

## CHAPTER 5 HUMAN ACTIVITIES IN THE EAST MARINE REGION

Planning for long term ecologically sustainable use in the East Marine Region requires an understanding of human interactions with the marine environment. Chapter 5 provides a broad overview of the nature and extent of human activities that take place within and adjacent to the Region. It provides background material that will assist in the next stage of the planning process. It is not intended to provide a detailed information base for assessing the socio-economic costs and benefits of conservation measures that may be proposed in developing the East Marine Bioregional Plan. In addition to finer scale information, the assessment will also require consultation with stakeholders. More information on how the East Marine Bioregional Plan will be developed is provided in chapter 6.

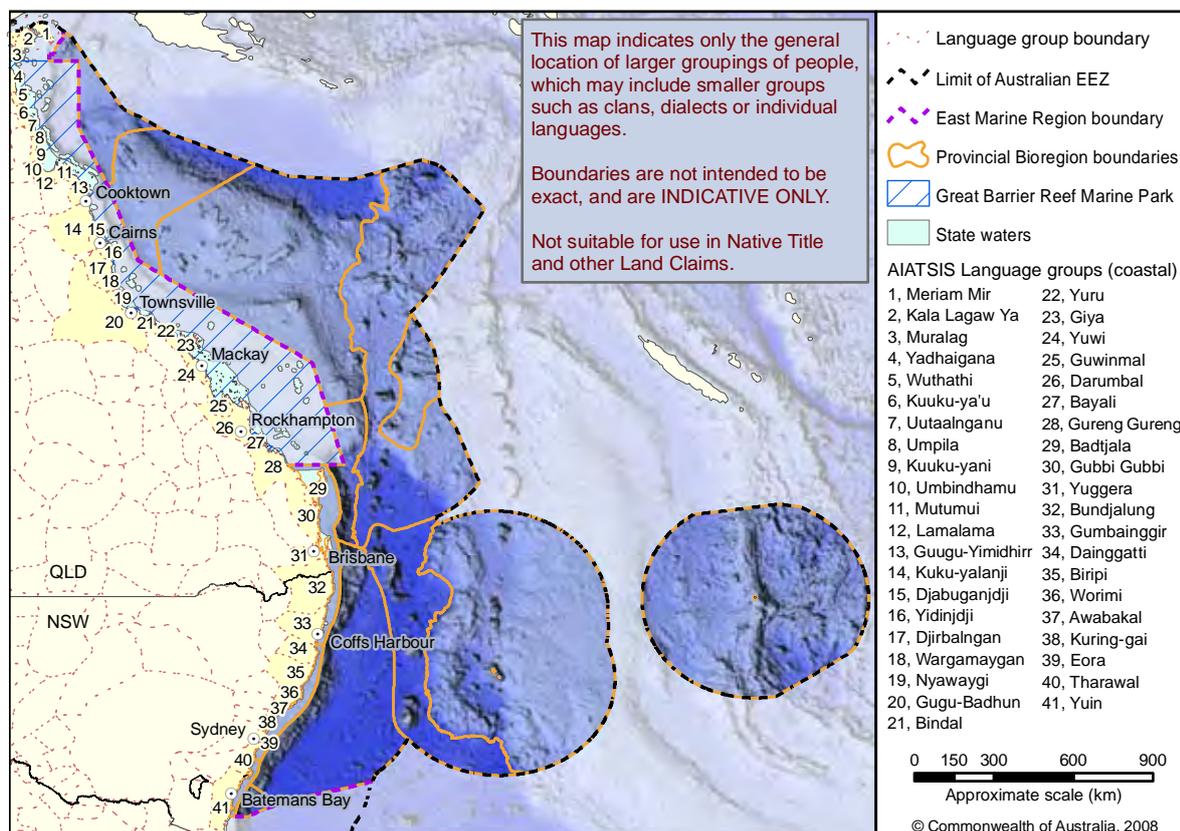
Encompassing some 2.4 million square kilometres, the East Marine Region is the largest in Australia and is adjacent to the most heavily populated coastline in Australia. Human settlement in and adjacent to the Region ranges from a tiny four-person scientific outpost on the remote Willis Island in the Coral Sea through to the large metropolises of Brisbane and Sydney with resident populations in the millions.

Cities like Wollongong, Newcastle, the Gold Coast, Mackay and Cairns are regional hubs for numerous coastal towns and villages. On Cape York Peninsula in far north Queensland there are a number of small remote communities, and far from the mainland shore, Norfolk Island and Lord Howe Island have their own small townships.

