2002). *Making sense of the Census: Observations of the 2001 Enumeration in Remote Aboriginal Australia*, Research Monograph No.22. Centre for Aboriginal Economic Policy Research, Canberra.
[5] See Fenton DM and Marshall NA (2001). *A Guide to the fishers of Queensland,* parts A, B and C. CRC Reef Technical Reports 36, 37& 38, and Schirmer J, and Pickworth, J. (2005). *A social assessment of the Marine Scalefish Fishery of South Australia*. Case study report for FRDC Project 2003/056 A, Bureau of Rural Sciences, Canberra.

SLAs along the coastline were included, except those adjoining estuaries or bays in metropolitan areas, for example SLAs surrounding Sydney Harbour, the Swan River in Perth or the Brisbane River. These SLAs were excluded in order to minimise the influence of metropolitan data on Coastal Australia averages. In the South East Marine Region, however, SLAs bordering estuarine systems (Launceston area) and bays (greater Melbourne and greater Hobart) *were included* in order to replicate the analysis of the South East Marine Region undertaken by the BRS in 2001-2002 (*Larcombe, J. et al (2002). Marine Matters – Atlas of marine activities and coastal communities in Australia's South-East Marine Region,* Bureau of Rural Sciences, Canberra).

Within the Coastal Australia classification many SLAs, particularly in remote areas of Western Australia and the Northern Territory, extend far inland (Figure 1). Clearly not all communities in these SLAs could be defined as coastal, however, after consultation with the key stakeholders it was determined to include these SLAs and to maintain a consistent approach in defining Coastal Australia across all States/Territories. Moreover, many of the coastal segments in these SLAs had been identified as important recreational fishing areas.

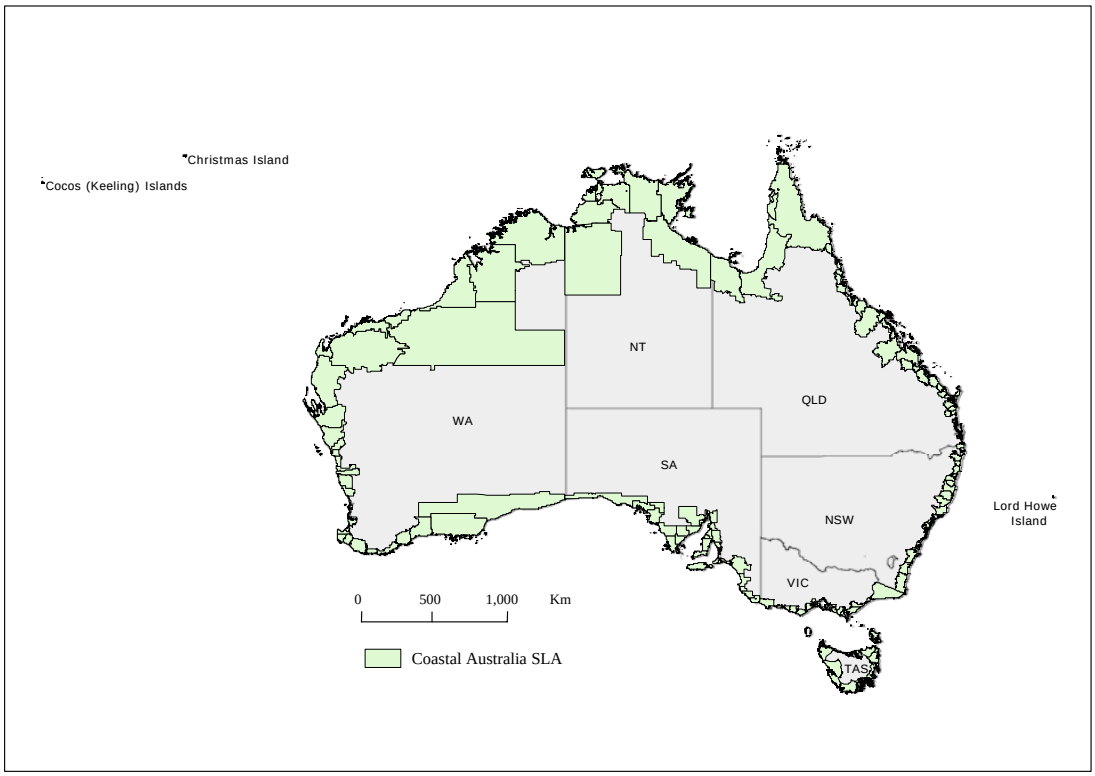


Figure 1 Extent of Coastal Australia (Statistical Local Areas) 2001.

Defining Marine Regions

The geographic extent and number of SLAs within boundaries of each Marine Region vary based on the intersection of Marine Regions (as in the 1998 *Australia's Oceans Policy*) and the SLAs representing Australia's coastline based on the 2001 ASGC.

Nevertheless, Large Marine Domain boundaries do not align precisely with SLA or State/Territory boundaries and in many cases where they intersect the coastline the impacted SLA is divided in two (Figure 2). In such instances the divided SLA has been assigned to one Marine Region. The only exception to this rule was the SLA of Cook (S) (excl. Weipa) in Far North Queensland, which was included in the analysis and social profiles of the Northern Carpentaria Marine Region and the North Eastern Marine Region because it occupies a significant portion of coastline in both regions.

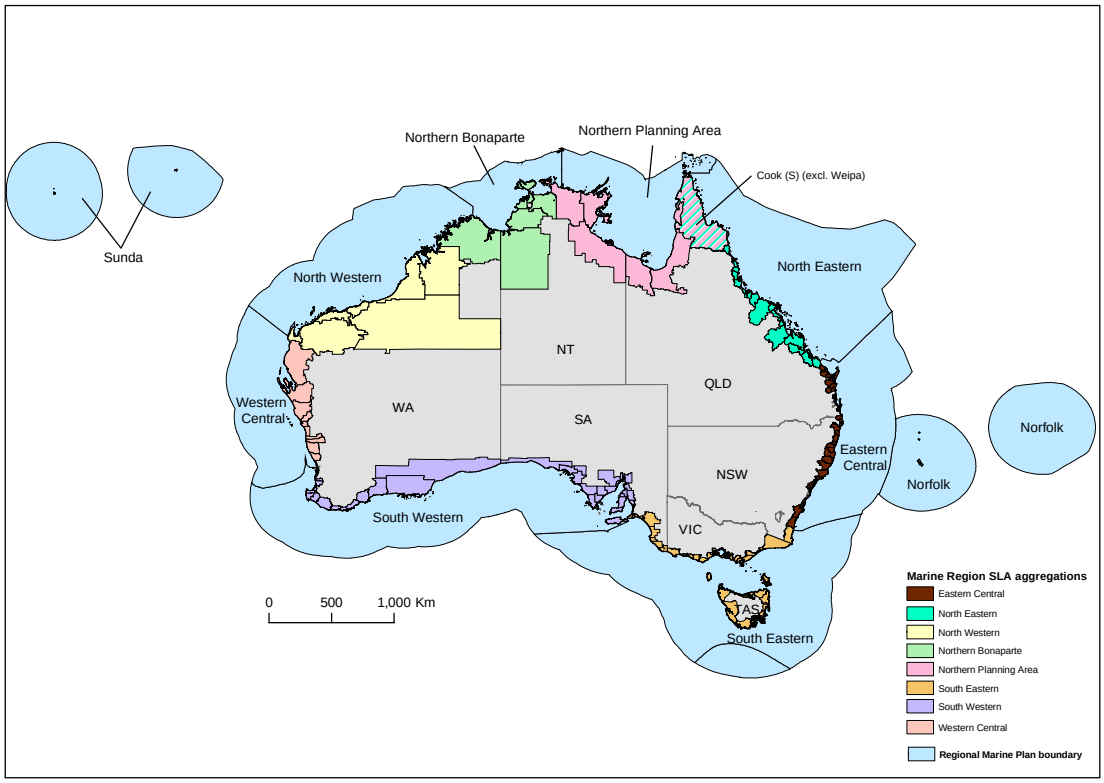


Figure 2 Distribution of SLAs within Large Marine Domain boundaries.

Figure 2 also highlights that Regional Marine Plan boundaries in the northern Australia coastal strip do not correspond fully with geographic land boundaries (SLAs) used for statistical collection purposes by the Australian Bureau of Statistics, thus some adjustments have been necessary to match the two. These adjustments have been based on demographic considerations and other relevant boundaries. For example, the West Arnhem SLA straddles both the Northern Carpentaria Marine Region and the Northern Bonaparte Marine Region. The West Arnhem SLA has been included in the Northern Carpentaria Marine Region because two thirds of the West Arnhem SLA and Maningrida, the largest coastal town in this SLA, lay within this Marine Region. Likewise, two coastal localities in West Arnhem, Minjilang and Warruwi, lay adjacent to the Northern Bonaparte Marine Region but are included in the Northern Carpentaria Marine Region because they fall within the West Arnhem Region as defined by the Northern Land Council (NLC)[6]. For instance, the Wyndham-East Kimberley SLA is included in the Northern Bonaparte Marine Region because most of its population resided adjacent to this marine region and its two coastal towns (Kalumburu and Wyndham) have stronger ties with Darwin and Port Keats than to some of the more remote parts of Western Australia.

[6] For further information, refer to http://www.nlc.org.au.

The inclusion of UC/Ls was also based on the proximity of the UC/L to the coastline. Many SLAs contain UC/Ls not on the coastline, which arguably have links with coastal communities however these UC/Ls were excluded in order to maximise the focus on the coastal settlements. The State/Territory capitals are often mentioned in the Marine Region profiles, but they are discussed in terms of the areas within them that adjoin the coastline rather than the entire metropolitan area. With regard to the online mapping facility, UC/L data are displayed for Melbourne and Hobart only (again to replicate earlier analyses) and the other State/Territory capitals are displayed for referential purposes.

The names of the SLAs and UC/Ls within each Marine Region are listed can be accessed via the reports page on the website. In the case of the Norfolk Marine Region, information is restricted to Lord Howe Island, as Norfolk Island is outside the scope of the Australian Census.

Methodology and data presentation

Information presented in the Marine Region profiles is based on randomised ABS data (cells were randomly adjusted by the ABS to avoid the release of confidential information), with calculated values (both proportions and changes over time) computed by the BRS. Information is presented in a number of different ways (maps, graphs, tables, text), all sourced from the same data stockpile to minimise errors across the presentation methods.

Text references

Individual Marine Region profiles include regional totals and average values based on the SLAs within the Marine Region. The averages are usually expressed as — *"The SEMR total dependency ratio in 2001 was 52.5…"*— and they serve as a comparative benchmark between Coastal Australia and Marine Regions.

Boundaries Maps

Boundaries maps were included in each Marine Region social profile to provide the geographical extent and location of a Marine Region.

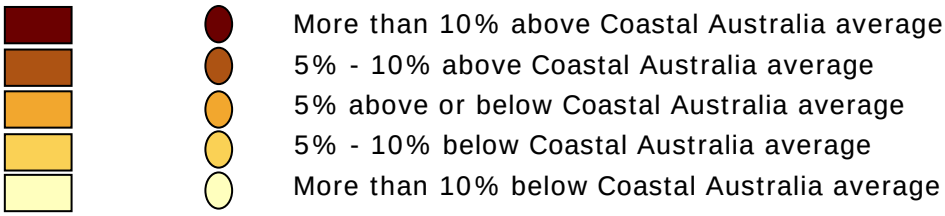
Thematic Maps

Maps displaying the data values for SLAs and UC/Ls were excluded deliberately to not replicate the online mapping functionality which allows users to select a socio-economic variable and apply it to a map of Coastal Australia or a particular Marine Region.

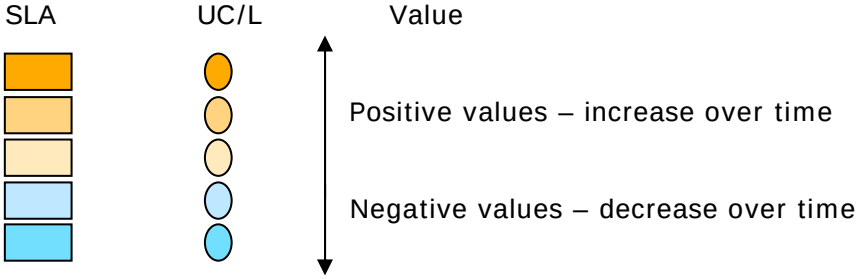
Socio-economic data presented in the online product is restricted to SLA and UC/L geographies. Mapped data are shown as absolutes or proportions. Where data permit, map classes are calculated around the Coastal Australia average and presented as proportions above and below it.

Mapped socio-economic data are represented by five classes, either as a snapshot of 2001 Census data (orange/brown graduating colour scheme) or as a change over time (orange/blue dichromatic colour schemata), as shown below:

2001 Snapshot:



1996-2001 change map:



Value of fishing - methodology and application

Introduction

To enable an assessment of the benefit or value derived by each region from fishing, fish catch data was used to provide a measure of the value of fishing from a marine region which could be attributed back to each coastal community.

Given the available data, two main approaches were undertaken.

1. The value of commercial fishing (Commonwealth and State) from the Marine Region's waters (that is, the water abutting the land region, but not necessarily landed in the region).

This approach used half-degree, National Atlas, commercial wild-catch data that provides a simple catch total in terms of the gross value of production (GVP) by jurisdiction for the Region (example in Table 3).

Table 3 Northern Planning Area – value of commercial fisheries within the Area waters.

	Northern Planning Area (2001 GVP)
Northern Territory	19,892,319
Queensland	14,622,989
Commonwealth	152,269,281

2. Linking Commonwealth and State fishing data back to coastal community localities within Marine Regions.

This approach employed all of the Commonwealth data and the Northern Territory fishery data using a geographic information system (GIS) methodology to attribute value to localities.

Data from other States Fisheries was not available, and hence the second approach is presented only in reports for two Marine Regions. However, it is an illustration of what can be done with the approach of using existing quantitative data which has been collected by fisheries agencies for administrative and management purposes. The

flexibility enabled by employing a GIS makes it possible to determine the GVP by State/Territory and by customised geographies, but this has not been reported in the profiles as the focus was on marine regions. With data from other State agencies the total flow of GVP across all marine regions or States/Territories would be possible, completing an Australia wide picture.

The application of Commonwealth data was straightforward since the information is gathered and reported by port name, making identification of the locality a simple task. The Northern Territory fishery data was more complex because it is based on an operator or vessel, requiring a higher degree of interpretation before values could be attributed to localities and secondly Marine Regions. Confidentiality of license holders was provided through attributing value to a town or suburb rather than the discrete address. Confidentiality was further assured through removing any data which represented fewer than five operators.

There are a number of caveats and limitations to this approach:

1. The data only covers a component of the value of fish caught.

GVP as reported in the profiles is based only on the wildfish catch data from the Commonwealth and the Northern Territory fisheries. The value per Marine Region is therefore understated since it excludes aquaculture, other fish rearing methods, and data from other State fisheries agencies

2. GVP was divided equally among multiple licence holders.

Where a fishing operation has multiple licence holders the GVP was distributed equally among the licence holders in the absence of business structure information and financial arrangements between licensees. Hence, where multiple licence holders live in different marine regions, the GVP attributable to each marine region may be higher or lower than that reported.

3. Accuracy of the database.

It was assumed that the address information represented the home address of licensees as opposed to a licensee's financial advisor/planner, tax consultant etc. It was also assumed that a licensee had only one home address.

4. This approach only examines one aspect of how a fishery provides value to a region.

This approach does not attempt to look beyond the catch figures to the value-add and associated activities taking place within a region which are reliant on fishing activity.

5. Values are for landed catch

The values used may therefore not reflect market values.

Application

The description of the application below is represented in flowchart format (Figure 4). The description does not cover the finer details of the application, for example editing databases and performing calculations, and is presented without discussing the complexities of data processing.

1. Commonwealth data:

The home-port GVP data set was directly attributed to towns/cities and then summed based on the number of towns within a marine region. This was possible because the Commonwealth data included port names within the identification system.

2. Northern Territory data:

The data provided by the Northern Territory fisheries agency contains GVP figures for each fishing operator or vessel. An operator/vessel may have multiple license holders (business partners) some of which may reside outside the Northern territory. In the absence of information on partnership arrangements, where multiple licensees were identified against a single operation/vessel the GVP was divided equally among the licence holders as a proxy for actual distribution.

The total GVP for each town was the sum of the GVP of individual licensees in that town. Likewise, the total GVP for a marine region was the sum of the GVP of all towns within an individual marine region and adding this to the GVP data from Commonwealth fisheries (Table 4). A breakdown of the GVP indicates which fishery contributes most to the marine region in addition to demonstrating which towns in a marine region recorded the highest GVP (Table 4). The GVP remaining in a marine region and the GVP flowing to other marine regions can also be determined as indicated in Table 5.

Table 4 Northern Planning Area – value of fishing from various fisheries.

NPA Port/town	GVP ($)	% of Total
Commonwealth fisheries 2000-2001(a)	**3,932,488**	**66.0**
Northern Territory fishery 2001		
Nhulunbuy	1,044,583	17.5
Karumba	608,254	10.2
Borroloola	261,124	4.4
Mataranka	68,896	1.2
Coburg Peninsula	*	*
Croker Island	*	*
Port Roper	*	*
Corroboree Park	*	*
Ngukurr	*	*
Alyangula	*	*
Elcho Island	*	*
Galiwinku	*	*
Maningrida	*	*
Umbakumba	*	*
Roper Bar	*	*
NT fishery total	**2,026,150**	**34.0**
Total all fisheries	**5,958,638**	**100.0**

(a) All GVP linked to Karumba

* Not available due to confidentiality concerns

Table 5 Northern Territory Fishery: Catch Value by Marine Region, 2001.

Marine Region	No. of localities	GVP ($)	% of Total
Value remaining in the Northern Planning Area.	**15**	**2,025,756**	**6.6**
Value to other marine regions			
Northern Bonaparte	66	15,088,727	48.9
South Western	6	3,587,583	11.6
North Western	3	*	*
North Eastern	8	2,335,102	7.6
Eastern Central	17	2,272,464	7.4
South Eastern	6	2,032,399	6.6
Western Central	2	*	*
Other areas	3	*	*
Total NT Fisheries	**122**	**30,863,915**	**100.0**

***** Not available due to confidentiality concerns

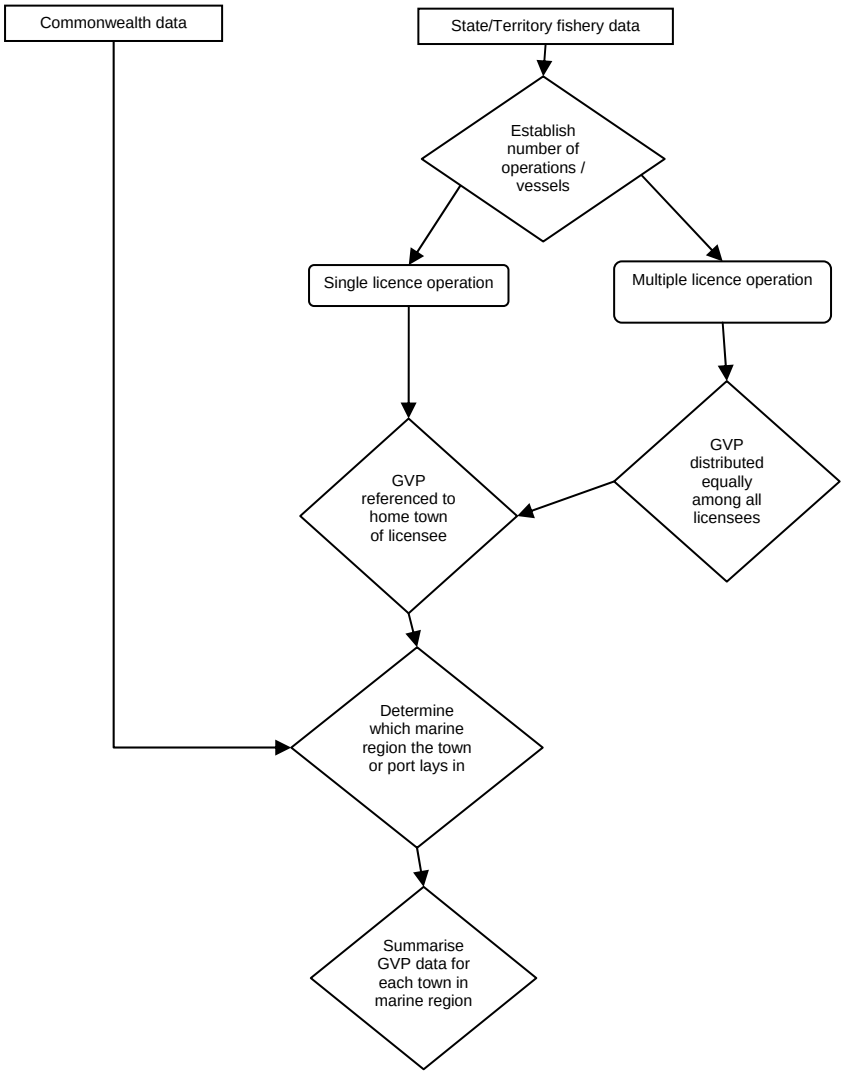


Figure 3 Flow diagram of fisheries data processing.

Results and Discussion

Complete results of the project are available through the online system, accessible through the world wide web, and in Appendices 3, 4 and 5. An outline of results and discussion for the *National Atlas of Marine Fishing and Coastal Communities* and the National Fisheries Data Strategy are treated separately below, followed by a general discussion.

National Atlas of Marine Fishing and Coastal Communities

The results of the National Atlas of Marine Fishing and Coastal Communities are contained in an online system at www.brs.gov.au/fishcoast, and in the publication *Marine Matters National*.

The Atlas focuses on mapping and analysis of Australian wild-capture commercial, recreational and Indigenous fisheries and their adjacent coastal communities. The Atlas is the first Australia-wide, comprehensive and authoritative mapping of fishing activities and their related coastal communities and provides decision makers with a credible scientific resource for informing current and future marine and coastal planning initiatives.

Marine Matters National

Marine Matters National is a hardcopy publication that provides a summary of the collected data and analysis work (see Appendix 3). There are 24 presentations in the publication. Each comprises a map showing the extent and intensity of fishing operations, usually combined with a text description, comments and analysis, as well as a graph of total catch and GVP over recent years. The Atlas is organised as follows:

- Map 1 portrays water depths and marine regions around Australia.
- Maps 2–6 summarise and map catches of commercial, recreational and Indigenous sectors, as well as an overview of the aquaculture sector.
- Maps 7–11 show the commercial wild-catch of a selection of species.
- Maps 12–16 show the commercial wild-catch by a range of fishing methods.
- Maps 17–24 focus on each of the marine regions around Australia.

Online System

At the core of the online system is an internet mapping capability that allows users to interactively access and map commercial fisheries data and coastal Australian socio-economic data.

The online system provides information in the form of regional assessments, reports, maps and information on commercial species/families. Users can view reports, regional summaries and pre-prepared maps. Users can also make their own maps containing commercial fishing and coastal community themes by using the Mapper. There is also a facility to find and map commercial catch of particular species or groups of commercial fish.

How is it organised?

The main components and organisation of the system are presented in Figure 4 below.

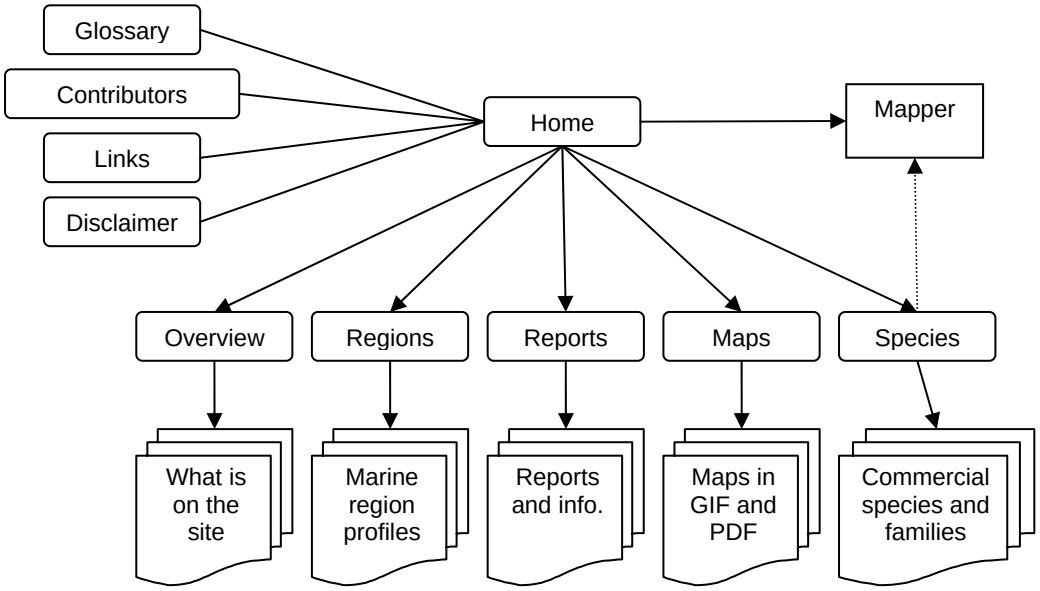


Figure 4 The main components and organisation of the system.

Home page
The home page provides a brief overview of the system and provides access to the system contents. It has a map that can take users strait to a particular Region.

Regions and Social Profiles
Each Marine Region profile contains a brief description of the Region's fisheries and a summary of socio-economic characteristics, as well as links to further maps and to a detailed social profile of the regions coastal communities (Appendix 4). Each detailed social profile comprises of the following elements:

- Introduction.
- Summary – Keys Points.
- Population and Demography.
- Households, Income and Education.
- Labour Force and Employment.
- Commercial fishing – employment and value.

Reports
The reports page provides a list of key reports and documents that contributed the development of the *National Atlas of Marine Fisheries and Coastal Communities*, and other related documents. A link to download reports, where possible, is also provided.

Maps
The Maps page provides access to prepared thematic maps of Australian commercial, recreational and Indigenous fishing sectors, along with maps of Aquaculture and other themes. A map description and link to prepared maps in both GIF and PDF format is provided. GIF files are small and easy to paste into other documents. PDF files are larger and have higher quality for printing.

Mapper (Make Your Own Maps)
The Mapper allows users to create their own maps containing commercial fishing catch/GVP and socio-economic indicators in adjacent coastal communities. Instructions are contained in the Mapper and Help sections of the site.

The online system allows Australia-wide mapping of 21 different socio-economic indicators for coastal communities, as well as catch/ GVP mapping of over 700 individual fish taxa (species and families) across seven different fishing method classes. The data has full coverage of the years 2000-2002 and partial coverage for a wider range of years dependent on jurisdiction.

Species and Families
The Species and Families section allows users to find commercial fish (and invertebrate) species and display their catches within the Mapper. A species or family of interest can be found by using the Search tool, through lists of species and families, or from the dropdown lists available within the Mapper.

National Fisheries Data Strategy

A draft National Fisheries Data Strategy was developed through a strategy development group and the Fisheries Statistics Working Group, and given in-principle approval by the Australian Fisheries Management Forum. In late 2006 there were two meetings of the Fisheries Statistics Working Group that resulted in a complete rewrite of the strategy reflecting the desires of the group. The new draft is titled *National Fisheries Data Strategy (Draft) – A strategy to improve the collection and management of Australia's fisheries data* is attached at Appendix 5. This draft strategy will be passed on to the Australian Fisheries Managers Forum in January 2007 for endorsement. The strategy gives fisheries directors and managers an opportunity to understand the current issues with fisheries data nationally, agree on some aspirational objectives and select some of the recommendations to implement that will give the greatest benefit for cost. The focus is now on implementation of elements within the strategy. The recommendations include development of standards and guidelines, national reporting requirements and mechanisms for information sharing and delivery (including the potential for a fisheries information system). In general AFMF have indicated that they could only consider funding of highest priority tasks in the strategy.

BRS currently (April 2006) Chair of the FSWG and has responsibility for the secretariat function. This is likely to continue for the foreseeable future with the level of engagement dependant to some extent on BRS internal resources. BRS have a strong commitment to the concepts and proposals laid out in the strategy and are engaged in investigating a business case for a national fisheries information system under the strategy.

General Discussion

National Fisheries Data Sets

There are now at least three Australian national level comprehensive fisheries data sets, each with different objectives and strengths. These are summarised in Table 6.

Table 6 National fisheries datasets, description and notes on strengths and maintenance.

Database	Strengths	Maintenance
***National Fisheries Production Database*. Provides public information on the production (or landings) of wild commercial fisheries in Australia. Data are available by species (or species combination), jurisdiction and year for the period July 1964 to June 1999.** www.edaff.gov.au/nfpd/index.cfm	• **Focus on taxonomy (species).** • **Accurate estimation of total catch from landings databases (cf. logbook databases).**	**Moderate**
Australian Fisheries Statistics **Provides annual volume and value of production from state and Commonwealth fisheries, as well as annual volume and value of trade, by destination, source and product. The series extends from 1989 to 2005.** **e.g. ABARE (2005)**	• **Focus on managed fisheries (cf. taxonomy) particularly for Commonwealth.** • **Gross Value of Product estimation.** • **Includes aquaculture.**	**Moderate**
National Atlas of Marine Fishing and Coastal Communities **Provides public information on spatial distribution of commercial fisheries catch. Data are available by species (or species combination), fishing method and year, complete for the period 2000 to 2002.** www.brs.gov.au/fishcoast	• **Focus on taxonomy and fishing method, seamlessly across jurisdictions.** • **Spatial data.** • **Catch from logbooks and gross value of product from markets prices.**	**High (due to intensive spatial data processing requirements)**

All of the national datasets rely on a degree of collaboration or in kind contribution from the various fisheries jurisdictions. They all also require a substantial commitment in terms of time and resources to maintain (see the National Fisheries Data Strategy, Appendix 5 for a fuller discussion of these issues).

With respect to the National Atlas of Fishing Activities and Coastal Communities, there has been considerable effort invested in developing systems and conversion tables for data processing. Specifically these include lookup tables to:

- Convert fish taxonomies in use by each jurisdiction to CSIROs Codes for Australian Aquatic Biota (CAAB).
- Transform data collected on jurisdiction spatial grids to a common half-degree grid.
- Convert jurisdictional fishing method codes to a common, high level set of fishing methods.

All three national datasets are freely available for use.

Social Data for Resource Management – A Strategic View

Strategic social data collection and collation requires an understanding firstly of what data already exists, followed by what additional data is needed to best answer the questions and issues within the industry. Within the resource sector generally, there has been significant activity to redress the lack of available data to meet current needs. Within the fisheries sector specifically, current data collection activities have not proven sufficient or effective in providing resource managers and policy makers with information relevant to responding to social issues.

Secondary data sources (e.g. the ABS census data) provide broad level information, such as employment levels in particular resource industries. However secondary data may have been collected for an unrelated purpose and hence may not shed light on the questions which need to be answered. That is, it may not address issues of concern, or it may not be at a suitable scale to provide specific detailed information, or else it may contain biases. For example, secondary data on fishing employment collected outside of a fishing season may understate the true level of employment. Also, secondary data sources or national collections may not contain information related to individual's values and practices, which are important in better managing natural resources.

Given these limitations, additional targeted information often needs to be collected to inform resource management use. Directly gathering data from a sample of a population allows questions to be targeted to relevant issues, such as resource managers' awareness of particular practices. This allows a much wider and more detailed range of information to be examined than from secondary data. Methods for gathering data include surveys, interviews and focus groups. Different methods have particular advantages, limitations and costs, so methods should be carefully chosen based on data needs, intended data uses and context.

