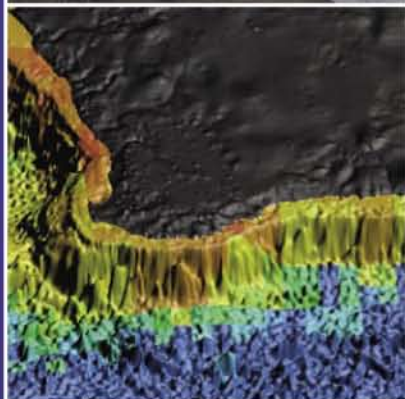




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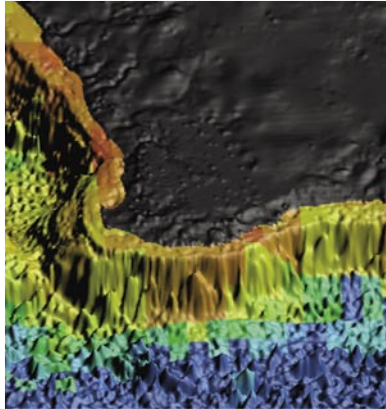


# marine matters

NATIONAL

Atlas of Australian  
Marine Fishing and  
Coastal Communities

DEPARTMENT OF AGRICULTURE, FISHERIES AND FORESTRY



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Atlas of Australian  
Marine Fishing and  
Coastal Communities

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# 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](http://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.



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

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Cooked whole lobster, Western Australia (Dylan Skims, 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](http://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 (© Lauritz, supplied by Ecofish)

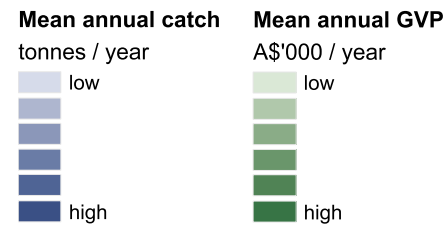
Most of the commercial fishing maps show catch (tonnes) or GVP (\$) on a half degree statistical grid (approximately 55km by 55km). The standard reporting period spans 2000 to 2002 calendar years, the maps present a mean annual figure for this period. GVP is expressed as the 'beach price' — defined as 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

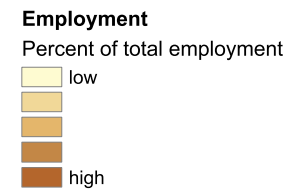
- Colour shading is used to indicate areas of higher or lower catch or GVP. More intense colours indicate higher values and lighter shades lower values. Blue shading in maps refers to catch (tonnes) whereas green shading refers to GVP (\$).
- All jurisdictions have a ‘five boat rule’ confidentiality 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.

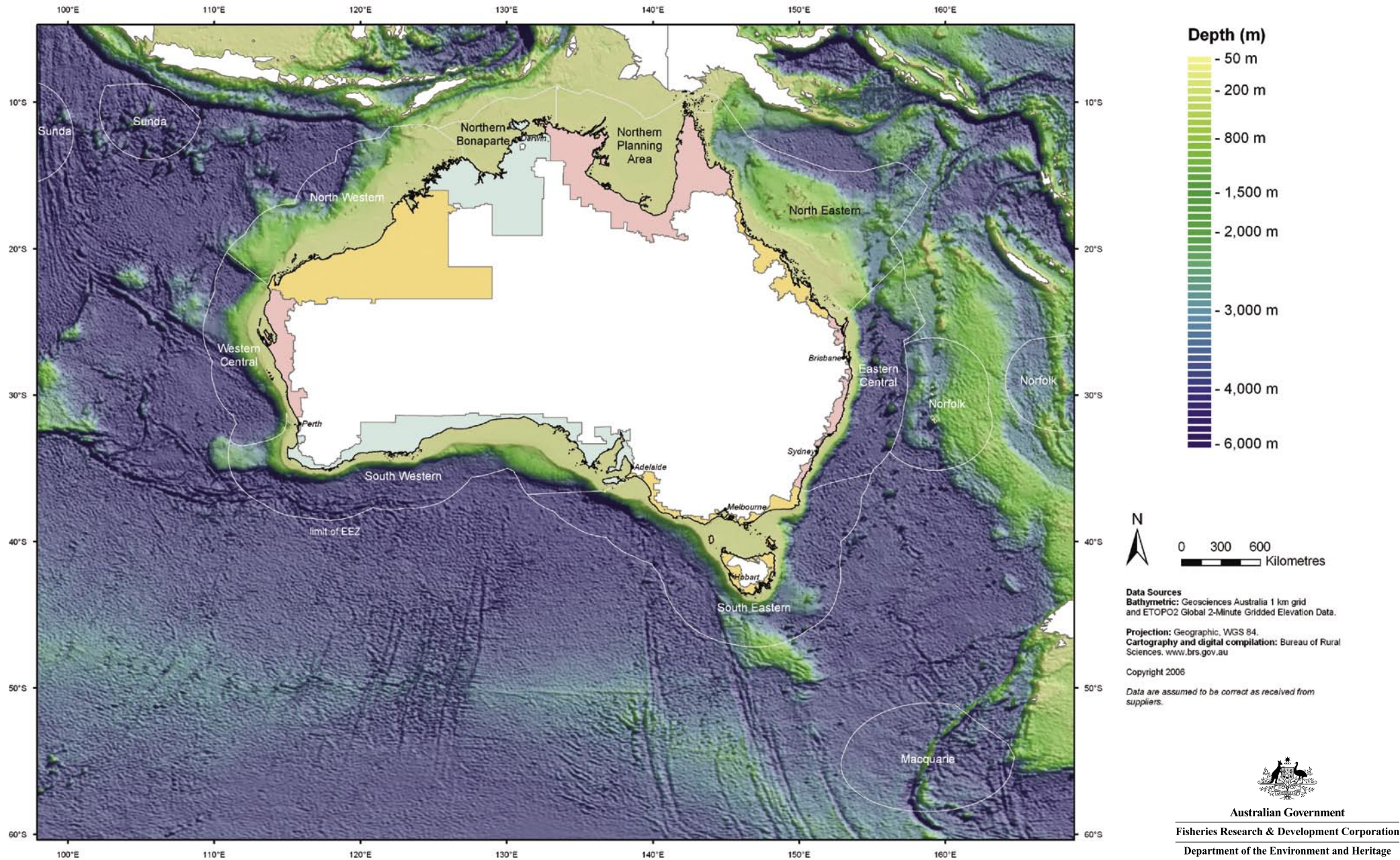
### Socio-economic

- 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).





# The Australian Marine Region



**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](http://www.brs.gov.au)  
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**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

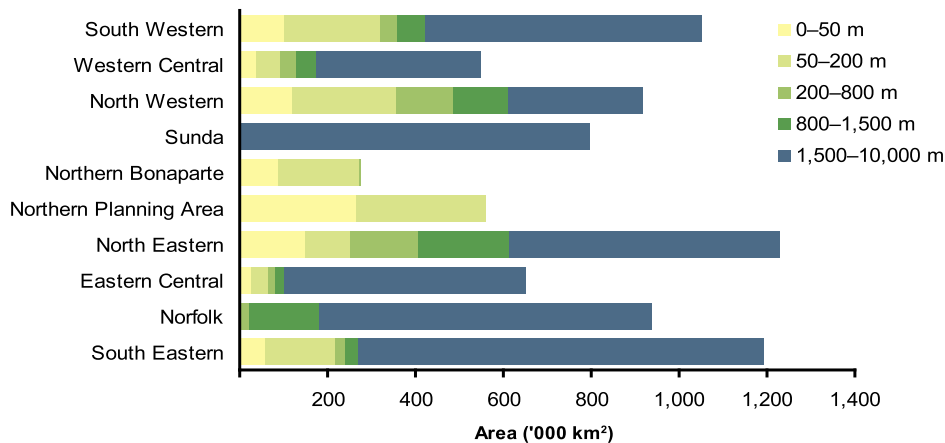
part of the Australian Fishing Zone is north of Christmas Island, at some 6700 m. The most important parts of the ocean for Australia’s fisheries production are the continental shelf and the upper part of the continental slope.

**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.

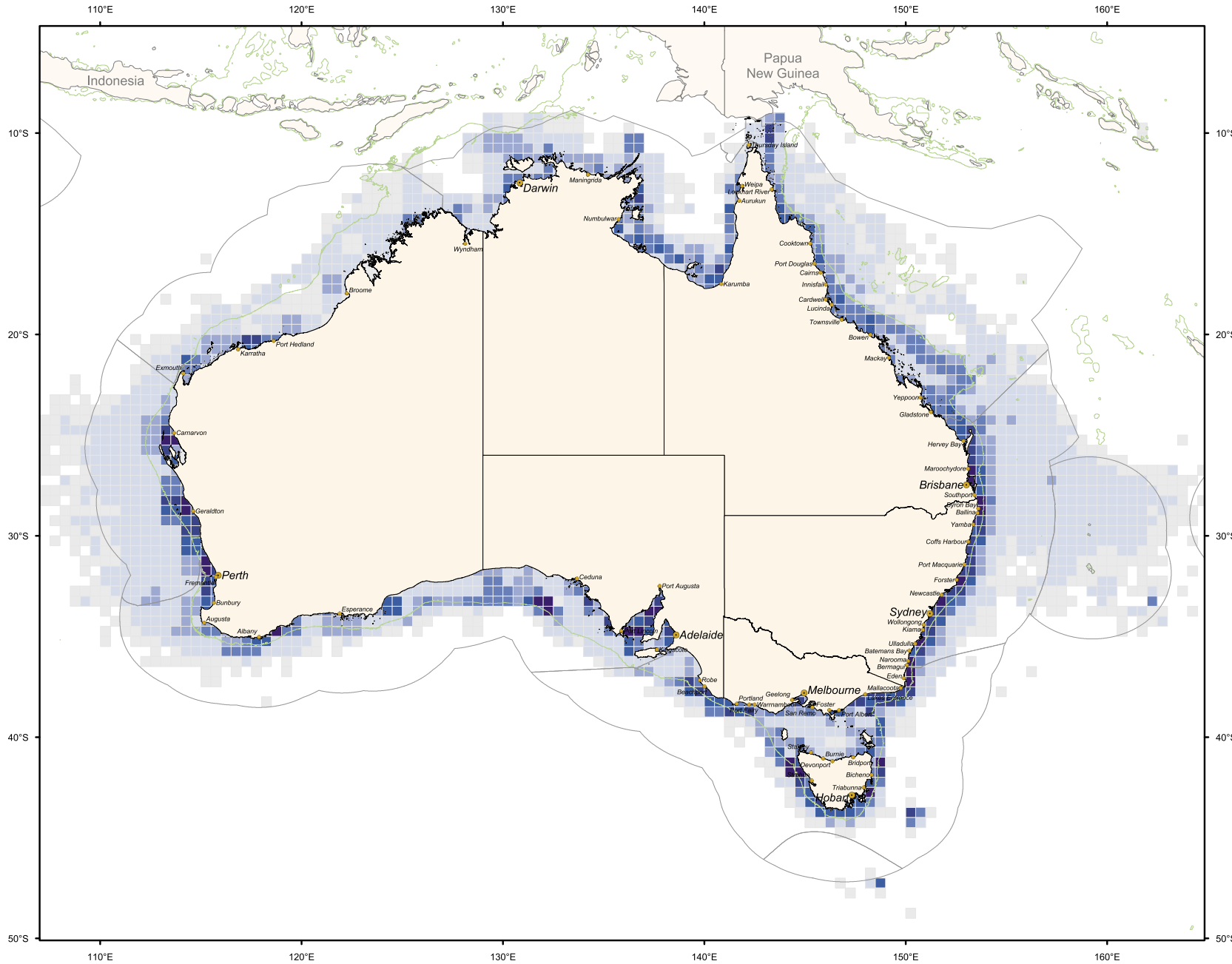
This Atlas reports on the fishing activity within each Marine Region and also on fishing-related socio-economic indicators in the adjacent, terrestrial, coastal statistical areas (see Appendix 3).

Area of each Marine Region, broken down by depth



Hauling the net, South Australia (supplied by SAFEC)

# Australian commercial fishing catch



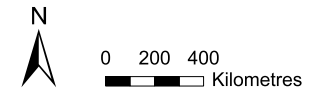
### Mean annual catch (2000-02)

tonnes / year

- 0 - 35
- 36 - 100
- 110 - 240
- 250 - 480
- 490 - 890
- 900 - 4,300

confidential

200m depth contour



**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](http://www.brs.gov.au)

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**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:

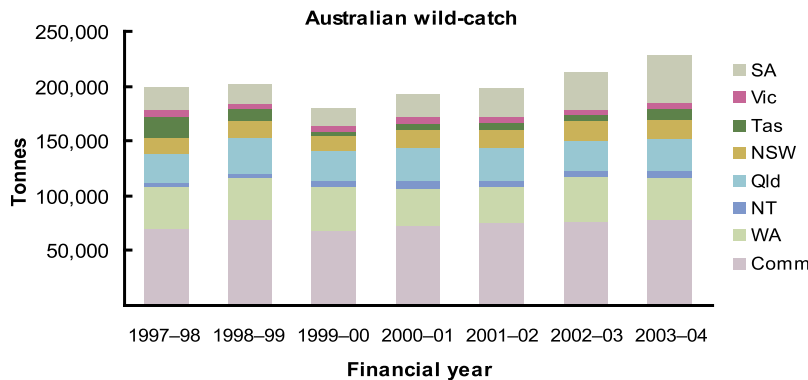
- the west coast of Tasmania (4260 t/year/half degree cell), associated with the trawl fishery for blue grenadier (*Macruronus novaezelandiae*).
- the Great Australian Bight (3146 t/year/half degree cell), associated with purse seining for southern bluefin tuna (*Thunnus maccoyii*) and other pelagic 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.

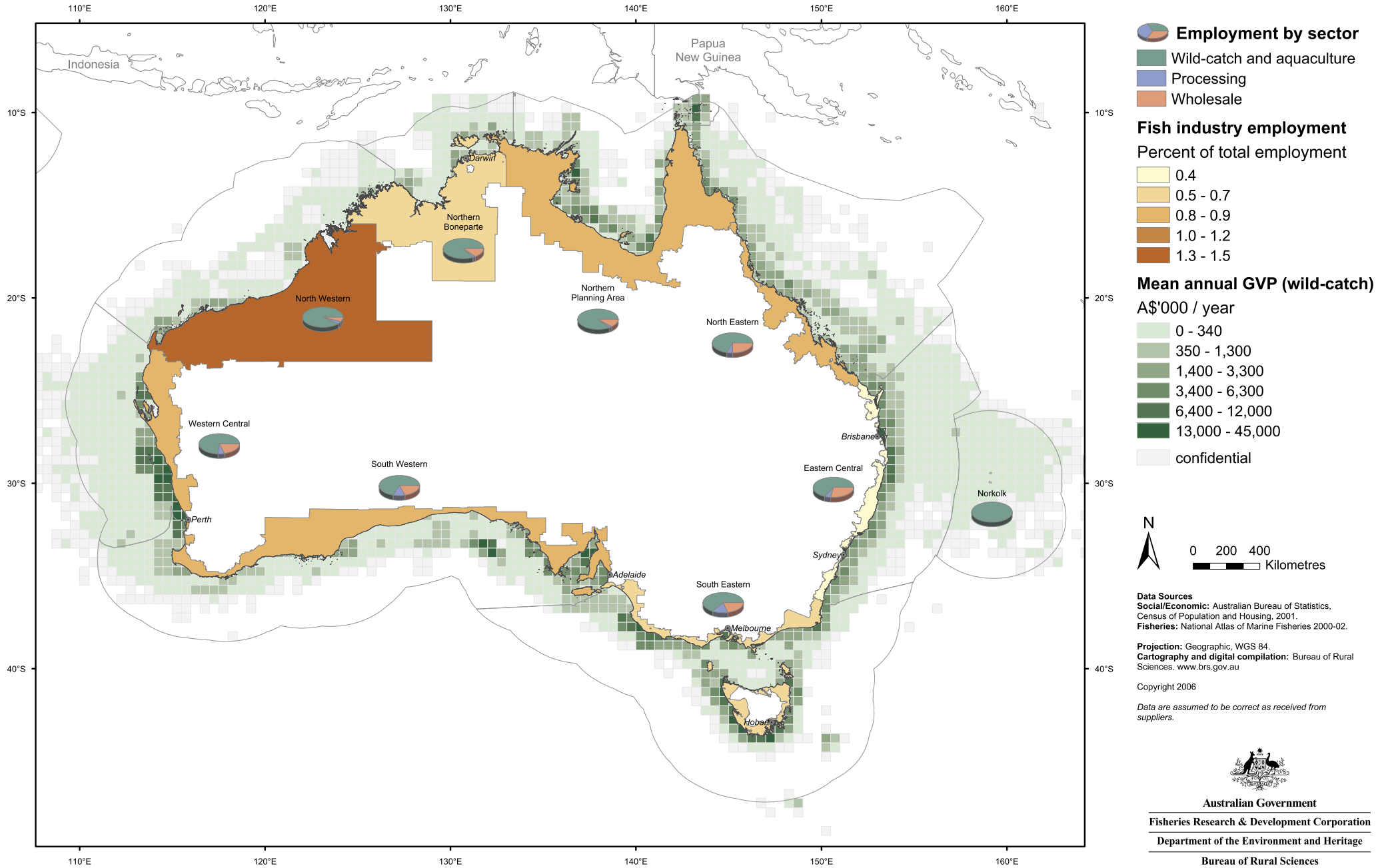
The total wild-fishery catch has increased over recent years to 228,000 t in 2003–04.