The pattern of human use in the Region is shaped by many factors including the extreme isolation of much of the Region, the presence of major population centres on the adjacent coastline and the varied physical and biological characteristics of the Region. The majority of human activity in the Region occurs closest to the major population centres in New South Wales and south-east Queensland. The most extensive human activities that occur in the offshore environment are commercial fishing and shipping. Closer to shore, commercial fishing and shipping activity increases and tourism and recreational use of the Region becomes more significant.

Further more detailed information on the Region is contained in the reports and other web-based resources that are available on the Department's website at [www.environment.gov.au/coasts/mbp/east/](http://www.environment.gov.au/coasts/mbp/east/).

**Figure 5.1 Indigenous language groups adjacent to the East Marine Region**





Boats moored in a marina on the south coast of New South Wales. Photo: Arthur Mostead and the Department of the Environment, Water, Heritage and the Arts.

## 5.1 The human dimension: an overview

### The Indigenous People – The First Settlers in the Region

Dreamtime stories of the Indigenous people tell of their ancestors' arrival into the Region from across the sea between 20,000 and 40,000 years ago. Physical evidence found at cultural heritage sites on the coastline support this, with radio-carbon dating demonstrating that areas around Newcastle and Wollongong were occupied by the Indigenous people at least 20,000 years ago (Barnett and Ceccarelli 2007).

Over 60 Indigenous tribal groups have been identified along the coastline adjacent to the Region. These people have a spiritual connection to the Region through cultural traditions, ancient sites of cultural importance and enduring relationships with marine species such as whales, turtles and dolphins.

The Indigenous people have a long history of utilising natural marine resources in and adjacent to the Region, particularly as a source of food. Natural resource use and management is a part of the traditional culture of the Indigenous people and is closely intertwined with their spirituality.

The long history of the Indigenous people has seen the passing of ice ages and the rise and fall of the sea. During

the last ice age (approximately 10 000-18 000 years ago), sea level was significantly lower than it is today. The Great Barrier Reef lagoon was exposed land, as were other sections of the continental shelf along the coastline. According to Indigenous oral tradition, sacred sites that were once on dry land were flooded as the ice age ended and sea levels rose about 6000 years ago. These flooded sites remain important to the Indigenous people (Barnett and Ceccarelli 2007).

Further discussion of Indigenous resource use in the Region and the Indigenous people's connection to the marine environment follows in section 5.3.

### European Settlement in the Region

Lieutenant James Cook arrived on the east coast of Australia aboard *HMS Endeavour* in 1770 and named the land New South Wales. The first European settlement on the coastline was at Port Jackson on Sydney Cove, settled by Captain Arthur Phillip and the First Fleet in 1788 (Culture and Recreation Portal 2008).

After establishing the colony, Arthur Phillip immediately dispatched *HMS Supply* to start a new penal colony on Norfolk Island (discovered by James Cook in 1774). En route to the island the commander of the *Supply*, Lieutenant Henry Lidgbird Ball, discovered Lord Howe Island. The *Supply* carried convicts and free men under the command of Lieutenant Phillip Gidley King who established the first penal colony on Norfolk Island in March, 1788. It was not

**Table 5.1 Major population centres adjacent to the East Marine Region**

New South Wales		Queensland	
City	Population	City	Population
Sydney	4 284 379	Brisbane	1 820 400
Newcastle	288 732	Gold Coast	472 279
Wollongong	234 482	Townsville	128 808
Port Macquarie	39 219	Cairns	98 349
Nowra	27 478	Mackay	66 874
Lismore	27 069	Rockhampton	60 827
Coffs Harbour	26 353	Bundaberg	46 961
Batemans Bay	10 845	Hervey Bay	41 225
Ulladulla	10 298	Gladstone	28 808

Source (Australian Bureau of Statistics 2008a)

until 1834 that a permanent settlement was established on Lord Howe Island (Lord Howe Island Tourism Association 2008, Norfolk Island Tourism 2008).

The colony of Queensland separated from the colony of New South Wales in 1859. Moreton Bay Settlement had been established as a penal colony in 1824, and was later moved to the future site of Brisbane. Free settlers first moved into the area in 1838 (Culture and Recreation Portal 2008).

### The East Marine Region today

Today, the waters in and around the Region have a complex pattern of use that has formed around our history of trade and settlement and the unique marine environment of the Region. The uses and activities that have been examined in this report include:

- commercial fishing
- recreational and charter fishing
- tourism
- ports and shipping
- border protection
- offshore oil and gas
- offshore mineral exploration
- aquaculture
- sea dumping
- submarine cables
- emerging industries such as biodiscovery and renewable energy
- Indigenous activities

These activities directly affect the socio-economic character of the Region, are activities of national interest, or are uses that may be of significance in the future.