However, there are often a range of **existing opportunities to collect data** which can be tapped into for more cost-effective and efficient collection of additional information. For instance, in the fisheries sector, fishery managers and others regularly collect information from licence holders and agencies undertake regular surveys (e.g. ABARE fisheries surveys). Using these existing opportunities provides a means of gathering data on an ongoing basis and minimises the occasions on which people are requested to provide information. It also provides an opportunity to integrate social information with biophysical and economic information, to better understand complex decision making processes.

There is also an opportunity for **improved collation of existing data** for resource management use. For instance, a modified version of the BRS 'Social Atlas of Rural and Regional Australia' (Country Matters) could focus on data of most relevance for resource managers and draw together the best available data at a national, regional and/or local scale. Previously the Social Atlas has not included regional or local scale data. However, such data is usually more detailed than national data and is also at a more meaningful level of analysis for many resource managers. As part of such an atlas, or distinct from it, there is also the potential for greater integration of social data with biophysical data (e.g. testing relationships between landholders' awareness of marine impacts from land practices and the land-based impacts on the nearby marine environment). Such data integration can provide strategic insights for targeting of particular interventions, including education and government incentives.

Opportunities also exist for **greater co-ordination of social data**. The Socio-Economic National Co-ordination Committee (SENCC) is currently developing a common set of principles for how each State will approach socio-economic data collection in the natural resource management field. This activity aims to provide improved co-ordination and collation of targeted social data for future resource management. Collection of data from within an agreed framework and indicator set allows for consistency and amalgamation of information across related sectors. An important part of this co-ordinated approach is building a common understanding of decision-making about resource management use, with appropriate social indicators. The BRS framework for landholder decision-making has potential applicability to other resource sectors, including fisheries.

Benefits and Adoption

The fishing sectors benefiting from this research are, in descending order, the Australian commercial wild-catch sector, recreational and Indigenous sectors and the aquaculture sector. The wider community, particularly in regional coastal Australia, also receives benefits from the National Atlas of Fishing Activities and Coastal Communities. These benefits primarily relate to the availability of information and evidence for decision making within the marine environment and the coastal zone.

The benefits and beneficiaries align quite closely with those originally identified for the project. There have been benefits for marine planning generally. More specifically there have been significant benefits to the fishing industry and to governments in the planning of MPAs and in fisheries socio-economic assessment of MPAs. The project has also contributed to the following areas:

- Research on marine mammal interactions with fisheries.
- Spatial management scenarios for the Southern and Eastern Scalefish and Shark fishery.
- National reporting for international Regional Fisheries Management Organisations.
- Census of Marine Life, Ocean Biogeographic Information System (OBIS).
- *Northern Marine Atlas. Fisheries Uses and Social Indicators in Australia's Marine Jurisdiction.*

The above benefits have accrued throughout the life of the project however the bulk of the benefit will not accrue until after outputs are publicly available.

Further Development

The National Atlas of Fishing Activities and Coastal Communities was a one-off exercise using data from the five yearly census of population and housing and fisheries data from all jurisdictions. For a strategic view on these topics the reader is referred to the Results/Discussion and the Appendices of this document. It is briefly noted here that any further development and maintenance of the Atlas and its associated website will be dependant first on its adoption and the value to clients and the public, and second on commitments by fisheries jurisdictions and other parties to make such a resource available in future.

Conclusion and Outcomes

The results and outcomes of the project are summarised against each of the objectives below:

1. *Develop a strategy for the management of national fisheries data. The strategy will focus on partnership arrangements and agreements with custodian agencies, scheduled data maintenance and updating and systems of data distribution. The strategy will refer to marine and estuarine commercial fishing and aquaculture specifically but will also consider recreational and Indigenous fishing.*

   Outcome: Complete - The National Fisheries Data Strategy was developed by the strategy development group and the Fisheries Statistics Working Group, and given approval by the Australian Fisheries Management Forum. The focus is now on implementation of the strategy or elements of the strategy. The strategy gives fisheries directors and managers opportunity to understand the current issues with fisheries data nationally, agree on some aspirational objectives and select components of the strategy to implement that will give the most benefit for cost.

2. *Undertake a one-off fisheries national fisheries data collection, within the context of the National Fisheries Data Strategy development. These data will focus on catch, effort, method, location and port of landing collected from logbooks and fishery returns.*

   Outcome: Partially complete - A National collection of fisheries data has been compiled that comprises over 700 taxa, across seven fishing method classes, spanning three complete years (more for some jurisdictions) from eight jurisdictions at a half-degree scale. These data have been used to generate maps for publication and form one component of an online interactive mapping system. They form the first complete picture of where fishing occurs around Australia and the value of that fishing. To date, the results have been used in marine planning, Marine Protected Area planning and assessment as well as making contributions in a number of other research areas. Privacy legislation and confidentiality requirements prevented direct linking of catches to port of landing in most jurisdictions. Unless a very specific and sufficiently urgent need exists, it is likely that some jurisdictions will be unable to provide this sort of information in future.

3. *Derive social, demographic and economic profiles of coastal communities from existing data (1991, 1996 and 2001 ABS census data; BRS, AFMA and ABARE data; State and Local Government and other data sources such as consultants reports etc.).*

   Outcome: Complete – Detailed socio-economic and profiles have been developed for eight marine regions around Australia. Each profile provides a summary and detailed analysis in the themes of Population and Demography, Households, Income and Education, Labour Force and Employment and Commercial Fishing Employment and Value. This socio-economic data have been used to generate maps for publication and form a component of the online interactive mapping system. The social profiles are a very useful piece of analysis because they give marine resource decision makers a better and

deeper understanding of the social climate in the adjacent coastal communities.

4. *Relate mapped fisheries resource usage to coastal communities.*

   Outcome: Complete – Largely undertaken through the socio-economic and demographic profiling. Relating of fisheries resource usage to coastal communities was largely by inference, accept in the case of Commonwealth and Northern Territory fisheries where some direct links between resource use and coastal communities were achieved. The direct linking of catches to port of landing is quite problematic in most jurisdictions due to privacy legislation and confidentiality requirements. Notwithstanding, the projects results give governments (at all levels) and planners a much better understanding of the dependence of coastal communities on fishing. The results also show the important interrelationship between fishing resource dependency and other familiar socio-economic indicators of resilience such as unemployment, population age and population growth.

5. *Develop a strategy for collection and collation of social data on an ongoing basis for future resource management use.*

   Outcome: Partially Complete – The current state of social data collection and collation from a strategic viewpoint is discussed, particularly with respect to the resource sector generally and the fisheries sector specifically. The themes of existing opportunities to collect data, improved collation of existing data and greater co-ordination of social data are covered within this report and within the social assessment material.

References

ABARE (2005) *Australian Fisheries Statistics 2004*, Canberra, February.

Appendix A – Intellectual Property

There is no specific and developable intellectual property or income arising from this work. The source fisheries datasets from State, Territory and Commonwealth jurisdictions are owned by the respective jurisdictional agencies. The source social and economic data is owned by the Australian Bureau of Statistics. The derived National fisheries datasets are under the custodianship of the Bureau of Rural Sciences, with any intellectual property residing jointly amongst the Bureau of Rural Sciences, the Fisheries Research and Development Corporation, and the Department of the Environment and Heritage.

Appendix B – Staff

James Larcombe, principal investigator, BRS
Con Charalambou, social scientist, BRS
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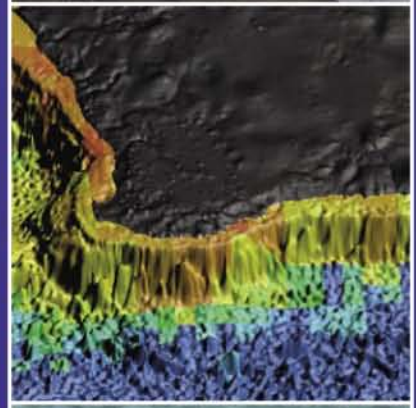
Kylie Paulsen, communications, BRS
Stephen Miller, webmaster, BRS
Neil Bensley, fisheries scientist, BRS

Appendix C – Marine Matters National

(full colour report attached)



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Atlas of Australian
Marine Fishing and
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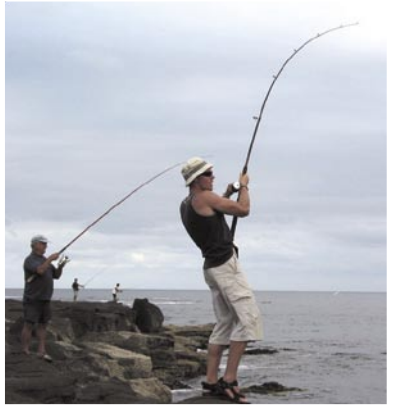
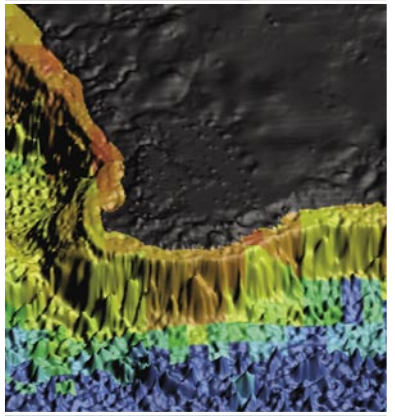
DEPARTMENT OF AGRICULTURE, FISHERIES AND FORESTRY





marine matters
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Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
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Bottom image: G. Williams

Foreword

The *Atlas of Australian Marine Fishing and Coastal Communities* is the first Australia-wide, comprehensive and authoritative mapping initiative presenting an overview of Australian fishing activities and coastal communities.

The Atlas shows where fish are caught in Australia's oceans, the value of those catches, where different fishing gears are used and the species that are taken. It also provides information on the socio-economic characteristics of coastal communities in eight Marine Regions around Australia.

This information has not previously been readily available at regional and national levels and therefore difficult to take into consideration when planning.

The Atlas is comprised of two products, this document, *Marine Matters National* and a companion website featuring an interactive online mapping system (www.brs.gov.au/fishcoast).

Marine Matters National has been produced to inform decision makers responsible for the management of activities in Australia's marine waters, and to aid the Australian and State/Territory Governments in developing and implementing policy initiatives. It is also a flexible and readily accessible information source for anyone with an interest in the management of Australia's marine estate.

Mesh netting (Stutterd, 2002)

The Department of Agriculture Fisheries and Forestry produced the Atlas with the support of the Fisheries Research and Development Corporation, the Department of the Environment and Heritage (National Oceans Office), and other agencies around Australia with a responsibility related to fisheries. This work builds upon the successful *Marine Matters - Atlas of marine activities and coastal communities in Australia's South-East Marine Region*.

I look forward to seeing the Atlas used both within and outside governments, to assist the Australian fishing sector to continue to remain competitive, profitable and sustainable.

The Hon. Peter McGauran MP
Minister for Agriculture, Fisheries and Forestry

Contents

Commercial fisheries by broad species category

Commercial fishing by fishing method

Commercial fisheries and coastal communities – Region by region

Appendices

Cooked whole lobster, Western Australia (Dylan Skinns, Newfish)

Introduction

The National Atlas of Australian marine fishing and coastal communities

The National Atlas comprises *Marine Matters National* (referred to as 'the Atlas') and a more detailed set of resources, databases and mapping tools that are accessible online (www.brs.gov.au/fishcoast). The Atlas is, for the most part, a summary of that online data.

There are 24 presentations in the Atlas. Each comprises a map showing the extent and intensity of fishing operations, usually a text description and comments, as well as a graph of total catch and gross value of production (GVP) over recent years. The Atlas is organised as follows:

- Map 1 portrays bathymetry and Marine Regions around Australia.
- Maps 2–6 summarise commercial, recreational, Indigenous and aquaculture sectors.
- Maps 7–11 show the commercial wild-catch of a selection of broad species categories.
- Maps 12–16 show the commercial wild-catch by a range of fishing method classes.
- Maps 17–24 focus on each of the Marine Regions around Australia.

The online system allows Australia-wide mapping of 21 different socio-economic indicators for coastal communities, as well as catch or GVP mapping of over 700 individual fish taxa (species and families) across eight different fishing method classes. It also provides substantially more detailed context and analyses.

Mapping and methods

Fisheries agencies in each of the states, Northern Territory and the Australian Government collect information from fishers, who provide logbooks or returns. Basic information usually includes some measure of the amount of fishing effort, the species composition of the catch and where the fishing took place. These records, contributed by each agency, enabled a comprehensive, quantitative mapping of commercial fishing activity across Australia (see Appendices).

Processing fillets, Queensland (J Lauritz, supplied by Ecofish)

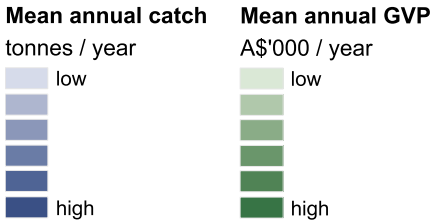
Most of the commercial fishing maps show catch (tonnes) or GVP ($) on a half degree statistical grid (approximately 55km by 55km). The standard reporting period spans 2000 to 2002 calendar years, the maps present a mean annual figure for this period. GVP is expressed as the 'beach price' — defined as the assessed value at the point of landing for the quantity produced, excluding transport and marketing costs. The recreational and Indigenous maps use the spatial reporting framework adopted by each jurisdiction for the *National Recreational and Indigenous Survey* of 2000 and 2001 (Henry and Lyle, 2003).

In developing the socio-economic component of the Atlas, BRS has drawn upon existing data for coastal Statistical Local Areas (SLA) from the Australian Bureau of Statistics, *Census of Population and Housing, 2001*. Employment in the various sectors of the fish industry is the primary theme mapped in this Atlas. The term 'fish industry' is used when referring to the combined wild-catch, aquaculture and processing/wholesale sectors (see Appendices).

Reading the maps

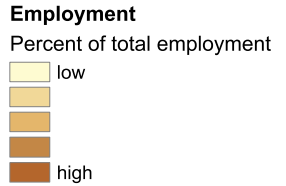
Fishing catch and GVP

- Colour shading is used to indicate areas of higher or lower catch or GVP. More intense colours indicate higher values and lighter shades lower values. Blue shading in maps refers to catch (tonnes) whereas green shading refers to GVP ($).
- All jurisdictions have a 'five boat rule' confidentiality requirement with respect to fishery logbook data. The rule precludes the presentation of data that represents less than five vessels or licencees. Statistical areas with data for less than five boats are mapped as masked data with no indication of the magnitude.
- Some statistical grids cross jurisdictional boundaries and may overlap areas that are closed to fishing.
- While a section of ocean may be shaded to represent a level of fishing, this does not mean activity is equally dispersed across the ocean or seabed. In most cases fishing is quite patchy in its distribution; so, noting the half degree reporting grid and the source data, caution is required when interpreting map data (see Appendices).



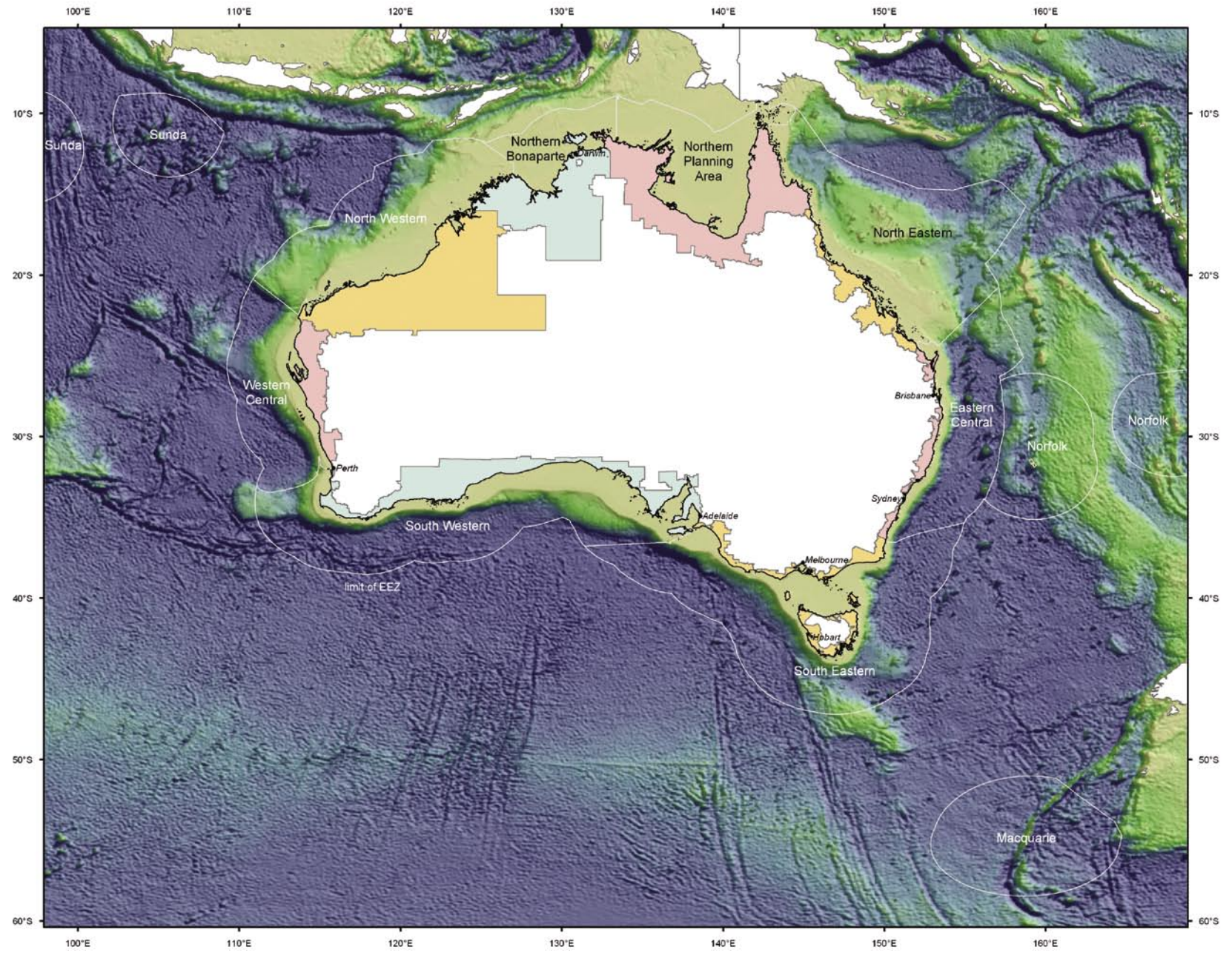
For detailed and comprehensive information on the species taken, the reader is referred to the BRS publication *Australian Fisheries Resources* (Kailola *et al.* 1993). For information on the status of Australian Government-managed fisheries (in Commonwealth waters) the reader is referred to the BRS publication *Fishery Status Report*, published annually. For information on the status of State/Territory managed fisheries the reader is referred to the relevant State or Territory fisheries agency.

Socio-economic



- Colour shading is used to indicate areas of higher or lower employment. More intense colours indicate higher values and lighter shades lower values (see Appendices).
- Employment is reported as the proportion of persons employed in the fishing sector, relative to total employment for the SLA.
- This study focuses on coastal Australia, defined as the SLAs that adjoin the Australian coastline (including remote islands) based on the 2001 Australian Standard Geographical Classification (ASGC).

Map 1 The Australian Marine Region



Depth (m)

- 50 m
- 200 m
- 800 m
- 1,500 m
- 2,000 m
- 3,000 m
- 4,000 m
- 6,000 m

N

0 300 600 Kilometres

Data Sources
Bathymetric: Geosciences Australia 1 km grid and ETOPO2 Global 2-Minute Gridded Elevation Data.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

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Bureau of Rural Sciences

Description

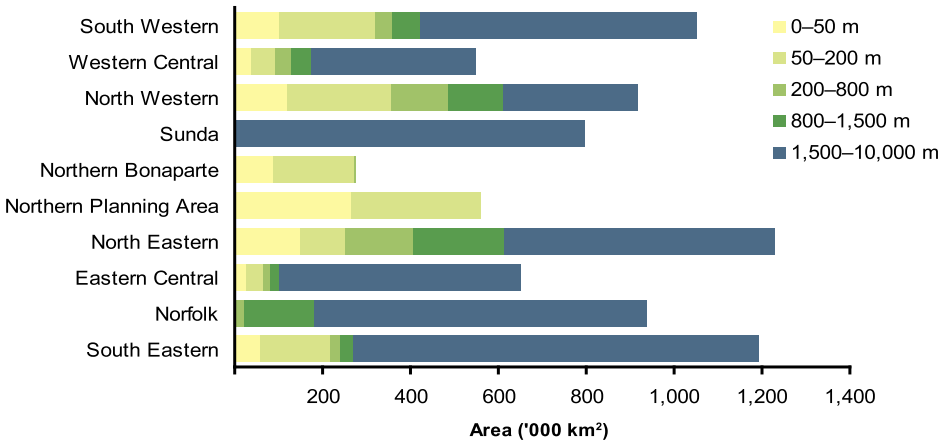
Map 1 shows the depth of the seabed (bathymetry) and the boundaries of Marine Regions around continental Australia and adjacent areas. The Marine Regions are a set of regional marine planning units for Australia's marine jurisdiction. On land, the map shows coastal zone statistical areas that are derived from the Australian Bureau of Statistics census collections areas. These land areas correspond as closely as possible to the Marine Regions.

The fishing environment

The Australian Fishing Zone (AFZ) is a management zone of some nine million square kilometres that extends up to 200 nautical miles from the shore or coastal baselines. It includes waters around continental Australia as well as waters around the external territories of Cocos, Christmas, Norfolk, Macquarie, Heard and McDonald Islands, but excludes water adjacent to the Australian Antarctic Territory. The Zone extends from tropical to subantarctic latitudes, and longitudinally across a quarter of the globe from the Indian Ocean in the west to the Pacific in the east.

The continental shelf comprises the ocean seabed from the coastline out to a depth of approximately 200 m. From the edge of the continental shelf (the shelf break) the seabed falls away rapidly to a depth of approximately 4000 m, forming the continental slope. The abyssal plane is at 4000 m and is incised with deeper trenches. The deepest part of the Australian Fishing Zone is north of Christmas Island, at some 6700 m. The most important parts of the ocean for Australia's fisheries production are the continental shelf and the upper part of the continental slope.

Area of each Marine Region, broken down by depth



Marine Regions

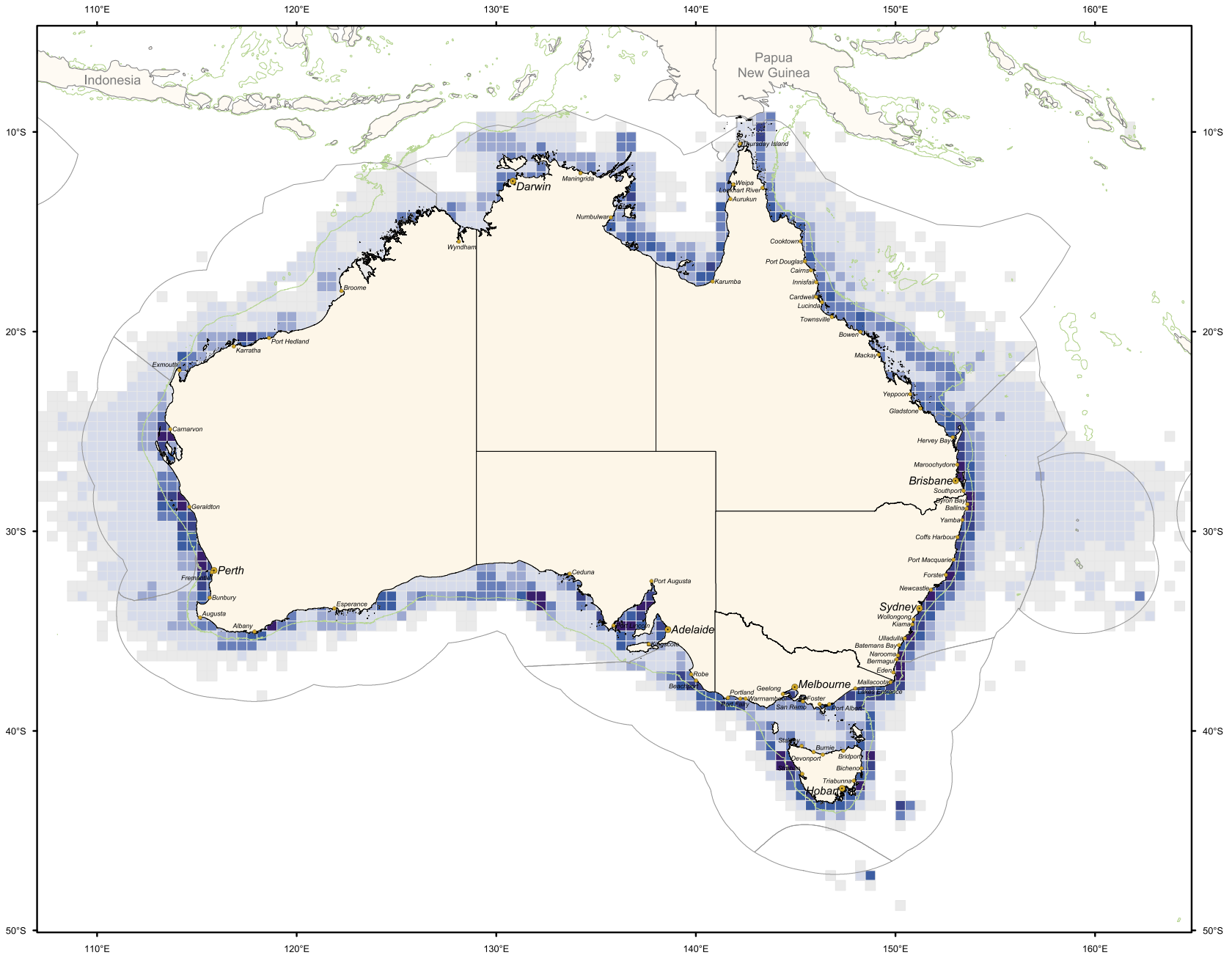
Large Marine Domains separate the Australian marine jurisdiction into province-scale (thousands of kilometres) areas, and represent major ecological units. These ecological domains, derived largely from distributions of fish species, have since been modified into Marine Regions for planning purposes. These Marine Regions accommodate policy and planning considerations, and the boundaries shown here reflect those changes, notably the split of the northern domain into two and the shift of Torres Straits into the Northern Planning Area. It is likely that there will be additional changes to the domains in future to accommodate marine planning initiatives.

This Atlas reports on the fishing activity within each Marine Region and also on fishing-related socio-economic indicators in the adjacent, terrestrial, coastal statistical areas (see Appendix 3).

Hauling the net, South Australia (supplied by SAFIC)

Map 2

Australian commercial fishing catch



Mean annual catch (2000-02)

tonnes / year

- 0 - 35
- 36 - 100
- 110 - 240
- 250 - 480
- 490 - 890
- 900 - 4,300
- confidential
- 200m depth contour

N

0 200 400 Kilometres

Data Source
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

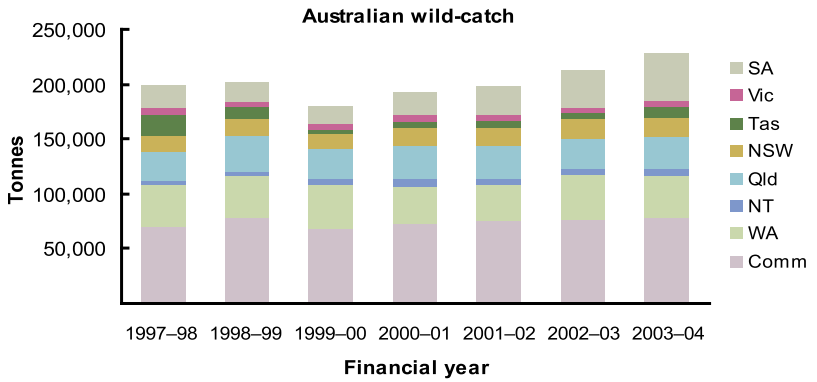
Gear
All marine and estuarine fishing methods.

Primary species
All commercially taken marine and estuarine species.

Description
Map 2 shows mean annual total catch in 2000–2002 for all Australian marine and estuarine commercial fisheries. The catches are reported on a half-degree (approximately 55 km) system of grid cells (see Appendices).

Facts and figures
While large areas of ocean are subject to some level of fishing, most fisheries production comes from a relatively small area of the AFZ. The great majority of Australia's wild-fisheries production is taken on the continental shelf and upper continental slope, usually quite close to the mainland.

At a broad scale, the largest catches and catch per area are found in the South East Region and the lowest in the North West Region.



At a fine scale, areas of largest catch in the AFZ were:

- the west coast of Tasmania (4260 t/year/half degree cell), associated with the trawl fishery for blue grenadier (*Macruronus novaezelandiae*).
- the Great Australian Bight (3146 t/year/half degree cell), associated with purse seining for southern bluefin tuna (*Thunnus maccoyii*) and other pelagic species.
- near Port Lincoln, South Australian (3000 t/year/half degree cell), associated with purse seining for pilchard (*Sardinops neopilchardus*).
- the Spencer Gulf (2968 t/year/half degree cell), associated with trawl fishery for western king prawn (*Melicertus latisulcatus*).

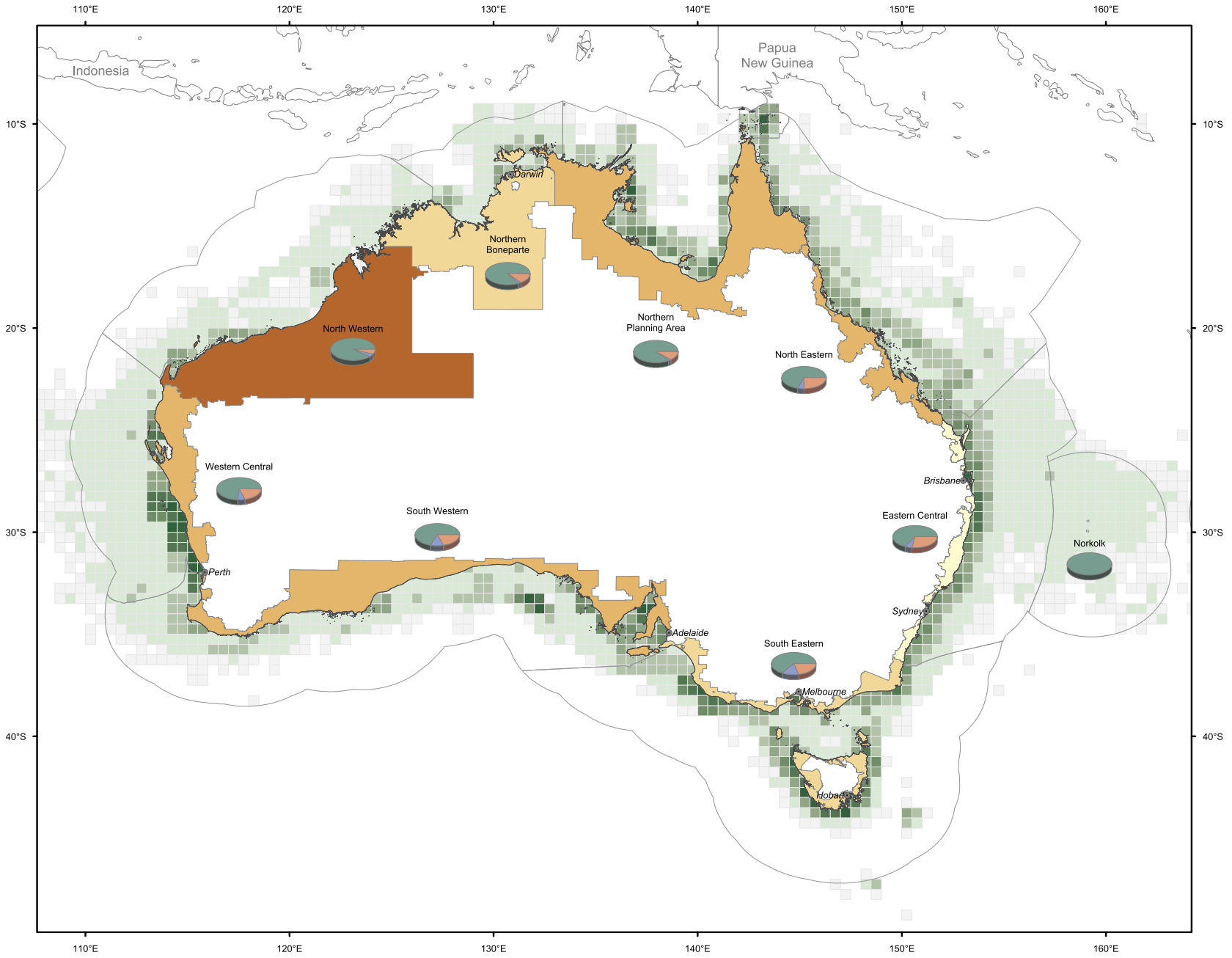
A significant proportion of Australia's wild-caught prawn, rock lobster, tuna and abalone catch is exported. The main export markets are Japan, Hong Kong and the United States.