**Source**

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



# Australian commercial fishing GVP and fish industry employment



**Gear**

All marine and estuarine fishing methods.

**Primary species**

All commercially taken species.

**Description**

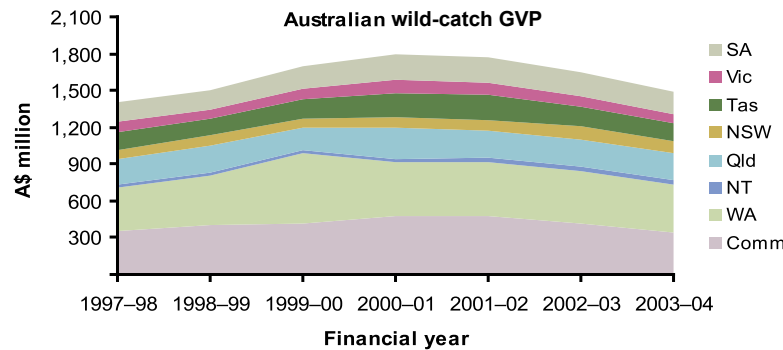
Map 3 shows employment in the fish industry, as a percentage of total employment, for each of the coastal SLAs associated with the Marine Regions. The fish industry employment data covers three sectors: wild-catch and aquaculture; processing; and wholesale. Pie charts for each Region indicate the contribution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

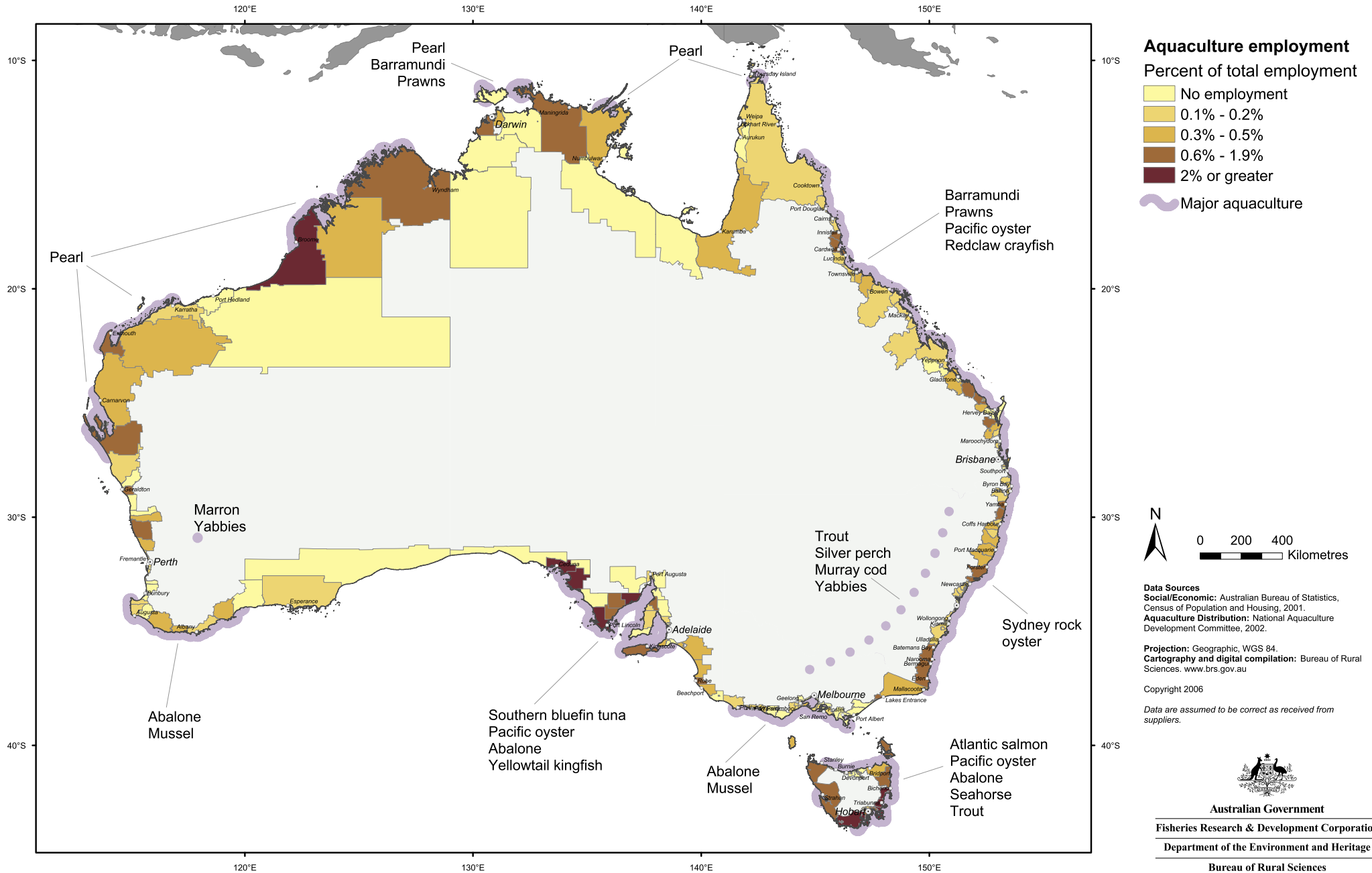
The total wild-catch fishery GVP has decreased over recent years—to \$1,486m in 2003–04, down from a peak of \$1,793m in 2000–01.

**Source**

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



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



**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.

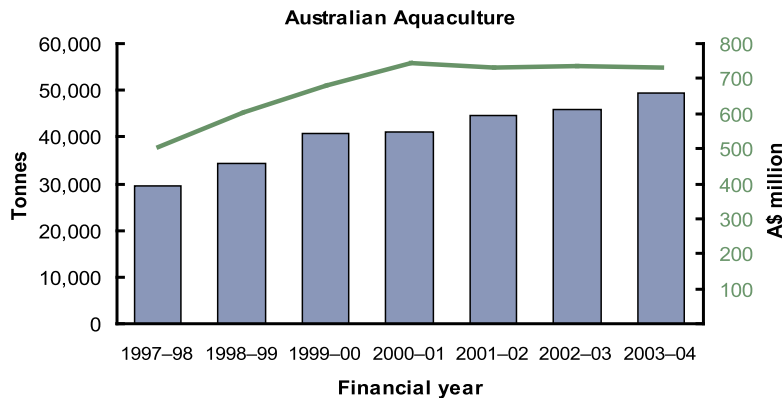
Trout and salmon hatcheries have a history going back to the 1860s and Sydney rock oyster culture to the 1930s. Pearl culture began in Western Australia in the 1950s. However most species have a relatively short history of aquaculture in Australia, with much of the development occurring since the 1980s.

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.

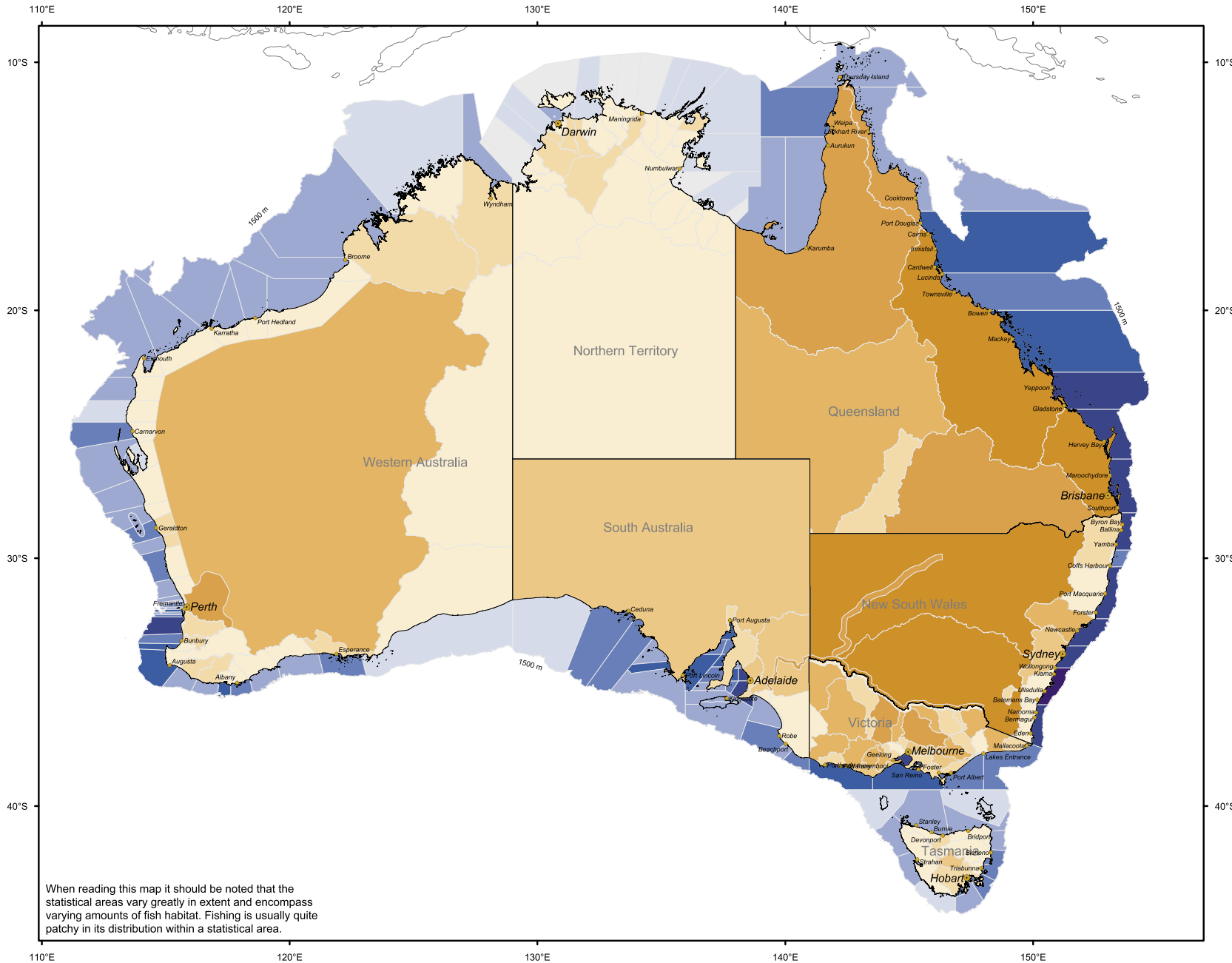
**Source**

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)





**Marine and estuarine**

Number of fish (non-bait)

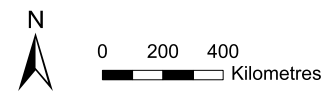
- 0 - 35,000
- 36,000 - 230,000
- 240,000 - 710,000
- 720,000 - 1,600,000
- 1,700,000 - 5,600,000
- 5,700,000 - 9,600,000

**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



**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](http://www.brs.gov.au)

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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.

### Gear

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

### Primary species

All recreationally taken species.

### Description

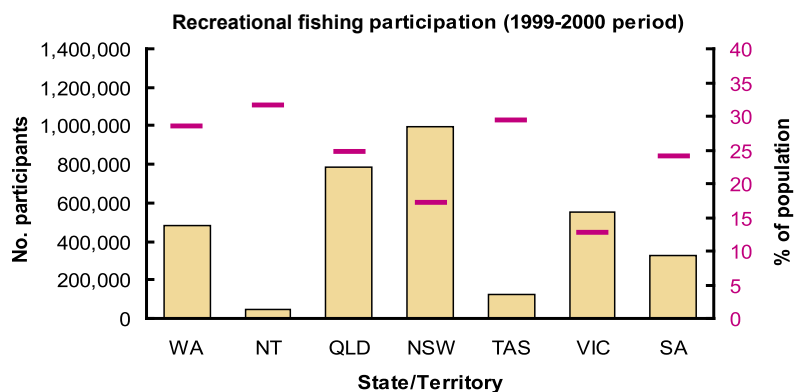
Map 5 shows total annual catch of fish (non-baitfish) in numbers from the *National Recreational and Indigenous Fishing Survey* of 2000–01.

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:

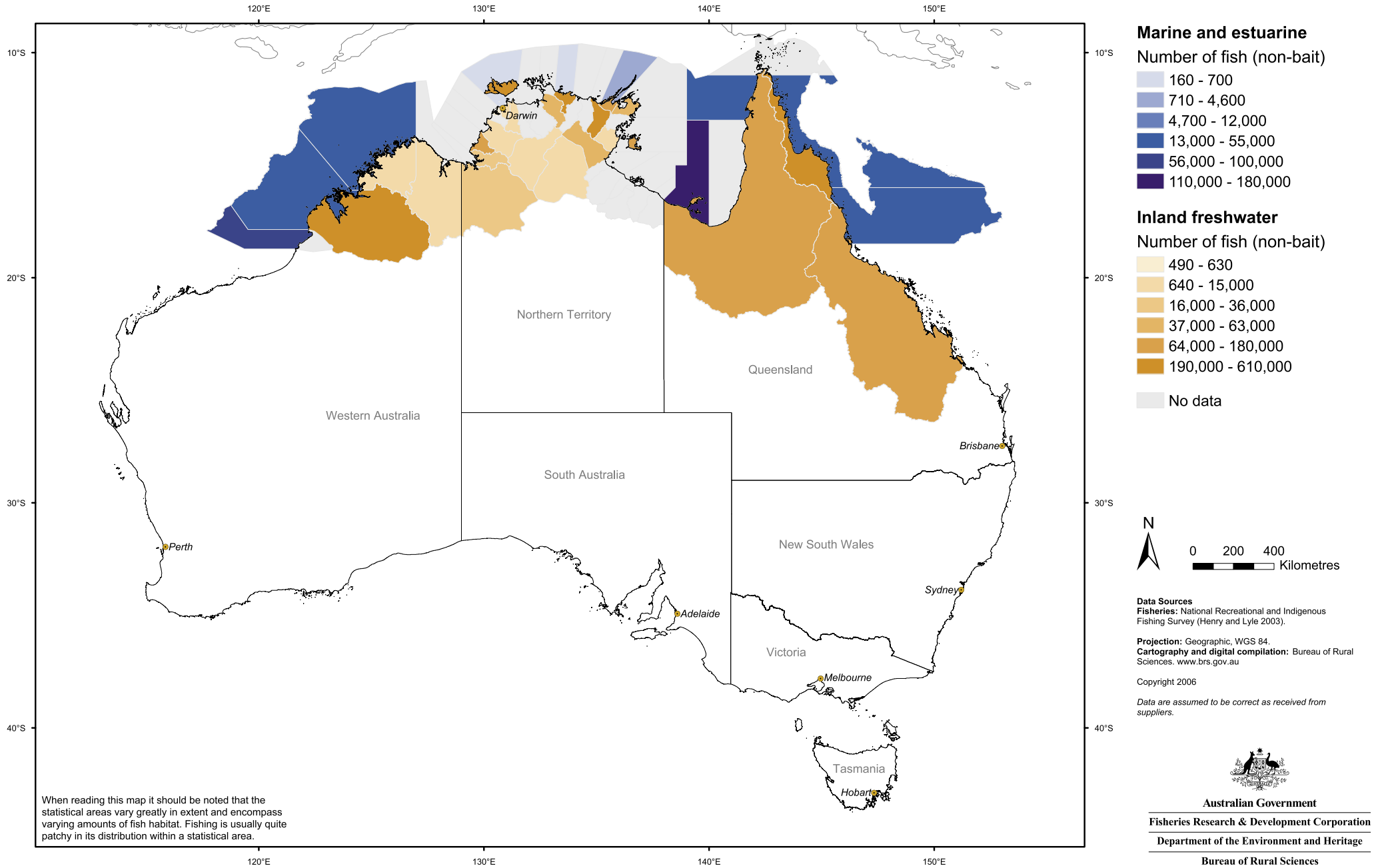
- Recreational anglers spent an estimated 20.6 million days fishing, representing 23.2 million separate fishing events or 102.9 million hours fishing.
- Recreational fishing in coastal waters attracted 41% of fishing effort, followed by fishing in estuarine waters (35%), freshwater rivers (11%), freshwater 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)



**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**

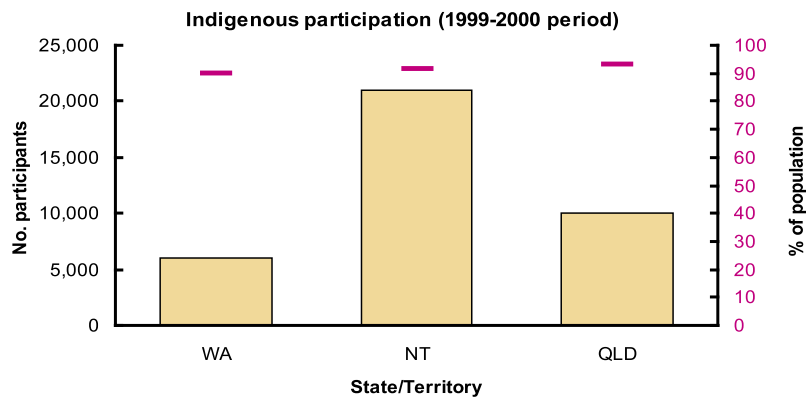
Map 6 shows total annual catch of fish (non-baitfish) in numbers estimated by the *Recreational and Indigenous Fishing Survey* in northern Australia in 2000–01.