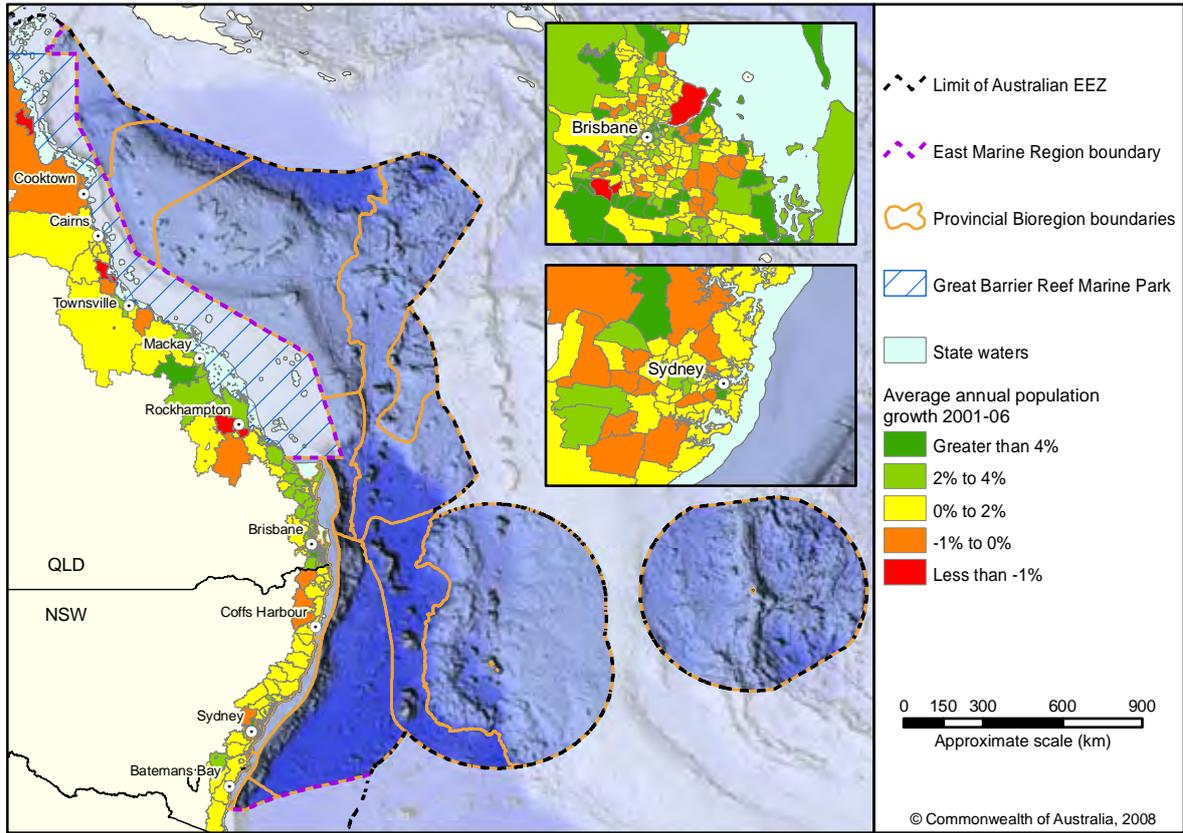
Population in the coastal areas adjacent to the Region is concentrated around the capital cities of Sydney and Brisbane with Sydney being home to 4.3 million people and Brisbane to 1.8 million. Other major population centres include the Shoalhaven (including Batemans Bay, Ulladulla and Nowra), Wollongong, Newcastle, Port Macquarie, Coffs Harbour and Lismore in New South Wales and the Gold Coast, Hervey Bay, Bundaberg, Gladstone, Rockhampton, Mackay, Townsville and Cairns in Queensland (Australian Bureau of Statistics 2008b).

These cities have generally formed around industry and tourism. Many regional cities such as Gladstone and Mackay were established to support the mining and agricultural industries inland and function as ports for the export of resources, particularly coal. Other cities, such as Newcastle and Wollongong, support industries such as steel works and foundries that process raw materials and export finished products. Many of these ports have a history of commercial fishing and others, such as Cairns and the Gold Coast, are centres for tourism.

In the period 2001–2006 the most significant areas of national population growth outside of the capital cities were along the coasts of Australia. Queensland in particular has experienced a large growth in coastal population most notably in the areas around the Gold Coast, Maroochy, Caloundra, Cairns and Rockhampton. In New South Wales, substantial coastal growth was experienced in the Tweed, Newcastle, Hastings and Nowra regions (see figure 5.2) (Australian Bureau of Statistics 2008b).