The total wild-fishery catch has increased over recent years to 228,000 t in 2003–04.

Source
ABARE (2005) *Australian Fisheries Statistics 2004*. Australian Bureau of Agricultural and Resource Economics, Canberra. 65pp.

Net hauling, Queensland (J. Lauritz; supplied by Ecofish)

Map 3 Australian commercial fishing GVP and fish industry employment



Employment by sector

- Wild-catch and aquaculture
- Processing
- Wholesale

Fish industry employment

Percent of total employment

- 0.4
- 0.5 - 0.7
- 0.8 - 0.9
- 1.0 - 1.2
- 1.3 - 1.5

Mean annual GVP (wild-catch)

A$'000 / year

- 0 - 340
- 350 - 1,300
- 1,400 - 3,300
- 3,400 - 6,300
- 6,400 - 12,000
- 13,000 - 45,000
- confidential

N

0 200 400 Kilometres

Data Sources
Social/Economic: Australian Bureau of Statistics, Census of Population and Housing, 2001.
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Gear
All marine and estuarine fishing methods.

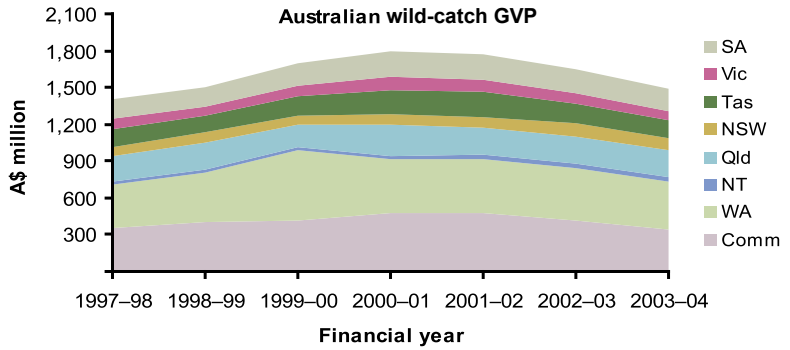
Primary species
All commercially taken species.

Description
Map 3 shows employment in the fish industry, as a percentage of total employment, for each of the coastal SLAs associated with the Marine Regions. The fish industry employment data covers three sectors: wild-catch and aquaculture; processing; and wholesale. Pie charts for each Region indicate the contribution of each of these sectors to employment.

The map also shows mean annual GVP in 2000–2002 for all Australian marine and estuarine commercial fisheries. GVP is defined as the assessed value of fisheries products at the point of landing and excludes transport and marketing costs.

Facts and figures
Higher proportions of fish industry employment is observed in Regions more remote from Metropolitan areas, such as the North Western Region and the Northern Planning Area (greater than 1% of employment). Low proportions of fish industry employment are observed in the south eastern quarter of Australia (less than 0.7%).

Wild-catch and aquaculture is the dominant sector in terms of employment in the broader fish industry with processing and wholesaling sectors comprising approximately 30% of the total. The less populous Regions of northern Australia tend to have relatively small processing and wholesale sectors.



Most of the fishing GVP is generated from continental shelf and near-shore areas, in a pattern that is more pronounced than that seen with raw catches (see Map 2). Some notable ocean 'hotspots' for GVP include:

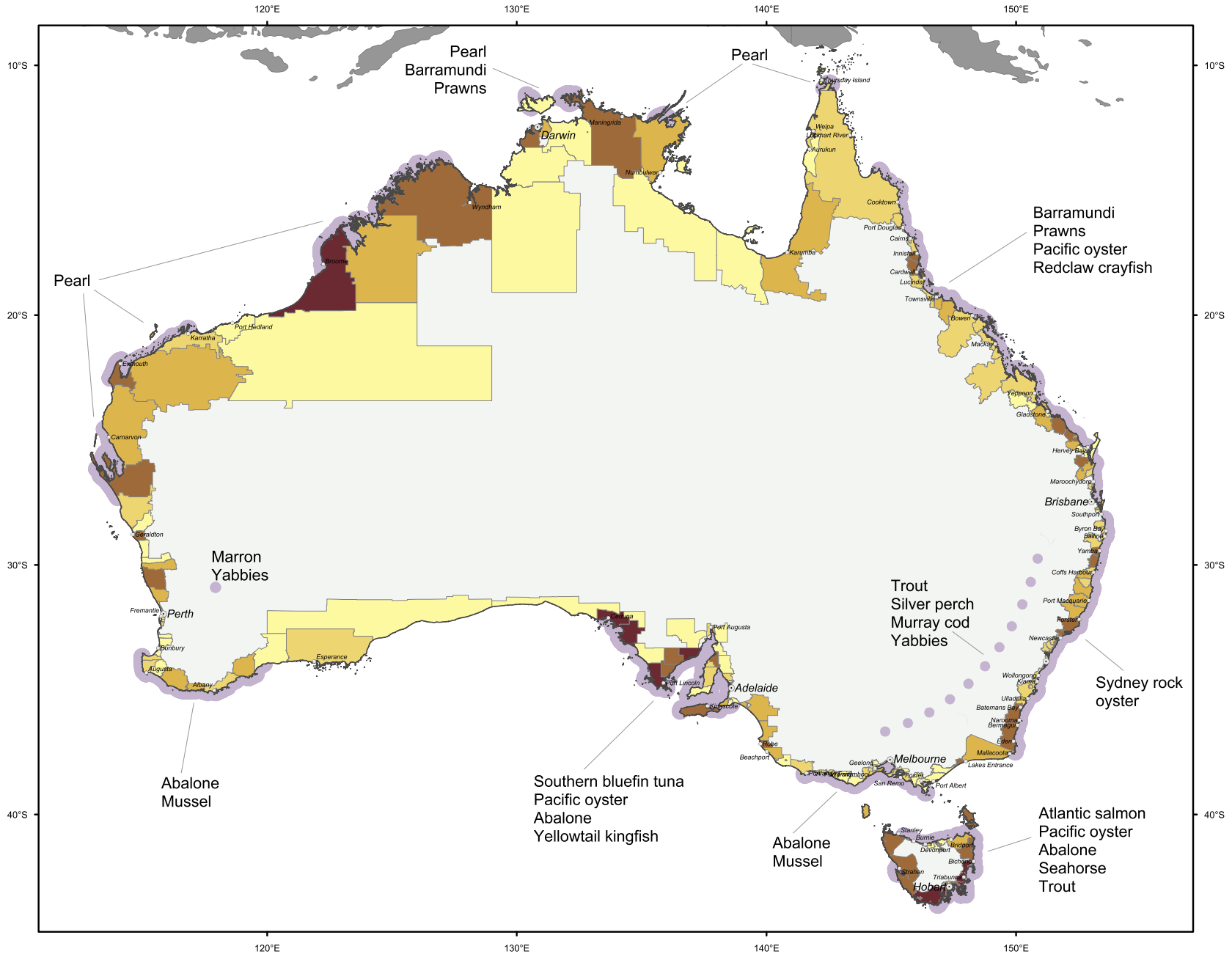
- Central Great Australian Bight (up to $44m/year/half degree cell) associated with the southern bluefin tuna fishery.
- Western Australian west coast (up to $38m/year/half degree cell) associated with the rock lobster (*Panulirus cygnus*) fishery.
- South western Tasmania (up to $20m/year/half degree cell) associated with the abalone (Haliotidae) fishery.
- Prawn (Penaeidae) fisheries of the South Australian gulfs, along the eastern seaboard, Torres Strait and the Gulf of Carpentaria (up to $20m/year/half degree cell).

The total wild-catch fishery GVP has decreased over recent years—to $1,486m in 2003–04, down from a peak of $1,793m in 2000–01.

Source
ABARE (2005) *Australian Fisheries Statistics 2004*. Australian Bureau of Agricultural and Resource Economics, Canberra. 65pp.

Unloading broadbill swordfish (*Xiphias gladius*), Mooloolaba, Queensland (J. Kalish, 2003)

Map 4 Australian aquaculture – Industry employment and major species



Aquaculture employment

Percent of total employment

- No employment
- 0.1% - 0.2%
- 0.3% - 0.5%
- 0.6% - 1.9%
- 2% or greater
- Major aquaculture

N

0 200 400 Kilometres

Data Sources
Social/Economic: Australian Bureau of Statistics, Census of Population and Housing, 2001.
Aquaculture Distribution: National Aquaculture Development Committee, 2002.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

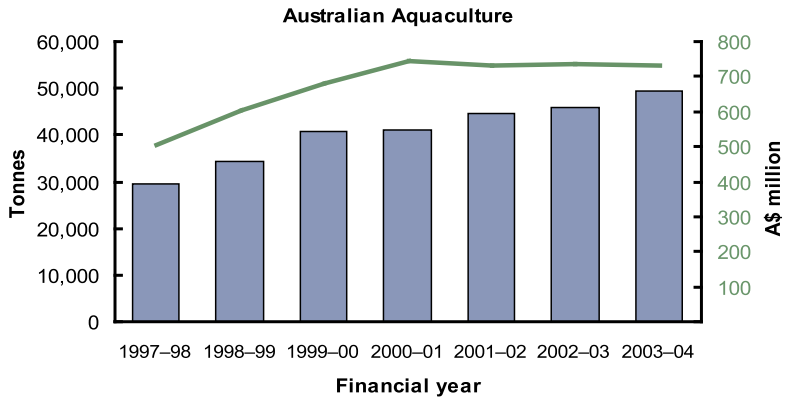
Gear
Ponds, tanks, raceways, cages, nets, racks and ropes.

Primary species
Southern bluefin tuna, pearl (*Pinctada maxima*), Atlantic salmon (*Salmo salar*), prawns (mainly *Penaeus monodon*) and edible oysters (mainly *Saccostrea glomerata* and *Crassostrea gigas*).

Description
Map 4 shows employment in the aquaculture industry, as a percentage of total employment, for SLAs along the coastal margin. The map also indicates the locations where the major Australian aquaculture species are produced.

Comments
The Australian aquaculture industry is based on over 40 different species, but the five main sectors—southern bluefin tuna, pearls, Atlantic salmon, prawns and edible oysters—account for some 90% of the GVP.

The siting of aquaculture is the result of climate, geography/bathymetry, government regulation, markets and the availability of stock. Marine on-water aquaculture is sited close to shore, often in bays, inlets and estuaries with good water flow and easy access to services. Pond culture of marine species is sited adjacent to sources of clean seawater.



Trout and salmon hatcheries have a history going back to the 1860s and Sydney rock oyster culture to the 1930s. Pearl culture began in Western Australia in the 1950s. However most species have a relatively short history of aquaculture in Australia, with much of the development occurring since the 1980s.

Farmed southern bluefin tuna, kuruma prawns (*Marsupenaeus japonicus*) and abalone are for export to east Asia. Yabbie (*Cherax destructor*) and marron (*Cherax cainii*) are sold on both the domestic and the export markets. The remaining species are largely destined for domestic markets.

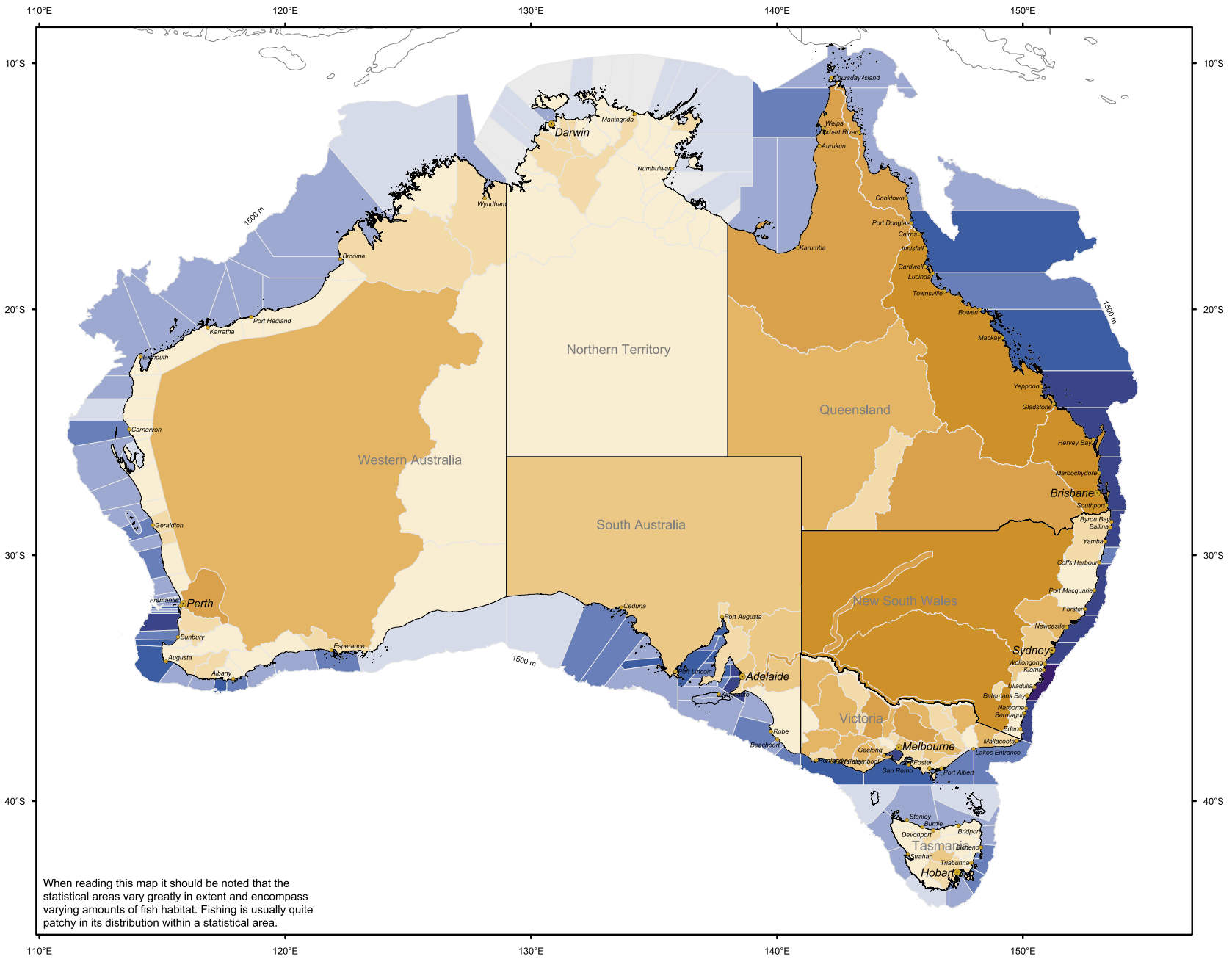
Aquaculture is one of the fastest growing industries in Australia. Production has increased steadily over the last 15 years, amounting to 49,000 t in 2003–04. GVP increased up until 2000–01 and stabilised at $730m in recent years following market and price trends.

Source
Love, G. and Langenkamp, D. (2003) *Australian Aquaculture: Industry Profiles for Related Species*. ABARE eReport 03.8, prepared for the Fisheries Resources Research Fund, Canberra.

Barramundi aquaculture ponds, North Queensland (E. Stutterd, 2002)

Map 5

Recreational fishing – Catch



When reading this map it should be noted that the statistical areas vary greatly in extent and encompass varying amounts of fish habitat. Fishing is usually quite patchy in its distribution within a statistical area.

Marine and estuarine

Number of fish (non-bait)

- 0 - 35,000
- 36,000 - 230,000
- 240,000 - 710,000
- 720,000 - 1,600,000
- 1,700,000 - 5,600,000
- 5,700,000 - 9,600,000

Inland freshwater

Number of fish (non-bait)

- 0 - 20,000
- 21,000 - 77,000
- 78,000 - 170,000
- 180,000 - 370,000
- 380,000 - 1,200,000
- 1,300,000 - 8,800,000

No data

N

0 200 400 Kilometres

Data Sources
Fisheries: National Recreational and Indigenous Fishing Survey (Henry and Lyle 2003).

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Gear

All recreational fishing methods, by persons aged five years and older, Australia wide.

Primary species

All recreationally taken species.

Description

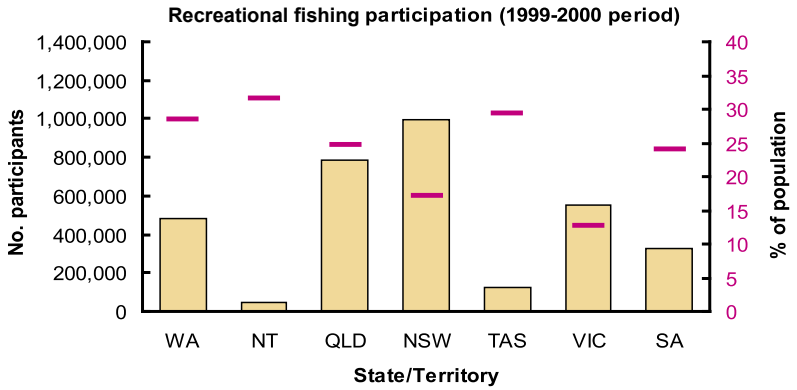
Map 5 shows total annual catch of fish (non-baitfish) in numbers from the *National Recreational and Indigenous Fishing Survey* of 2000–01.

The survey collected primary fishery statistics including: number of fishers; the proportion of the Australian population that goes fishing; fishing effort; catch; and the diversity of species taken by the non-commercial fishing sectors. The national screening survey (a random telephone survey) estimated participation in recreational fishing twelve months prior to May 2000. This was followed by the national diary survey that was used to estimate levels of effort, catches by species and location of fishing for the period May 2000 to April 2001.

Facts and figures

On a national basis, for the twelve months prior to May 2000, the survey found:

- 3.36 million people, or 19.5% of the population over the age of five years, fished at least once. Participation rates were highest in the Northern Territory, Western Australia and Tasmania.
- 24.4% of households had at least one recreational fisher living there.



- The 30–44 age group contained the highest *number* of recreational fishers (644,000 males and 325,000 females), although participation *rates* were highest among the 5–14 age group (33% for males and 23% for females).

On a national basis, in the twelve months prior to May 2001:

- Recreational anglers spent an estimated 20.6 million days fishing, representing 23.2 million separate fishing events or 102.9 million hours fishing.
- Recreational fishing in coastal waters attracted 41% of fishing effort, followed by fishing in estuarine waters (35%), freshwater rivers (11%), freshwater lakes and dams (8%) and offshore waters (4%).
- Shore-based fishing attracted a greater level of activity (13.3 million events or 57% of total) than fishing from boats (9.8 million events or 43% of total).
- The most numerous groups of finfish in the recreational harvest were, in descending order, whiting (Sillaganidae), flathead (Platycephalidae), Australian herring (*Arripis georgianus*), bream (Sparidae), King George whiting (*Sillaginodes punctata*), mullet (Mugilidae), garfish (Hemiramphidae), tailor (*Pomatomus saltatrix*), Australian salmon (*Arripis trutta*) and snapper (*Pagrus auratus*).
- Fishers spent an estimated $1.8 billion on fishing-related equipment and activities, an average of $552 per fisher.

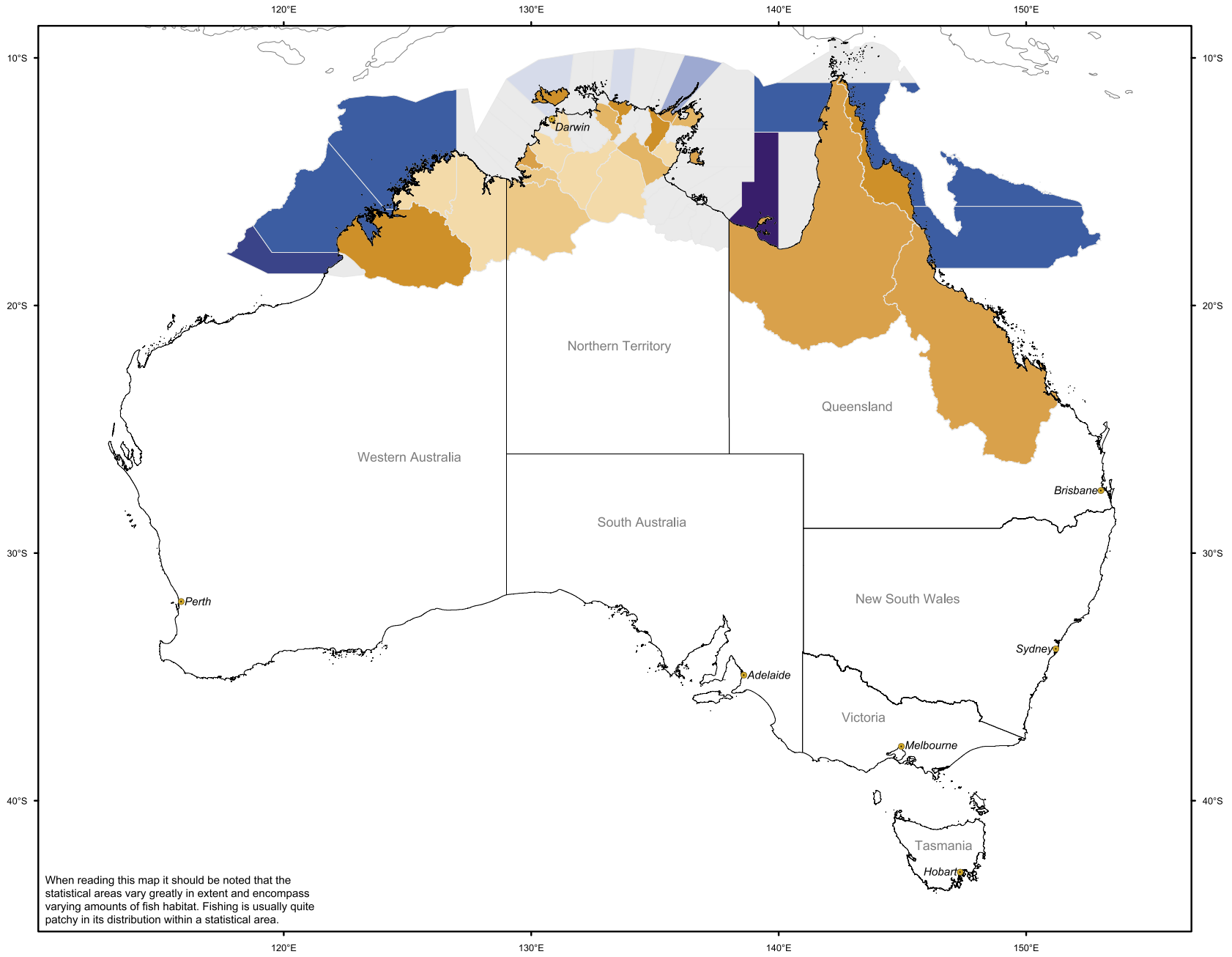
Source

Henry, G.W. and Lyle J.M. (2003) *The National Recreational and Indigenous Fishing Survey*. FRDC Project 99/158. New South Wales Fisheries Final Report Series No 48. 188pp.

Barramundi, Northern Territory (J. Larcombe, 2005)

Map 6

Indigenous fishing – Catch



When reading this map it should be noted that the statistical areas vary greatly in extent and encompass varying amounts of fish habitat. Fishing is usually quite patchy in its distribution within a statistical area.

Marine and estuarine

Number of fish (non-bait)

- 160 - 700
- 710 - 4,600
- 4,700 - 12,000
- 13,000 - 55,000
- 56,000 - 100,000
- 110,000 - 180,000

Inland freshwater

Number of fish (non-bait)

- 490 - 630
- 640 - 15,000
- 16,000 - 36,000
- 37,000 - 63,000
- 64,000 - 180,000
- 190,000 - 610,000

No data

N

0 200 400 Kilometres

Data Sources
Fisheries: National Recreational and Indigenous Fishing Survey (Henry and Lyle 2003).

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Gear
All non-commercial fishing by Indigenous people, aged five years and older, living in coastal communities across the north of Australia from Broome in Western Australia to Cairns in Queensland.

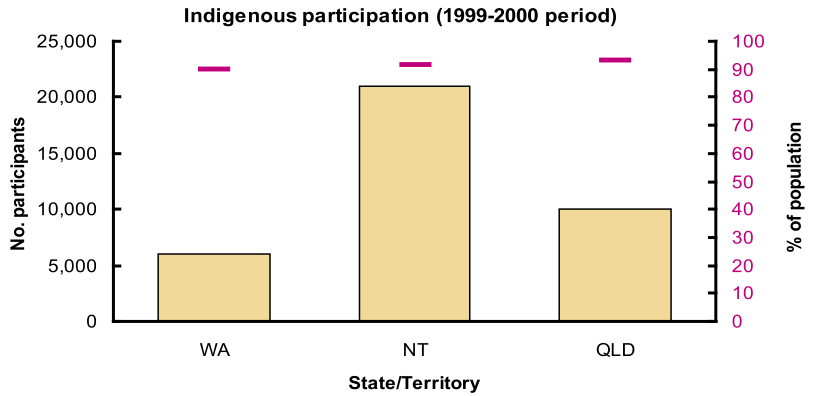
Primary species
All non-commercial species taken by Indigenous people.

Description
Map 6 shows total annual catch of fish (non-baitfish) in numbers estimated by the *Recreational and Indigenous Fishing Survey* in northern Australia in 2000–01.

The survey collected primary fishery statistics including: number of fishers; the proportion of the Indigenous population that goes fishing; fishing effort; catch; and the diversity of species taken for non-commercial purposes. The screening survey estimated the level of participation in fishing as well as providing a socio-demographic profile of fishers. This was followed by a catch-and-effort survey that was used to estimate levels of effort, catches by species and location of fishing, for the period June 2000 to November 2001.

Facts and figures
In the twelve months prior to interviews (held between April and November 2000):

- An estimated 37,000 Indigenous people, or 91.7% of the Indigenous population, aged five years or older and living in coastal communities in northern Australia, fished at least once.



In a twelve month period between June 2000 and November 2001:

- Indigenous fishers made an estimated 671,000 fishing trips (or fishing events), with 1% of trips offshore, 55% inshore, 15% estuarine and 28% freshwater.
- 53% of Indigenous fishing trips used lines to fish, 26% hand collected, 12% used nets and 9% used spears.
- The most numerous groups of finfish in the Indigenous harvest were, in descending order, mullet, catfish (Ariidae), perch/tropical snappers (Lutjanidae), bream and barramundi (*Lates calcarifer*).
- Northern Australia Indigenous harvest comprised some three million aquatic animals, comprising:

910,000	Finfish	660,000	Prawns and yabbies
980,000	Small baitfish	1,150,000	Molluscs
180,000	Crabs and lobsters	930,000	Other

Source
Henry, G.W. and Lyle J.M. (2003) *The National Recreational and Indigenous Fishing Survey*. FRDC Project 99/158. New South Wales Fisheries Final Report Series No 48. 188pp.

Indigenous fishing, Cape York (G. Williams)

marine matters

NATIONAL

COMMERCIAL FISHERIES BY BROAD SPECIES CATEGORY

This section of the Atlas maps and presents information on a selection of five broad taxonomic groupings that make up some of Australia's major fisheries. These are:

Map 7 Lobster fisheries – Commercial catch

Map 8 Prawn fisheries – Commercial catch

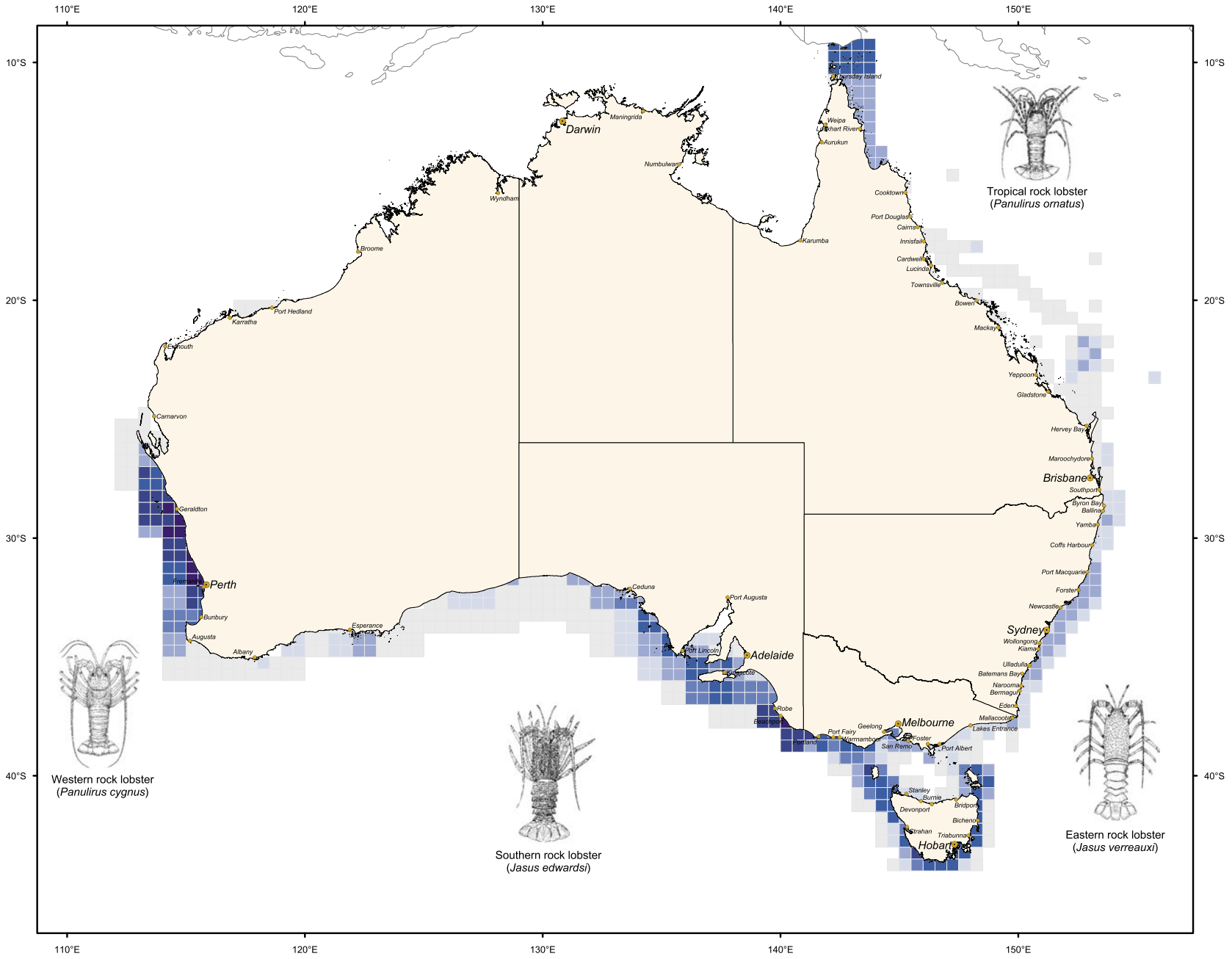
Map 9 Tuna and mackerel fisheries – Commercial catch

Map 10 Shark fisheries – Commercial catch

Map 11 Mollusc fisheries – Commercial GVP

Map 7

Lobster fisheries – Commercial catch



Mean annual catch (2000-02)

tonnes / year

- 0 - 2
- 2 - 10
- 11 - 20
- 21 - 100
- 101 - 400
- 401 - 1,300
- confidential

N

0 200 400 Kilometres

Data Source
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Gear

Primarily lobster pots and traps.