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

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## 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

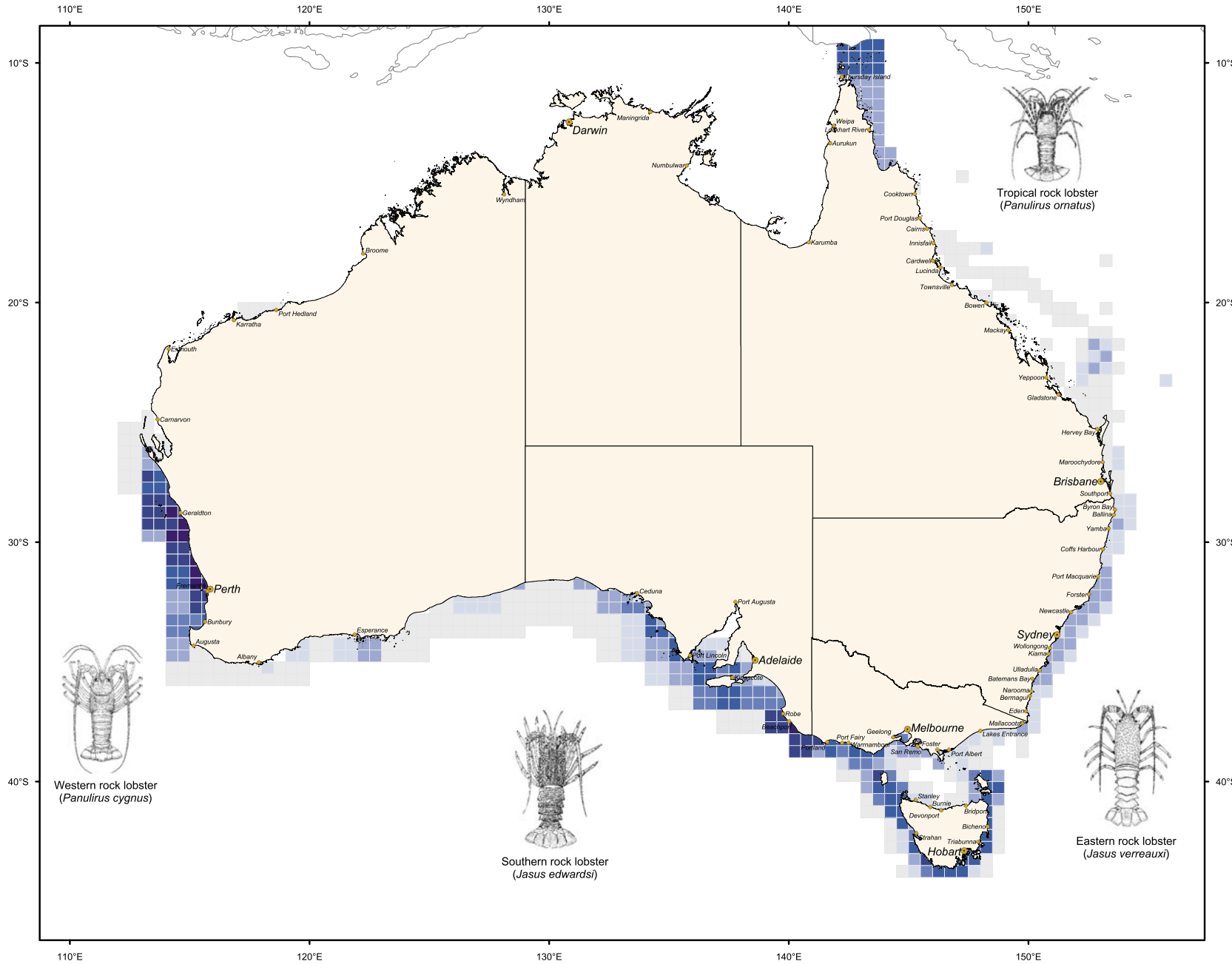
**Map 8** Prawn fisheries – Commercial catch

**Map 9** Tuna and mackerel fisheries – Commercial catch

**Map 10** Shark fisheries – Commercial catch

**Map 11** Mollusc fisheries – Commercial GVP

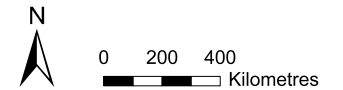
# Lobster fisheries – Commercial catch



**Mean annual catch (2000-02)**

tonnes / year

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



**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](http://www.brs.gov.au)

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 Department of the Environment and Heritage  
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**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**

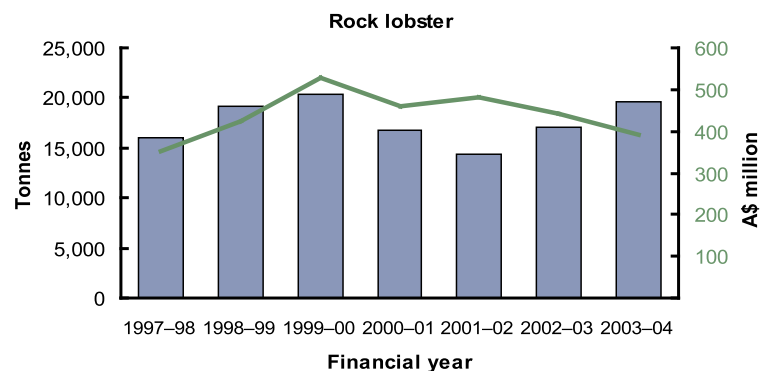
- Fisheries for the temperate species of rock lobster (*Jasus spp.*) are distributed across southern Australia, with southern rock lobster along the coast from Western Australia to Tasmania and eastern rock lobster off the coast of New South Wales. The fishery for the western rock lobster is the largest 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**

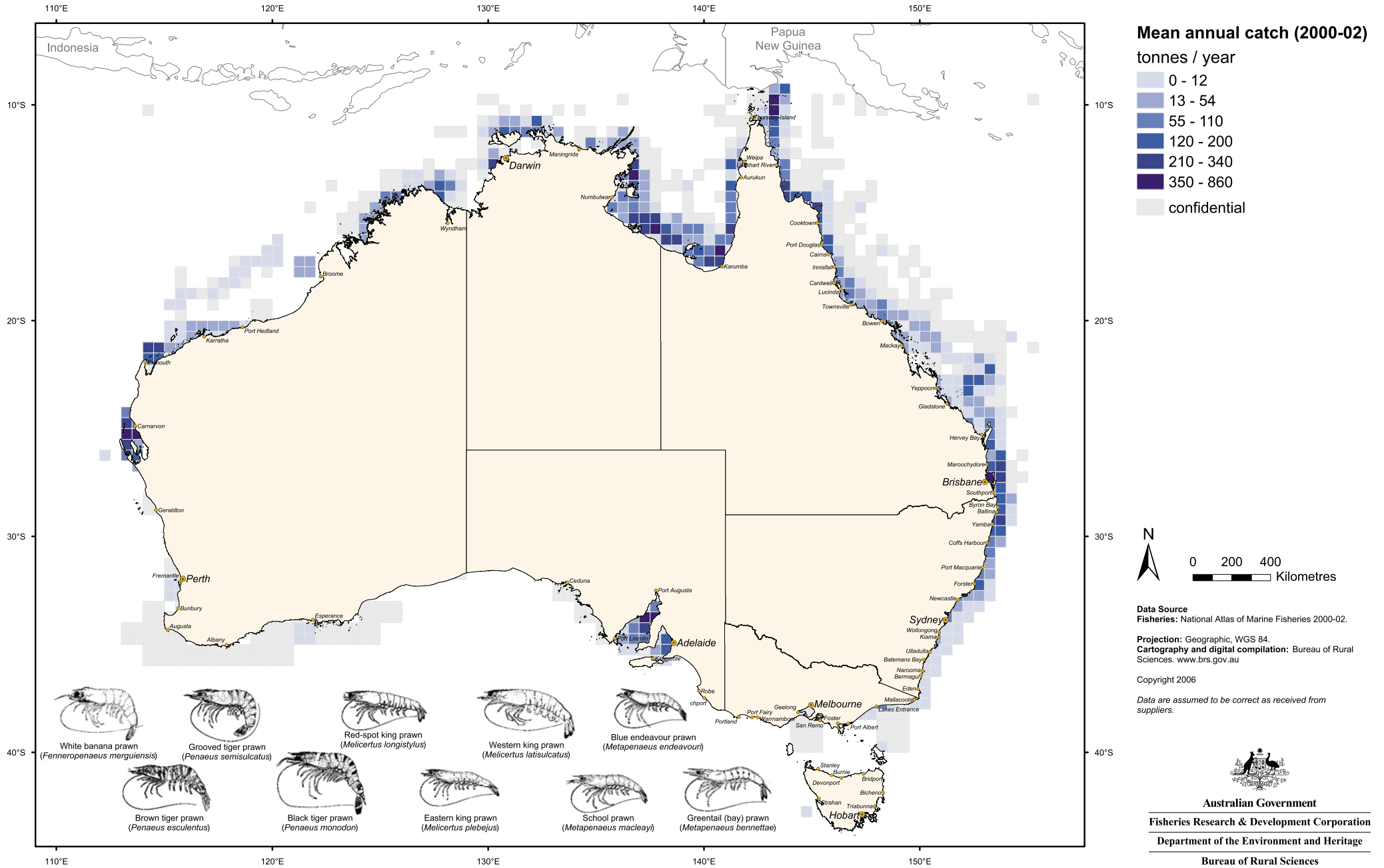
ABARE (2005) *Australian Fisheries Statistics 2004*. Australian Bureau of Agricultural and Resource Economics, Canberra. 65pp.

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)





**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**

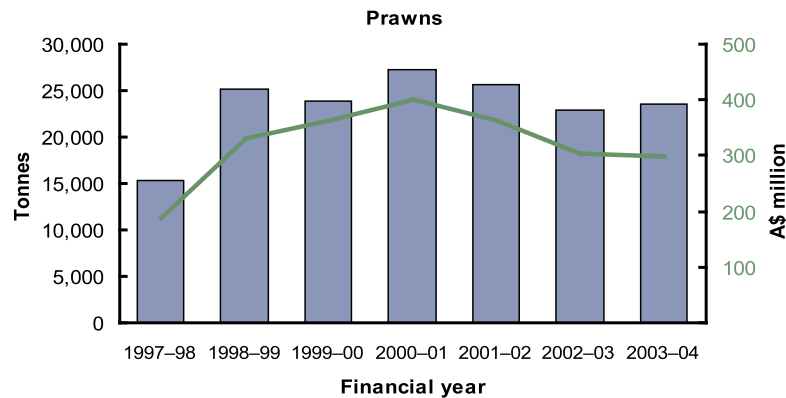
- Penaeid prawn populations are usually quite closely associated with river and estuarine systems, as well as habitats such as mangroves and seagrass, that are important at various stages of the prawn lifecycle. The associated trawl fisheries for penaeid prawns generally occur in shallow, near-shore 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 19<sup>th</sup> 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.

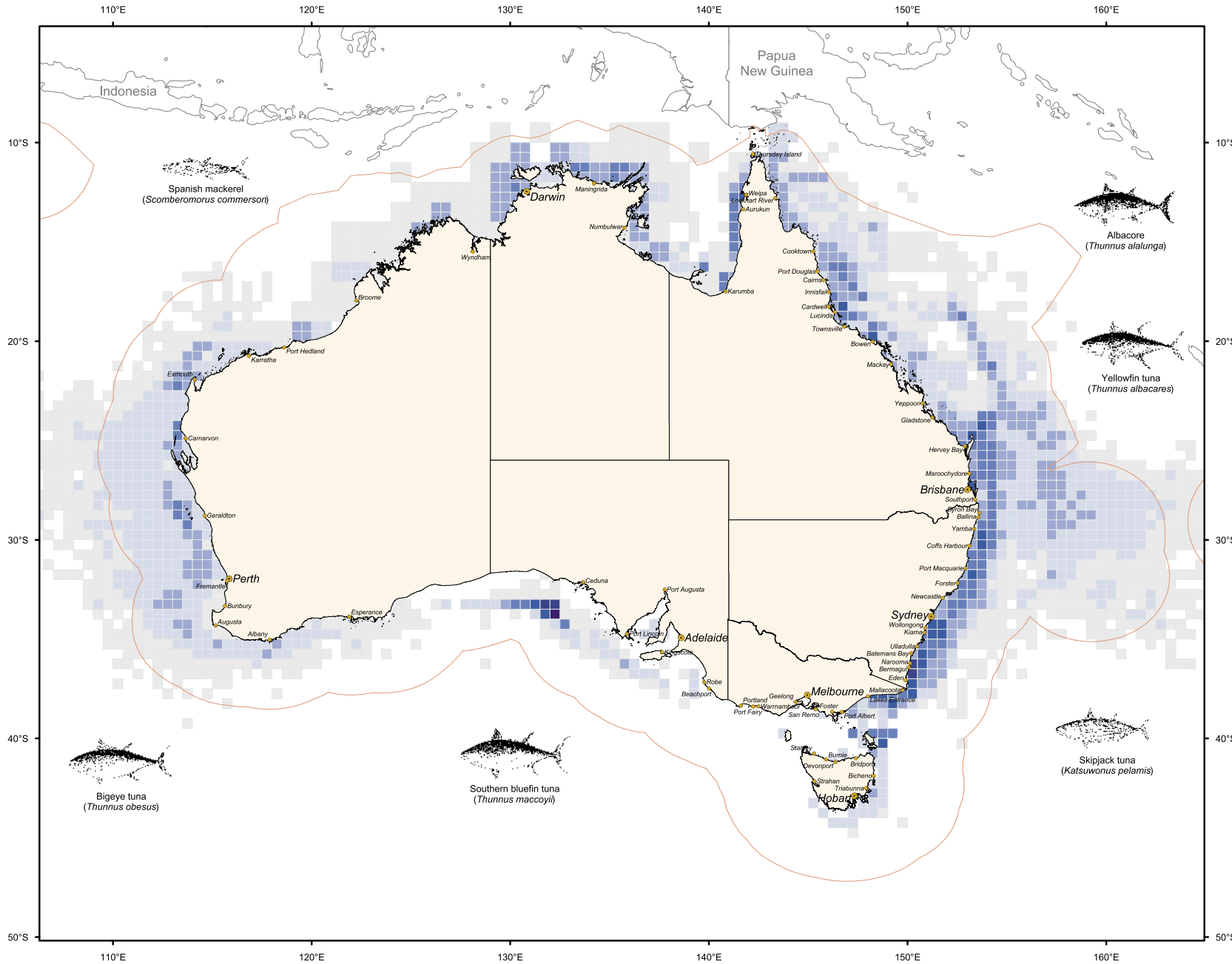
**Sources**

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)

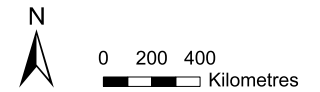


**Mean annual catch (2000-02)**

tonnes / year

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

Exclusive Economic Zone



**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](http://www.brs.gov.au)

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### Gear

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

### Primary species

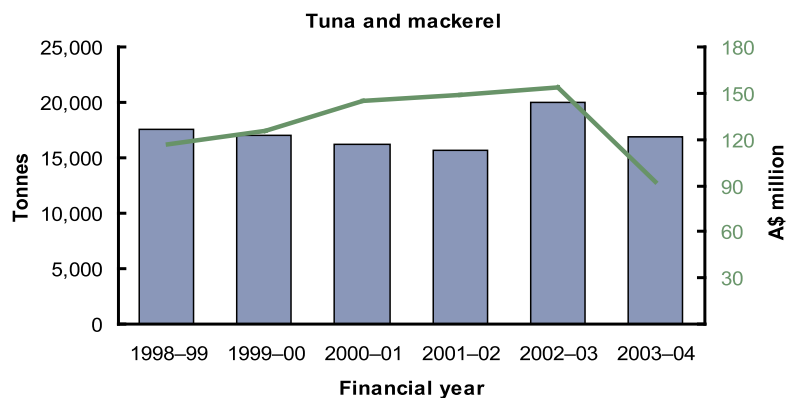
Fishes of the family Scombridae (mackerels, tunas and bonitos).