Figure 5.2 Average annual population growth 2001- 2006



Trawling in the Southern and Eastern Scalefish and Shark Fishery, off Bermagui. Image courtesy of the Australian Fisheries Management Authority.

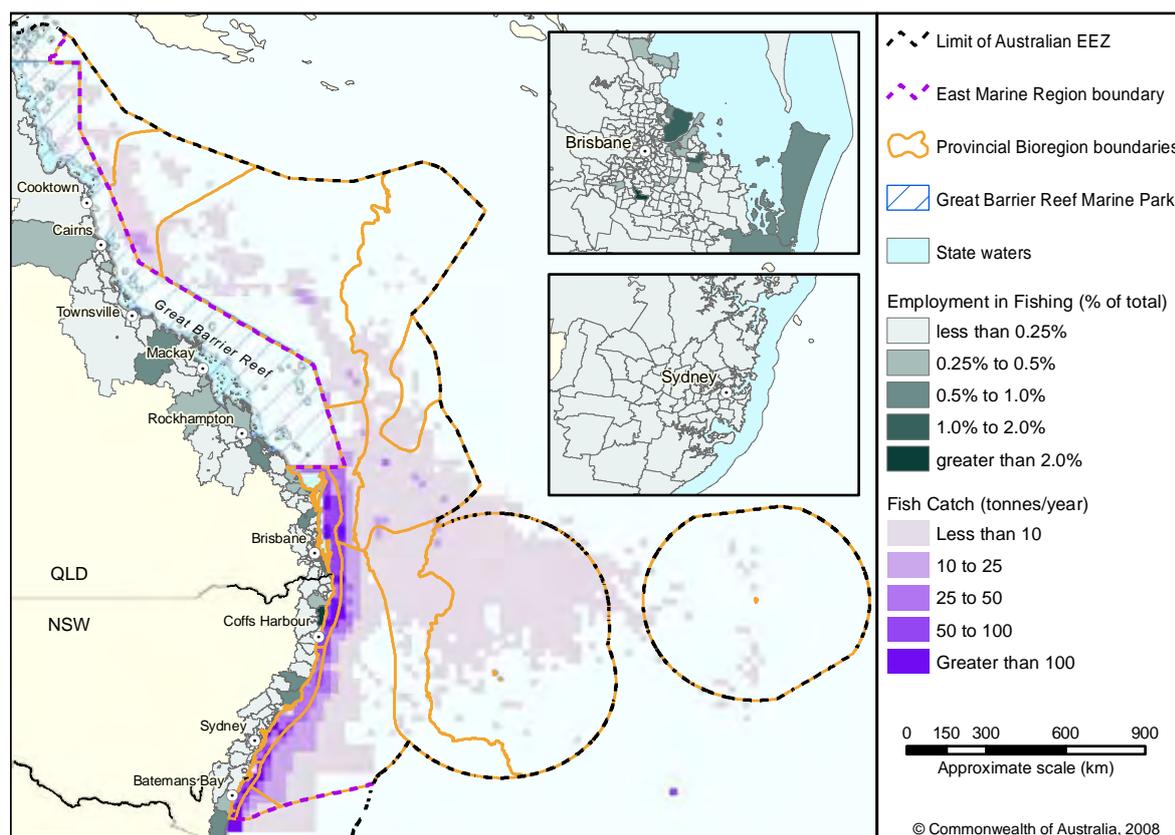
In 2006 more than half of Australia's Indigenous population resided in Queensland and New South Wales with an estimated 28.3% (146,400 people) living in Queensland and 28.7% (148,200 people) living in New South Wales. Indigenous people formed an estimated 3.6% of Queensland's total population and 2.2% of New South Wales' population, but in far north Queensland an estimated 14% of the population were of Indigenous descent. Over a third of Australia's Indigenous total population lives in major coastal cities (Australian Bureau of Statistics 2007c, Australian Bureau of Statistics 2007b, Australian Bureau of Statistics 2007a).

## 5.2 Marine activities

### 5.2.1 Commercial fishing

The East Marine Region includes 18 commercial fisheries – nine managed by the Australian Government, six managed by the Queensland Government and three by the New South Wales Government (Moore et al. 2007). Given that the location of a fishery is determined by the presence of the target stock rather than by the location of political boundaries, many fisheries cross the borders of several jurisdictions. Under the terms of the Offshore Constitutional Settlement (OCS) the governments of Australia have

Figure 5.3 Annual fish catch tonnage in the East Marine Region and commercial fishing industry employment in adjacent communities



agreed to a sharing of fisheries management responsibilities which has resulted in the Queensland and New South Wales governments managing fisheries that are partly within Commonwealth waters (Department of Agriculture Fisheries and Forestry 2006).