Primary species

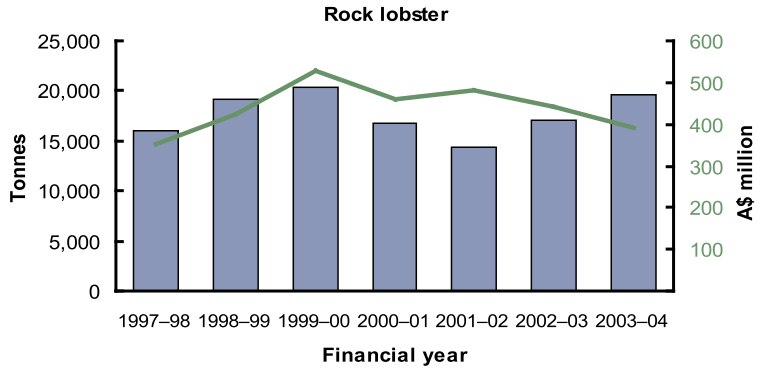
Rock lobsters of the genera *Panulirus* and *Jasus*.

Description

Map 7 shows mean annual catch of rock lobsters (Panuliridae) in the years 2000–02. The primary commercial species of rock lobster are illustrated on the map.

Notes

- Fisheries for the temperate species of rock lobster (*Jasus spp.*) are distributed across southern Australia, with southern rock lobster along the coast from Western Australia to Tasmania and eastern rock lobster off the coast of New South Wales. The fishery for the western rock lobster is the largest trap fishery in Australia and is restricted to the west coast of Western Australia. In the tropics there are substantial fisheries for species such as ornate rock lobster and painted rock lobster (*Panulirus spp.*), particularly in Torres Strait and north east Queensland. Rock lobster fishing is restricted to the continental shelf, particularly in shallow near-shore waters, with catches tending to diminish offshore towards the shelf edge.
- Each of the southern states have dedicated rock lobster fisheries that are managed through lobster size-limits, closed areas, limited entry to the fishery, and catch and effort limitations.



- Rock lobster fisheries around Australia have a history dating from around the arrival of Europeans. The fisheries expanded with the development of export markets after the Second World War.
- The bulk of the rock lobster catch is exported live, fresh, cooked or frozen to markets in Asia, USA and, more recently, Europe. There are about 1400 rock lobster licence holders around Australia operating out of numerous small and large ports.
- Rock lobster fisheries account for 27% of the total GVP of all Australian wild-catch fisheries. In 2003–04 this amounted to $390m and was as high as $527m in 1999–00. The 2003–04 production was 19,500 t, or 8.5% of the total Australian wild-catch tonnage, serving to illustrate the high value nature of rock lobster fisheries.

Sources

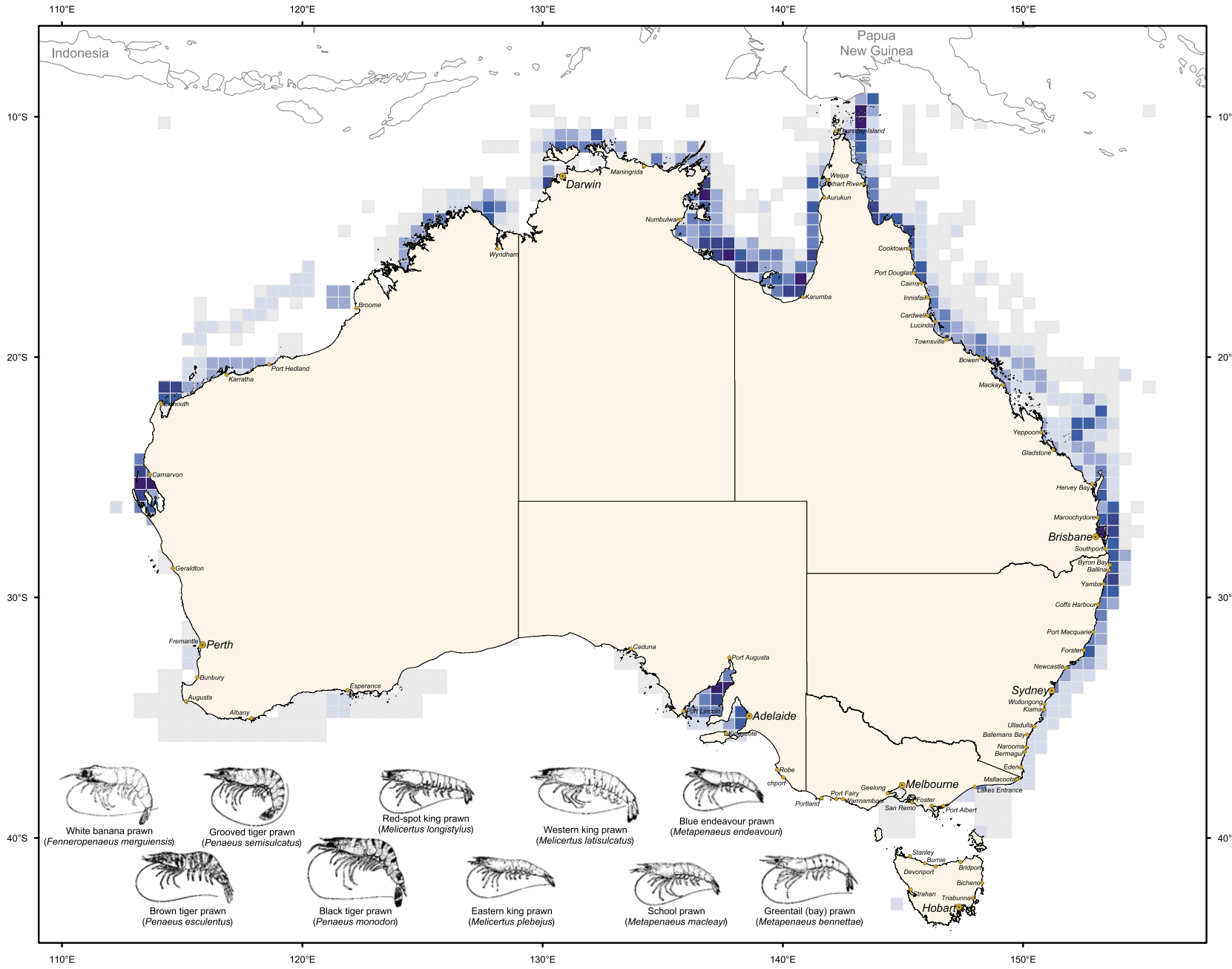
ABARE (2005) *Australian Fisheries Statistics 2004*. Australian Bureau of Agricultural and Resource Economics, Canberra. 65pp.

Kailola, P.J., Williams, M.J., Stewart, P.C., Russell, E.R., McNee, A. and Grieve, C. (1993) *Australian Fisheries Resources*. Bureau of Resource Sciences and the Fisheries Research and Development Corporation, Canberra. 422pp.

Setting lobster traps, Western Australia (Department of Fisheries, WA)

Map 8

Prawn fisheries – Commercial catch



Mean annual catch (2000-02)

tonnes / year

- 0 - 12
- 13 - 54
- 55 - 110
- 120 - 200
- 210 - 340
- 350 - 860
- confidential

N

0 200 400 Kilometres

Data Source
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

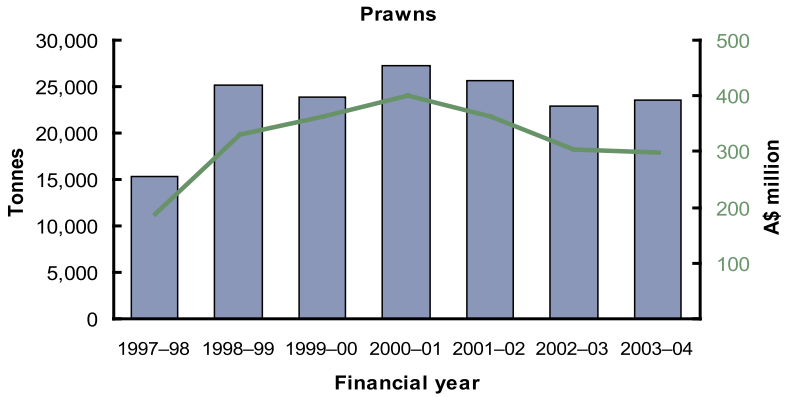
Gear
Prawn otter-trawl.

Primary species
Prawns of the family Penaeidae.

Description
Map 8 shows mean annual catch of prawns (Penaeidae) in the 2000–02, reported on a half-degree grid. A selection of the primary commercial species of prawn are illustrated on the map.

Notes

- Penaeid prawn populations are usually quite closely associated with river and estuarine systems, as well as habitats such as mangroves and seagrass, that are important at various stages of the prawn lifecycle. The associated trawl fisheries for penaeid prawns generally occur in shallow, near-shore waters, bays and estuaries. Australia's large-scale prawn fisheries are generally tropical or subtropical, with the exception of the substantial fisheries in Spencer Gulf and the Gulf of St Vincent, Southern Australia. In Western Australia, large fisheries occur in Shark Bay, Exmouth Gulf and along the Kimberly coast. The Northern Prawn Fishery extends across Northern Territory and throughout the Gulf of Carpentaria. Torres Strait also has a substantial prawn trawl fishery. Prawn trawling extends down the entire east coast of Queensland and New South Wales, with catches diminishing south of Sydney.



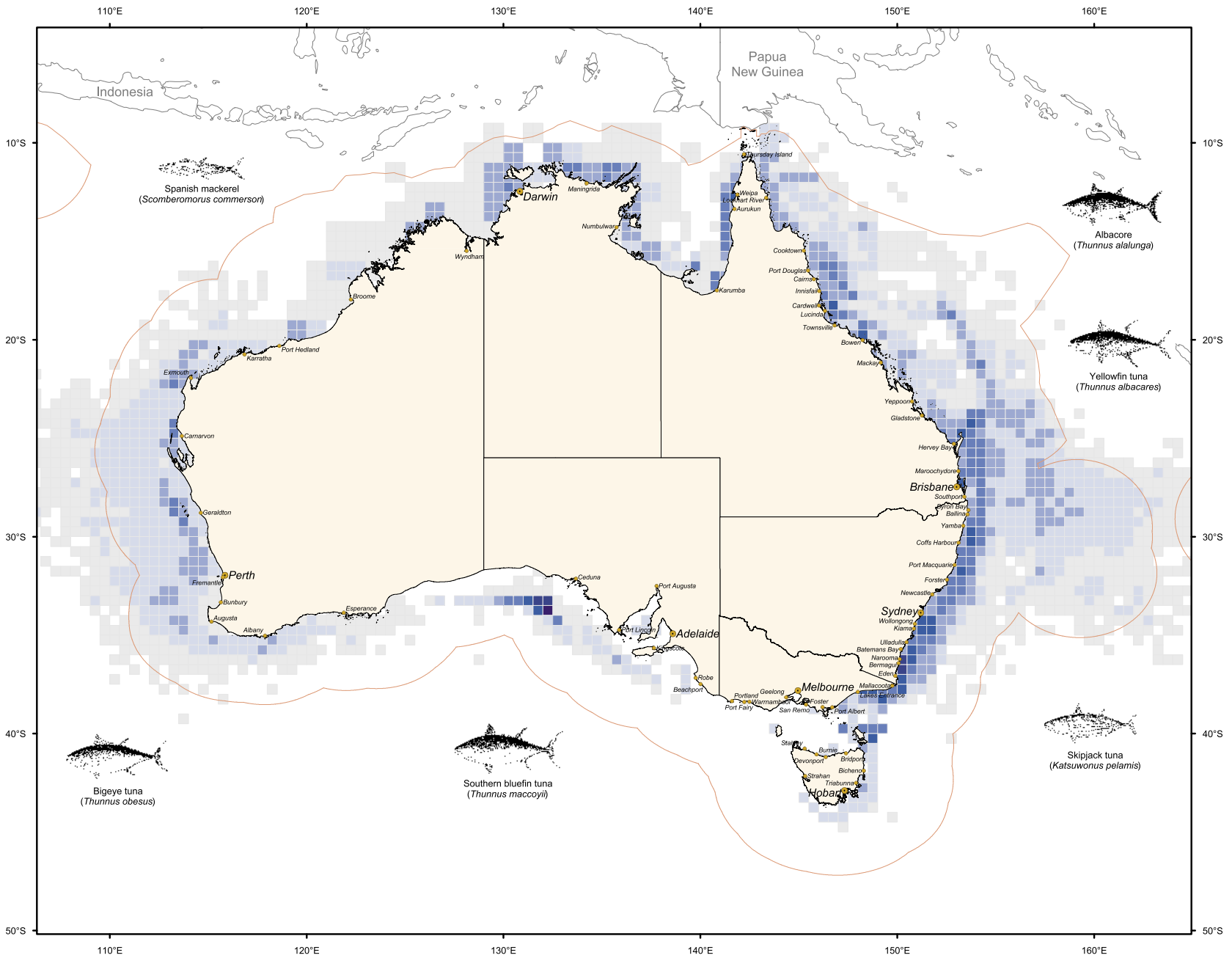
- There have been small estuarine fisheries for prawns since the 19th century, and an otter-trawl fishery for prawns has existed in New South Wales since the late 1920s. However, for the most part, today's large-scale industrial prawn fisheries began in the 1960s and underwent their major growth in the 1970s.
- Product may be frozen and packed at sea or chilled for processing on shore. Most of the catch is exported to Asian and US markets, with an emphasis on high quality and larger prawns. There are about 1550 prawn trawl licence holders around Australia.
- Prawn fisheries account for 20% of the total GVP of all Australian wild-catch fisheries. In 2003–04 this amounted to $298m and was as high as $401m in 2000–01. The 2003–04 production was 23,500 t or 10% of all Australian wild-catch tonnage.

Sources
ABARE (2005) *Australian Fisheries Statistics 2004*. Australian Bureau of Agricultural and Resource Economics, Canberra. 65pp.

Kailola, P.J., Williams, M.J., Stewart, P.C., Russell, E.R., McNee, A. and Grieve, C. (1993) *Australian Fisheries Resources*. Bureau of Resource Sciences and the Fisheries Research and Development Corporation, Canberra. 422pp.

Northern Prawn Fishery fleet, Darwin (J. Larcombe, 2005)

Map 9 Tuna and mackerel fisheries – Commercial catch



Mean annual catch (2000-02)

tonnes / year

- 0 - 5
- 5 - 20
- 21 - 60
- 61 - 200
- 201 - 1,000
- 1,001 - 2,900
- confidential
- Exclusive Economic Zone

N

0 200 400 Kilometres

Data Source
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Gear

Mainly line gear such as troll and pelagic longline, and purse seine.

Primary species

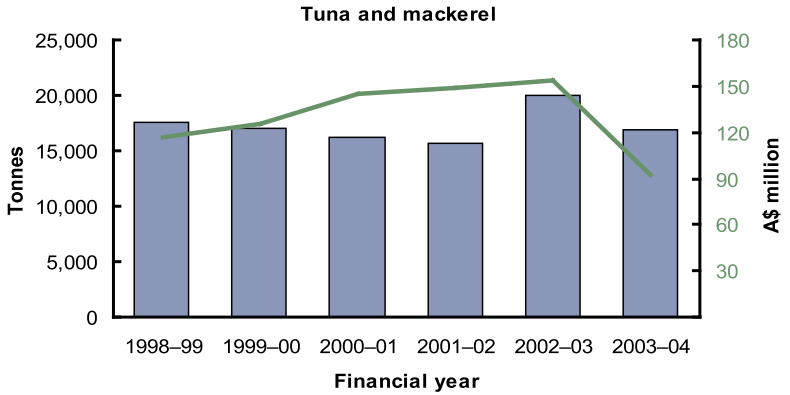
Fishes of the family Scombridae (mackerels, tunas and bonitos).

Description

Map 9 shows mean annual catch of scombrids in 2000–02, reported on a half-degree grid. A selection of the primary commercial species of scombrid are illustrated on the map. Note that blue mackerel and jack mackerel (Carangidae) and are not included in this presentation.

Notes

- A number of distinct fisheries are encompassed in this presentation. Trolling for mackerel (*Scomberomorus spp.*) occurs close to the surface in coastal areas around reefs, shoals and headlands in tropical and subtropical waters off Western Australia, Northern Territory and Queensland. Pelagic longlining for tuna (*Thunnus spp.*) occurs from the edge of the continental shelf out to deep oceanic waters, off the eastern and western coasts of Australia. Pelagic longlining by Australian vessels also extends outside the Australian Fishing Zone onto the high seas. Purse seining for southern bluefin tuna occurs in the Great Australian Bight, and purse seining for skipjack tuna (*Katsuwonus pelamis*) occurs from the Great Australian Bight to New South Wales.
- Mackerel fisheries are usually managed by the States/Territories whereas tuna fisheries are managed by the Australian Government.



- Mackerel are consumed domestically but a significant proportion is exported (to Taiwan in particular). Longline caught tuna are largely for the Asian export market (particularly Japan). Purse seine caught southern bluefin tuna are destined for grow-out cages near Port Lincoln and fattened for up to six months before harvest and export to Japan.
- The GVP for tuna and mackerel fisheries was $93m with a catch of 17,000 t in 2003–04. This was down from a high of $150m and a catch of 20,000 t in 2002–03. Note that in relation to southern bluefin tuna, the GVP figures are estimates at entry to the tuna farms and exclude value adding by the farms.

Sources

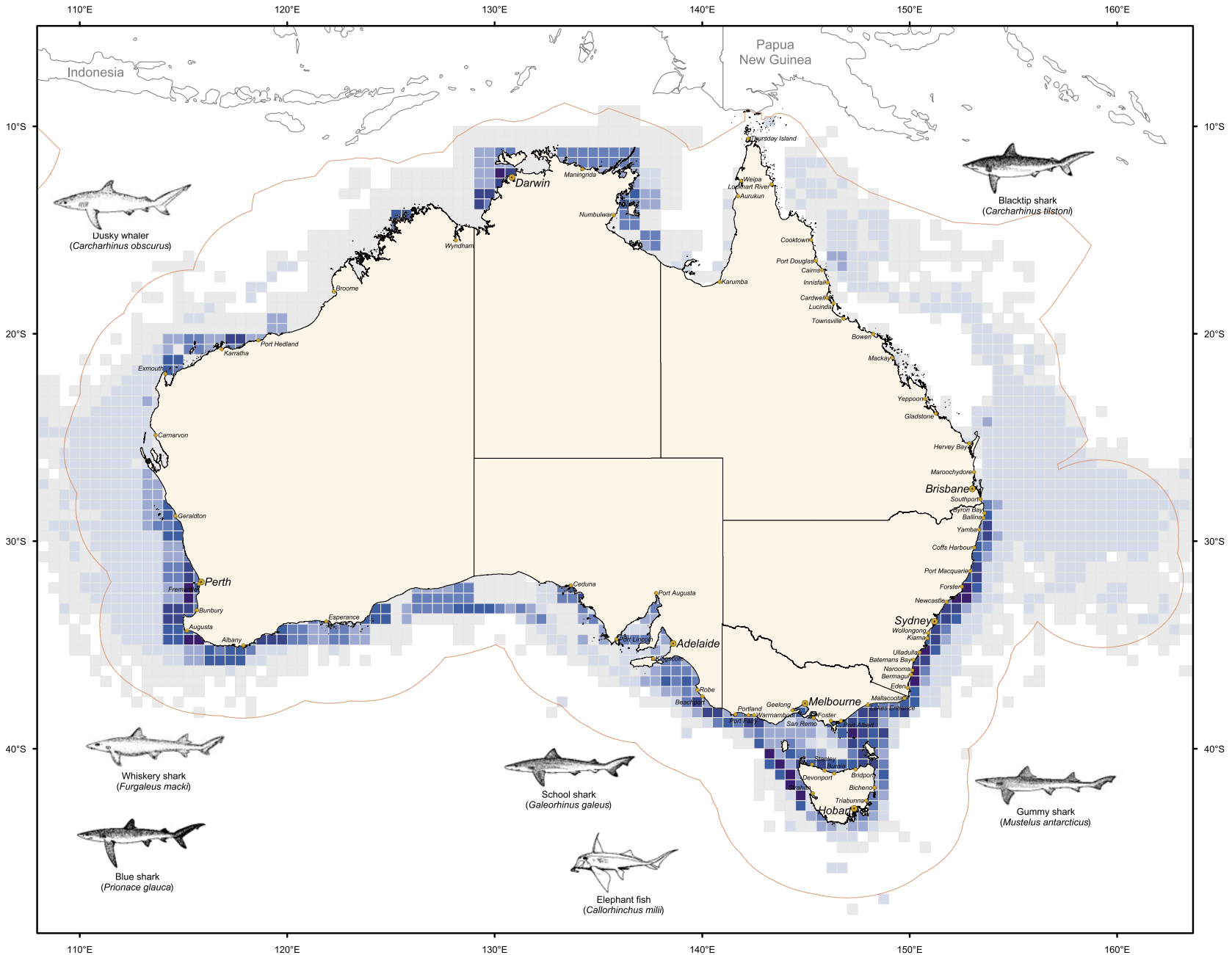
ABARE (2005) *Australian Fisheries Statistics 2004*. Australian Bureau of Agricultural and Resource Economics, Canberra. 65pp.

Kailola, P.J., Williams, M.J., Stewart, P.C., Russell, E.R., McNee, A. and Grieve, C. (1993) *Australian Fisheries Resources*. Bureau of Resource Sciences and the Fisheries Research and Development Corporation, Canberra. 422pp.

Yellowfin tuna, Mooloolaba, Queensland (J. Kalish, 2003)

Map 10

Shark fisheries – Commercial catch



Mean annual catch (2000-02)

tonnes / year

- 0 - 2
- 3 - 5
- 6 - 11
- 12 - 19
- 20 - 29
- 30 - 50
- confidential
- Exclusive Economic Zone

N

0 200 400 Kilometers

Data Source
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Gear

Mainly net gear, such as gillnet, and line gear such as bottom-set and pelagic longline.

Primary species

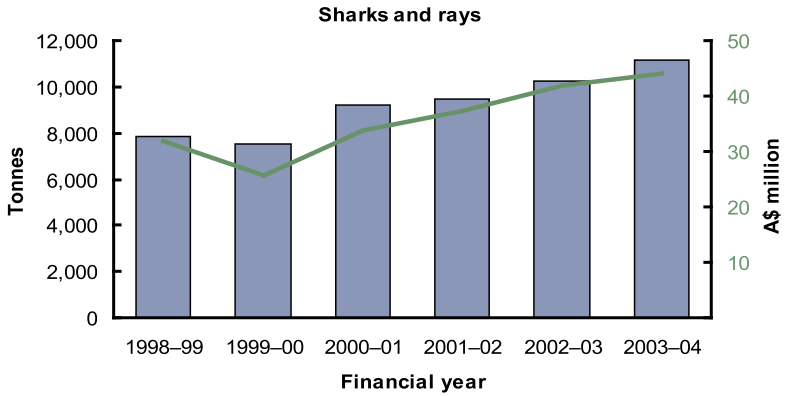
Sharks, rays and other cartilaginous fish (Chondrichthyes).

Description

Map 10 shows mean annual recorded catch of sharks and rays over the years 2000–02 inclusive, reported on a half-degree grid. A selection of the primary commercial species of shark and ray are illustrated on the map.

Notes

- There are a number of dedicated shark fisheries in Australia, including two Western Australian fisheries using demersal gillnet in the south west, the Western Australian northern shark fisheries and the Northern Territory Shark Fishery (in the north west), and the Australian Government managed Southern and Eastern Scalefish and Shark Fishery (in the south east). In addition, sharks and rays are a retained bycatch of a large variety of other fisheries, including pelagic longlining for tuna and billfish, trolling for mackerel, prawn and finfish trawling, and various forms of gillnet and baited hook fishing. The map clearly illustrates catches from the dedicated shark fisheries on the continental shelf, as well as extensive areas of shark bycatch from pelagic longlining in oceanic waters off the eastern and western seaboards.



- Fisheries for shark have been operating in south eastern Australia since the 1920s, while other fisheries around Australia have developed more recently. In northern Australia, the domestic fisheries succeeded a large Taiwanese gillnet fleet that operated until the 1980s.
- Most shark is marketed filleted in Australia as flake, and is a staple of fish and chip shops in southern states. Shark fin is exported dried, primarily to Asian markets.
- The GVP of fisheries for sharks and rays was $44m with a catch of 11,000 t in 2003–04. The total recorded catch has shown an increasing trend since 1999–00. Quantities of shark are commonly discarded in some fisheries. The results in this presentation are for the recorded retained catch only.

Sources

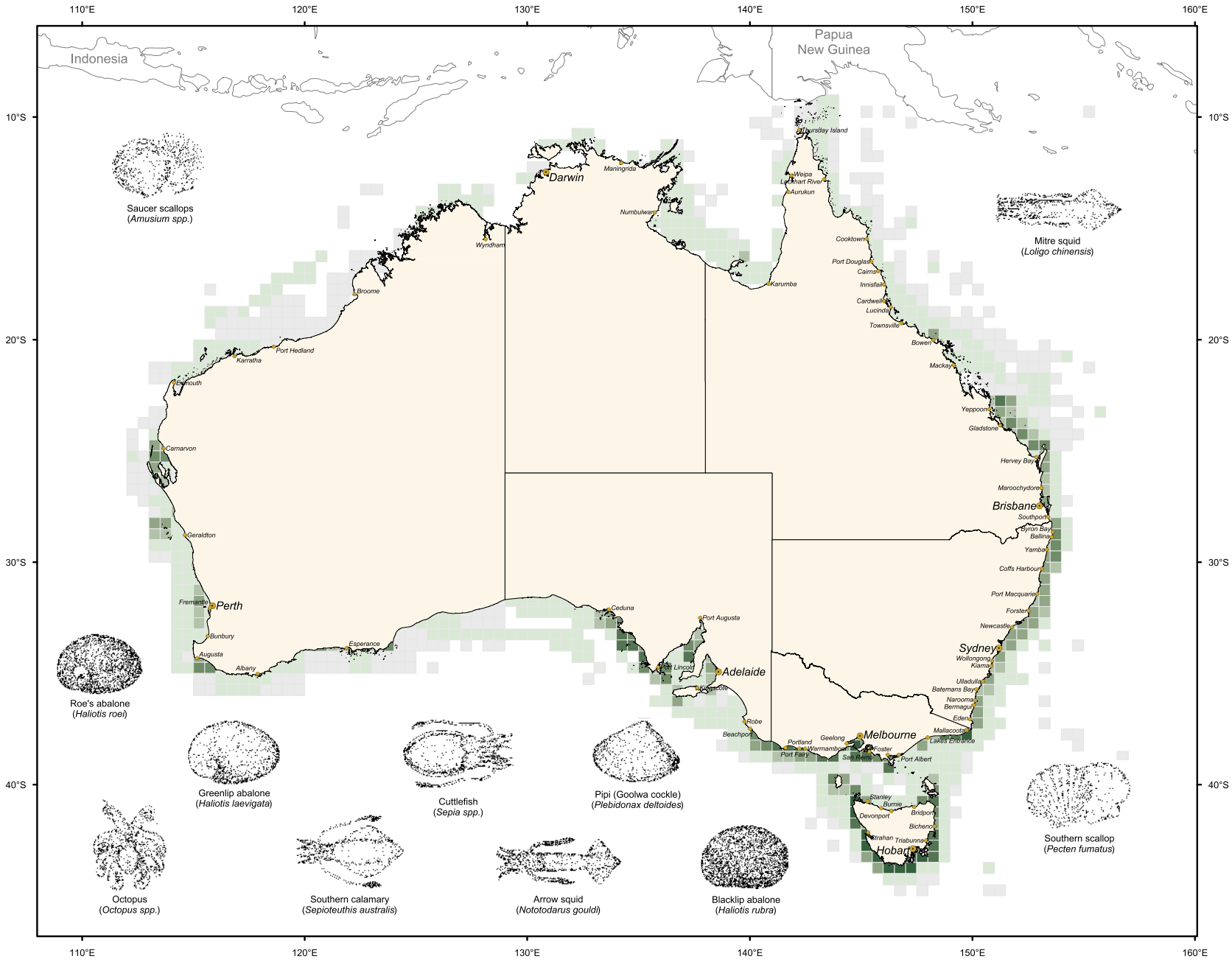
ABARE (2005) *Australian Fisheries Statistics 2004*. Australian Bureau of Agricultural and Resource Economics, Canberra. 65pp.

Kailola, P.J., Williams, M.J., Stewart, P.C., Russell, E.R., McNee, A. and Grieve, C. (1993) *Australian Fisheries Resources*. Bureau of Resource Sciences and the Fisheries Research and Development Corporation, Canberra. 422pp.

Shark research and monitoring, Western Australia (Department of Fisheries, WA)

Map 11

Mollusc fisheries – Commercial GVP



Mean annual GVP (2000-02)

A$'000 / year

- 0 - 250
- 251 - 500
- 501 - 1,000
- 1,001 - 2,000
- 2,001 - 6,000
- 6,001 - 15,000
- confidential

N

0 200 400 Kilometres

Data Source
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Gear (species)

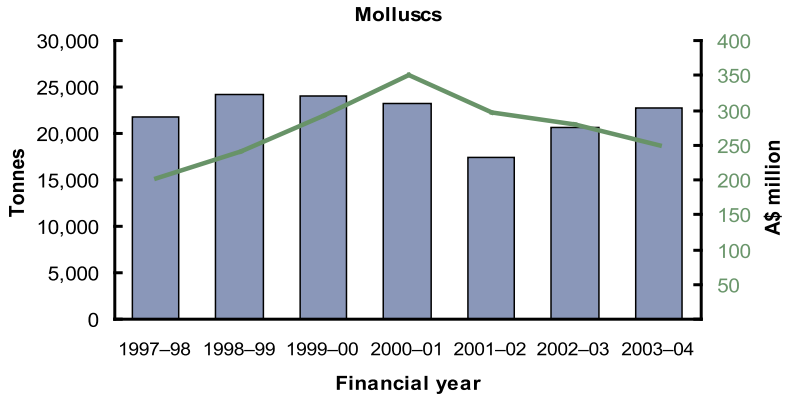
Hand collection (abalone, oysters, pipis), dredge and trawl (scallop), jig and trawl (squid), pots (octopus) and haul nets (calamari).

Description

Map 11 shows mean annual GVP of mollusc catch in 2000–02, reported on a half-degree grid. A selection of the primary commercial mollusc species are illustrated on the map.