### 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) 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.

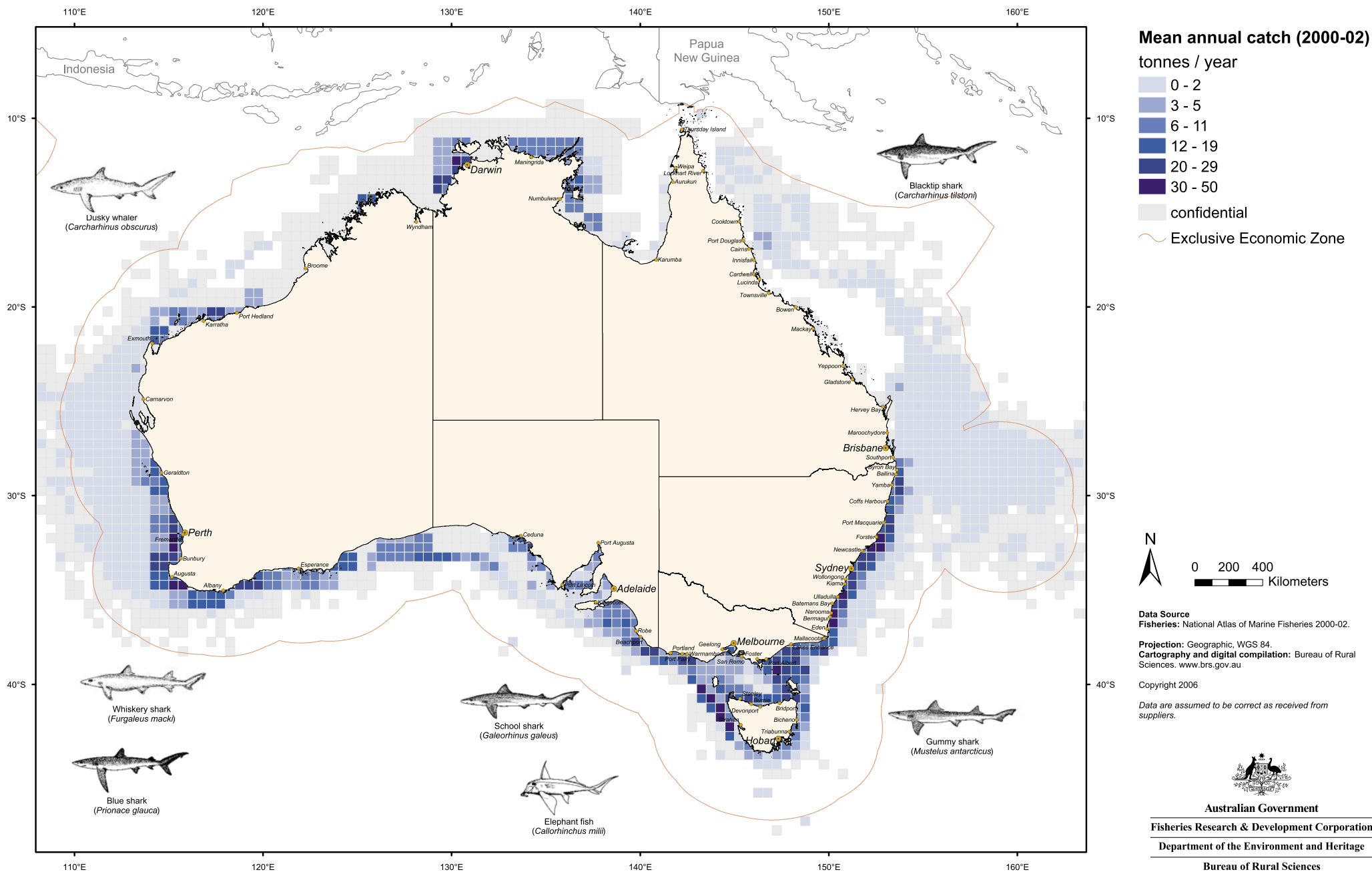
### Sources

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. Kaitish, 2003)



**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**

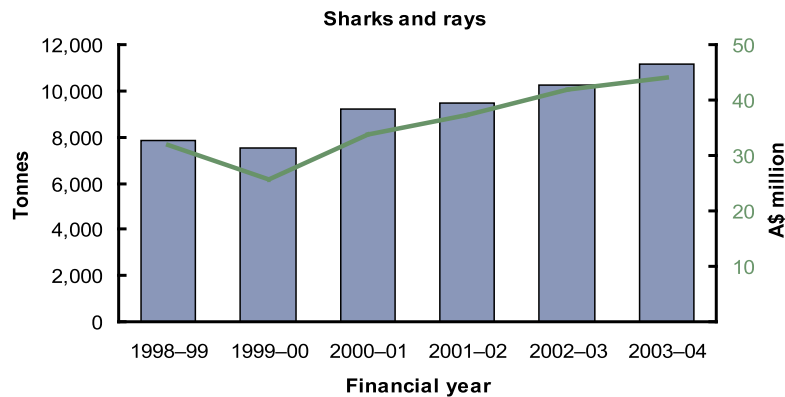
- There are a number of dedicated shark fisheries in Australia, including two Western Australian fisheries using demersal gillnet in the south west, the Western Australian northern shark fisheries and the Northern Territory Shark Fishery (in the north west), and the Australian Government managed Southern 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 seaboard.

- 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.

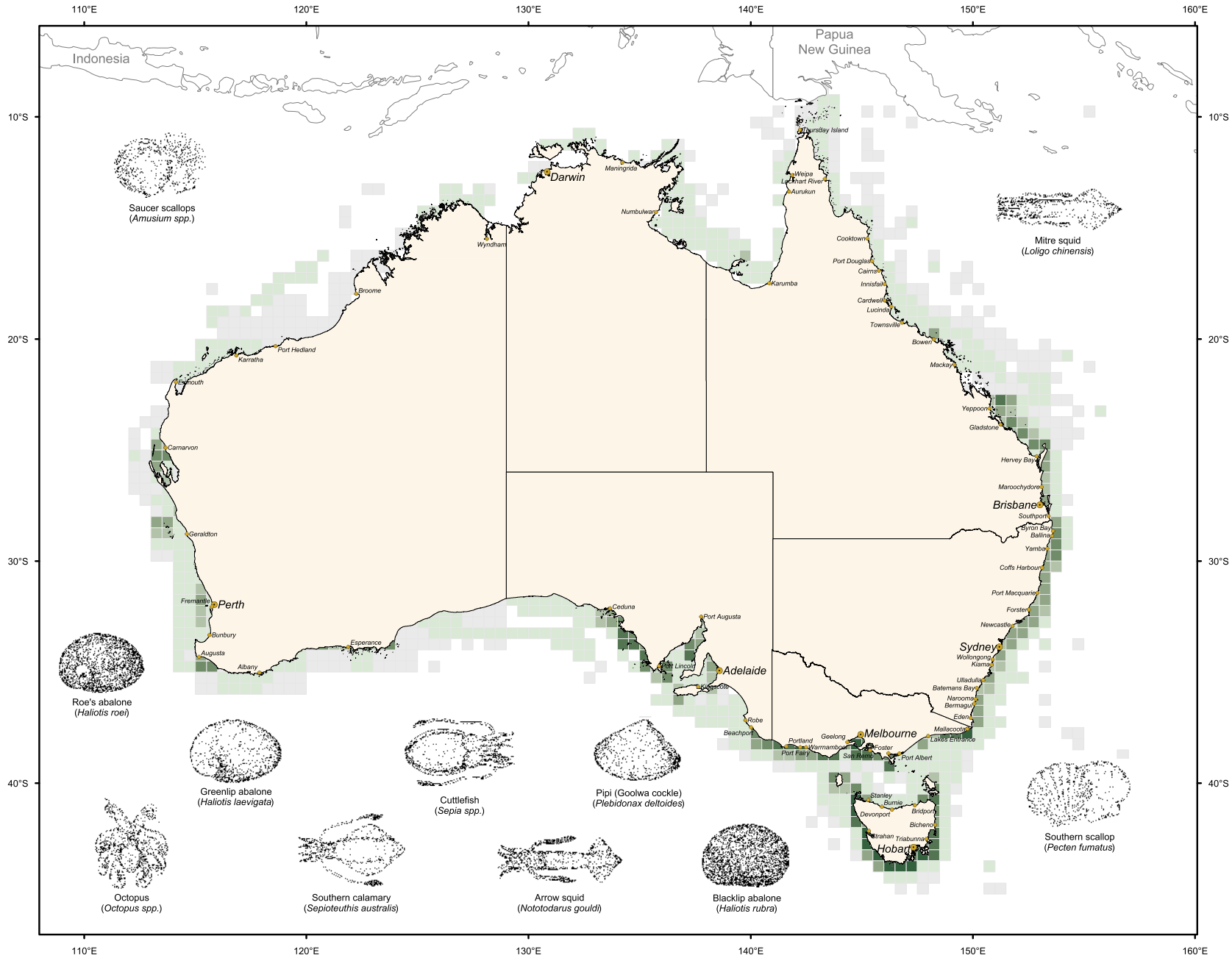
**Sources**

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.



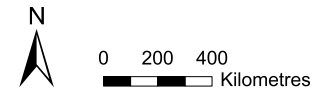
Shark research and monitoring, Western Australia (Department of Fisheries, WA)



### 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



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](http://www.brs.gov.au)

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### Gear (species)

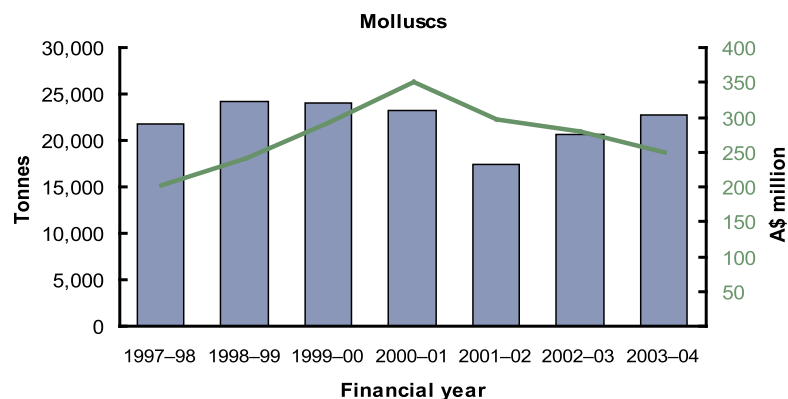
Hand collection (abalone, oysters, pipis), dredge and trawl (scallop), jig and trawl (squid), pots (octopus) and haul nets (calamari).

### 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. Kailish, 2003)



# marine matters

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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

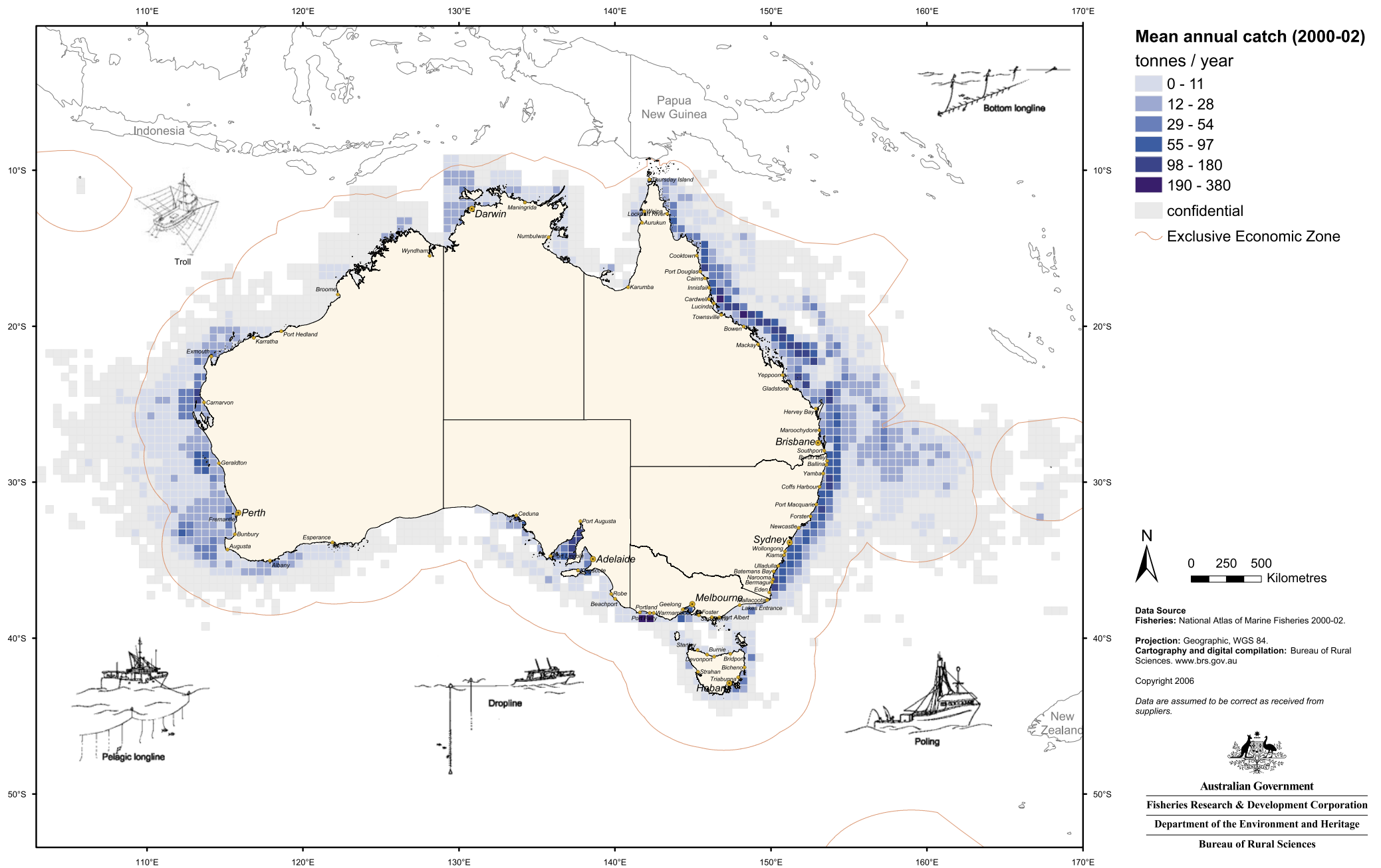
**Map 14** Trap fisheries – Commercial catch

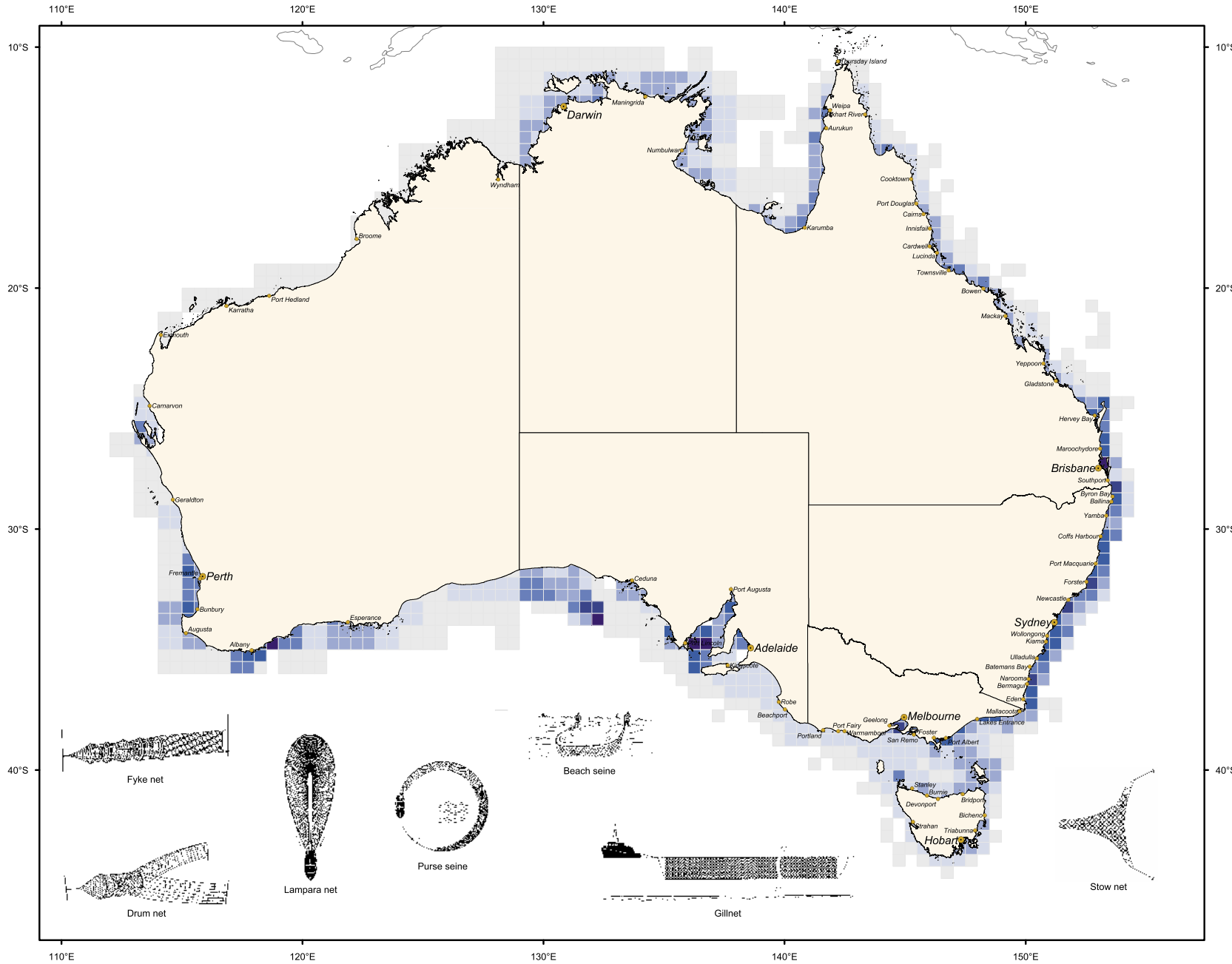
**Map 15** Trawl fisheries – Commercial catch

**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.

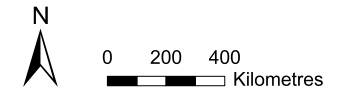
# Hook and line fisheries – Commercial catch