In Queensland, commercial fishing is managed by the Department of Primary Industries and Fisheries under the *Fisheries Act 1994*. In New South Wales it is managed by the Department of Primary Industries under the *Fisheries Management Act 1994*. Commonwealth fisheries are managed by the Australian Fisheries Management Authority under the *Fisheries Management Act 1991*.

The *Environment Protection and Biodiversity Conservation Act 1999* strengthens the role of the Australian Government in promoting ecologically sustainable management of fisheries and assessing their environmental performance, including:

- the strategic assessment of fisheries under Part 10 of the Act (note that only Commonwealth fisheries require a Part 10 assessment);
- assessments relating to impacts on protected marine species under Part 13 of the Act; and
- assessments for the purpose of export approval under Part 13A of the Act (Commonwealth of Australia 2007b).

Commercial fishing effort in the Region is heavily concentrated along the New South Wales and southern Queensland coastlines. Activity in the deeper waters of the Region is widespread although much less intensive than in areas closer to shore. Figure 5.3 shows the distribution of catch tonnage throughout the Region.

In 2006, fisheries of the Region landed more than 32 000 tonnes of seafood estimated to have a Gross Value of Production (GVP) of approximately \$130 million (Moore et al. 2007)<sup>10</sup>. GVP is a measure of the annual value of harvested seafood at the point of landing and is generally used as the primary economic indicator for the industry (ABARE 2007b). Table 5.2 compares the GVP of the Region's fisheries against some other primary industries in Australia.

It should be noted that although GVP is used as an economic indicator for many primary industries, it does

<sup>10</sup> Most jurisdictions are required to guarantee the confidentiality of log book data supplied by fishermen. This is known as the "Five Boat Rule". In cases where less than five boats contribute to any given statistic, that figure can not be reported in the public domain to ensure that it can not be attributed to specific fishing boats and their operators. The consequence of this requirement is that some quoted fisheries statistics are under-represented. As a result, all Australian fisheries statistics should be considered as approximations unless specifically stated otherwise.





Fishing boat. Image courtesy of the Department of Fisheries.

**Table 5.2 Gross Value of Production – Primary Industry Comparison**

East Marine Region Commercial Fisheries (combined)	Western Australian Rock Lobster Fishery	Sugar Cane	Salt	Bananas	Capsicums and chillies (Queensland)	Zinc
\$130m	\$292m	\$1.02 b	\$237m	\$270m	\$80m	\$3.8b

Source: (ABARE 2007a, Australian Banana Growers Council Inc 2008)

not represent the overall contribution of these industries to the Australian economy. Although current and accurate figures are not available, based on 2002–03 data, the Allen Consulting Group (2004) estimated that the direct and indirect contribution of the commercial fishing industry to the national economy was approximately \$4 billion. This figure includes contributions through the purchase of fuel and equipment and supporting onshore industries such as fish markets and canneries and other related businesses.

Data on the costs and net returns of the Region’s fisheries is patchy and incomplete and is subject to a number of external influences such as world seafood market prices and fluctuations in the value of the Australian dollar against major currencies. However, available data, the high level of latency and low GVP, suggest that fisheries in the Region generally appear to have either a low or negative

return on investment (ABARE 2007b, Moore et al. 2007, Newton et al. 2007).

Over the past decade, the commercial fishing industry in the Region has been characterised by an overall decline in catch tonnage and value and a high rate of latency (permitted effort or allocated catch that is not being used). Recent Government licence buy-back and structural adjustment schemes have reduced fishing effort and/or latency in many of the Region’s fisheries with the objective of increasing the profitability of remaining fishing businesses (Moore et al. 2007).

The Region’s decline in GVP and catch tonnage since 2000 has been due to a number of factors including reduced fish stocks, decreased catch quotas, increased overheads, greater fuel and maintenance costs and a significant increase in the value of the Australian dollar. Some sectors

**Table 5.3** Number of commercial fishing related businesses and proportion of workforce employed in the commercial fishing industry in ports adjacent to the East Marine Region

Port	Commercial fishing (no.)	Fish wholesaling (no.)	Seafood Processing (no.)	Consolidated fishing industry (CFI) (no.)	Fishing employment (% of total employment)
Cairns	228a	161a	21a	410a	< 1a 0.5b
Innisfail	42a	3a	3a	48a	1.4b
Townsville	29a	9a	3a	41a	1.3b
Mackay	61a	36a	5a	102a	0.3b
Gladstone	77a	57a	20a	154a	0.6b
Bundaberg	72a	40a	16a	128a	0.8b
Mooloolaba	-	-	-	-	< 1a 0.4b
Brisbane	-	-	-	-	0.2b
Southport	-	-	-	-	0.1b
Coffs Harbour	71a	22a	3a	96a	< 1a 1.1b
Sydney	-	-	-	-	0.1b
Ulladulla	-	-	-	-	0.5b
Bermagui	-	-	-	-	2.3b

Source: a – Larcombe et al. 2006, b – Australian Bureau of Statistics 2001

of the industry appear to have stabilised over recent years, however it is an industry that is susceptible to rapid change in response to environmental and socio-economic factors such as variable fish stock abundance and fluctuations in market prices (Moore et al. 2007).