Notes

- Abalone fisheries are restricted to shallow (usually less than 20 m) rocky reef areas of southern Australia that are accessible to divers. Highly valuable abalone fisheries can be observed around Tasmania, Victoria, South Australia and southern Western Australia. Pipis are harvested from high energy surf beaches in South Australia and New South Wales. Dedicated fisheries for scallop are located in Bass Strait; Shark Bay and Abrolhos Islands (Western Australia); inshore waters of Northern Territory; and along the central Queensland coast. Dedicated haulnet and jig fisheries for squid and calamary are located in the South Australia Gulfs and in shelf waters of eastern Bass Strait.
- Significant quantities of squid and calamari are taken as bycatch in trawl and net fisheries around Australia.
- Intensive commercial fishing for abalone across southern Australia began in the 1960s.



- Most abalone and scallop product is destined for export to the Asian market. The remaining mollusc catches are largely for the domestic market.
- The GVP for mollusc fisheries in Australia was $249m (17% of the Australia's total fisheries GVP) with a catch of 22,000 t in 2003–04. Abalone accounted for $189m and 5,500 t of this 2003–04 total. The total recorded catch has shown an increasing trend since 2001–02, but a downward trend in GVP over the same period.

Sources

ABARE (2005) *Australian Fisheries Statistics 2004*. Australian Bureau of Agricultural and Resource Economics, Canberra. 65pp.

Kailola, P.J., Williams, M.J., Stewart, P.C., Russell, E.R., McNee, A. and Grieve, C. (1993) *Australian Fisheries Resources*. Bureau of Resource Sciences and the Fisheries Research and Development Corporation, Canberra. 422pp.

Scallop catch, Mooloolaba, Queensland (J. Kalish, 2003)

Fish traps, Darwin (J. Larcombe, 2005)

COMMERCIAL FISHING BY FISHING METHOD

A very wide range of fishing methods and gears are used across Australia's fisheries, reflecting characteristics of the species targeted. The Atlas presents broad summaries as follows:

Map 12 Hook and line fisheries – Commercial catch

Map 13 Net fisheries – Commercial catch

Map 14 Trap fisheries – Commercial catch

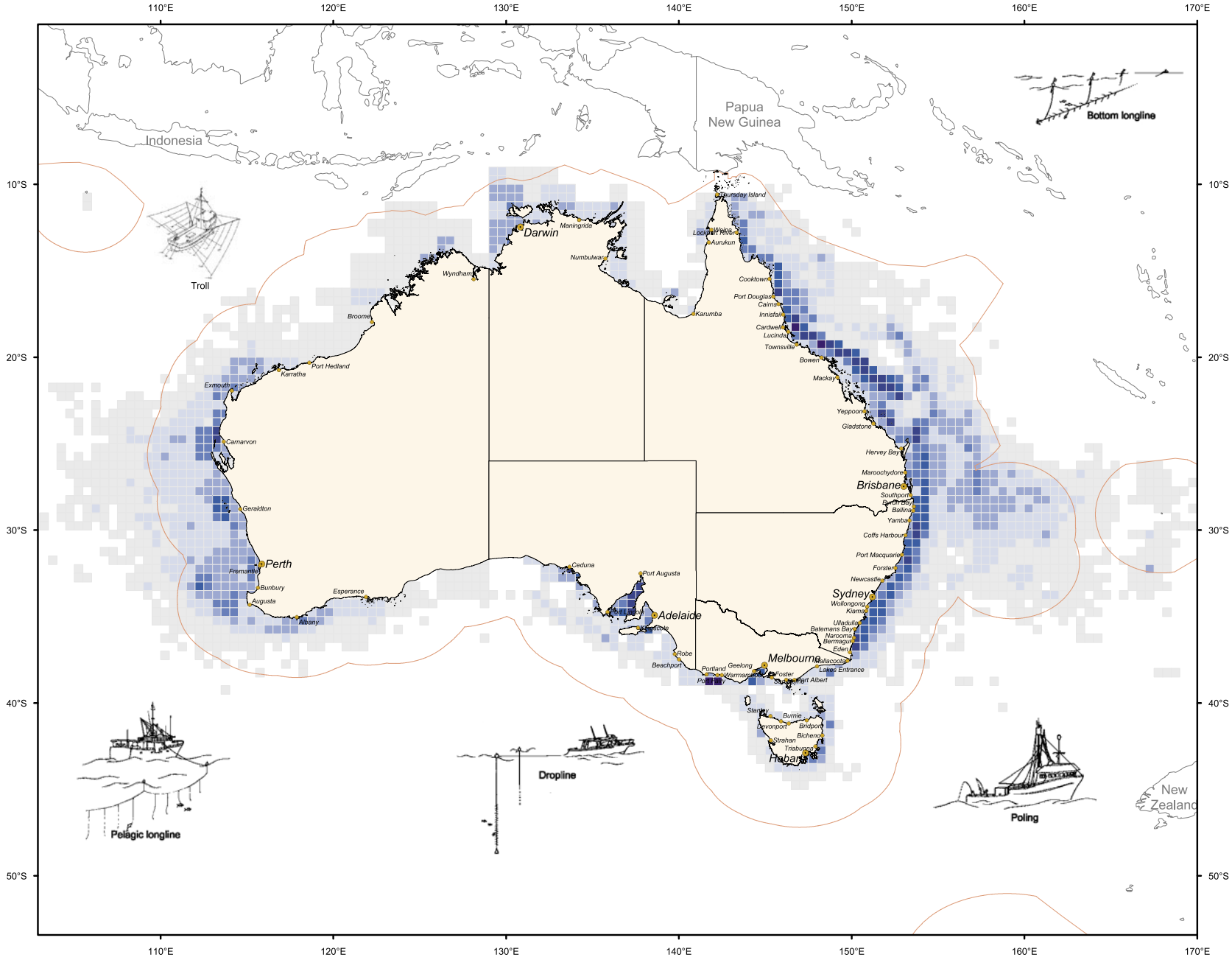
Map 15 Trawl fisheries – Commercial catch

Map 16 Dive and hand collection fisheries – Commercial GVP

The composition of these classes is detailed in Appendix 1. Each map shows mean annual catch or GVP in 2000–02 for each method class, reported on a half-degree grid. The maps also contain illustrations of some the fishing methods within the class.

Map 12

Hook and line fisheries – Commercial catch



Mean annual catch (2000-02)

tonnes / year

- 0 - 11
- 12 - 28
- 29 - 54
- 55 - 97
- 98 - 180
- 190 - 380
- confidential
- Exclusive Economic Zone

N

0 250 500 Kilometres

Data Source
Fisheries: National Atlas of Marine Fisheries 2000-02.

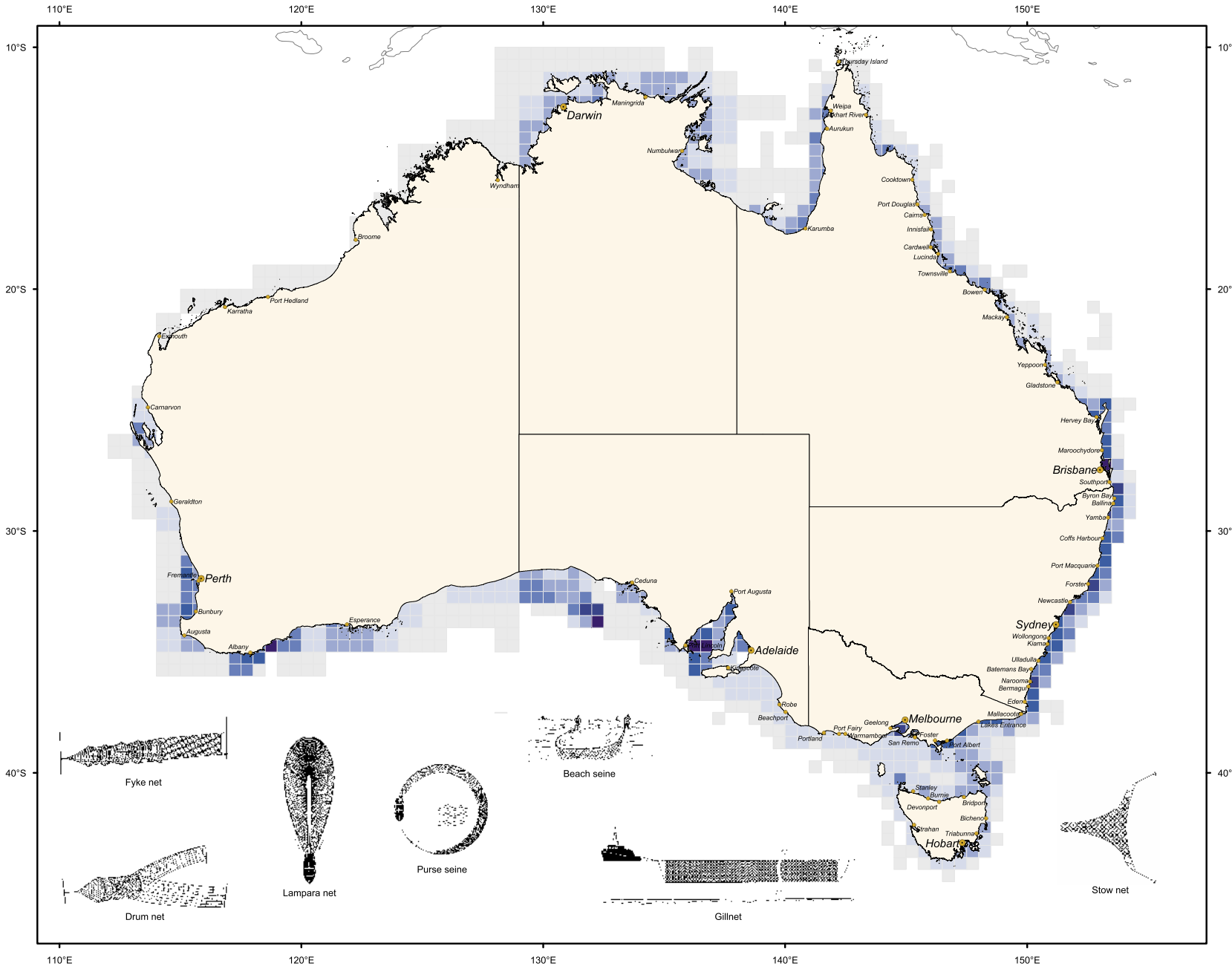
Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Map 13

Net fisheries – Commercial catch



Mean annual catch (2000-02)

tonnes / year

- 0 - 25
- 26 - 96
- 97 - 220
- 231 - 440
- 441 - 1,100
- 1,101 - 2,900
- confidential

N

0 200 400 Kilometres

Data Source
Fisheries: National Atlas of Marine Fisheries 2000-02.

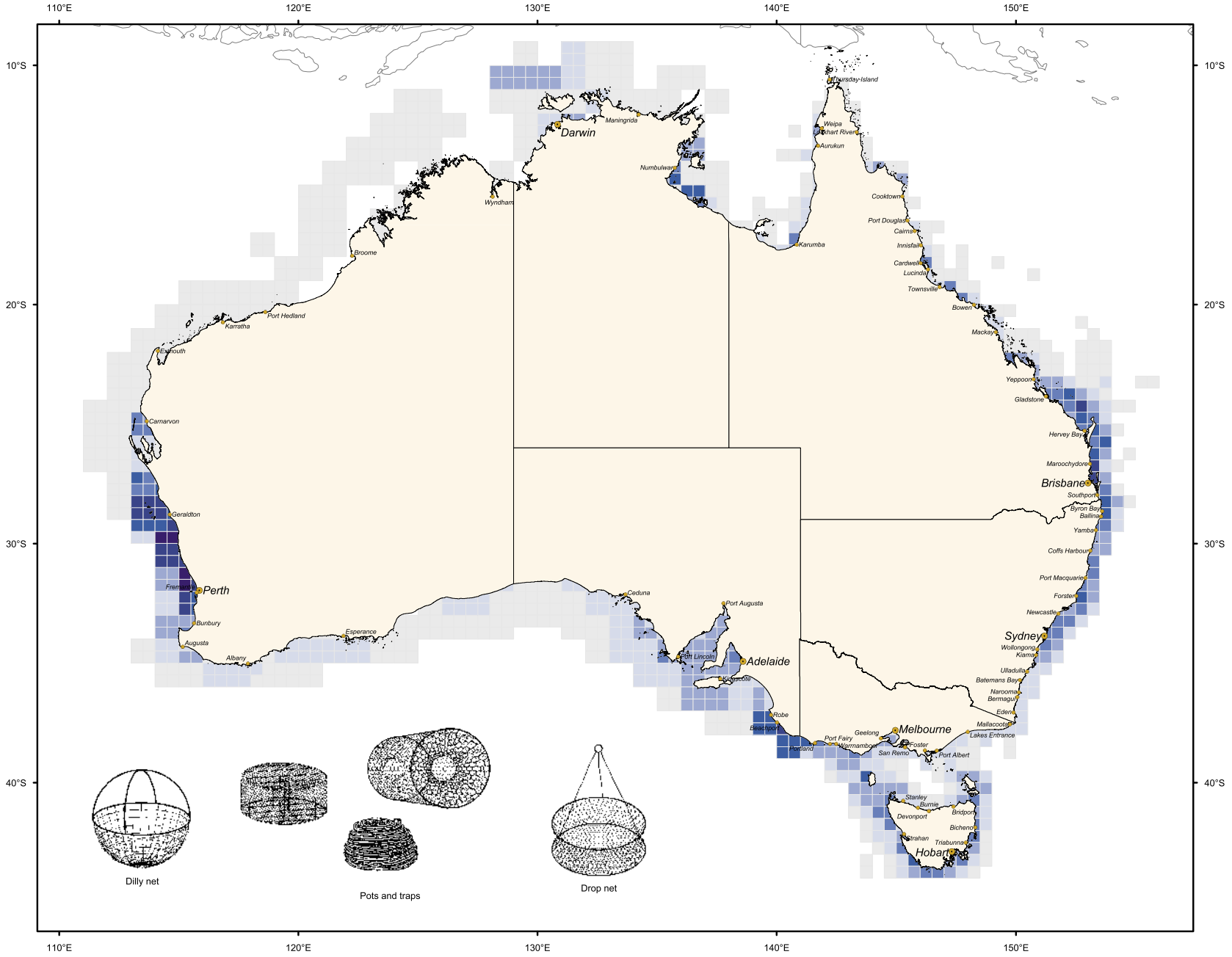
Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Map 14

Trap fisheries – Commercial catch



Mean annual catch (2000-02)

tonnes / year

- 0 - 13
- 14 - 44
- 45 - 110
- 111 - 250
- 251 - 560
- 561 - 1,400
- confidential

N

0 200 400 Kilometres

Data Source
Fisheries: National Atlas of Marine Fisheries 2000-02.

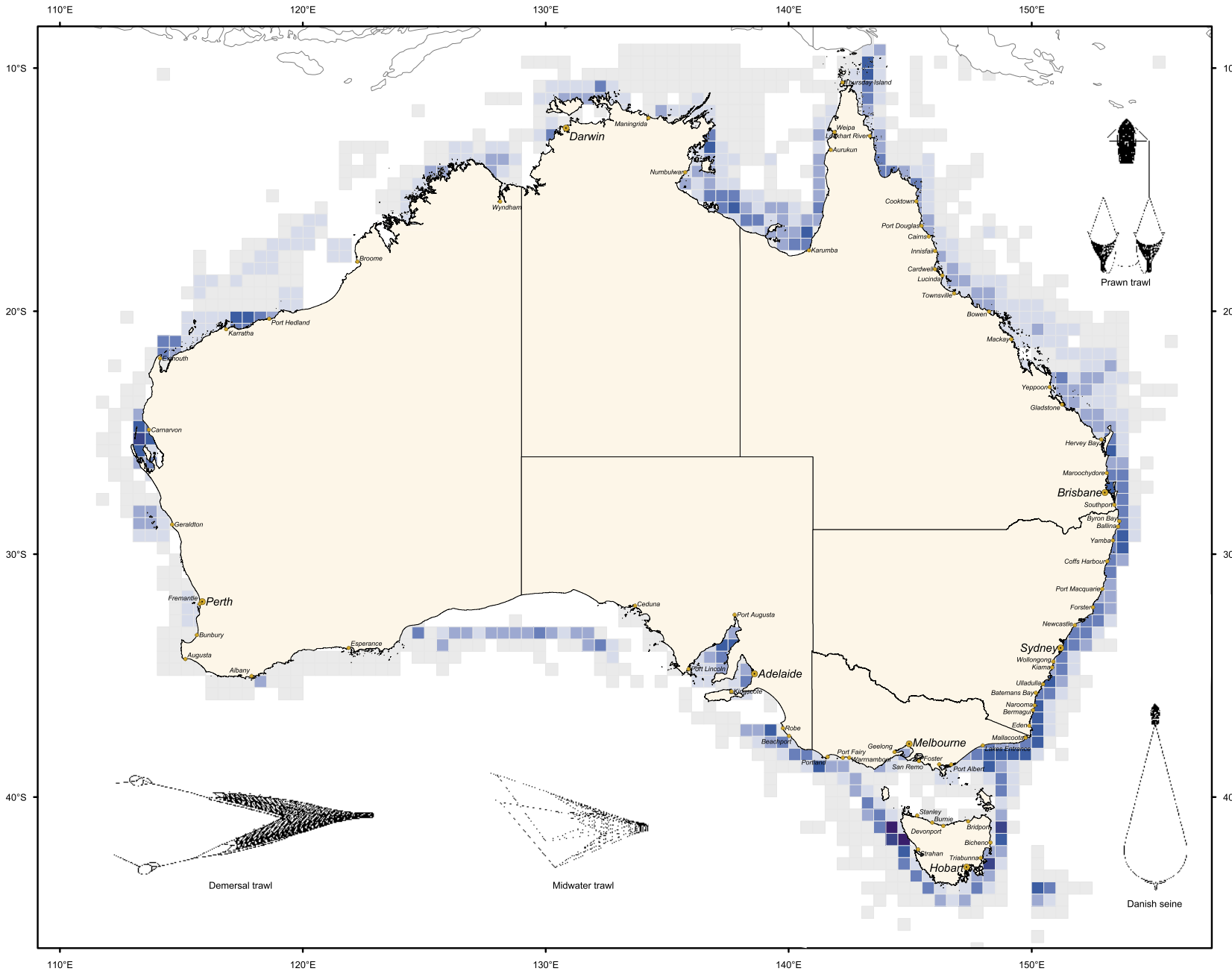
Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Map 15

Trawl fisheries – Commercial catch



Mean annual catch (2000-02)

tonnes / year

- 0 - 57
- 58 - 160
- 161 - 370
- 371 - 880
- 881 - 1,900
- 1901 - 4,100
- confidential

N

0 200 400 Kilometres

Data Source
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
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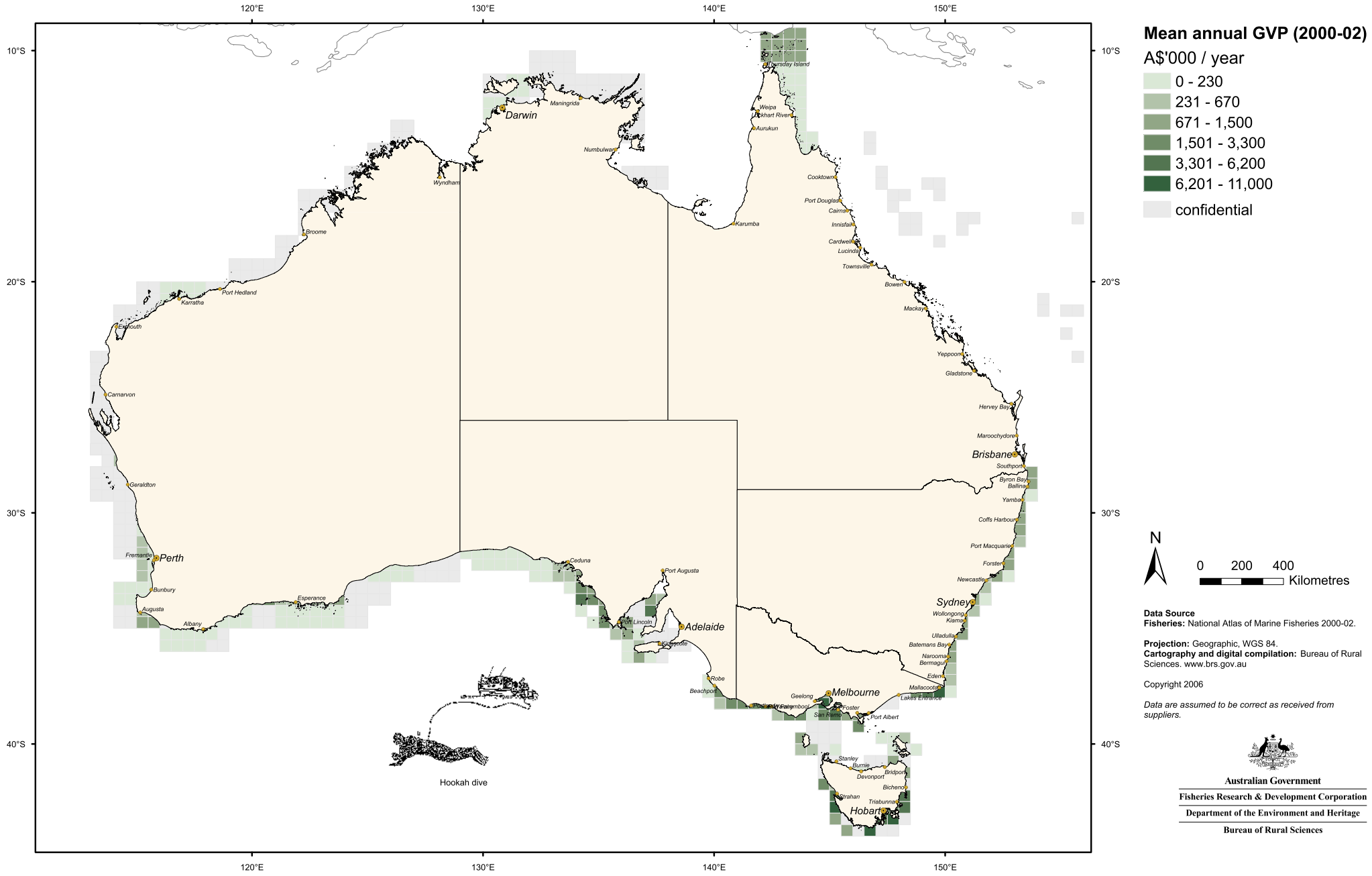
Map 16

Dive and hand collection fisheries – Commercial GVP



Mean annual GVP (2000-02)

A$'000 / year

- 0 - 230
- 231 - 670
- 671 - 1,500
- 1,501 - 3,300
- 3,301 - 6,200
- 6,201 - 11,000
- confidential

N

0 200 400 Kilometres

Data Source
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

marine matters

NATIONAL

COMMERCIAL FISHERIES AND COASTAL COMMUNITIES

– Region by region

This section of the Atlas presents Region by Region mapping and analysis of fisheries activities and social context. Each map contains three themes:

- **Land:** Employment in the fish industry.
- **Ocean:** Pie charts indicating the percentage of commercial catch, by weight, from each fishing method.
- **Ocean:** Mean annual gross value of production of commercial fishing.

In the *Description*, a brief examination of each of the above themes is provided. A summary of *Socio-economic characteristics* for each Region is based on a comprehensive analysis of socio-economic indicators undertaken by BRS (see Appendices).

The following Marine Regions are covered:

Map 17 South Western Region

Map 18 Western Central Region

Map 19 North Western Region

Map 20 Northern Bonaparte Area

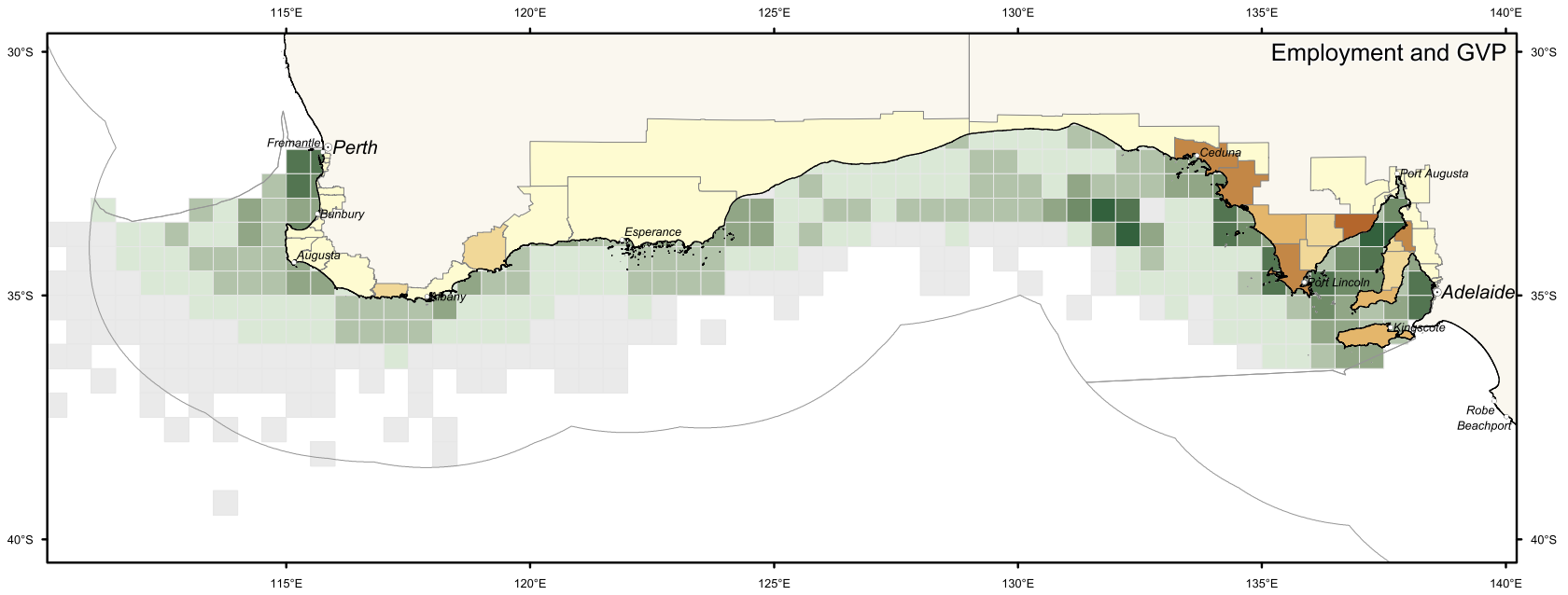
Map 21 Northern Planning Area

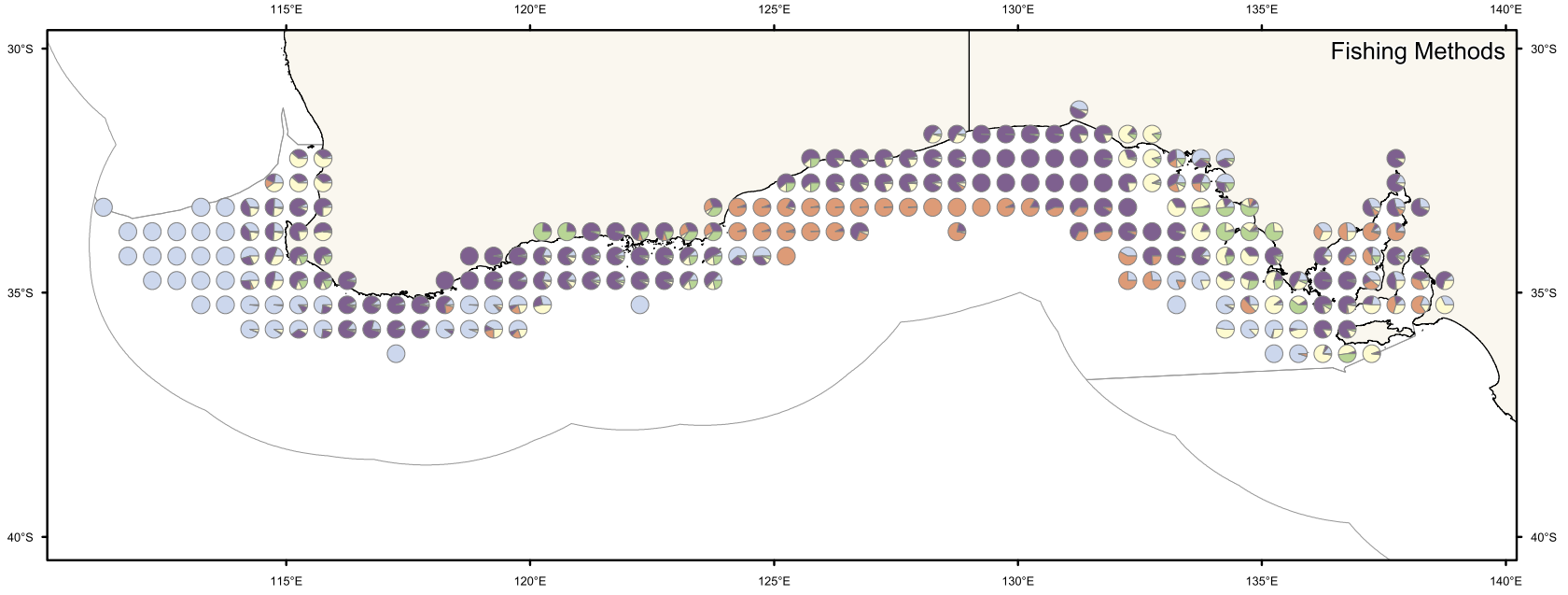
Map 22 North Eastern Region

Map 23 Eastern Central and Norfolk Regions

Map 24 South Eastern Region

Map 17 South Western Region – Fish industry employment, GVP and fishing methods





Fish industry employment

Percent of total employment

- less than 1%
- 1.0% - 2.5%
- 2.6% - 5.0%
- 5.1% - 10%
- greater than 10%

Mean annual GVP (wild-catch)

A$'000 / year

- 0 - 200
- 201 - 700
- 701 - 2,000
- 2,001 - 4,000
- 4,001 - 12,000
- 12,001 - 45,000
- confidential

% Catch (tonnes) by Method

- Line
- Net
- Trawl
- Dredge
- Trap
- Dive/Hand

N

0 100 200 Kilometres

Data Sources
Social/Economic: Australian Bureau of Statistics, Census of Population and Housing, 2001.
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Description

Ochre shading over the land shows employment in the fish industry as a percentage of total employment, for coastal SLAs. Commercial fishing employment, including aquaculture is largely concentrated across the Eyre Peninsula where almost all coastal towns have strong linkages to commercial fishing activities. For instance, the town of Port Lincoln has the largest number and proportion of people employed within the fishing sector of any coastal town in Australia.

Pie charts over the ocean illustrate the percentage of the commercial catch, by weight, from each fishing method. Major fisheries in the Region include: South Australia prawn trawl fisheries, abalone dive and rock lobster trap fisheries (South Australia and Western Australia); Great Australian Bight Trawl Fishery (Australian Government); southern bluefin tuna net fishery (Australian Government); and net fisheries for small pelagic species (South Australia and Australian Government).

Green shading over the ocean shows the mean annual GVP of commercial fishing in 2000–02. The total production for the Region in 2002 was estimated at 39,500 t with a GVP of $335m.