**Mean annual catch (2000-02)**

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



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

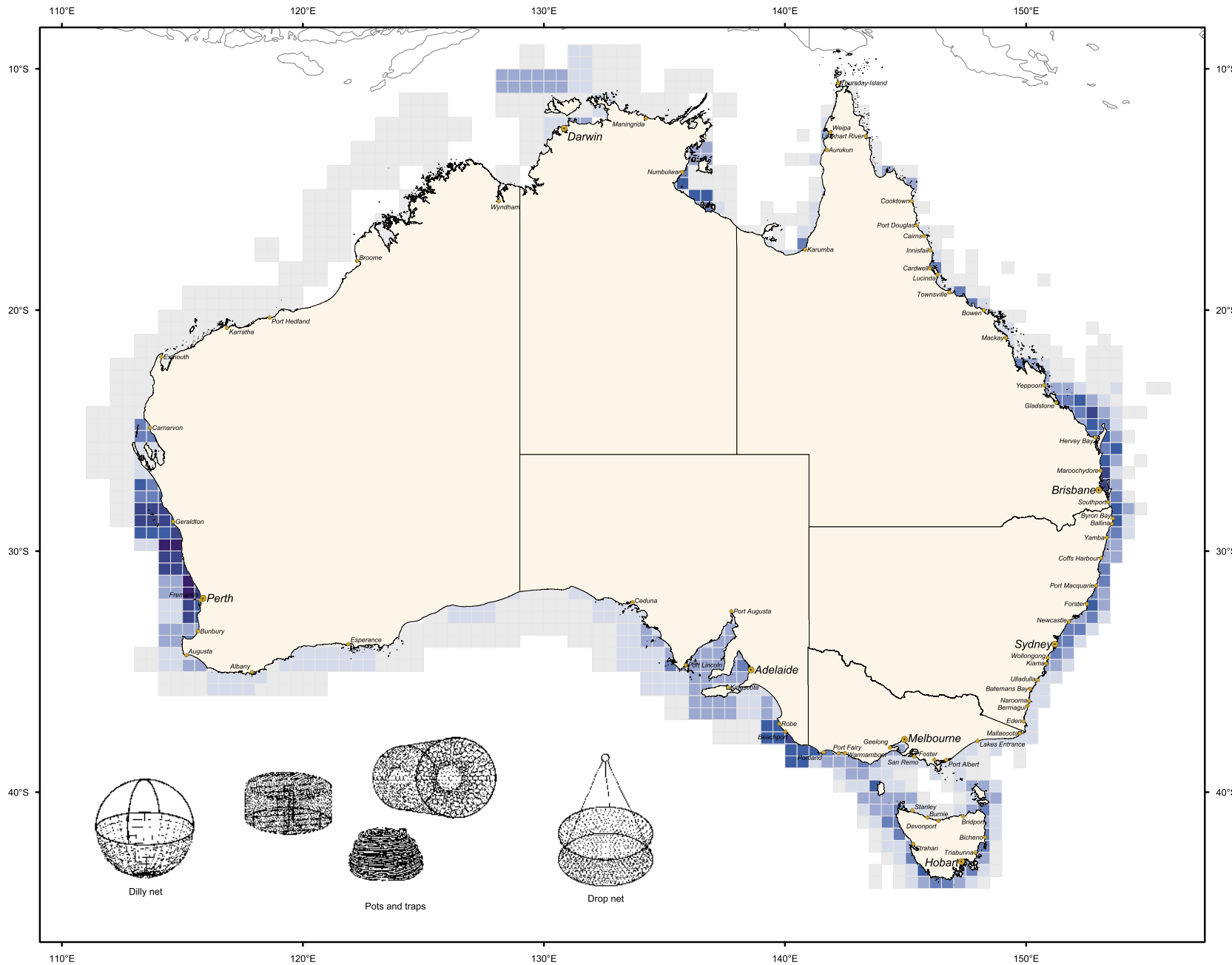
**Projection:** Geographic, WGS 84.  
**Cartography and digital compilation:** Bureau of Rural Sciences. [www.brs.gov.au](http://www.brs.gov.au)

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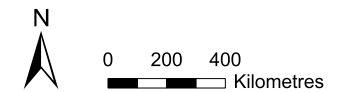
# Trap fisheries – Commercial catch



### Mean annual catch (2000-02)

tonnes / year

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



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

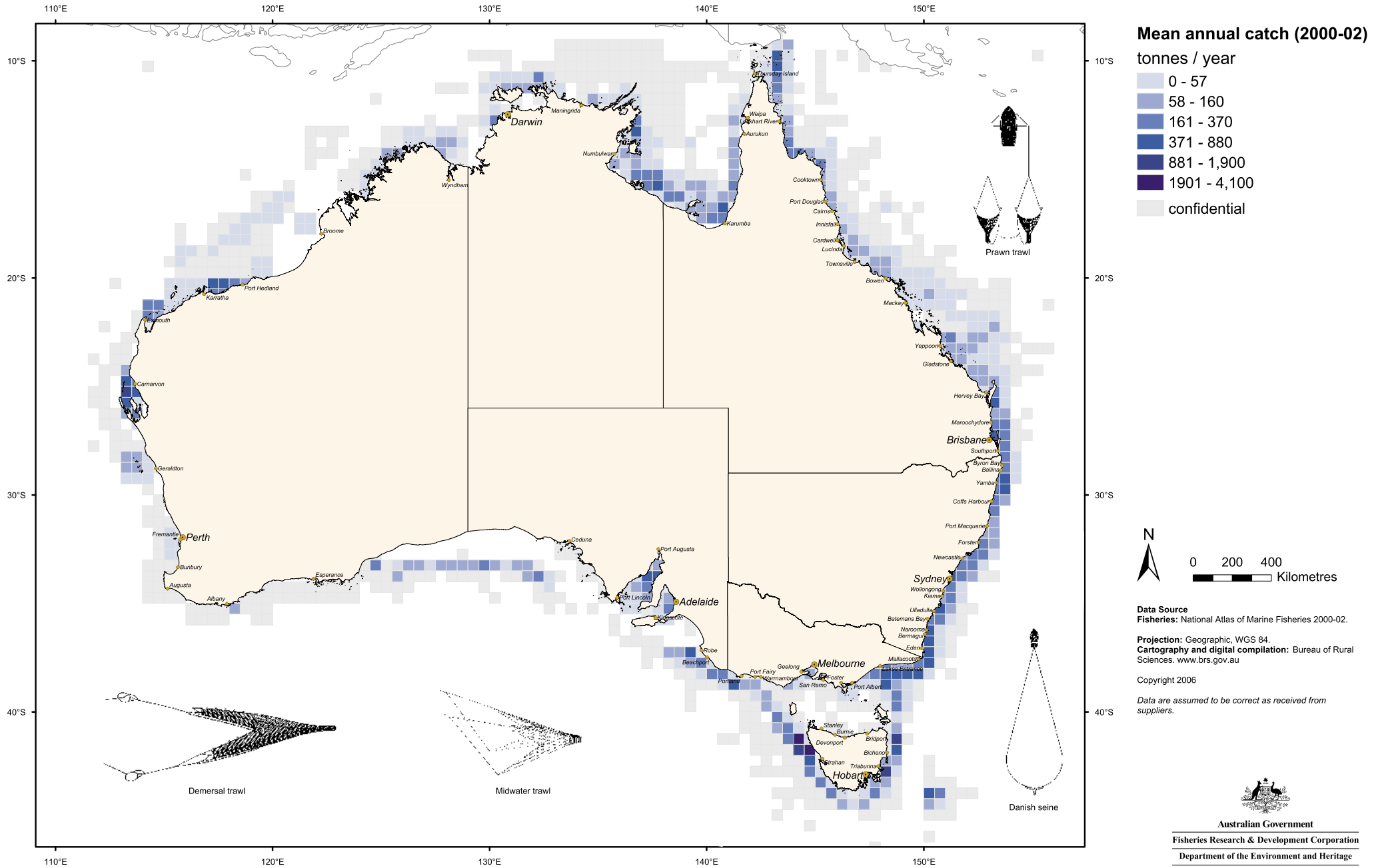
Projection: Geographic, WGS 84.  
Cartography and digital compilation: Bureau of Rural Sciences. [www.brs.gov.au](http://www.brs.gov.au)

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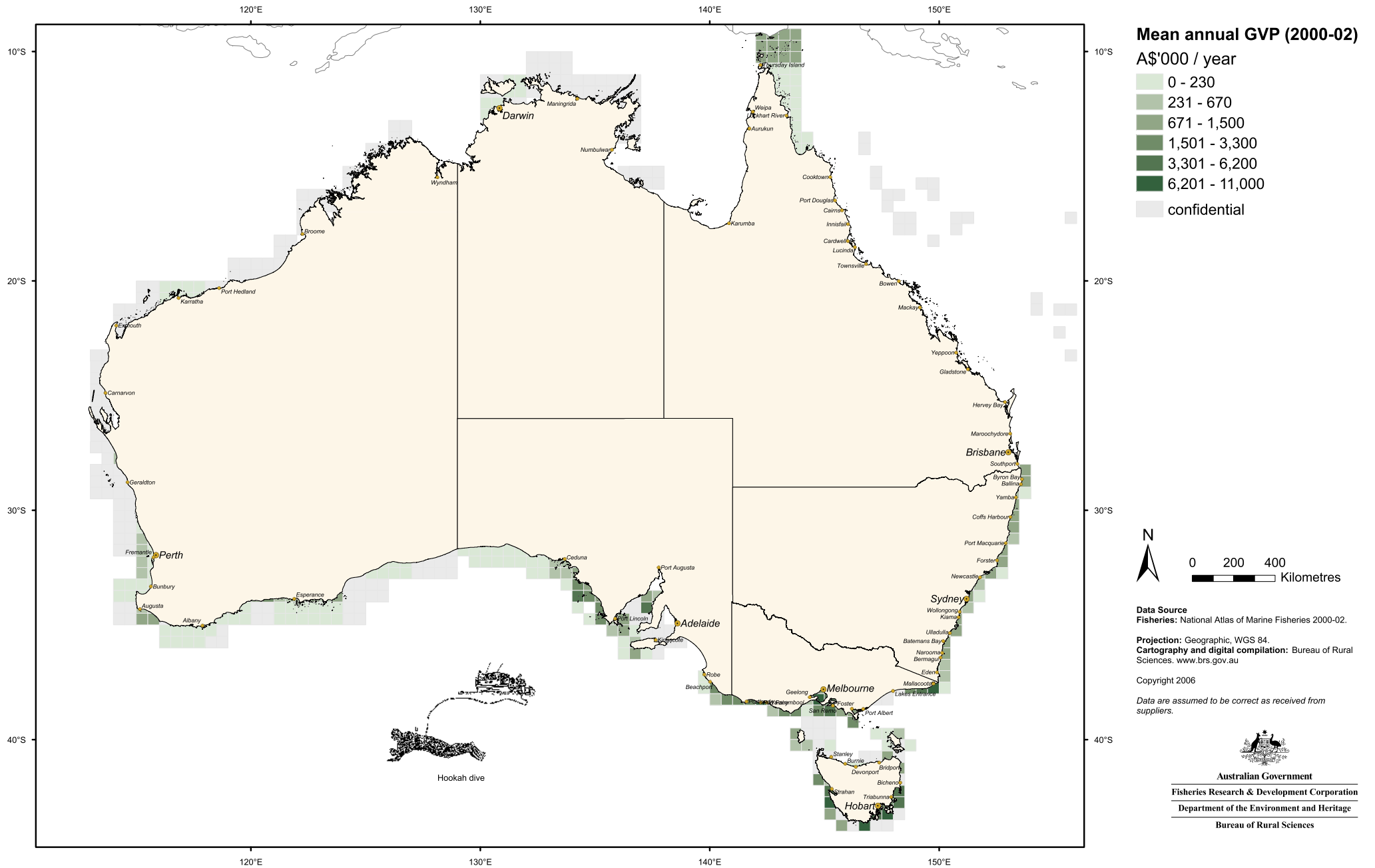
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# Dive and hand collection fisheries – Commercial GVP



# marine matters

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## ■ 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

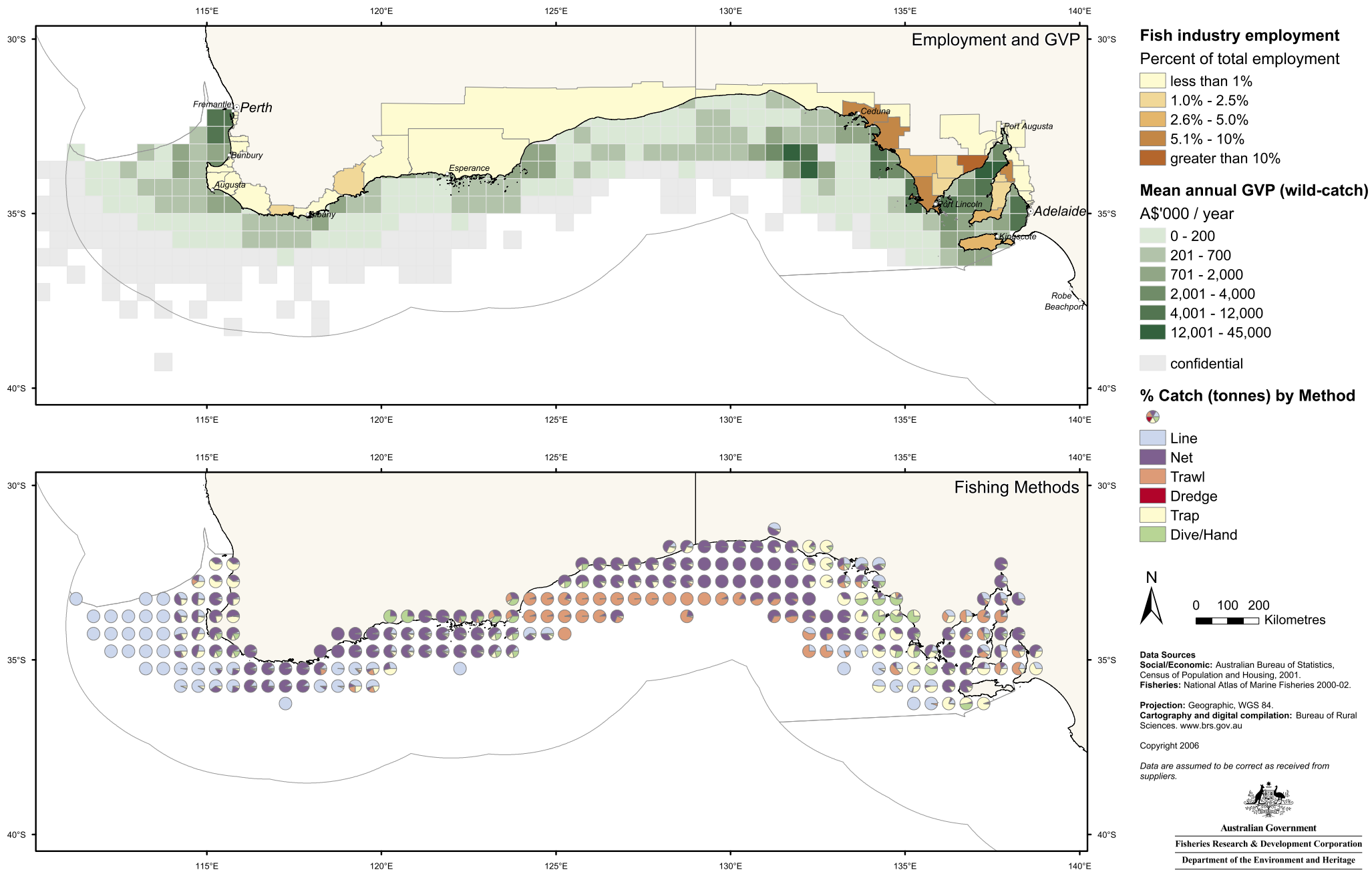
**Map 21** Northern Planning Area

**Map 22** North Eastern Region

**Map 23** Eastern Central and Norfolk Regions

**Map 24** South Eastern Region





**Description**

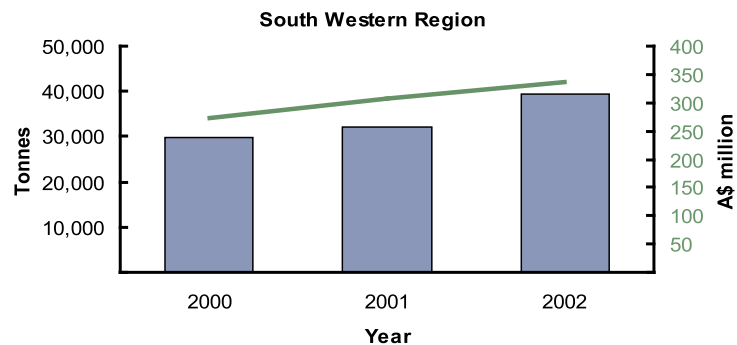
Ochre shading over the land shows employment in the fish industry as a percentage of total employment, for coastal SLAs. Commercial fishing employment, including aquaculture is largely concentrated across the Eyre Peninsula where almost all coastal towns have strong linkages to commercial fishing activities. 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.