The decline in the Region's fisheries is consistent with industry trends at the national level. Australia's fisheries have been steadily declining since 2000 with a 25 per cent drop in GVP and a 36 per cent drop in exports over that period. In the 2005–06 financial year the GVP of all Australian fisheries dropped by 13 per cent. A key factor behind this national trend has been the strength of the Australian dollar over that period (Newton et al. 2007). It should be noted that the full effect of the recent Government licence buy-out and structural adjustment efforts have not been felt yet: they may go some way to reducing the current negative trend.

The key ports for fishing within the Region include Cairns, Innisfail, Townsville, Mackay, Gladstone, Bundaberg, Mooloolaba, Brisbane, Southport, Coffs Harbour, Sydney, Ulladulla and Bermagui. With over 1300 fishing-related businesses, these ports are all important centres for the commercial fishing industry (Moore et al. 2007).

Including both direct and indirect employment, the Region's fisheries are believed to employ about 3600

people. However, commercial fishing is traditionally a family-oriented industry and businesses are often managed by extended family groups. Employment statistics for the fishing industry do not account for a significant number of unpaid family members who work in fishing companies in a casual or temporary capacity (Moore et al. 2007).

By examining what proportion of each port's workforce is employed in the industry (see table 5.3), we can infer which ports are most reliant on commercial fishing. According to 2001 Census data, Bermagui is the most reliant with 2.3 per cent of the town's workforce employed in the commercial fishing industry, followed by Innisfail, Townsville, Coffs Harbour and Bundaberg, each with less than 2 per cent (Moore et al. 2007).

Commercial fishing activities are known to have an impact on the marine environment. There are many different types of fishing gear that are used by commercial fishers, each designed to target particular species and to operate in particular environments and each with a different set of impacts associated with its use. A more detailed description of some of the equipment used by commercial fishers in Australia is available at appendix E.

Generally speaking, the impacts associated with the commercial fishing industry include the removal of target species, by-catch, entanglement in discarded fishing gear



and physical damage to seafloor habitats. The scale of these impacts will vary depending on the type of fishing gear used, the species targeted, the degree and location of fishing effort, and the effectiveness of fisheries management practices.

There are a variety of tools used by fisheries management agencies to promote the sustainable use of fisheries resources including catch quotas, fisheries closures, industry guidelines and by-catch reduction devices. For example, the Australian Fisheries Management Authority is putting in place an ecological risk management framework to identify a list of key species in Commonwealth fisheries requiring management attention. Management initiatives can then be focussed on reducing threats to these species.

The appropriate use of environmental conservation tools such as marine reserves, species protection regulations, strategic environmental impact assessments and fisheries export accreditations can reduce fisheries-related impacts.

#### **Australian Government Fisheries**

Australian Government fisheries are managed by the Australian Fisheries Management Authority (AFMA). There are currently nine Commonwealth fisheries that occur wholly or partly within the East Marine Region:

- Coral Sea Fishery
- Eastern Skipjack Fishery
- Eastern Tuna and Billfish Fishery
- Small Pelagics Fishery
- Southern Bluefin Tuna Fishery
- South East Scalefish and Shark Fishery (includes Commonwealth Trawl Sector; Commonwealth Gillnet, Hook and Trap Sectors; and East Coast Deepwater Trawl Sector)
- Norfolk Island Fishery (includes inshore shelf/upper slope fishery and an exploratory offshore deepwater fishery)
- Southern Squid Jig Fishery
- Torres Strait Turtle Fishery<sup>11</sup>

The Coral Sea Fishery and the Norfolk Island Inshore and Offshore Fisheries are located entirely within the Region. Part of the Torres Strait Turtle Fishery is located in the north of the Region. The Eastern Tuna and Billfish Fishery and Skipjack Fishery includes all of the Region's waters and extends southwards, however, the majority of effort in these fisheries occurs outside of the Region. The Southern Bluefin Tuna Fishery includes all Australian waters although very little activity occurs in the Region. The remaining fisheries occur in the southern half of the Region and extend around the southern coastline of Australia (Larcombe et al. 2006, Moore et al. 2007).