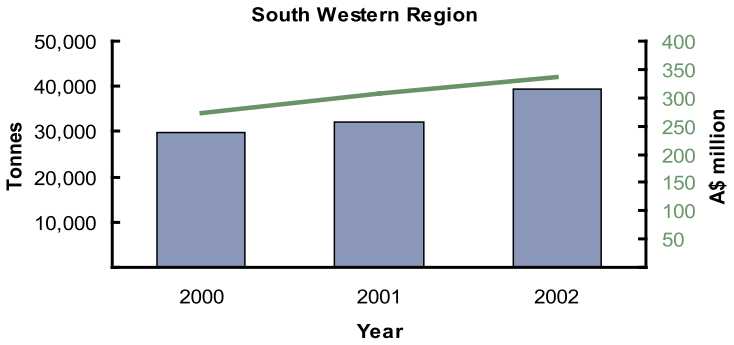
Socio-economic characteristics

The distribution and density of the Non-metropolitan population in conjunction with the natural geography of the Region has created several distinct coastal communities, such as the Yorke and Eyre Peninsulas, the Nullarbor Plain, and the south western corner of Western Australia. Within these communities there are coastal towns that act as key regional centres, for example Bunbury, Albany, Esperance, Ceduna, Port Lincoln and Whyalla. However, the Augusta–Margaret River area in Western Australia has more inland settlements than coastal settlements.

The coastal fringe of the Great Australian Bight from Ceduna to Esperance has a large proportion of Indigenous people, a very low population density and a highly transient population, with the area acting as a transport corridor between the western and the eastern parts of the continent. The western part of the South Australian coastline is mainly desert and comprises the Yalata Aboriginal Land.

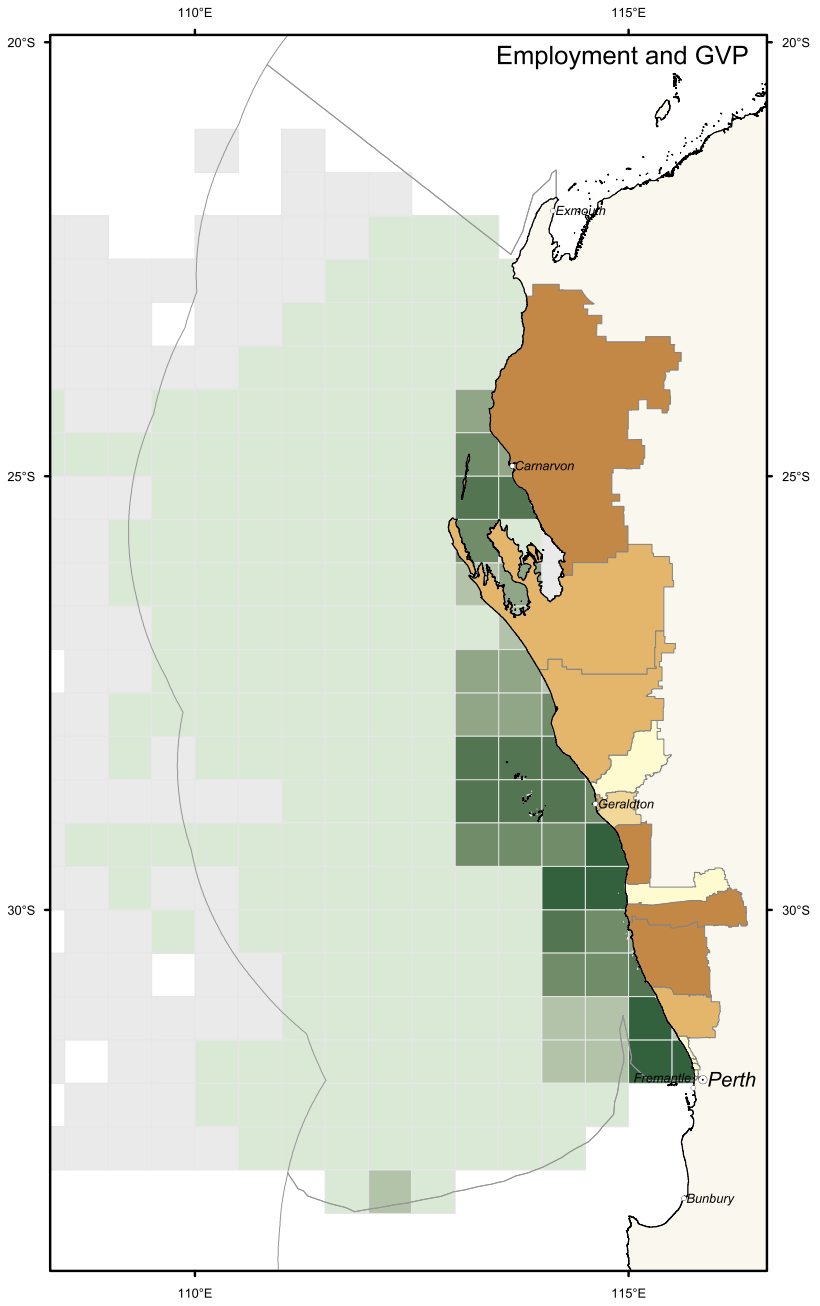
The South-west coastal region has a population of approximately 774,330 persons distributed across 61 coastal SLAs (36 in South Australia and 25 in Western Australia). Around 60% of the Region's total population reside in Metropolitan SLAs. Between 1996 and 2001, population growth was higher across the Western Australian portion than across the South Australian portion, with rapid population growth around Bunbury, Busselton, Albany, Denmark, the southern fringes of Perth, and the Augusta–Margaret River area.

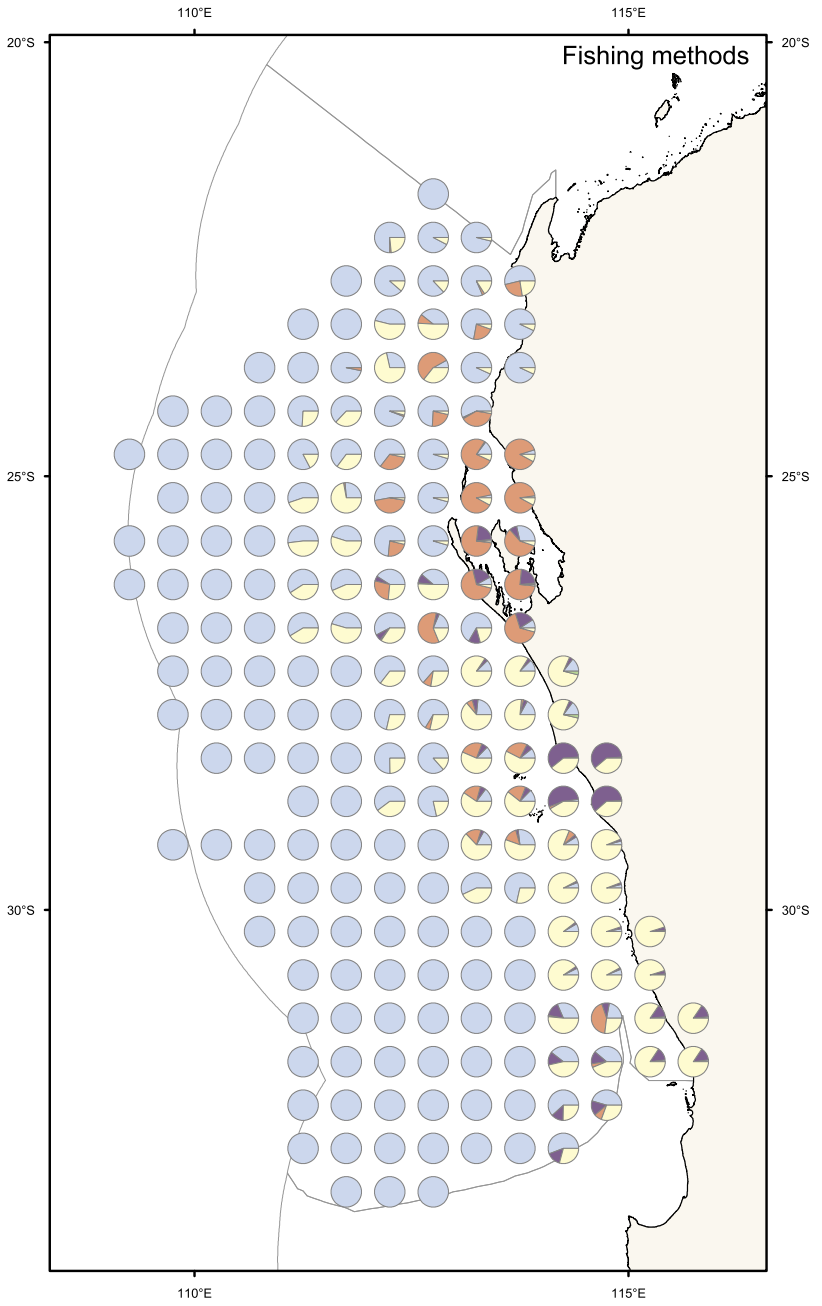
The South Australian portion of the Region is characterised by substantially older median ages and high elderly dependency, and is more dependent on agriculture, fisheries and forestry industries with lower employment diversification outside regional centres.



Ocean jacket fish trapping, South Australia (R. Grove Jones, Focus Magic)

Map 18 Western Central Region – Fish industry employment, GVP and fishing methods





Fish industry employment

Percent of total employment

- less than 1%
- 1.0% - 2.5%
- 2.6% - 5.0%
- 5.1% - 10%
- greater than 10%

Mean annual GVP (wild-catch)

A$'000 / year

- 0 - 450
- 451 - 1,600
- 1,601 - 3,600
- 3,601 - 7,600
- 7,601 - 15,000
- 15,001 - 38,000
- confidential

% Catch (tonnes) by method

- Line
- Net
- Trawl
- Dredge
- Trap
- Dive/Hand

N

0 100 200 Kilometres

Data Sources
Social/Economic: Australian Bureau of Statistics, Census of Population and Housing, 2001.
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

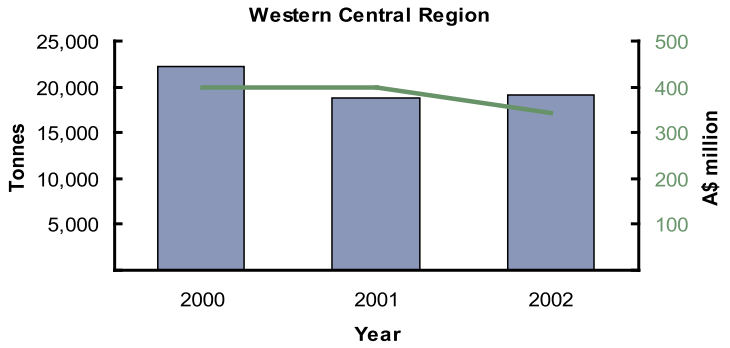
Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Description

Ochre shading over the land shows employment in the fish industry as a percentage of total employment for coastal SLAs. Fishing activities play an important role for local economies across the Region, given that fish industry employment is largely located outside of the Metropolitan portion where the vast majority of its workforce resides. The Region includes the Shark Bay and the Ningaloo Marine Parks.

Pie charts over the ocean illustrate the percentage of the commercial catch, by weight, from each fishing method. Major fisheries in the Region include: the western rock lobster trap fishery (Western Australia); prawn and scallop trawl fisheries in the vicinity of Shark Bay (Western Australia); pelagic longline fisheries offshore (Australian Government); and various finfish fisheries (Australian Government and Western Australia).

Green shading over the ocean shows the mean annual GVP of commercial fishing in 2000–02. The total production for the Region in 2002 was estimated at 19,000 t with a GVP of $334m, down from $400m in 2000.



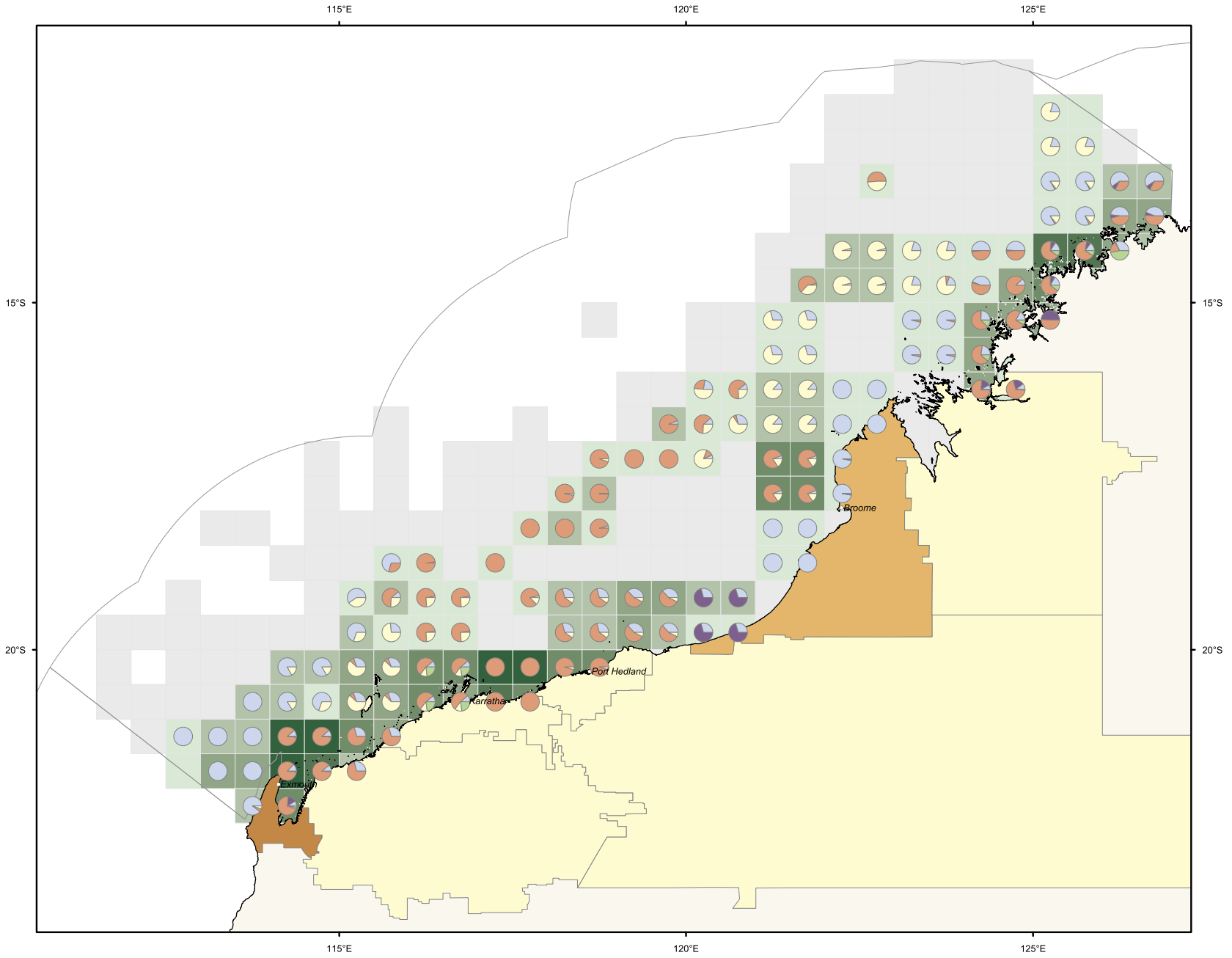
Socio-economic characteristics

The Region has a population of approximately 312,100 persons, 81% of whom reside within the coastal Metropolitan portion. Between 1996 and 2001 the population grew at an annual rate slightly higher than for coastal Australia, with much of this population growth occurring across the northern and peri-urban fringes of Perth, and around Geraldton.

The Region is characterised by the sharp contrast between socio-demographic conditions in the Metropolitan and Non-metropolitan portions, which comprised sparsely distributed coastal towns, many of them holiday villages. These coastal Non-metropolitan areas had larger proportions of Indigenous people, an older median age, a higher level of dependents and fewer working age persons, a larger proportion of low-income households and a less diversified employment structure.

Emptying the rock lobster catch, Western Australia (Dylan Skinns, Newfish)

Map 19 North Western Region – Fish industry employment, GVP and fishing methods



Fish industry employment

Percent of total employment

- greater than 10%
- 5.1% - 10%
- 2.6% - 5.0%
- 1.0% - 2.5%
- less than 1%

Mean annual GVP (wild-catch)

A$'000 / year

- 0 - 70
- 71 - 170
- 171 - 300
- 301 - 750
- 751 - 1,800
- 1,801 - 2,800
- confidential

% Catch (tonnes) by method

- Line
- Net
- Trawl
- Dredge
- Trap
- Dive/Hand

N

0 75 150 Kilometres

Data Sources
Social/Economic: Australian Bureau of Statistics, Census of Population and Housing, 2001.
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Description

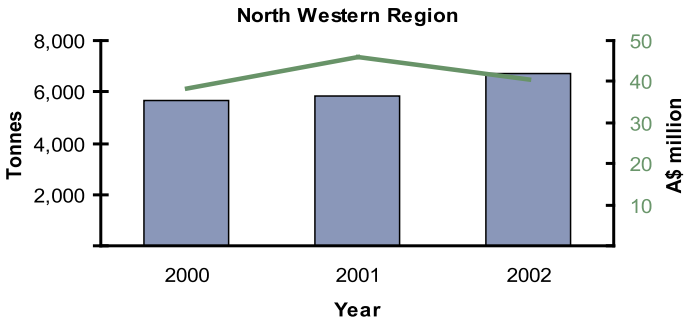
Ochre shading over the land shows employment in the fish industry as a percentage of total employment for coastal SLAs. Much of the employment within the fish industry is based on aquaculture activities around the fast growing areas of Broome and Exmouth, where a strong pearl-based aquaculture industry operates on a migratory basis from Broome.

Pie charts over the ocean illustrate the percentage of the commercial catch, by weight, from each fishing method. Major fisheries in the Region include: prawn trawl fisheries (Western Australia) mainly in the northern and southern parts of the Region; and a variety of tropical finfish (emperors, snappers and cods—Lethrinidae and Lutjanidae) fisheries utilising trawl, trap, line and net, methods (Western Australia and Australian Government).

Green shading over the ocean shows the mean annual GVP of commercial fishing in 2000–02. The total production for the Region in 2002 was estimated at 6,700 t with a GVP of $40m.

Socio-economic characteristics

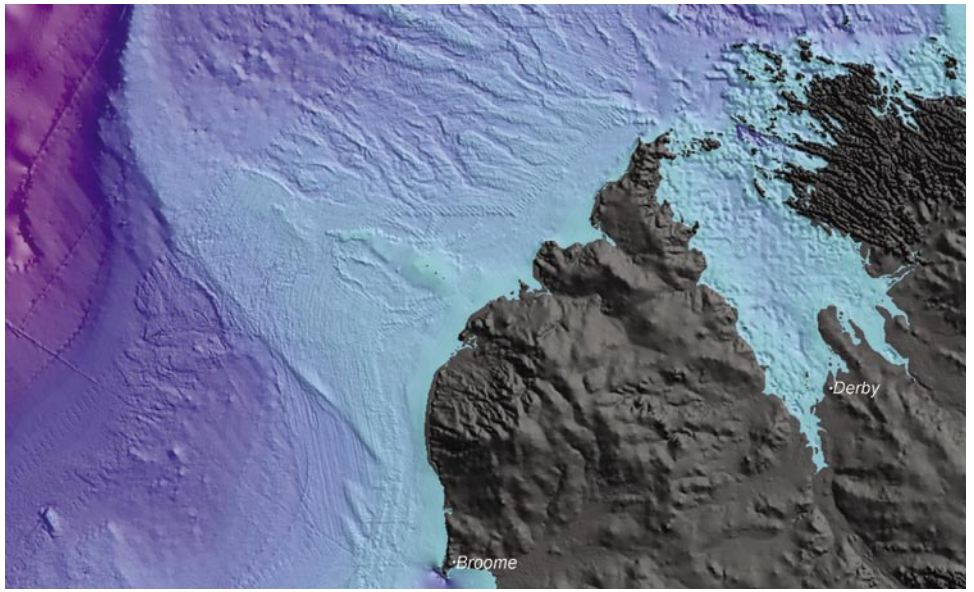
The North Western Region comprises three broad areas, which display considerable differences in terms of population composition and employment. These are the north eastern area from Broome to Derby, the central area from Roebourne to Port Hedland and the western area made up of Exmouth and Onslow.



The north east, characterised by employment in aquaculture and tourism, has a strong Indigenous presence exemplified by several distinct Indigenous coastal communities. Land access to inland settlements east of Derby may be affected by seasonal weather conditions. The central area is industrial in character, underpinned by employment in mining and agriculture. Here there are numerous small inland settlements and outposts which, although isolated, have loose community bonds formed by industrial heritage and a likeness of lifestyle. Typical of such areas, the population comprises many more males than females. The western area has a mixture of mining, tourism and fishing related activity and an older population.

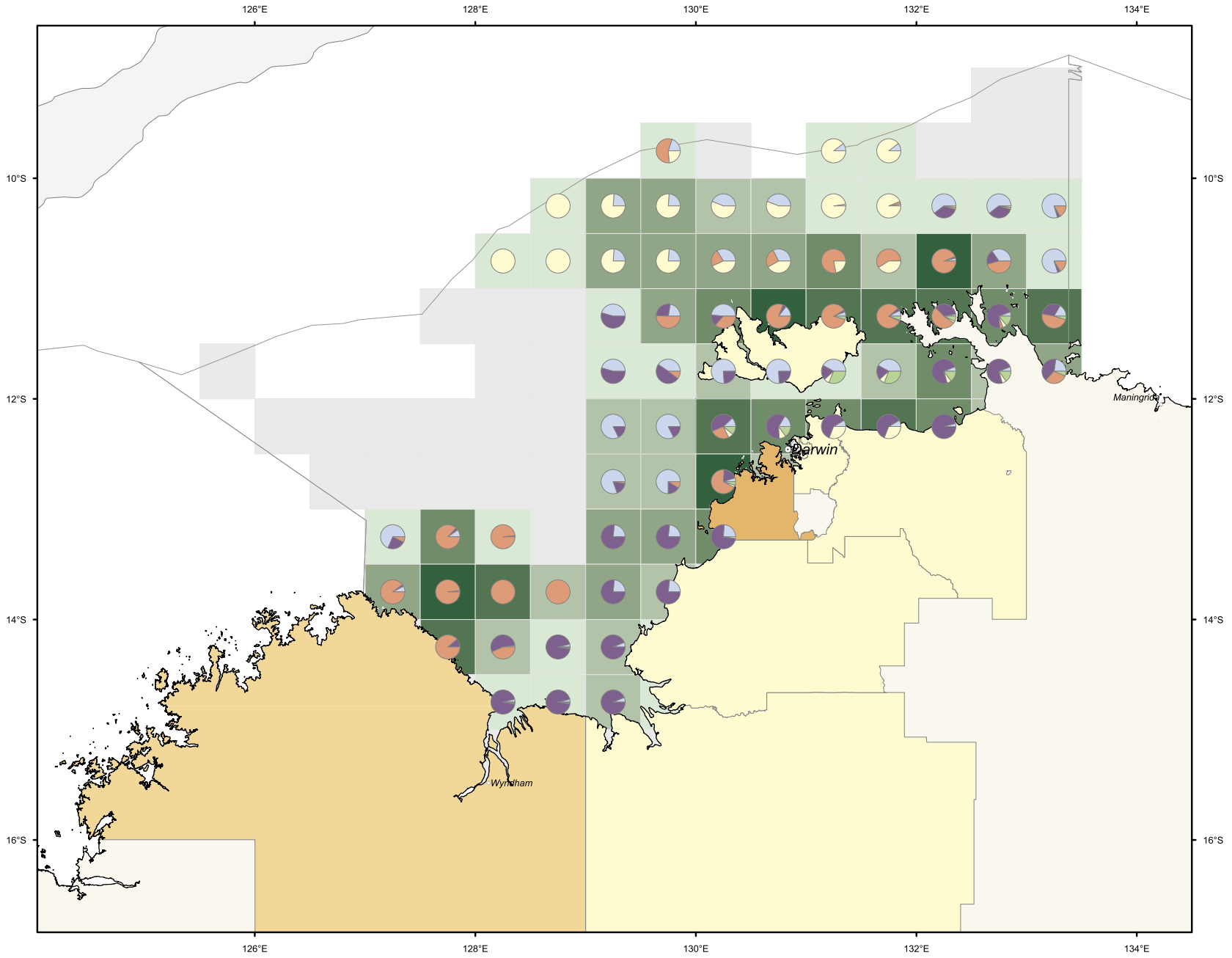
Common to all three areas is a reliance on fly-in fly-out employment extending across mining and commercial fishing (pearling in particular) activities, a high degree of seasonality associated with employment and a fluctuating population due to labour force shifts in the mining industry and tourism.

Approximately 73,300 people live within the Region, largely in coastal urban centres. Almost 20% of the population is of Indigenous origin. While population growth within the Region has been at a level similar to the rest of coastal Australia, the areas of Broome and Derby have shown rapid population growth in the period 1996 to 2001.



Bathymetry, paleo river chanels, NW Region (J. Larcombe, 2006)

Map 20 Northern Bonaparte Area – Fish industry employment, GVP and fishing methods



Fish industry employment

Percent of total employment

- less than 1%
- 1.0% - 2.5%
- 2.6% - 5.0%
- 5.1% - 10%
- greater than 10%

Mean annual GVP (wild-catch)

A$'000 / year

- 0 - 72
- 73 - 180
- 181 - 350
- 351 - 670
- 671 - 1,500
- 1,501 - 3,100
- confidential

% Catch (tonnes) by method

- Line
- Net
- Trawl
- Dredge
- Trap
- Dive/Hand

N

0 50 100 Kilometres

Data Sources
Social/Economic: Australian Bureau of Statistics, Census of Population and Housing, 2001.
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

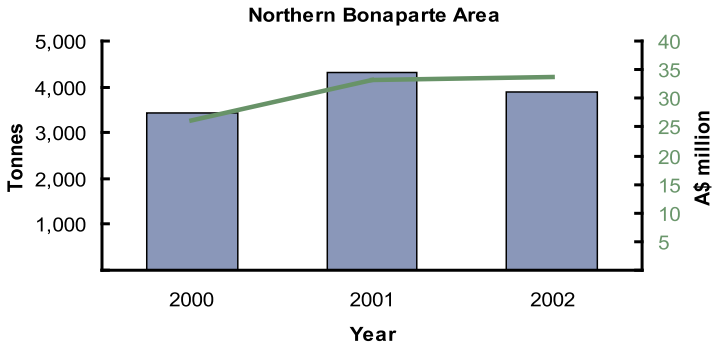
Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Description

Ochre shading over the land shows employment in the fish industry as a percentage of total employment, for coastal SLAs. Commercial fishing is an important economic activity in the area, with the aquaculture industry accounting for more than half of the fish industry workforce. There are several small-scale Indigenous 'fish-pond' operations, and pockets of pearling activities scattered along the Region's coastline. Fishing employment in the Region is characterised by daily commuting to fish farms or aquatic centres, or fly-in and fly-out roster systems for those working in more isolated areas.

Pie charts over the ocean illustrate the percentage of the commercial catch, by weight, from each fishing method. Major fisheries in the area include: the Northern Prawn (trawl) Fishery; mud crab trap fishery; barramundi net fishery; mackerel line fishery; and a variety of tropical finfish fisheries utilising trap, line, net and trawl methods. All fisheries are managed by Northern Territory, accept for the Northern Prawn Fishery managed by the Australian Government.

Green shading over the ocean shows the mean annual GVP of commercial fishing in 2000–02. The total production for the area in 2002 was estimated at 3,900 t with a GVP of $33m.



Socio-economic characteristics

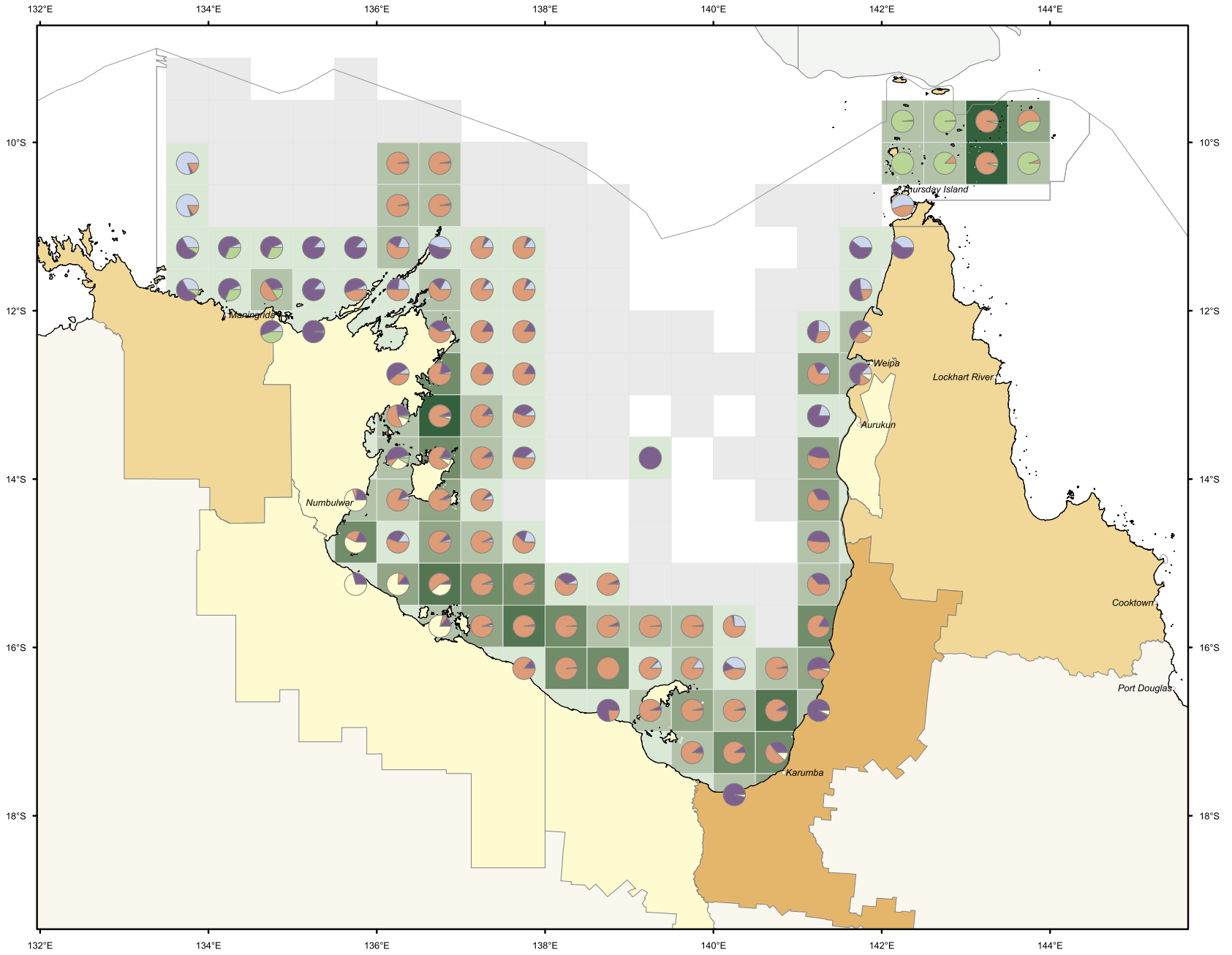
This area covers Metropolitan Darwin as well as encompassing Bathurst and Melville Islands, several Aboriginal Land Trust areas in both the NT and WA portions and vast desert areas. Due to the swampy nature of the coastal terrain, outside of the Metropolitan areas there are few coastal towns that account for only a small share of the area's population.