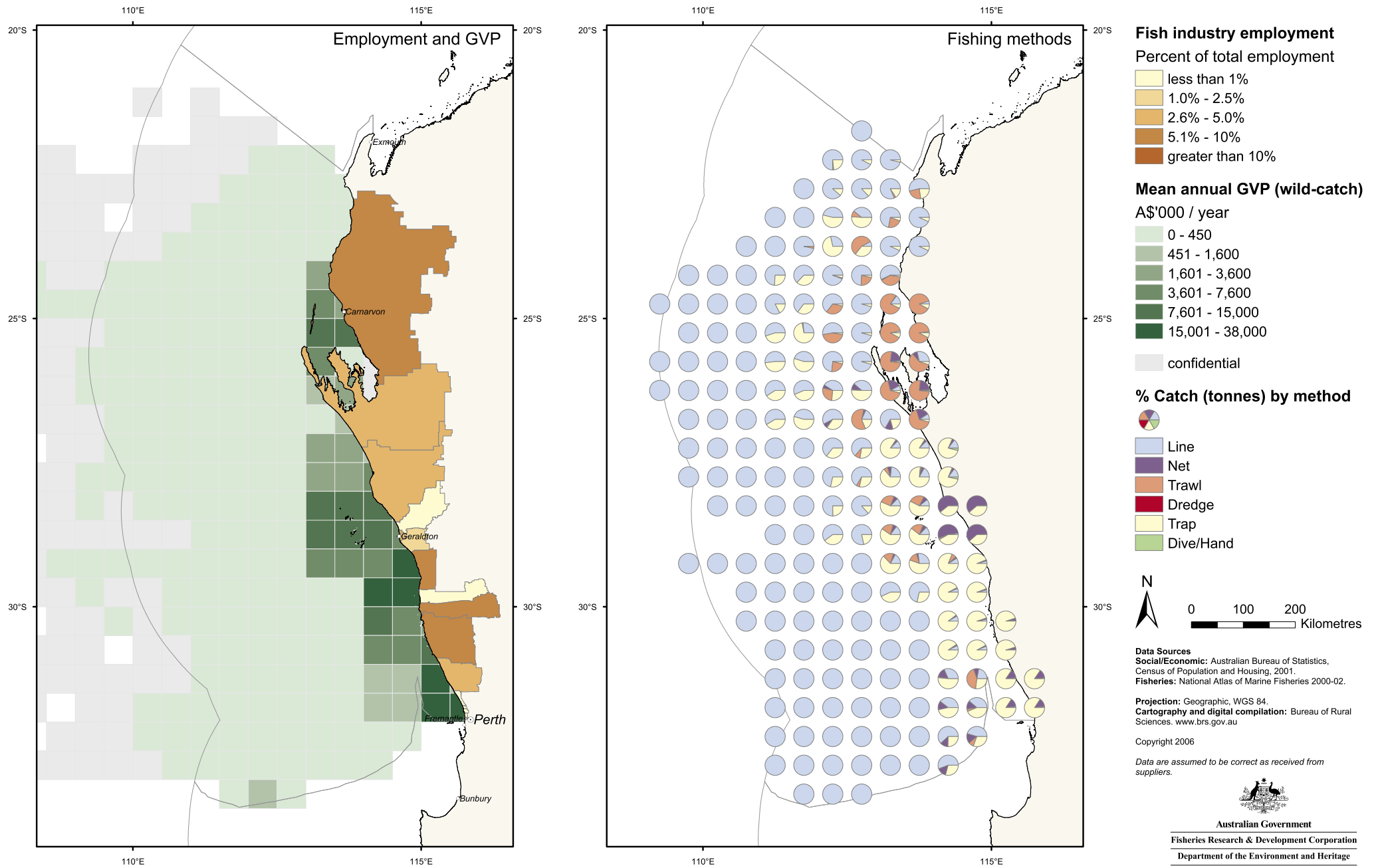
The coastal fringe of the Great Australian Bight from Ceduna to Esperance has a large proportion of Indigenous people, a very low population density and a highly transient population, with the area acting as a transport corridor between the western and the eastern parts of the continent. The western 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)

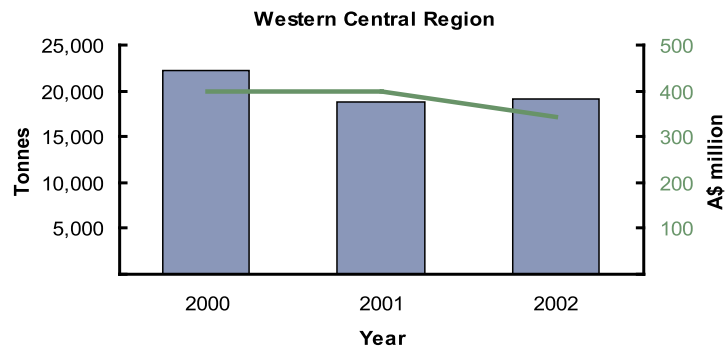


**Description**

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.



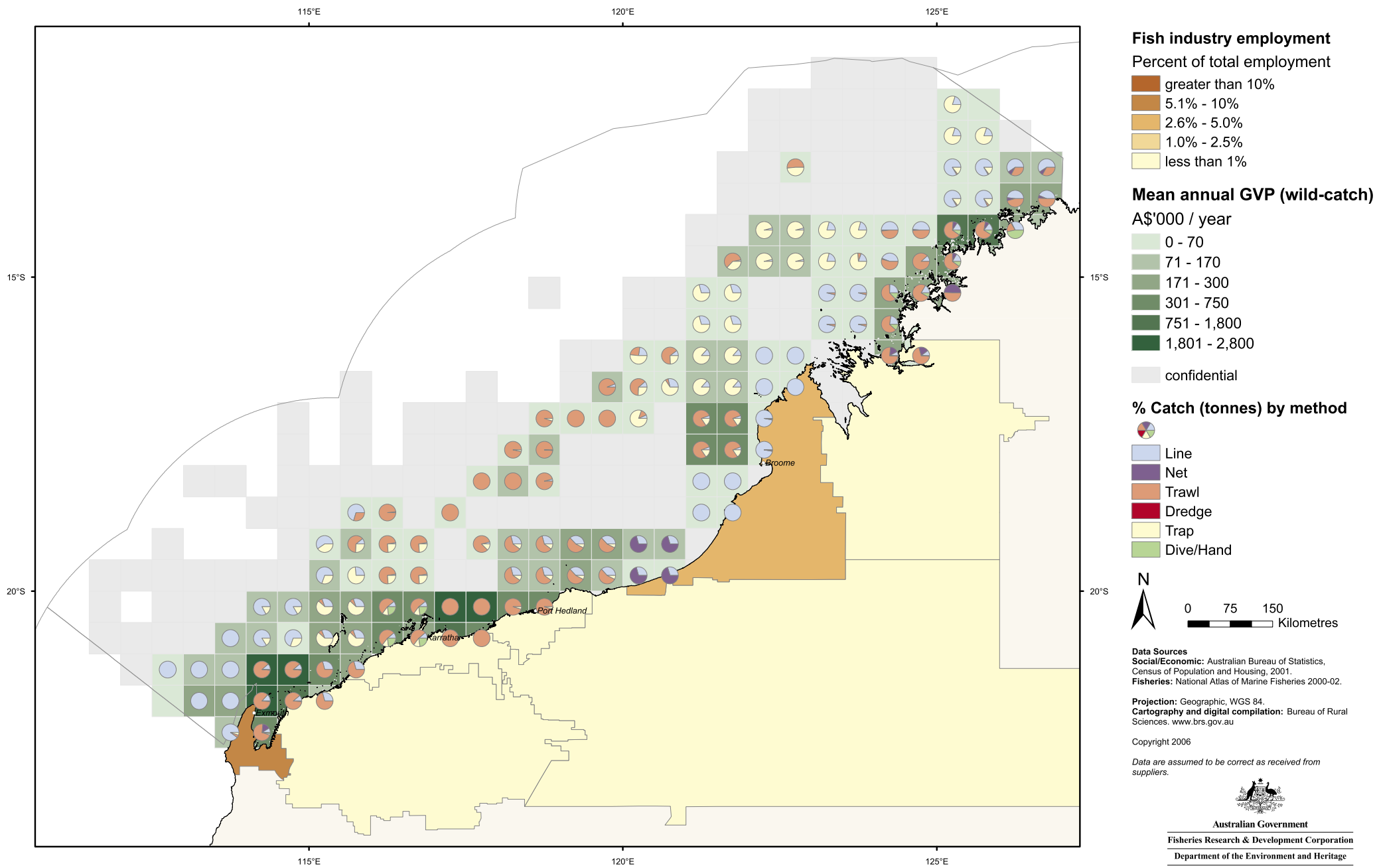
**Socio-economic characteristics**

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 Skimms, Newfish)



**Description**

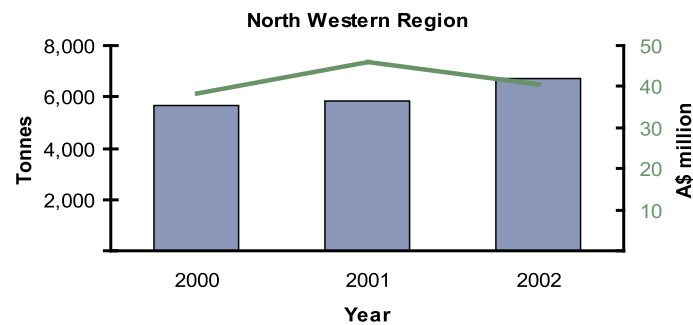
Ochre shading over the land shows employment in the fish industry as a percentage of total employment for coastal SLAs. Much of the employment within the fish industry is based on aquaculture activities around the fast growing areas of Broome and Exmouth, where a strong pearl-based aquaculture industry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

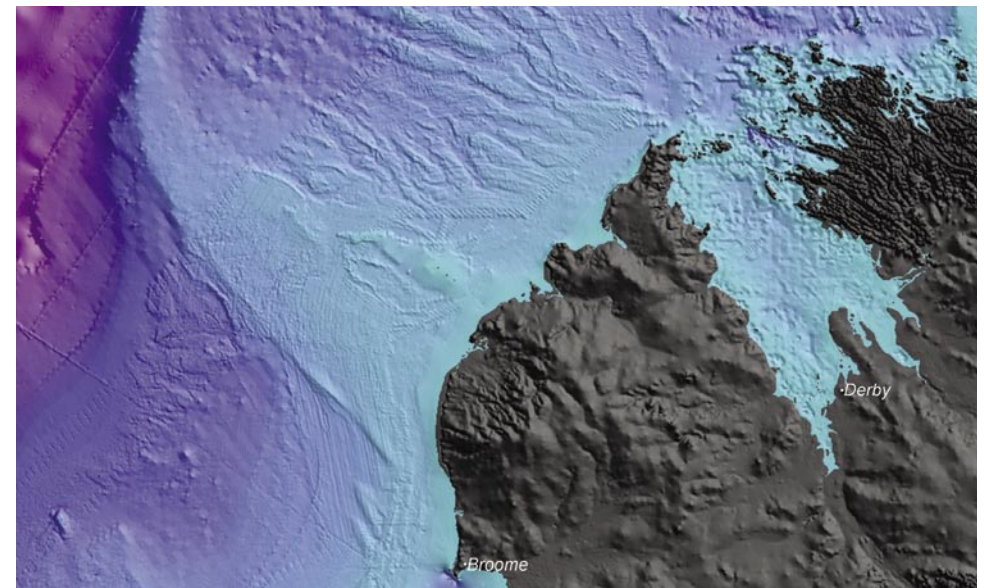
The North Western Region comprises three broad areas, which display considerable differences in terms of population composition and employment. These are the north eastern area from Broome to Derby, the central area from Roebourne to Port Hedland and the western area made up of Exmouth and Onslow.



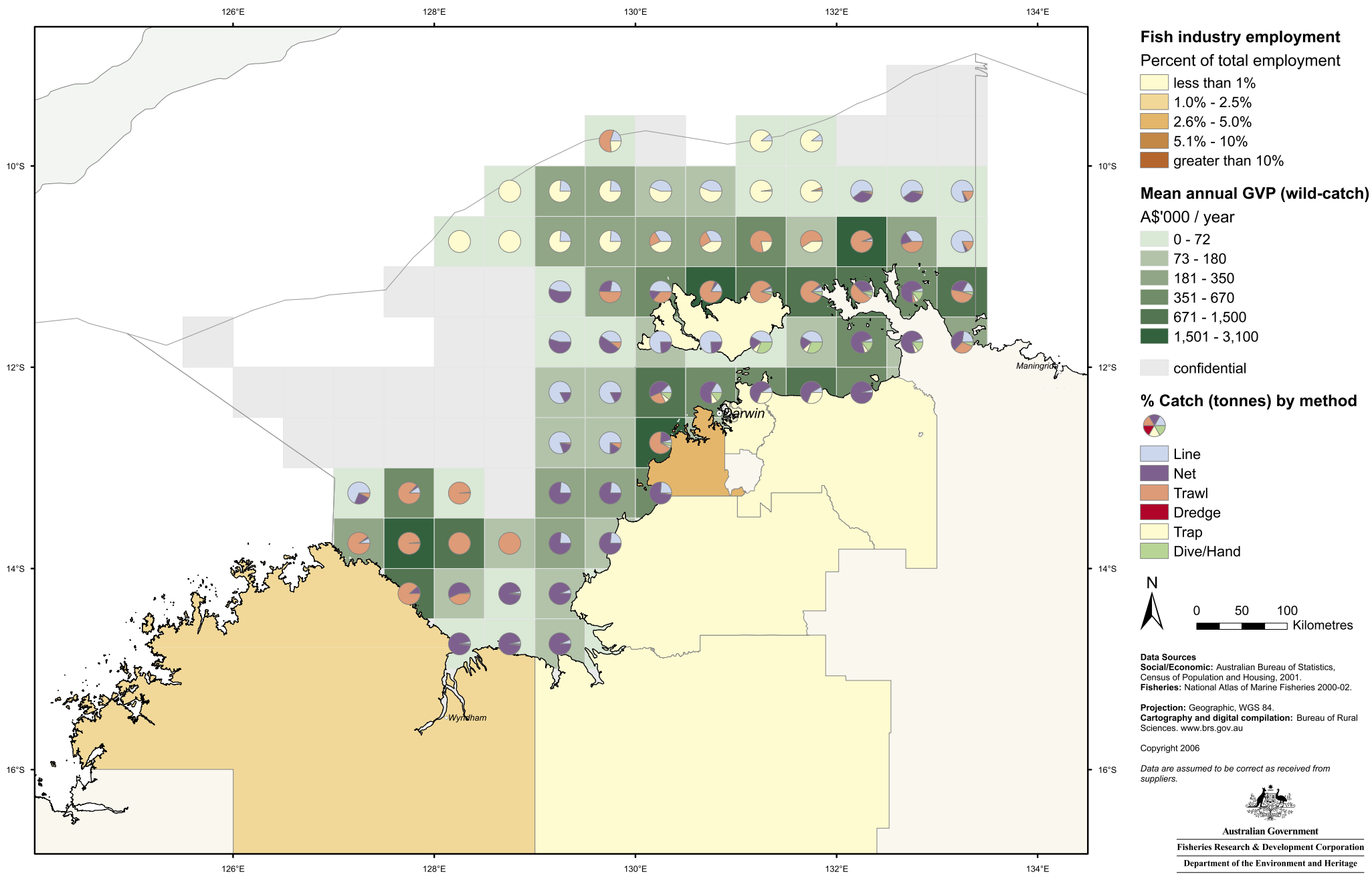
The north east, characterised by employment in aquaculture and tourism, has a strong Indigenous presence exemplified by several distinct Indigenous coastal communities. Land access to inland settlements east of Derby may be affected by seasonal weather conditions. The central area is industrial in character, 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 channels, NW Region (J. Larcombe, 2006)

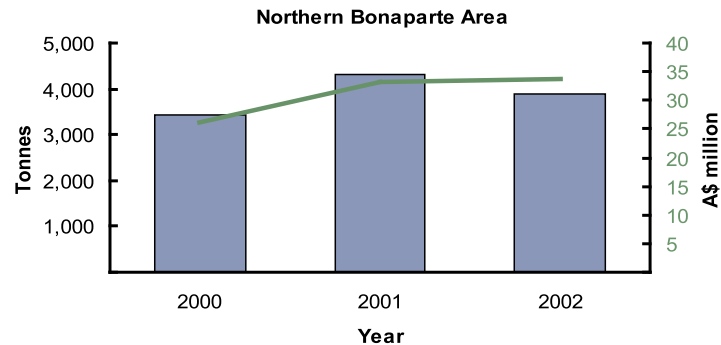


**Description**

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, except 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.