In 2006 the Region's Commonwealth Fisheries landed a catch of approximately 19,800 tonnes valued at about \$35 million of which more than 80 per cent was accounted for by the Eastern Tuna and Billfish Fishery. Despite being the most economically significant Commonwealth fishery in the Region, the Eastern Tuna and Billfish Fishery has suffered a sharp decline in recent years with a 50 per cent drop in GVP since the early 2000's. Until recently, the fishery had a high level of latent (or unused) fishing capacity. However, in response to recent structural adjustments, 100 of the more than 200 available longlining permits for this fishery were surrendered (Moore et al. 2007). Table 5.4 outlines the area of operation, catch tonnage and GVP for Commonwealth Fisheries.

The main home ports for fishing vessels working in the Region's Commonwealth fisheries include Cairns, Mooloolaba, Sydney, Ulladulla and Bermagui. The key landed ports (those ports in which catch is actually taken ashore) include Cairns, Mooloolaba, Brisbane, Southport, Wollongong, Greenwell Point, Ulladulla and Bermagui.

There is an overall trend to decreasing fishing effort in the Region's Commonwealth fisheries associated with reduced fish abundance, low quotas and increasing costs. Overall catch in the Region has declined in recent seasons and most of the capacity for the expansion of fishing effort is confined to isolated, less profitable fisheries such as the small pelagic and southern squid jig fisheries which are unlikely to be exploited in the near future. There is potential for a significant expansion in the skipjack tuna fishery depending on the outcome of a decision to allow new fishing vessels to enter this fishery. The recent reduction in fishing effort resulting from structural adjustment in the Region may improve the sustainability and profitability of existing fisheries (Moore et al. 2007).

<sup>11</sup> This is a Commonwealth fishery managed by the Protected Zone Joint Authority (PZJA). The Australian Fisheries Management Authority provides management services for the PZJA.

Table 5.4 Commonwealth Fisheries in the East Marine Region

Fishery	Management area	Species	Fishing method	Catch within Region (value)	Concession holders/owners within Region*	Status #
Coral Sea Fishery.	Extends from the east of Fraser Island to the east of Cape York. The fishery commences east of the Great Barrier Reef Marine Park and extends to the edge of the Australian Fishing Zone.	A wide range of finfish species are taken as well as sharks, lobsters, trochus, sea cucumbers and live rock. Rosy jobfish, alfonsino and red emperor are the three most common species taken for seafood. The aquarium sector is highly selective and the species targeted vary in response to market demand.	<ul style="list-style-type: none"> <li>• Demersal Longlines</li> <li>• Trotlines</li> <li>• Droplines</li> <li>• Setlines</li> <li>• Handlines</li> <li>• Demersal Finfish Trap</li> <li>• Otter Board Trawl Gear for fish and for crustaceans</li> <li>• Hand collection</li> </ul>	In 2006: 105 t (\$0.503 m)	18 permits	All fisheries uncertain
Eastern Tuna and Billfish Fishery.	Extends from Cape York to the South Australia–Victoria border, out to AFZ boundary including Lord Howe and Norfolk Islands and adjacent high seas	Principle species include yellowfin tuna, bigeye tuna, albacore tuna, broadbill swordfish and striped marlin.	<ul style="list-style-type: none"> <li>• Pelagic longline</li> <li>• Minor line</li> </ul>	In 2006: 6380 t (\$28.7 m)	115 longline permits and 50 minor-line permits	Bigeye and yellowfin (overfishing, but not overfished). Striped marlin and broadbill swordfish (overfished status uncertain and overfishing status uncertain); Albacore (not overfished, no overfishing)
Norfolk Island Inshore and Offshore Fisheries (includes inshore shelf/upper slope fishery and an exploratory offshore deepwater fishery).	Norfolk Island is located 1500 km east of Brisbane. Australia exercises territorial control over the surrounding 200 n. miles EEZ	Inshore fishery: trumpeter kingfish cod snapper salmon trevally (Offshore not currently active)	Inshore: <ul style="list-style-type: none"> <li>• Demersal line</li> </ul> Offshore: (not currently active): <ul style="list-style-type: none"> <li>• Demersal line</li> <li>• Demersal trawl</li> </ul>	In 2005: Inshore 5 t (value confidential) Offshore (no current fishing activity)	Inshore - no permits Offshore - no current permits as exploratory fishery ceased in 2003	Inshore (uncertain), offshore (uncertain)
Eastern Skipjack Fishery.	Southern New South Wales to north-eastern Tasmania between November and June each year	Skipjack tuna	<ul style="list-style-type: none"> <li>• Purse seine</li> <li>• Pole</li> <li>• Line</li> </ul>	In 2005: confidential (less than 5 boats)	21 permits	(Not overfished and not subject to overfishing)