The distinctive socio-demographic composition of the area reflects the youthful age structure of Indigenous populations residing within Aboriginal Land Trust areas, the large number of defence personnel near Darwin, and the mining and agriculture related activities in the Ord River district. A predominant feature of the area is the variation in key socio-demographic characteristics across the Indigenous, Metropolitan and remote coastal areas. Lower median age and greater socio-economic disadvantage was evident in Indigenous areas. The degree of socio-economic disadvantage also increased with distance from Darwin, and larger proportions of high-income households were almost exclusively located around Metropolitan areas. Total dependency was greater in the more remote parts of the area and in the scattered Indigenous coastal towns where employment is heavily dependent on Community Development Employment Project (CDEP) schemes.

The area has a population of approximately 68,800 persons of whom 70% reside within the coastal Metropolitan portion of the area. Between 1996 and 2001 population growth was strong across most parts of the area, in part driven by increasing numbers of defence personnel and employment in resource-based industries.

Finfish traps, Darwin (J. Larcombe, 2005)

Map 21 Northern Planning Area – Fish industry employment, GVP and fishing methods



Fish industry employment

Percent of total employment

- less than 1%
- 1.0% - 2.5%
- 2.6% - 5.0%
- 5.1% - 10%
- greater than 10%

Mean annual GVP (wild-catch)

A$'000 / year

- 0 - 530
- 531 - 1,400
- 1,401 - 2,700
- 2,701 - 4,500
- 4,501 - 6,600
- 6,601 - 14,000

confidential

% Catch (tonnes) by method

- Line
- Net
- Trawl
- Dredge
- Trap
- Dive/Hand

N

0 60 120 Kilometres

Data Sources
Social/Economic: Australian Bureau of Statistics, Census of Population and Housing, 2001.
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

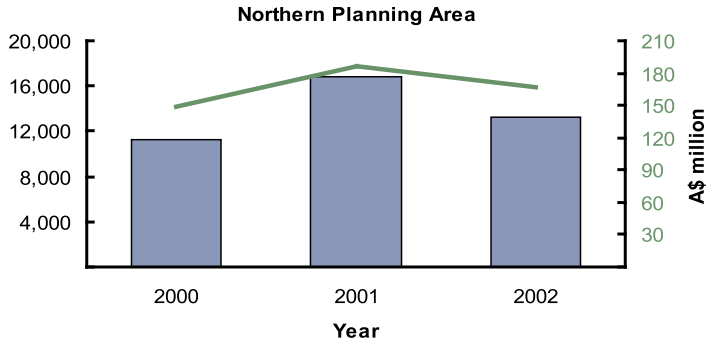
Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Description

Ochre shading over the land shows employment in the fish industry as a percentage of total employment, for coastal SLAs. Indigenous and recreational fishing activities are prominent across the Area, while employment within the fish industry comprises largely commercial fishing activities, with only a small number engaged in wholesaling and processing activities. Much of the employment within the commercial fishing sector occurs around Karumba, Cooktown and on Thursday Island. A distinctive characteristic of the fish industry in the Area is the high level of fishing activity which is undertaken by those with home ports outside the Region, reflecting an apparent lower regional level of fishing-related employment.

Pie charts over the ocean illustrate the percentage of the commercial catch, by weight, from each fishing method. Major fisheries in the Area include: the Northern Prawn and Torres Strait prawn trawl fisheries; mud crab trap fisheries; barramundi net fisheries; mackerel line fisheries; and a variety of tropical finfish fisheries utilising trap, line, net and trawl methods. All are Northern Territory and Queensland fisheries, except the Northern Prawn and Torres Strait prawn trawl fisheries which are managed by the Australian Government.

Green shading over the ocean shows the mean annual GVP of commercial fishing in 2000–02. The total production for the Area in 2002 was estimated at 13,200 t with a GVP of $167m, down from $187m in 2001.



Socio-economic characteristics

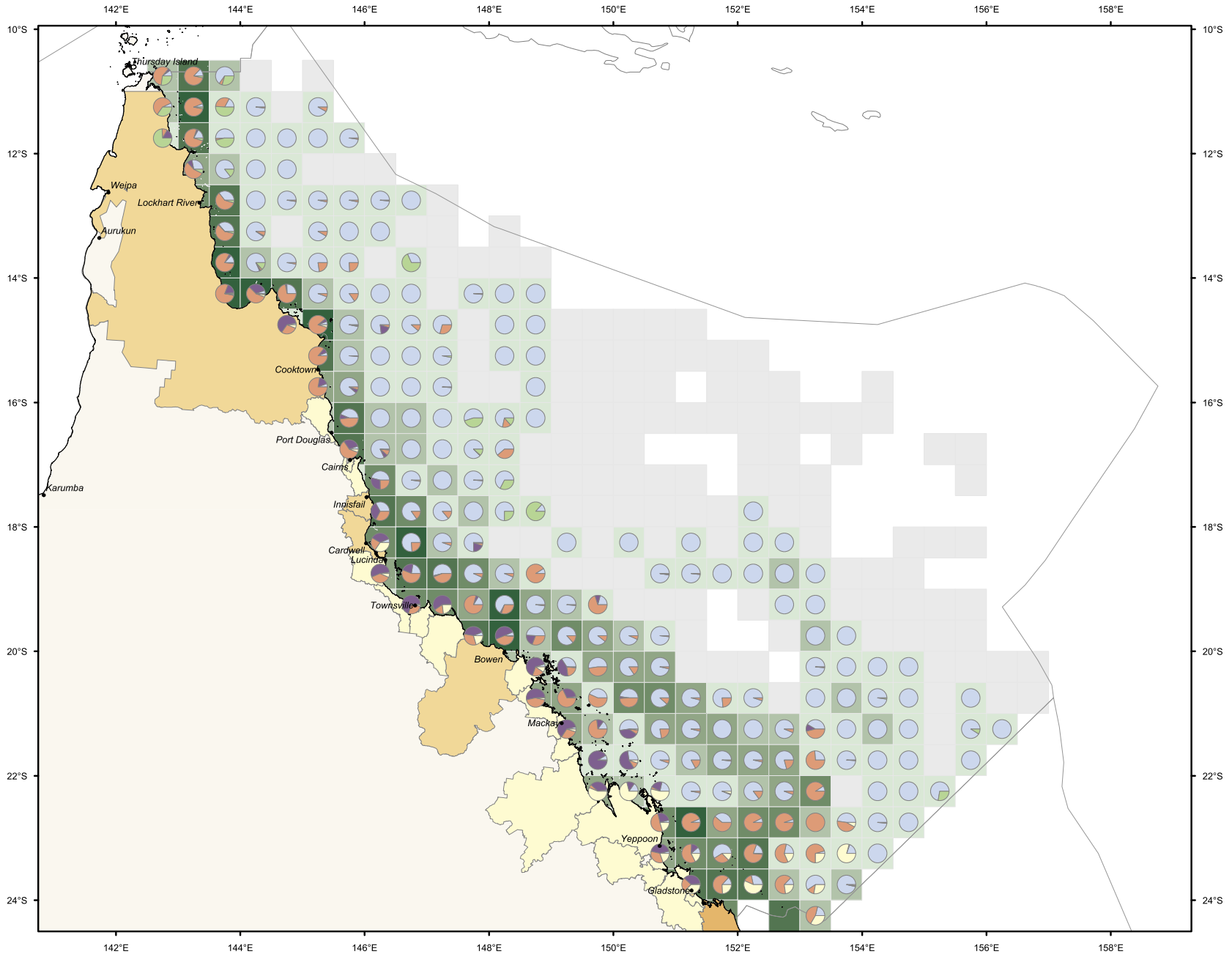
This Northern Planning Area has a unique socio-demographic composition due to half its population being of Indigenous origin, and the level of employment in the mining sector. Employment in almost all non-Indigenous parts of the Area is heavily concentrated on resource-based activities. Employment in Indigenous communities is largely based on Community Development Employment Project (CDEP) schemes. The Indigenous population has a younger median age, with higher proportions of younger persons and lower proportions of elderly persons. In contrast, the transient nature of mining employment results in a highly mobile population, a skewed sex composition, and high-income levels across mining-based areas. There is a strong contrast in the levels of socio-economic disadvantage across Indigenous and non-Indigenous communities.

Coastal towns in the Area are distributed sparsely, often separated by more than 70 kilometres. Much of the coastal strip of the Area is subject to severe flooding during the wet season, and almost uninhabited. A large part of the Northern Planning Area is Aboriginal land, including both mainland and islands. The various small island communities in the Torres Strait have strong traditional trade links with Papua New Guinea.

The Area has a population of approximately 48,900 persons, with an annual growth rate higher that the coastal Australia average. The highest population growth rates occurred between the Shire of Burke and Arnhem Land and the Indigenous area of Aurukun.

Crab Fishing (J Lauritz, supplied by Ecofish)

Map 22 North Eastern Region – Fish industry employment, GVP and fishing methods



Fish industry employment

Percent of total employment

- less than 1%
- 1.0% - 2.5%
- 2.6% - 5.0%
- 5.1% - 10%
- greater than 10%

Mean annual GVP (wild-catch)

A$'000 / year

- 0 - 240
- 241 - 700
- 701 - 1,200
- 1,201 - 1,700
- 1,701 - 2,600
- 2,601 - 4,600
- confidential

% Catch (tonnes) by method

- Line
- Net
- Trawl
- Dredge
- Trap
- Dive/Hand

N

0 75 150 Kilometres

Data Sources
Social/Economic: Australian Bureau of Statistics, Census of Population and Housing, 2001.
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Description

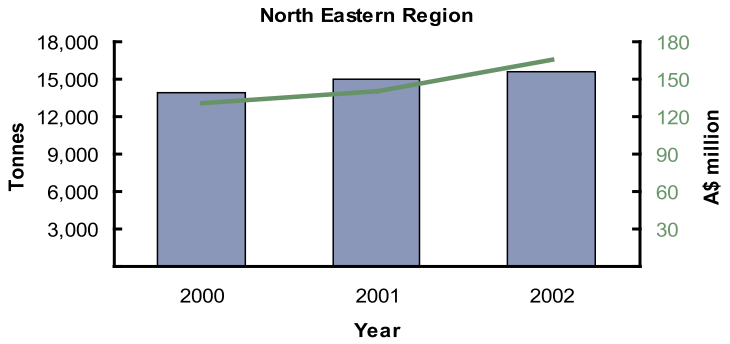
Ochre shading over the land shows employment in the fish industry as a percentage of total employment, for coastal SLAs. Employment within the fishing sector is heavily concentrated in the commercial sector, with scattered pockets of aquaculture activities and fish wholesaling and processing operating in coastal towns with strong linkages to commercial fishing activities.

Pie charts over the ocean illustrate the percentage of the commercial catch, by weight, from each fishing method. Major fisheries in the Region include: coral reef line fisheries for coral trout (*Plectropomus spp.*) and emperors (Lethrinidae); prawn trawl fisheries; inshore and estuarine fisheries for crabs and tropical finfish utilising trap, line, net and trawl methods; and offshore pelagic longlining for tuna and billfish. All are Queensland fisheries except the Australian Government managed pelagic longlining.

Green shading over the ocean shows the mean annual GVP of commercial fishing in 2000–02. The total production for the Region in 2002 was estimated at 15,600 t with a GVP of $165m.

Socio-economic characteristics

The North Eastern Region stretches from the Cape York Peninsula, and expands along the coastline of the Great Barrier Reef (GBR) to the northern most tip of the Wide Bay – Burnett Mary area, encompassing most of the sugar-belt area of Queensland and the popular tourist areas of Whitsunday and Port Douglas.



The Region comprises around 66 medium to large coastal towns and numerous smaller coastal settlements in the coastal strip between Yeppoon and Sarina. The smaller coastal towns and less densely populated hinterlands on the backdoor of the larger centres reflect the Region's diverse industrial base: tourism-driven retail and accommodation, manufacturing and light agriculture on the coastal strip, and in the hinterlands some mining activity and heavy agriculture mainly in the form of beef-cattle and sugar cane.

Marine tourism is an important activity, and employment in all forms of marine-related activity is apparent along the Region's coastline, particularly concentrated in the area from the Whitsunday Islands to Cairns.

The Region has a population of approximately 441,300 of whom 90% reside in coastal towns, including the large administrative centres of Townsville–Thuringowa, Cairns–Northern Beaches, Mackay, Gladstone, Yeppoon, Innisfail and Bowen. Increasing population growth between 1996 and 2001 occurred around the large centres of Cairns and Townsville and in the Miriam Vale area where employment within the fishing sector is substantially higher.

Overall, the Region is characterised by a younger age structure with a lower elderly dependency, and higher incidence of socio-economic disadvantage. It also has a lower annual population growth rate compared with coastal Australia as a whole, and a relatively larger proportion of Indigenous people. Due to the prevalence of male labour intense industries the population has a higher proportion of males than females. Areas where employment is concentrated in either natural resource-based industries or manufacturing show low levels of employment diversification.

Net fishing (J Lauritz, supplied by Ecofish)

Map 23 Eastern Central & Norfolk Regions – Fish industry employment, GVP & fishing methods

Fish industry employment

Percent of total employment

- less than 1%
- 1.0% - 2.5%
- 2.6% - 5.0%
- 5.1% - 10%
- greater than 10%

Mean annual GVP (wild-catch)

A$'000 / year

- 0 - 410
- 411 - 1,200
- 1,201 - 2,500
- 2,501 - 4,700
- 4,701 - 7,300
- 7,301 - 16,000
- confidential

% Catch (tonnes) by method

- Line
- Net
- Trawl
- Dredge
- Trap
- Dive/Hand

N

0 75 150 Kilometres

Data Sources
Social/Economic: Australian Bureau of Statistics, Census of Population and Housing, 2001.
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Description

Ochre shading over the land shows employment in the fish industry as a percentage of total employment, for coastal SLAs. Employment in the various fish industry sectors (commercial fishing including aquaculture, fish wholesaling and processing sectors) is widely scattered throughout the Region, numerically larger across large urban settlements, but proportionally larger across medium to small-sized communities. On Norfolk Island, employment in related-fishing industries appears to be negligible, and fishing activities might contribute to the local seafood supply.

Pie charts over the ocean illustrate the percentage of the commercial catch, by weight, from each fishing method. Major fisheries in these two Regions include: prawn trawl fisheries (Queensland and New South Wales); offshore pelagic longlining for tuna and billfish (Australian Government); finfish trawl fisheries (Australian Government and New South Wales); abalone dive and rock lobster trap fisheries in the south of the Region (New South Wales); and inshore and estuarine fisheries for crabs and finfish utilising trap, line and net methods (Queensland and New South Wales).

Green shading over the ocean shows the mean annual GVP of commercial fishing in 2000–02. The Eastern Central Region's total production in 2002 was estimated at 31,500 t with a GVP of $215m. The Norfolk Region's total production in 2002 was estimated at 1500 t with a GVP of $18m.

Socio-economic characteristics

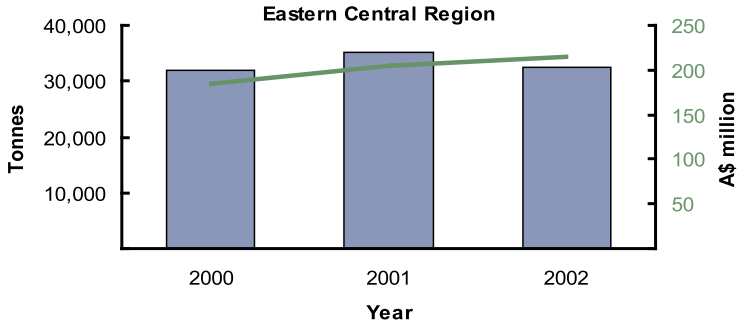
The Eastern Central Region encompasses 165 coastal towns and more than 2,500 kilometres of coastline. The Region is the most densely populated and urbanised of any Marine Region, with approximately 2,702,900 persons. One third of the Region's population live in the coastal Metropolitan NSW and Queensland portions, and almost half in the large coastal Non-metropolitan centres such as Newcastle, Wollongong, Gold Coast and Bundaberg.

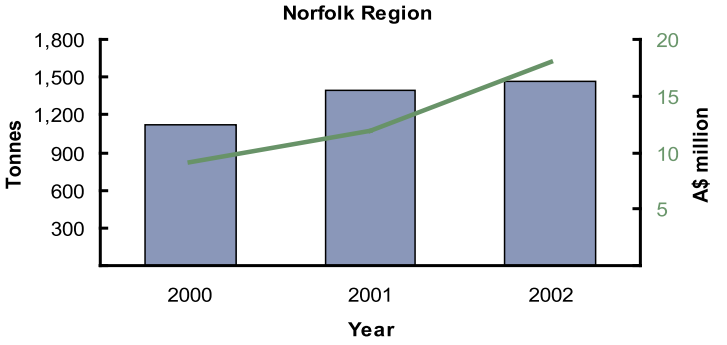
The Region is characterised by a higher elderly dependency, reflecting the large proportion of the population aged 65 years and older, the highest of any Marine Region. Between 1996 and 2001, the annual population growth rate in the Queensland portion was twice that in the NSW portion, and the Region's overall annual growth rate was similar to that for coastal Australia. Increasing population growth during this period occurred across the coastal conurbations between the northern tip of NSW and Burnett Heads, around Port Stephens, greater Shoalhaven, and the northern edges of Sydney.

Socio-demographic characteristics vary considerably across the Region. Indigenous people are highly represented in Jervis Bay, along the NSW north coast and in the Queensland northern coastal tip of the Region. Median ages are younger around coastal Metropolitan areas and large regional centres than elsewhere. In the NSW portion, low-income households are more common in Non-metropolitan areas whereas in the Queensland portion the occurrence of low-income households is spread evenly across Metropolitan and regional areas.

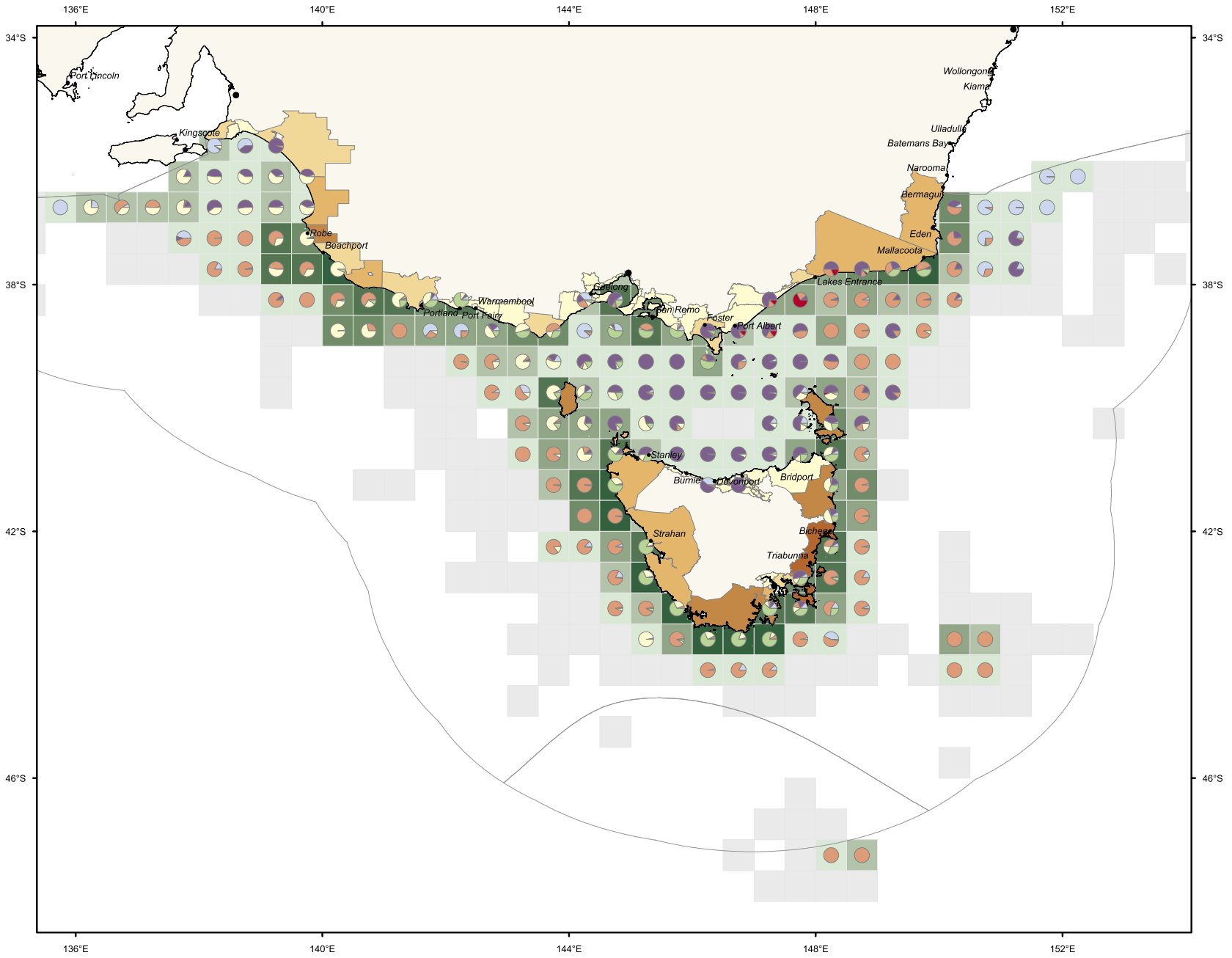
Norfolk Region

Tourism-related services are the main economic activities on Norfolk Island. The Region has a population of nearly 400 people, and since 1996 its population has declined. The Region has an older median age, low levels of child dependency, and a lower level of employment diversification, as it is largely based on tourism-related services.





Map 24 South Eastern Region – Fish industry employment, GVP and fishing methods



Fish industry employment

Percent of total employment

- less than 1%
- 1.0% - 2.5%
- 2.6% - 5.0%
- 5.1% - 10%
- greater than 10%

Mean annual GVP (wild-catch)

A$'000 / year

- 0 - 460
- 461 - 1,400
- 1,401 - 2,600
- 2,601 - 4,900
- 4,901 - 9,800
- 9,801 - 20,000
- confidential

% Catch (tonnes) by method

- Line
- Net
- Trawl
- Dredge
- Trap
- Dive/Hand

N

0 75 150 Kilometres

Data Sources
Social/Economic: Australian Bureau of Statistics, Census of Population and Housing, 2001.
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Description

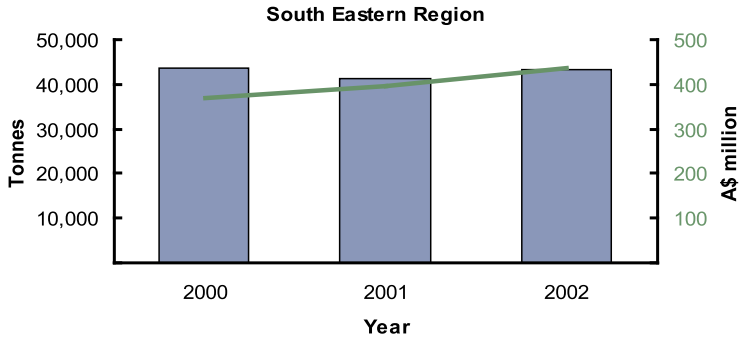
Ochre shading over the land shows employment in the fish industry as a percentage of total employment, for coastal SLAs. The fish industry is an important economic activity within the Region, in particular in Tasmania, where a relatively large fish wholesaling and processing industry operates along the eastern coastline.

Pie charts over the ocean illustrate the percentage of the commercial catch, by weight, from each fishing method. Major fisheries in this Region include: the Southeast Scalefish and Shark Fishery utilising fish trawl, net and line methods (Australian Government); and a range of New South Wales, Tasmania, Victoria and South Australian fisheries, namely, abalone fisheries, rock lobster fisheries, and inshore and estuarine fisheries for crabs and finfish utilising trap, line and net methods.

Green shading over the ocean shows the mean annual GVP of commercial fishing in 2000–02. The total production for the Region in 2002 was estimated at 43,300 t with a GVP of $436m.

Socio-economic characteristics

The South Eastern Region stretches across the coastline of four states in southern Australia; from south eastern South Australia, all of coastal Victoria and coastal Tasmania, to the southern part of New South Wales, with the majority of persons located in the area surrounding Port Phillip Bay in Victoria.



The Region is socially diverse, ranging from very small and isolated communities through to Metropolitan centres. Consequently, the Region contains the full diversity of social profiles, with distinct demographic patterns evident. The coastal margin of the Region has substantial ecological and aesthetic values and is the focus of recreational and holiday activities for a significant proportion of the Australian population.

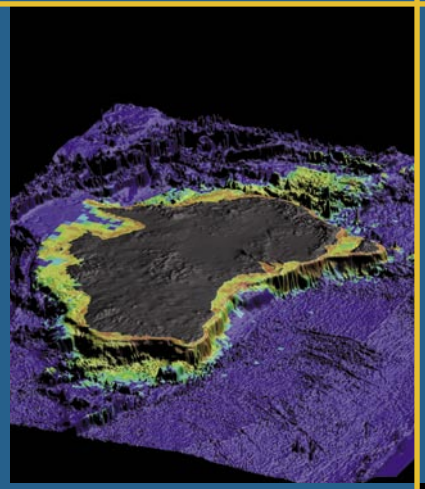
The Region is the second most populous Marine Region, with a population of approximately 1,465,200 persons, and comprises 80 coastal SLAs (42 in Victoria, 29 in Tasmania capturing 88% of the Tasmania population, 8 in South Australia, and 1 in New South Wales).

Between 1996 and 2001 population growth within the Region was highest close to and within coastal Metropolitan areas including the Bass Coast, and around Greater Geelong, the Surf Coast Shire, and around the Victor Harbour area.

The Region is characterised by a lower proportion of Indigenous persons, by younger median ages in coastal Metropolitan areas and large coastal regional centres, by higher child dependency in many regional areas, and by higher socio-economic disadvantage in many Non-metropolitan areas of coastal Tasmania with strong links to the fish industry.

Fish trawler out of Eden, NSW (Locky Marshal)

marine matters NATIONAL



APPENDICES

Appendix 1: Fisheries mapping and statistical methods

Fishing log books

All Australian fisheries management jurisdictions require licensed fishers to maintain a log of their operations. Basic data recorded in these logs includes catch (by species), some figure of effort such as hours, hooks or boat days, and the location of the fishing operations. Data from the logs forms an important research tool, and are the basis of all the commercial fisheries mapping in this Atlas.

Period of reporting

Wherever possible, fishing operations were summarised over the three year period from 2000 to 2002. The reporting period is noted on all maps.

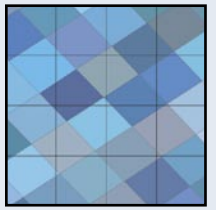
Spatial scale of reporting

All the maps of commercial fishing in this Atlas use a half-degree (30-minute) cell size for reporting. This scale was a compromise across the huge variety of spatial reporting frameworks used by the eight different fisheries jurisdictions. Various methods were used to process and integrate these data for presentation with standard half-degree grid cells.

Fishing mapping techniques

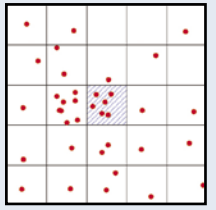
Transpose

- Fishing operations are reported on a regular grid (such as quarter- or half-degree), or in some cases on an irregular spatial framework unique to a fishery or jurisdiction
- This native reporting system is overlaid onto the common half-degree grid. Cells and statistics are assigned from the reported grid to the common grid using a demographic approach
- Catch and GVP are assigned proportionally from the old framework to the new, based on the areas of intersection between the two: segment area/total area x quantity
- Examples: All State/Territory managed fisheries (refer to Map 25)



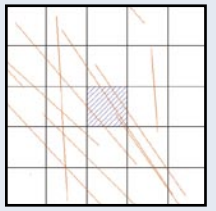
Tally point statistics within a square grid

- Fishing operations are represented as points on the earth's surface
- The half-degree square grid is overlaid
- Catch and GVP are summarised within each grid cell
- Example: Australian Government Northern Prawn Fishery



Intersect linear 'tracks' within a square grid

- The positioning of gear such as bottom trawl and pelagic longline may be approximated by a straight line between start and finish positions
- Lines are dissected at the intersection of the half-degree grid to create numerous smaller line segments that lie fully within a grid cell
- Catch and GVP are apportioned to segments using: segment length/total length x quantity
- Segment statistics are summed for each cell
- Examples: Most Australian Government fisheries, including pelagic longline, trawl and gillnet fisheries



Confidentiality

Most fisheries management jurisdictions are required to maintain confidentiality of logbook and other data. In practice this is achieved by not reporting statistics where less than five fishing vessels are represented. In cases where less than five vessels are represented in a reporting cell, that cell's colour is set to grey and the quantity is not indicated.

Value estimation

Statistics on the mean market value of major fished species are collected annually by each State/Territory and the Australian Government. The mean market value of a species is used to convert the catch of that species, at a particular location and year, into a value (catch [kg] mean annual market value [$/kg]). For each gear or fishery, values were estimated for the main target species (representing greater than 95% of the catch by weight) and a miscellaneous category, and summed.

Fishing method classes

Adapted from the *International Standard Statistical Classification of Fishing Gear*, FAO.