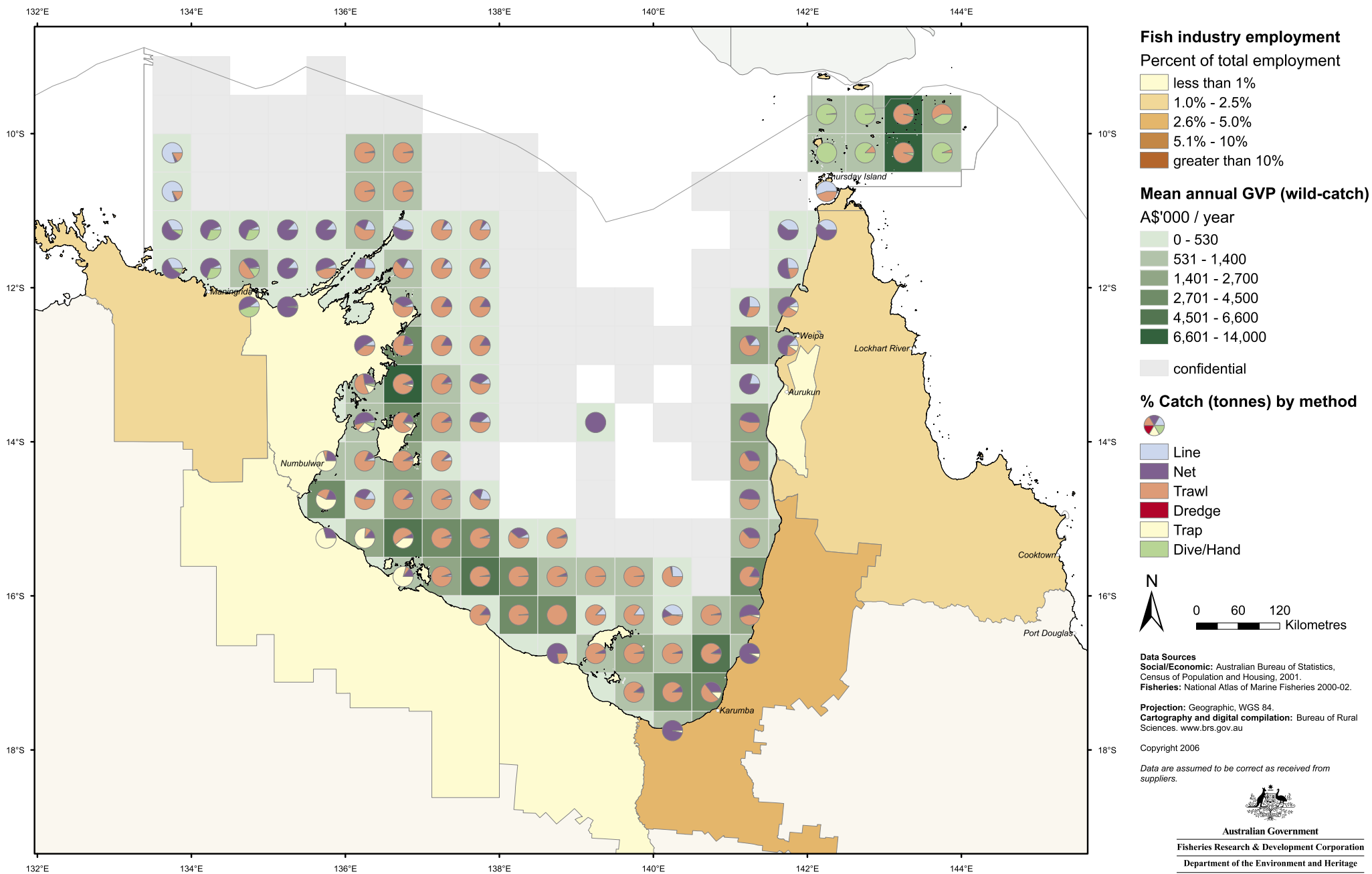
The distinctive socio-demographic composition of the area reflects the youthful age structure of Indigenous populations residing within Aboriginal Land Trust areas, the large number of defence personnel near Darwin, and the mining and agriculture related activities in the Ord River district. A predominant 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)



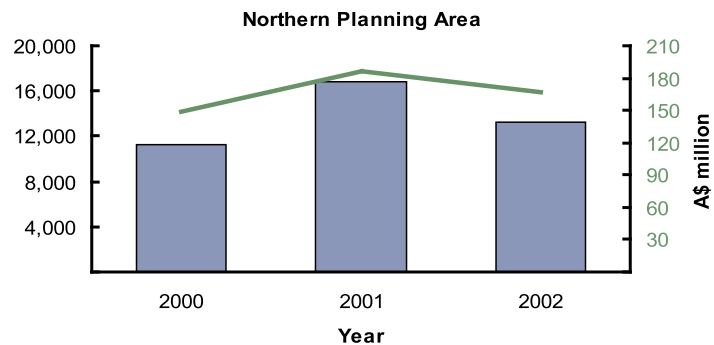


## Description

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

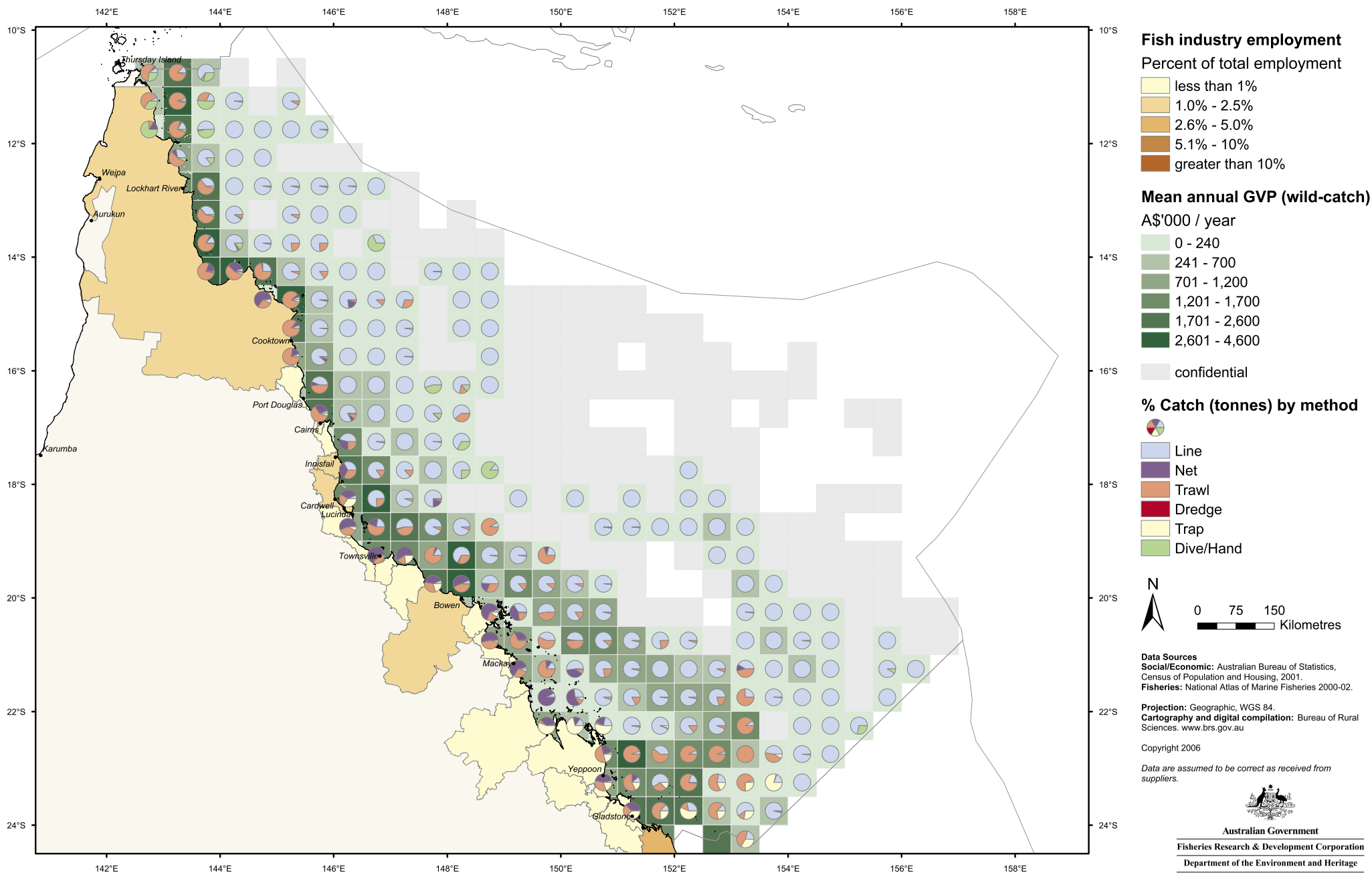
This Northern Planning Area has a unique socio-demographic composition due to half its population being of Indigenous origin, and the level of employment in the mining sector. Employment in almost all non-Indigenous parts of the Area is heavily concentrated on resource-based activities. Employment in 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 than 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)



**Description**

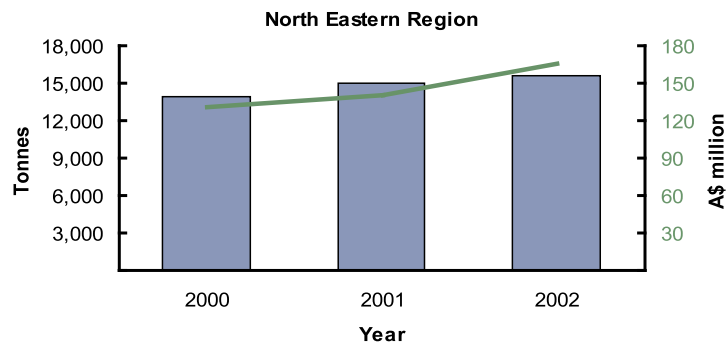
Ochre shading over the land shows employment in the fish industry as a percentage of total employment, for coastal SLAs. Employment within the fishing sector is heavily concentrated in the commercial sector, with scattered pockets of aquaculture activities and fish wholesaling and processing operating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

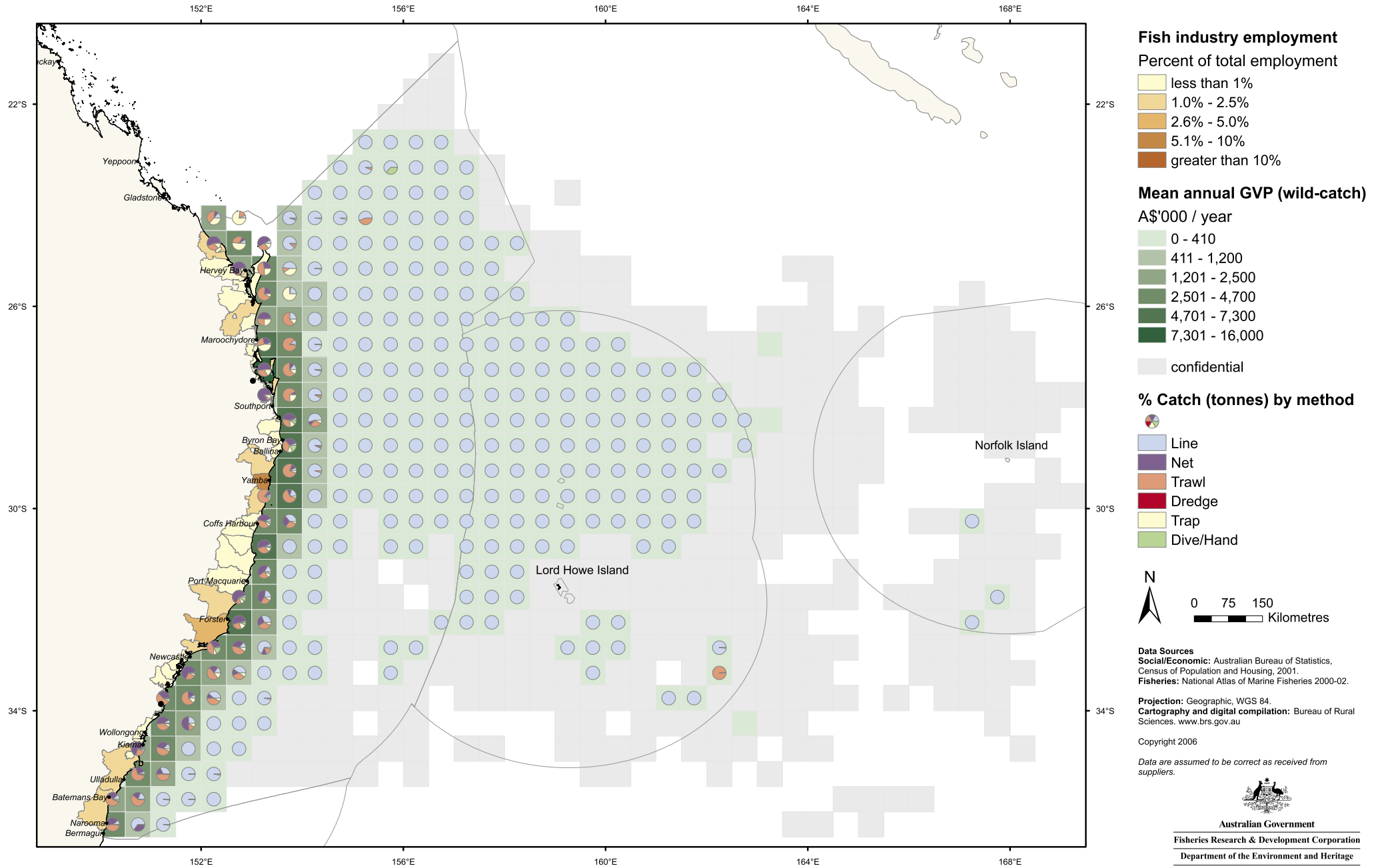
Marine tourism is an important activity, and employment in all forms of marine-related activity is apparent along the Region’s coastline, particularly concentrated in the area from the Whitsunday Islands to Cairns.

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)



**Description**

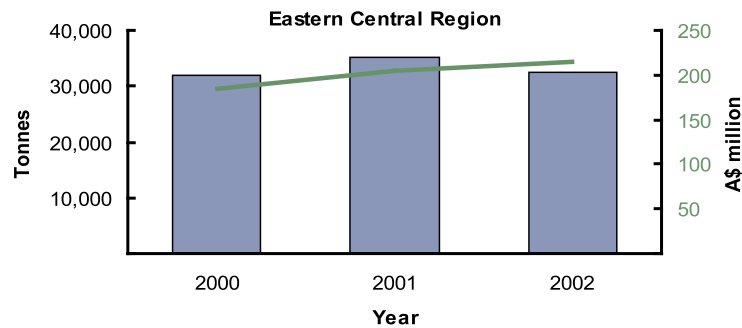
Ochre shading over the land shows employment in the fish industry as a percentage of total employment, for coastal SLAs. Employment in the various fish industry sectors (commercial fishing including aquaculture, fish wholesaling and processing sectors) is widely scattered throughout the Region, numerically 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



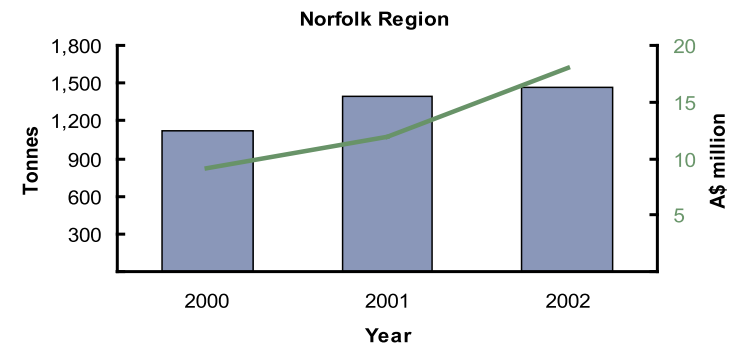
population live in the coastal Metropolitan NSW and Queensland portions, and almost half in the large coastal Non-metropolitan centres such as Newcastle, Wollongong, Gold Coast and Bundaberg.

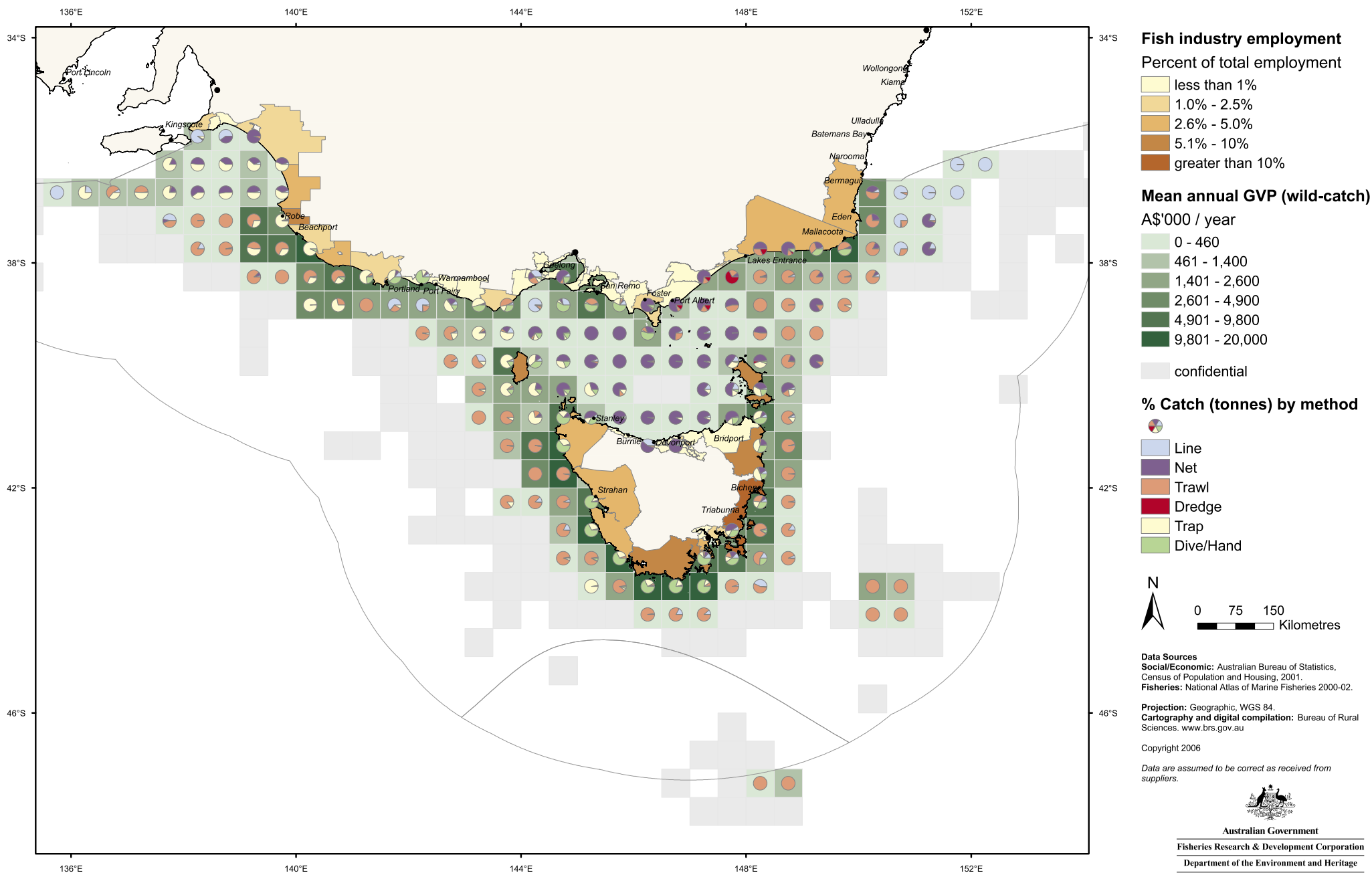
The Region is characterised by a higher elderly dependency, reflecting the large proportion of the population aged 65 years and older, the highest of any Marine Region. Between 1996 and 2001, the annual population growth rate in the Queensland portion was twice that in the NSW portion, and the Region’s 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.





**Description**

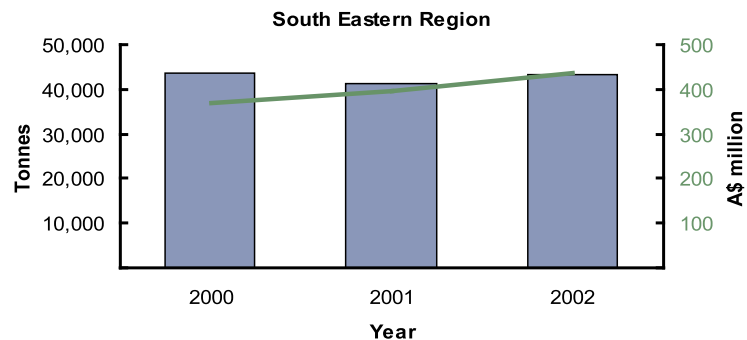
Ochre shading over the land shows employment in the fish industry as a percentage of total employment, for coastal SLAs. The fish industry is an important economic activity within the Region, in particular in Tasmania, where a relatively large fish wholesaling and processing industry operates along the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

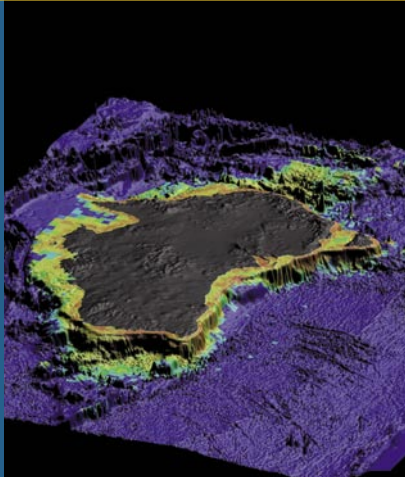


Fish trawler out of Eden, NSW (Locky Marshal)

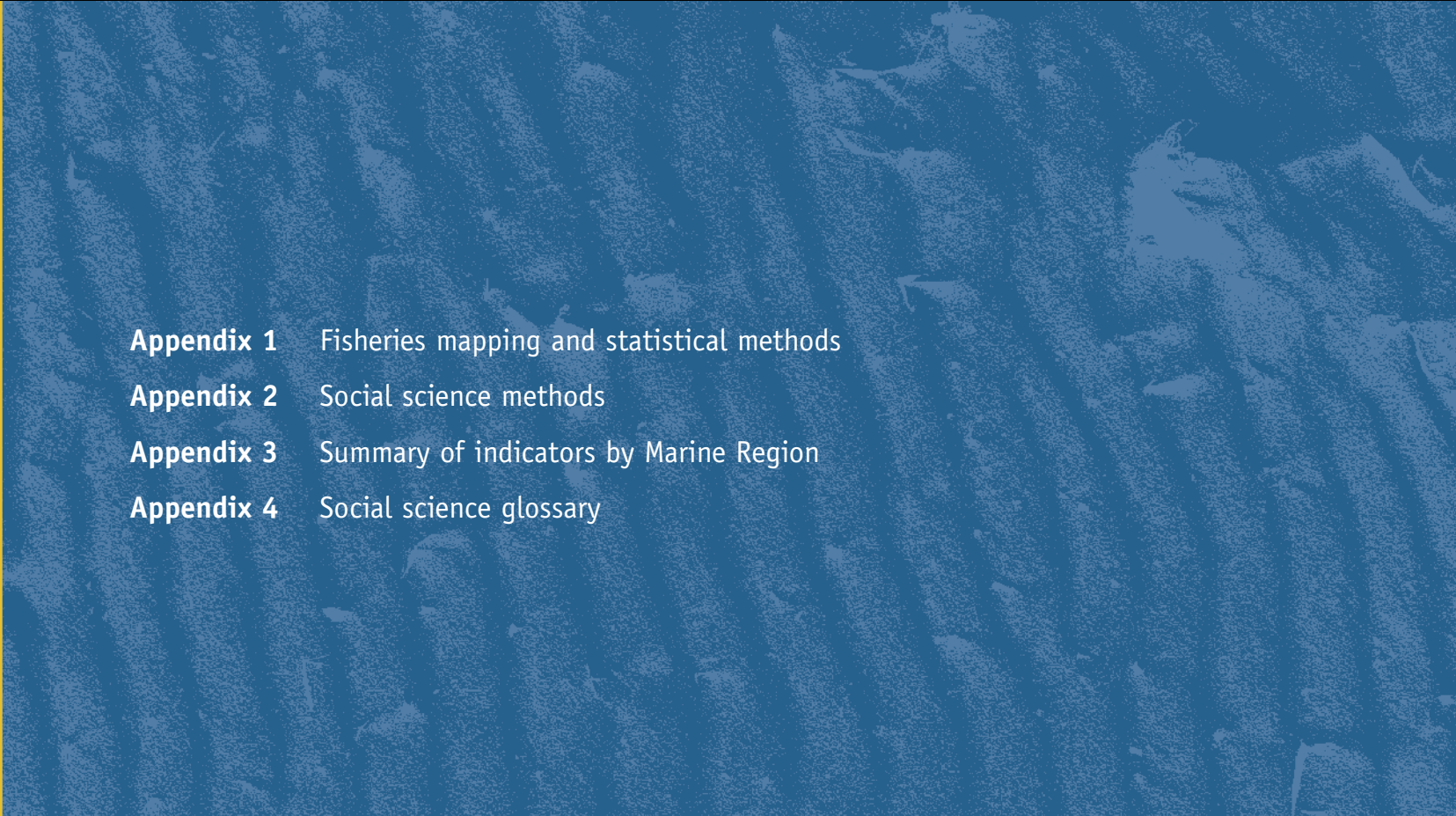



# marine matters

**NATIONAL**



**APPENDICES**

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- Appendix 1** Fisheries mapping and statistical methods
  - Appendix 2** Social science methods
  - Appendix 3** Summary of indicators by Marine Region
  - Appendix 4** Social science glossary

# 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

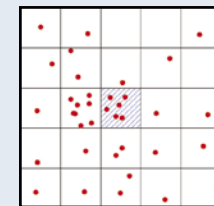
### Transpose

- 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:  $\text{segment area}/\text{total area} \times \text{quantity}$
- Examples: All State/Territory managed fisheries (refer to Map 25)



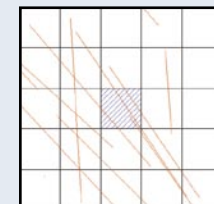
### Tally point statistics within a square grid

- 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:  $\text{segment length}/\text{total length} \times \text{quantity}$
- Segment statistics are summed for each cell
- Examples: Most Australian Government fisheries, including pelagic longline, trawl and gillnet fisheries



## Confidentiality

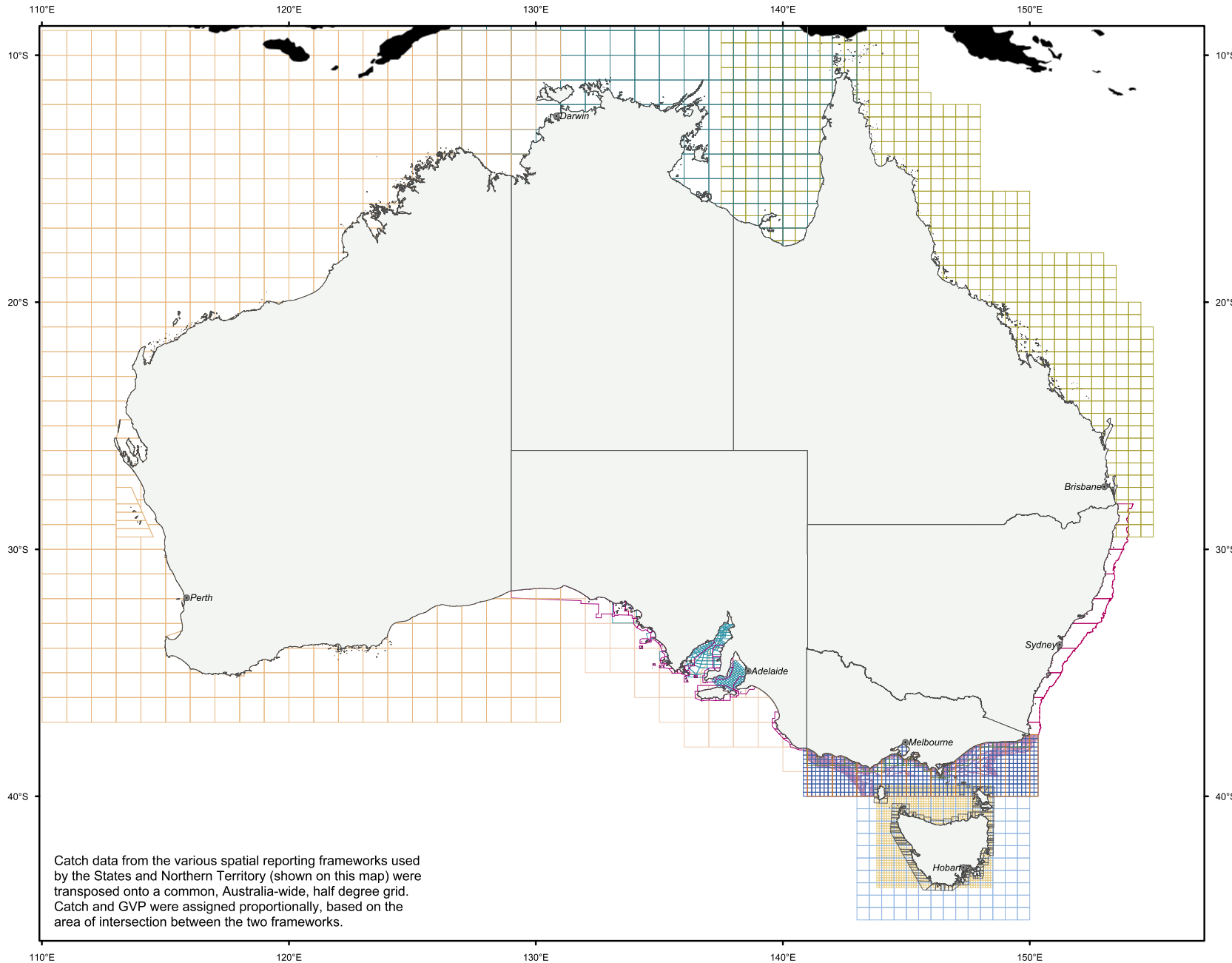
Most fisheries management jurisdictions are required to maintain confidentiality of logbook and other data. In practice this is achieved by not reporting statistics where less than five fishing vessels are represented. In cases where less than five vessels are represented in a reporting cell, that cell's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

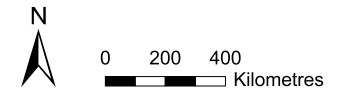
Fishing method classes <small>Adapted from the <i>International Standard Statistical Classification of Fishing Gear, FAO.</i></small>						
LINE AND HOOK	NETS		TRAP	TRAWL	DIVE/HAND	DREDGE
<b>Hooks and line</b> Handlines and pole-lines (hand operated) Handlines and pole-lines (mechanised) Set longlines Drifting (pelagic) longlines Longlines (not specified) Trolling lines Pole and lines Vertical (drop) lines Hooks and lines (not specified)	<b>Surrounding nets</b> Purse seines Lampara Ring nets	<b>Gillnets and Entangling nets</b> Set gillnets Driftnets Encircling gillnets Fixed gillnets (on stakes) Trammel nets Combined gillnets-trammel nets Gillnets and entangling nets not specified	<b>Pots</b> Fyke nets Stow nets Stationary uncovered pound nets Barriers, fences, weirs, corrals etc Aerial traps Traps (not specified)	<b>Bottom trawls (fish and prawn)</b> Midwater trawls Otter twin trawls Pair trawls Other trawls	Dive Harpoons Clamps Rakes Tongs Spears Wrenching gears Hand Pump	Boat dredges
	<b>Seine nets</b> Beach seines Other seines Seine nets not specified	<b>Other nets</b> Push nets Scoop nets				
	<b>Lift nets</b> Portable hand lift nets Boat-operated lift nets Shore-operated stationary lift nets Lift nets not specified					
	<b>Falling gears</b> Cast Cover pots Falling gears not specified					

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



- 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.



**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](http://www.brs.gov.au)

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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](http://www.brs.gov.au/fishcoast)). The methods described here are also a subset of the complete methods section 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).

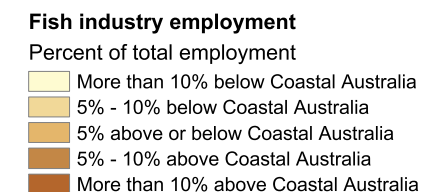
## Defining Marine Regions

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
<b>Population and demography</b>											
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
<b>Households, income and education</b>											
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 (%) <sup>(a)</sup>	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
<b>Labour force and employment</b>											
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
<b>Fish industry</b>											
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
<b>Fisheries GVP 2001 (\$M)</b>											
South Australia	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 of 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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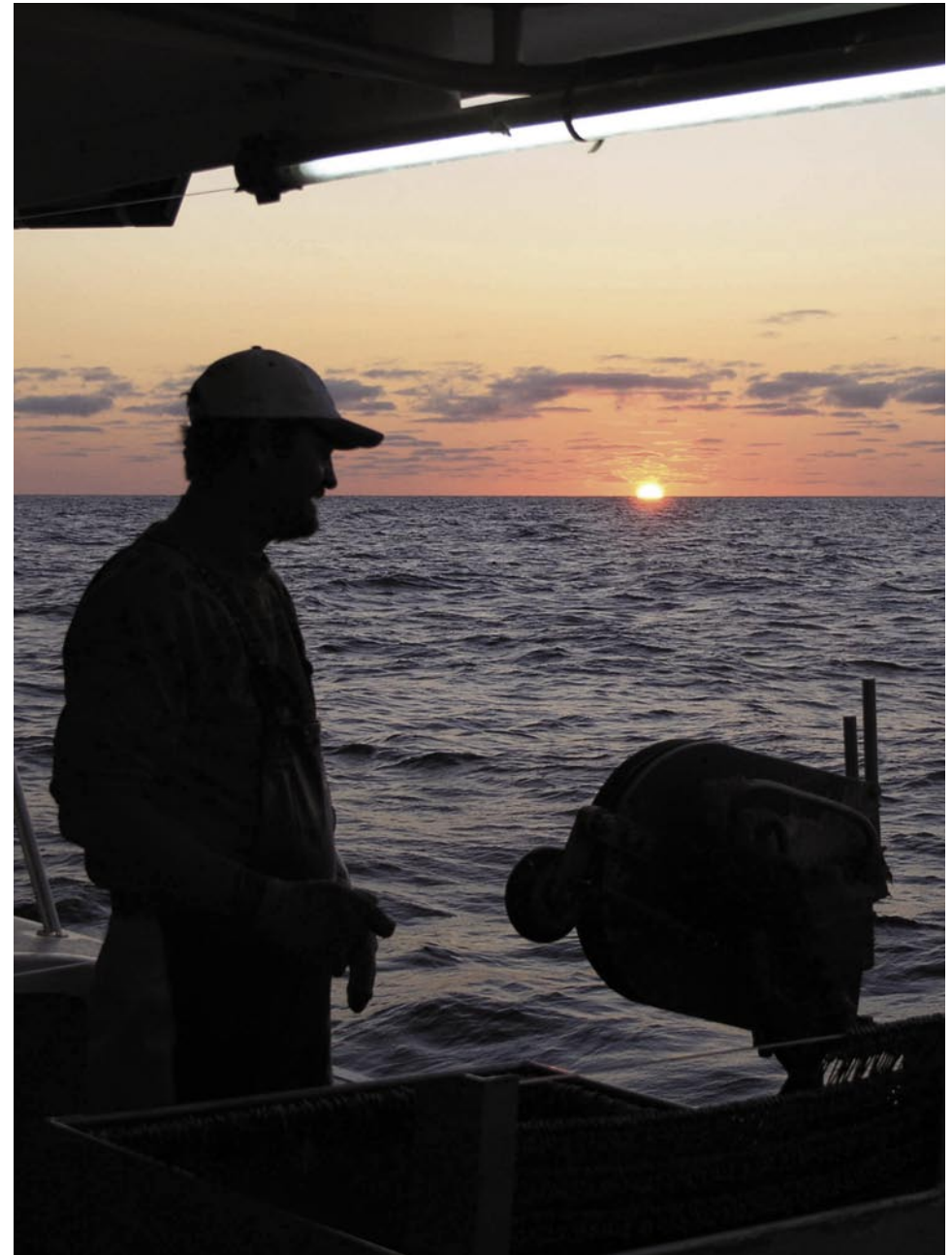
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Sunset line haul, northern New South Wales (P. Ward, 2005)



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

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