LINE AND HOOK

Hooks and line

- Handlines and pole-lines (hand operated)
- Handlines and pole-lines (mechanised)
- Set longlines
- Drifting (pelagic) longlines
- Longlines (not specified)
- Trolling lines
- Pole and lines
- Vertical (drop) lines
- Hooks and lines (not specified)

NETS

Surrounding nets

- Purse seines
- Lampara
- Ring nets

Seine nets

- Beach seines
- Other seines
- Seine nets not specified

Lift nets

- Portable hand lift nets
- Boat-operated lift nets
- Shore-operated stationary lift nets
- Lift nets not specified

Falling gears

- Cast
- Cover pots
- Falling gears not specified

Gillnets and Entangling nets

- Set gillnets
- Driftnets
- Encircling gillnets
- Fixed gillnets (on stakes)
- Trammel nets
- Combined gillnets-trammel nets
- Gillnets and entangling nets not specified

Other nets

- Push nets
- Scoop nets

TRAP

- Pots
- Fyke nets
- Stow nets
- Stationary uncovered pound nets
- Barriers, fences, weirs, corrals etc
- Aerial traps
- Traps (not specified)

TRAWL

- Bottom trawls (fish and prawn)
- Midwater trawls
- Otter twin trawls
- Pair trawls
- Other trawls

DIVE/HAND

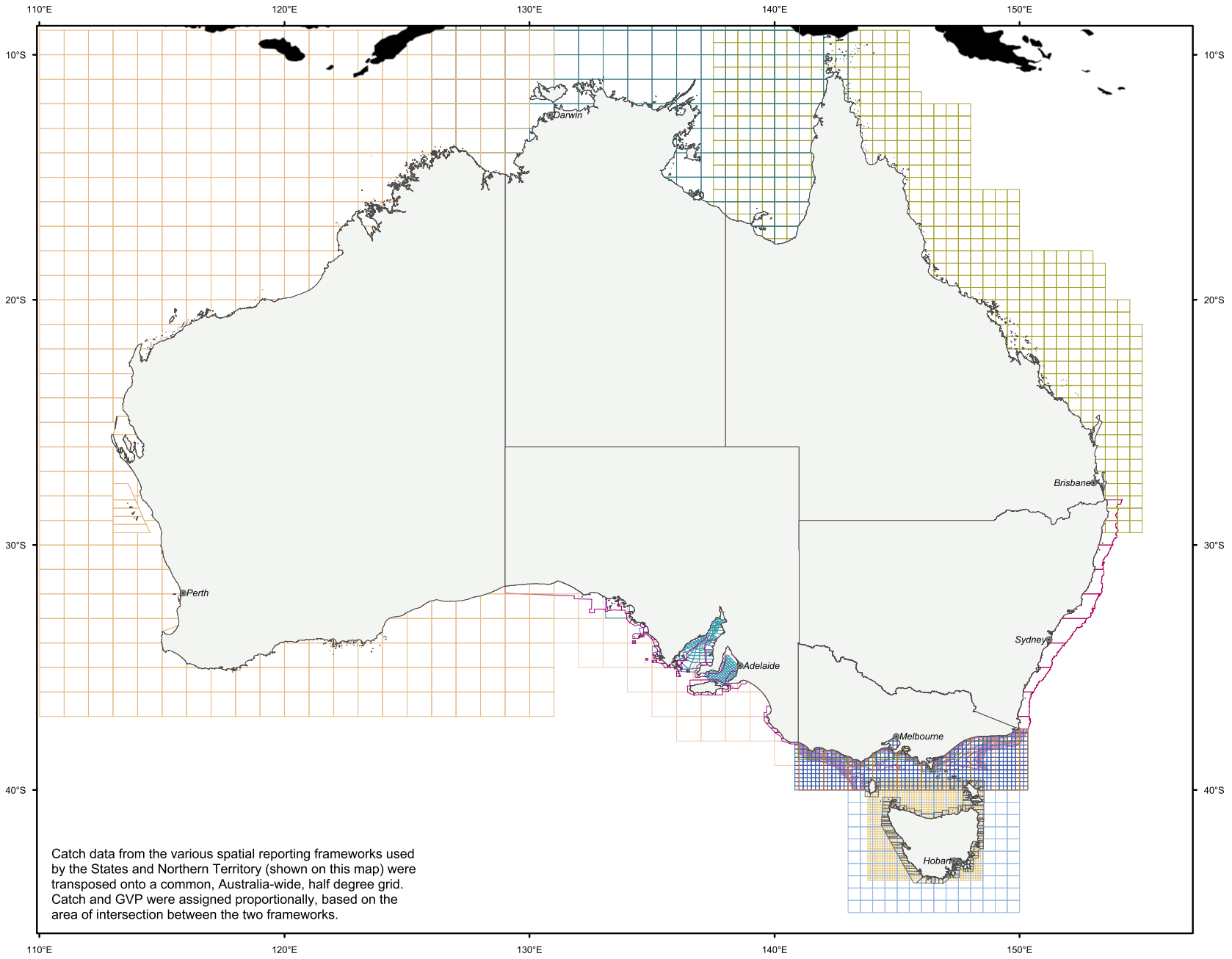
- Dive
- Harpoons
- Clamps
- Rakes
- Tongs
- Spears
- Wrenching gears
- Hand Pump

DREDGE

- Boat dredges

Source: FAO (2005) *United Nations Atlas of the Oceans*. URL http://www.oceansatlas.org, October 2005.

Map 25 Commercial fishing spatial reporting frameworks



Catch data from the various spatial reporting frameworks used by the States and Northern Territory (shown on this map) were transposed onto a common, Australia-wide, half degree grid. Catch and GVP were assigned proportionally, based on the area of intersection between the two frameworks.

- WA : 1 degree grid
- NT : 1 degree grid
- Queensland : half degree grid
- NSW : 1 degree latitude
- Tasmania : half degree grid
- Tasmania : 6 minute grid
- Tasmania : Abalone
- Victoria : Ocean General
- Victoria : Rock Lobster
- Victoria : Bait Fishery
- Victoria : Abalone
- SA : Abalone
- SA : Prawn
- SA : Marine Scalefish

Australian Government managed fisheries data are reported by operation latitude and longitude.

N

0 200 400 Kilometres

Data Sources
Fisheries: National Atlas of Marine Fisheries 2000-02.

Projection: Geographic, WGS 84.
Cartography and digital compilation: Bureau of Rural Sciences. www.brs.gov.au

Data are assumed to be correct as received from suppliers.

Australian Government
Fisheries Research & Development Corporation
Department of the Environment and Heritage
Bureau of Rural Sciences

Appendix 2: Social science methods

Marine Matters National presents a small subset of the complete mapping and analysis that is available online (www.brs.gov.au/fishcoast). The methods described here are also a subset of the complete methods setion available online.

Data source

Socio-economic statistical data for the Atlas were sourced from the *2001 Census of Population and Housing* (Australian Bureau of Statistics). The Census data used in this project are based on place of enumeration.

Issues associated with Census data

The transient nature of the population in some coastal areas driven by fly-in and fly-out mining-related employment and tourism-based activities may impact on the reliability of Census data for profiling purposes. This highlights the difficulties of using Census data to reflect the true socio-economic characteristics of transient populations.

It is well documented that Census data on fishing employment (both commercial and downstream activities) are likely to underrate a large number of unpaid family workers and casual workers engaged in fishing activities during peak-season times. The limitations of Census data on measuring employment within this sector is also reflected in the degree of underestimation in actual numbers of persons employed due to seasonality. Fluctuation in the level of employment in fishing activities is heavily affected by seasonal factors (e.g. fisheries temporary closures, etc.), which are not captured in the Census collection.

Defining coastal Australia

For the purpose of this study, the term coastal Australia, when used to describe a total value, an average or a geographic Region, is a reference to the selected SLAs adjoining the Australian coastline (including the remote islands) based on the 2001 Australian Standard Geographical Classification.

SLAs along the coastline were included, except those adjoining estuaries or bays in Metropolitan areas—for example SLAs surrounding Sydney Harbour, the Swan River in Perth or the Brisbane River. These SLAs were excluded in order to minimise the influence of Metropolitan data on coastal Australia averages. In the South East Marine Region, however, SLAs bordering estuarine systems (Launceston area) and bays (greater Melbourne and greater Hobart) were included in order to replicate the analysis of the South East Marine Region undertaken by the BRS in 2001–2002 (Larcombe *et al.* (2002) *Marine Matters—Atlas of Marine Activities and Coastal Communities in Australia's South-East Marine Region*, Bureau of Rural Sciences, Canberra).

Within the coastal Australia classification many SLAs, particularly in remote areas of Western Australia and the Northern Territory, extend far inland (Map 1). Clearly not all communities in these SLAs could be defined as coastal; however, these SLAs were included to maintain a consistent approach in defining coastal Australia across all States/Territories.

The coastal Australia geography is not equivalent to the 'Populated coastal' geography used in *Country Matters: Social Atlas of rural and Regional Australia* (BRS, 2004).

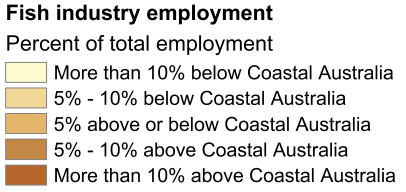
Defining Marine Regions

The geographic extent and number of SLAs within each Marine Region vary based on the intersection of the National Oceans Office Marine Regions (as of mid 2004) and the SLAs representing Australia's coastline based on the 2001 Australian Standard Geographical Classification. Marine Region boundaries do not align precisely with SLA or State/Territory boundaries and in many cases they intersect the coastline near the middle of an SLA (See Map 1). In such instances the divided SLA has been assigned to one of the Marine Regions. The only exception to this rule was the SLA of Cook (S) (excluding Weipa) in Far North Queensland, which was included in the analysis and social profiles of the Northern Planning Area and the North Eastern Marine Region because it occupies a significant portion of coastline in both Regions.

Data presentation

Information presented in the Marine Region profiles are based on randomised Australian Bureau of Statistics data (cells were randomly adjusted by the Australian Bureau of Statistics to avoid the release of confidential information). The calculated values (both proportions and changes over time) were computed by BRS.

Maps displaying socio-economic data for SLAs are shown as absolutes or as proportions. Where the data permit, map classes are calculated around the figure for coastal Australia and represented as proportions above and below it.



Appendix 3: Summary of indicators by Marine Region

Indicators	Coastal Australia	South Western	Western Central	North Western	Sunda	Northern Bonaparte	Northern Planning	North Eastern	Eastern Central	Norfolk	South Eastern
Population and demography											
Population (no.)	5,882,853	774,330	312,076	73,320	2,067	69,803	48,917	441,263	2,702,880	398	1,465,256
Indigenous people (%)	2.9	2.1	1.8	19.2	1.1	18.6	59.5	6.5	1.8	0.0	1.4
Annual pop' growth rate, 96-01 (%)	1.1	1.3	1.4	1.2	-4.1	2.5	2.2	0.7	1.2	1.5	1.0
Population sex ratio (%)	97.2	97.8	97.2	120.5	121.5	116.0	114.0	103.1	95.6	96.1	95.9
Persons under 15 years (%)	20.2	21.0	22.0	22.8	29.6	20.3	29.0	22.1	19.5	13.3	19.7
Persons aged 15-64 years (%)	64.9	64.7	67.6	70.1	66.3	72.6	65.7	66.9	63.7	70.1	65.6
Persons aged 65 years and over (%)	14.8	14.3	10.4	7.1	4.1	6.6	5.3	11.1	16.8	16.6	14.7
Median age (years)	37	37	35	32	36	33	28	35	38	44	37
Change median age (years)	2	2	2	1	4	2	3	2	1	3	2
Total dependency ratio (%)	54.0	54.6	47.9	42.6	50.9	36.9	52.1	49.5	57.0	42.7	52.5
Child dependency ratio (%)	31.1	32.5	32.5	32.5	44.7	27.9	44.1	33.0	30.7	19.0	30.1
Elderly dependency ratio (%)	22.9	22.1	15.4	10.1	6.2	9.0	8.0	16.5	26.3	23.7	22.4
Households, income and education											
Low-income households (%)	15.4	16.9	10.8	7.6	7.1	11.9	10.6	13.9	15.7	9.6	16.3
High-income households (%)	25.7	22.2	34.5	41.0	29.5	35.1	29.9	24.4	25.7	27.4	25.8
16 year olds in FT education (%)	84.6	83.2	84.0	61.1	55.6	66.6	44.5	82.5	84.2	100.0	87.6
Government pension recipients (%)(a)	42.2	42.8	33.4	49.1	20.4	50.3	55.6	40.1	43.9	7.4	40.5
Socio-econ' disadvantage index (no.)	1029.82	981.40	1045.13	956.22	809.86	977.43	780.96	976.57	997.38	1044.56	1010.21
Labour force and employment											
Labour force participation rate (%)	57.4	57.5	65.6	63.0	68.1	62.5	54.3	61.3	55.2	72.8	58.2
Change 91-01 (%)	-1.8	-2.2	-0.3	-4.5	-	-5.3	-1.9	-2.5	-1.6	3.5	-1.8
Unemployment rate (%)	8.3	8.9	6.8	5.0	9.2	5.9	4.9	7.8	8.9	2.0	7.7
Change 91-01 (%)	-4.2	-5.0	-4.4	-3.7	-	-6.8	-3.7	-3.4	-3.6	-0.6	-5.0
Industry employ' variance (%)	42.3	43.9	40.5	40.8	41.5	40.9	59.3	42.3	41.1	46.5	43.9
First largest employment industry	Retail Trade	Retail Trade	Retail Trade	Mining	Mining	Gov/Defence	Gov/Defence	Retail Trade	Retail Trade	Accom' Serv.	Retail Trade
Second largest employment industry	Manufacturing	Manufacturing	Prop/Bus' Serv.	Retail Trade	Education	Retail Trade	Education	Manufacturing	Prop/Bus' Serv.	Gov/ Defence	Manufacturing
Third largest employment industry	Prop/Bus' Serv.	Health/ C'm Serv	Health/ C'm Serv	Construction	Gov/ Defence	Prop/Bus' Serv.	Mining	Agr/Forest/ Fish	Health/ C'm Serv	Prop/Bus' Serv.	Prop/Bus' Serv.

Appendix 3: Summary of indicators by Marine Region (continued)

Indicators	Coastal Australia	South Western	Western Central	North Western	Sunda	Northern Bonaparte	Northern Planning	North Eastern	Eastern Central	Norfolk	South Eastern
Fish industry											
Persons employed in (no.):											
commercial fishing (b)	9,836	1,858	862	459	0	210	153	1,014	2,586	3	2,724
aquaculture	3,368	728	77	277	0	125	42	252	791	0	1,081
fish wholesaling	3,129	510	223	27	0	30	18	368	1,118	0	840
seafood processing	1,530	356	88	17	0	6	4	92	257	0	710
fish industry (c)	14,489	2,724	1,173	503	0	246	175	1,474	3,961	3	4,274
% in commercial fishing (d)	0.4	0.6	0.6	1.4	0.0	0.6	0.9	0.5	0.2	1.2	0.4
% in aquaculture (d)	0.1	0.2	0.1	0.8	0.0	0.4	0.2	0.1	0.1	0.0	0.2
% in fish industry (d)	0.6	0.8	0.8	1.5	0.0	0.7	1.0	0.8	0.4	1.2	0.7
Fisheries GVP 2001 ($M)											
South Ausralia	205	144									60
Western Australia	434	67	330	37		1					
Northern Territory	31					12	19				
Queensland	220						15	133	72		
New South Wales	99								97		2
Tasmania	197										197
Victoria	104										104
Australian Government	481	101	20	4		22	170	15	62	14	73

Source: *1991, 1996 & 2001 Censuses of Population and Housing*, ABS otherwise stated; (a) Centrelink, May 2001; (b) Commercial fishing includes aquaculture; (c) Includes commercial fishing, fish wholesaling and seafood processing; (d) Over total employed persons.

Appendix 4: Social science glossary

Annual population growth rate
The rate at which the population is increasing or decreasing in a given year expressed as a percentage of the base population size. It takes into consideration all the components of population growth, namely births, deaths and migration.

Child dependency ratio
Ratio of the child population (aged 0 to 14 years) per person of working age (15 to 64 years).

Commercial fishing employment
Persons aged 15 years and over employed in commercial fishing activities including Marine fishing and Aquaculture.

Fish industry (consolidated) employment
Persons aged 15 years and over employed in commercial fishing, aquaculture, fish wholesaling and seafood processing.

Dependency ratio
Ratio of the dependent population (aged 0-14 years and 65 years and over) per person of working age (15-64 years).

Elderly dependency ratio
Ratio of the elderly population (aged 65 years and over) per person of working age (15 to 64 years).

Government pension recipients
Families who receive some form of government pension or benefit including Newstart allowance, parenting payment, rent assistance, Austudy payment and disability support pension as a proportion of all families.

High income household
The proportion or households receiving a total weekly income of $1,200 or more.

Industry employment variance
Calculated by ranking industries by number of employed persons, from highest to lowest. The sum of the persons employed in the three main industries is expressed as a proportion of total persons employed across all industries.

Labour force participation rate
The labour force (persons employed or unemployed) expressed as a percentage of the population.

Low income household
The proportion of households receiving a total weekly income of $300 or less.

Median age
For any distribution the median value is that which divides the relevant population into two equal parts, half falling below the value, and half exceeding it. Thus, the median age is the age at which half the population is older and half is younger.

Metropolitan
Metropolitan areas in each state and territory have been defined as the Capital City Statistical Division.

Non-metropolitan
Non-metropolitan areas cover all other parts of a state or territory excluding the Metropolitan areas as defined above.

Population density
Population density is the total population within a geographic entity divided by the number of square miles of land area of that entity measured in square kilometres or square miles.

Appendix 4: Social science glossary (continued)

Sex ratio
The sex ratio relates to the number of males per 100 females.

Index of Relative Socio-Economic Disadvantage
Index of Relative Socio-Economic Disadvantage (2001) – includes variables that reflect or measure relative disadvantage. Variables include low-income, low educational attainment, high unemployment and people with low skilled occupations. A low index value reflects relative disadvantage and occurs where there are a large proportion of low-income families, people with low skilled occupations and high proportions of the population without training. A high value reflects lack of disadvantage in an area.

Statistical Local Area (SLA)
These geographical areas are in most cases identical with, or have been formed from a division of, whole Local Government Areas (LGAs). In other cases, they represent unincorporated areas. In aggregate, SLAs cover the whole of a state or territory without gaps or overlaps. In some cases legal LGAs overlap Statistical Subdivision boundaries and therefore comprise two or three SLAs (Part A, Part B and, if necessary, Part C).

Unemployment rate
The proportion of the total labour force that is aged 15 years and older and unemployed.

Working age
Population aged 15 to 64 years of age.

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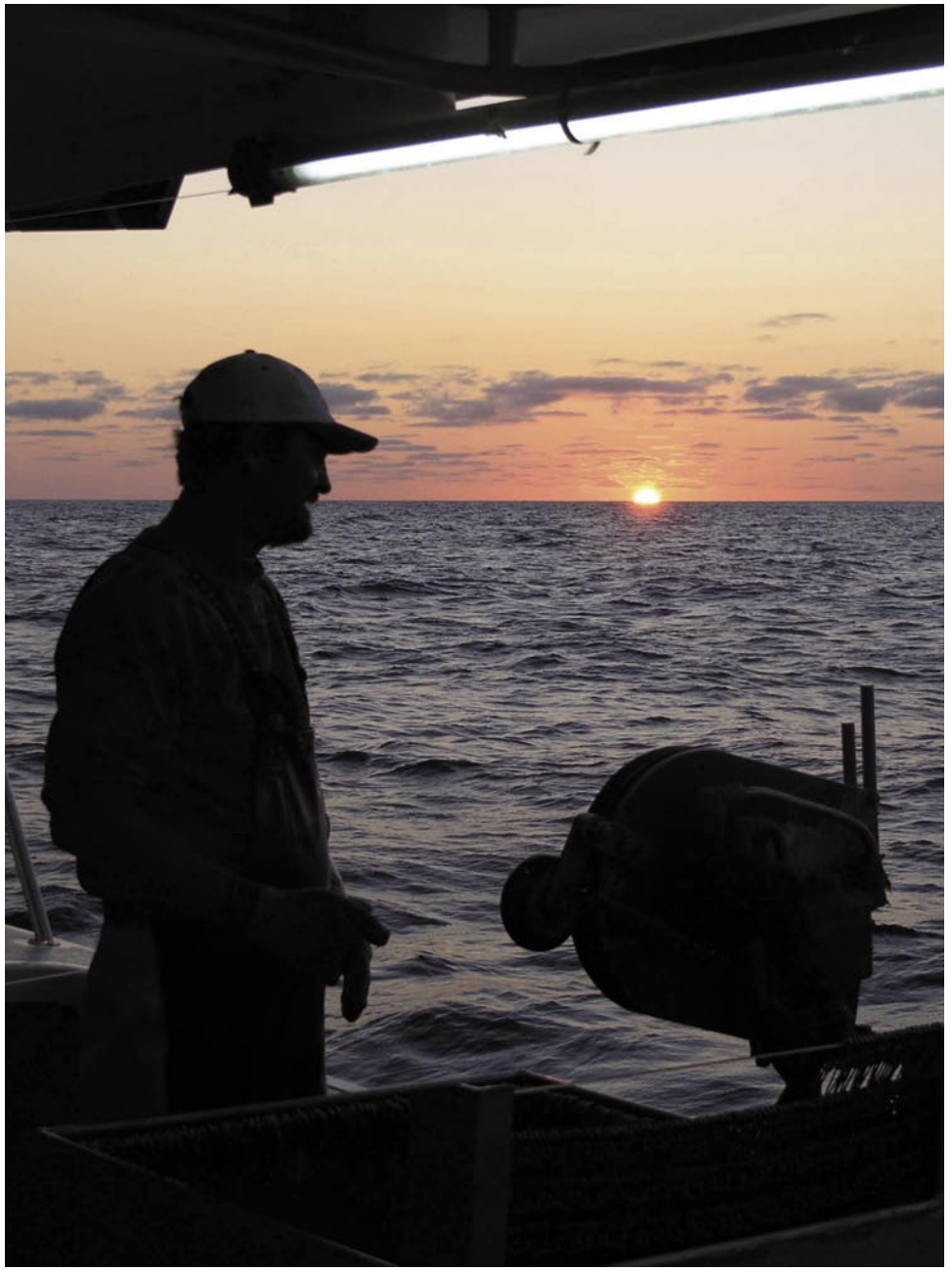
Photos are credited throughout the Atlas. Line drawings of fish are from Kailola *et al.* (1993). Line drawing of fishing methods are sourced from primarily from Kailola *et al.* (1993) and also courtesy of Genetic Prints and the United Nations Food and Agriculture Organisation.



Sunset line haul, northern New South Wales (P. Ward, 2005)

Marine Matters National is an Australia-wide, comprehensive and authoritative mapping of fishing activities and their related coastal communities.

The Bureau of Rural Sciences produced the Atlas to inform those responsible for the planning and management of Australia's marine jurisdiction, and to aid the Australian, State and Territory Governments in carrying out their policy initiatives.

For the production of this Atlas, BRS gratefully acknowledges the support of the Fisheries Research and Development Corporation, the National Oceans Office and fisheries agencies from all Australian jurisdictions.

Australian Government

Fisheries Research & Development Corporation

Department of the Environment and Heritage

Bureau of Rural Sciences

Appendix D – Socio-economic Profiles of Marine Regions

South Western Marine Region

Western Central Marine Region

North Western Marine Region

Sunda Marine Region

Northern Bonaparte Area

Northern Planning Area

North Eastern Marine Region

Eastern Central Marine Region

Norfolk Marine Region

South Eastern Marine Region

Appendix E – National Fisheries Data Strategy

NATIONAL FISHERIES DATA STRATEGY

(Final version for AFMF approval)

A strategy to improve the collection and management of Australia's fisheries data

This document outlines a strategy for improving the quality, comparability and availability of fisheries-data and statistics in Australia. High-priority recommendations have been identified and a work-plan put forward to progress these recommendations. This strategy was developed by the Fisheries Statistics Working Group - which has representatives from all Australian fisheries management agencies.

Australian Fisheries Management Forum

February 2007

BACKGROUND

Data associated with commercial and recreational fisheries (hereafter fisheries-data) have a pivotal role in the sustainable development of Australia's aquatic resources. Furthermore, credible information on the status of fish populations and the fishing industry is a fundamental component of transparent and accountable fisheries management.

The benefits associated with a coordinated approach to the collection of fisheries-data have been recognised for at least fifty years. The history of fisheries-data and statistics in Australia is marked by many events that have influenced the current situation (see Appendix 1).

Despite early attempts (in 1960) to introduce a national approach to fisheries-data collection, systems have independently developed within each jurisdiction. The key elements of fisheries data such as catch, landings, fishing effort and operator and vessel characteristics are collected by each jurisdiction, and the requirements of fisheries management in each jurisdiction have led to unique procedures for data collection in terms of forms, data entry and data storage. Currently there are no national guidelines for fisheries-data in Australia, nor is there a formal commitment to share these data between jurisdictions.

In August 2003, a discussion paper on the National Fisheries Data Strategy (NFDS) was provided to the Australian Fisheries Management Forum (AFMF) and its subcommittees. AFMF nominated representatives from each jurisdiction for a workshop on the NFDS. In October 2003, a workshop was held with the aim of developing a strategy for improving the national coordination of fisheries data collection. This document summarises the current state and direction of the NFDS.

NEED

The 2003 workshop identified the general scope of the NFDS and highlighted that the strategy should provide the basis for efficient and effective collection, management, utilisation and sharing of the data and statistics associated with Australia's fisheries.

Fisheries-data are used for a range of purposes. Ongoing commitment to maintaining and developing this resource will contribute to:

- Transparent and accountable management of fisheries and other living aquatic resources
- Stock assessment of targeted fish populations
- Allocation of access rights
- Environmental assessment of fisheries
- Compliance and quota management
- Statutory and non-statutory reporting
- Requirements associated with Commonwealth and state legislation, as well as international conventions and agreements
- Communication between governments, stakeholder groups and the Australian public.

Fish do not recognise jurisdictional boundaries. Assessment of fish stocks and management of fisheries across jurisdictional boundaries presents a challenge for Australian fisheries scientists and managers. A commitment to standardise and share relevant data and statistics will make an essential contribution to the sustainable development of aquatic resources shared between jurisdictions.

OBJECTIVES OF THE NFDS

There are three overall objectives of the National Fisheries Data Strategy (NFDS):

1. obtain a commitment from all jurisdictions to continue the collection and custodianship of data on Australian fisheries;
2. develop protocols that facilitate the sharing of fisheries-data within and between jurisdictions; and,
3. develop and implement recommendations to improve the quality, comparability and availability of fisheries-data and statistics derived from these data.

In the short-term, it is recognised that the majority of fisheries-data will be associated with the catch and effort of Australia's wild harvest commercial fisheries. However, in the longer-term, other data key to management of Australia's aquatic resources, such as those associated with recreational fisheries, charter boat fisheries and aquaculture operations should be considered. The NFDS acknowledges the importance of socio-economic data as well as data associated with aquatic species that are caught but not retained.

The NFDS will aim to improve the quality, comparability and availability of data and any associated statistics. The NFDS will not compromise the ability of individual jurisdictions to meet their obligations under relevant privacy laws or policies.

It is not intended that the outcomes from this strategy will replace the detailed data and systems managed by individual jurisdictions. Existing jurisdictional responsibilities for decision-making and policy implementation will not be affected.

RECOMMENDATIONS

In addition to the commitment to the collection and custodianship of fisheries-data and the development of protocols to facilitate data-sharing, the following recommendations (Table 1) have been developed and considered by the Fisheries Statistics Working Group. These recommendations are presented in order of priority.

Table 1 Summary of recommendations to progress Objective 3 of the NFDS. The top three recommendations will be undertaken by July 2008 by subgroups of agencies within the FSWG. All Australian fisheries management and research agencies will be consulted on these recommendations during their development.

	Recommendation	Comments
1	National guidelines be developed for the collection and management of Australian fisheries data.	The initial emphasis will be upon the collection and management of data from commercial fisheries, but the guidelines would also be applicable to recreational fisheries and research data. Subgroup: PIRSA, NTDPIF, TASDPIW Example: adoption of a single taxonomic coding scheme (CAAB)
2	National guidelines be developed for reporting statistics for Australian fisheries.	These guidelines will initially focus upon national and international reporting obligations. Development of these guidelines will also include an assessment of current reporting requirements within and between jurisdictions. Subgroup: AFMA, NSWDPI, BRS Example: guidelines for reporting units and conventions to ensure statistics meet confidentiality standards.
3	National guidelines be developed for collection and reporting of value and price statistics.	Although similar to recommendations (1) and (2), there was recognition that development of these guidelines requires specialist input. Subgroup: ABARE, FRDC, VICDPI Example: preferred sources and nomenclature to use for price data
4	Investigate current approaches in information services (such as web-sites and web-services) and propose or develop methods for improved access to fisheries information.	The objectives of such services are to improve the benefit-cost of inter-jurisdictional data exchange and the delivery of fishery statistics to the public. Subgroup: BRS Example: Development of an Australian Fisheries Information System (AFIS)

Recommendation		Comments
5	Develop a protocol for compiling national fleet statistics.	This protocol would necessarily have to address issues associated with double-counting between jurisdictional databases and confidentiality of licensing data. Identity of each hull and effective tracking of ownership history are necessary requirements for compiling snapshot statistics at the jurisdictional level. Comparable hull identifiers are essential for aggregation of jurisdictional records at a national level.
6	Develop guidelines for the identification and preservation of historical fisheries data sets.	This recommendation will be considered within recommendation (1). Example: Procedures for dealing with datasets that are in paper form or outdated digital formats.
7	Each jurisdiction adopt the principles of data custodianship that meet national and international standards.	This recommendation will be considered within recommendation (1). Example: Adherence to meta-data standards such as the 'marine community of practice' metadata profile of ISO 19115.
8	Review the management of data associated with 'fisheries research' and produce recommendations for improved storage and access.	Initiatives such as BlueNet and the Australian Ocean Data Centre Joint Facility (AODCJF) may have reduced the need for the NFDS to focus upon this issue.

OUTCOMES

The first three recommendations will be addressed by three separate subgroups within the FSWG (listed in Table 1). Each subgroup will prepare a detailed scoping document for the recommendation that will be distributed to all agencies for comment by July 2007. These scoping documents will then be developed into draft guidelines (also distributed for comment) which should be finalised by July 2008. The actual implementation of any specific guidelines that result from these recommendations within the NFDS will be the responsibility of individual jurisdictions. Each agency will likely have varying priorities, opportunities and resources for completing such tasks.

Development of a business case for the Australian Fisheries Information System (see recommendation (4)) is being undertaken by BRS within the 2006/07 financial year.

APPENDIX 1

Events that have shaped Australia's fisheries data

The history of national fisheries statistics collections in Australia is marked by many events that have influenced the current situation. This appendix provides a chronological list of significant events that have had, or intended to have, an impact on national fisheries data collection, management or dissemination.

1954 Australian Bureau of Statistics (ABS) first published national fisheries and whaling statistics.

1960 The Commonwealth-State Fisheries Conference appointed a Statistics Committee to introduce uniform collection of monthly fisheries data and annual vessel data. Although the model was adopted in some jurisdictions, it lapsed with time.

1968 A 12-mile fishing zone was declared and state and territory governments collected information on landings of fisheries products from marine and inland waters. Commonwealth agencies collected statistics on pearling, whaling and overseas trade, and dedicated catch and effort data systems were implemented for the tuna fishery off southern Australia and the prawn fishery in the Gulf of Carpentaria.

1979 With the declaration of a 200-mile Australian Fishing Zone, comprehensive fisheries statistics for Commonwealth waters between the three-mile territorial waters and the 200-mile limit began being collected.

1985 ABS ceased publication of detailed national fisheries statistics following difficulties in obtaining complete and reliable statistics.

1989 The Fisheries Statistics Working Group (FSWG) was formed and it facilitated provision of data for national statistics on an ad-hoc basis.

1990 ABARE commenced publication of the Australian Fisheries Statistics report. This annual report includes national commercial fisheries production, value of production and trade.

1997 The Standing Committee for Fisheries, Forestry and Aquaculture (FFA) recommended to Ministerial Council that national statistics should be given an ongoing funding commitment by the Commonwealth (MCFFA 4, Agenda item 11). The Council "*REQUESTED the Commonwealth Government continue the production of a national, standardised fisheries and aquaculture set of statistics as an ongoing service*".

1997 FRDC hosted a workshop to develop strategies for improving economic statistics for Fisheries.

1999 ABS Fish Account published as part of a broader project undertaken by the ABS to increase the understanding of environmental accounting.

2002 FSWG developed the Australian Fisheries Production Database (a one-off collation of historical fisheries production statistics).

2003 FRDC and the National Oceans Office commissioned development of the National Atlas of Marine Fishing and Coastal Communities, including development of a National Fisheries Data Strategy.

Terms of Reference for the Fisheries Statistics Working Group (2006/07)*

1. Advise the Australian Fisheries Management Forum and its subcommittees on national fisheries statistical data needs for all relevant sectors including aquaculture, commercial fisheries, recreational fisheries and traditional use of fisheries resources.

2. Facilitate the development of methodology, specifications and standards for the collection of fisheries statistics.

3. Encourage cooperation and mutual support to enhance the collection, compilation, analysis, management and archiving of fisheries statistics.

4. Facilitate exchange of, and compatibility of, fisheries statistics especially in multi-jursidictional fisheries. Identify technical standards and requirements for integrating fisheries databases and facilitate their use.

5. Facilitate the annual compilation, publication and dissemination of national fisheries statistics from data collected by each of the jurisdictions.

6. Ensure that fisheries statistics are appropriately represented in national forums.

* As agreed at FSWG meeting 28 September 2006

Current Fisheries Statistics Working Group membership (December 2006)

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Mr Michael Johansen	Database manager Fisheries Group NT Dept of Primary Industry, Fisheries and Mines
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