**Table 5.4 Commonwealth Fisheries in the East Marine Region**

Fishery	Management area	Species	Fishing method	Catch within Region (value)	Concession holders/owners within Region*	Status #
Small Pelagic Fishery.	Extends from Queensland/ New South Wales border (around southern Australia, to north of Perth. Typically occurs outside 3 nautical miles.	Jack mackerel yellowtail scad blue mackerel red bait	<ul style="list-style-type: none"> <li>• Purse seine</li> <li>• Mid-water trawling</li> </ul>	In 2006: 11060 t GVP is confidential	74 permits	Blue mackerel (not overfished and not subject to overfishing).  Jack mackerel, yellowtail scad and red bait (uncertain)
Southern Bluefin Tuna Fishery.	Includes all of the Australian Fishing Zone – most effort occurs outside Region	Southern bluefin tuna	<ul style="list-style-type: none"> <li>• Purse seine</li> <li>• Longline</li> <li>• Pole</li> <li>• Line</li> <li>• Trolling</li> </ul>	In 2006: Estimated 105 t (\$2.8m)	98 SFR holders nationally	(Overfished and subject to overfishing)
Southern Squid Jig Fishery.	Primarily offshore of Lakes Entrance, Queenscliff and Portland in Victoria, although fishery area does extend into southern half of Region	Arrow squid	<ul style="list-style-type: none"> <li>• Squid jigging</li> </ul>	In 2006: No catch in Region	N/A	(Uncertain)
South East Scalefish and Shark Fishery (Commonwealth trawl, scalefish-hook and deepwater trawl sectors).	Trawl sector from Sydney southwards around Tasmania to Cape Jervis in SA; adjoins east coast deep-water sector that extends to 24°30'S off Queensland. Scalefish-hook sector from the same boundary off Queensland to SA/WA border. Within the Region, the main effort is on seamounts from Sydney to Brisbane. Deepwater to 4000 m	Blue warehou, deepwater sharks, eastern gemfish, orange roughy, redfish, silver trevally, dories, blue-eye trevalla, blue grenadier, flathead and alfonsino	<ul style="list-style-type: none"> <li>• Mid-water trawl</li> <li>• Demersal otter trawl</li> <li>• Pair trawl</li> <li>• Demersal longline</li> <li>• Dropline</li> </ul>	In 2006: 1483 t (\$3.1m)	59 trawl SFRs, and 56 scalefish hook boat SFRs; 10 for deepwater trawl (1 active)	(Eight stocks overfished; nine stocks not overfished; overfishing status of seven stocks uncertain; no stocks classified as overfishing; 15 stocks not subject to overfishing; overfishing status of nine stocks is uncertain)
Torres Strait Turtle Fishery.	Torres Strait Protected Zone	Green turtle hawksbill turtle	<ul style="list-style-type: none"> <li>• Traditional Spear (wap)</li> <li>• Hand collection</li> </ul>	As a traditional fishery there is no catch monitoring in place	Traditional fishery	No monitoring in place

\* Note that not all concession holders/owners are actively fishing in the Region, although all concessions listed do give access to all or part of the Region

# Note that Commonwealth Fisheries use the following classification to indicate the status of fisheries: not overfished; overfished (or overfishing); or uncertain.

Source: <www.afma.gov.au>; ABARE 2007b; Moore et al. 2007



The bow of a fishing boat. Image courtesy of CSIRO.

### New South Wales Fisheries

The New South Wales Government manages three fisheries that extend into the Region:

- Ocean Trap and Line
- Ocean Trawl (including both the Fish Trawl and Prawn Trawl sectors)
- Rock Lobster

The New South Wales fisheries operating in the Region extend from the coastline out to the 4000 m isobath, or roughly 80 nautical miles from land. New South Wales managed trawling activity only occurs in the Region north of Barrenjoey Head (near Sydney). Trawling in the Region south of this point is managed by the Australian Government.

In 2006, the New South Wales fisheries in the Region landed a catch of approximately 3500 tonnes valued at about \$30 million. The Ocean Trawl fishery is the most economically significant, followed closely by the Ocean Trap and Line Fishery. Table 5.5 outlines the area of operation, catch tonnage and GVP for New South Wales Fisheries.

Key home ports for New South Wales fisheries include the Tweed Heads, Richmond, Clarence, Coffs Harbour, Hastings, Manning, Wallis Lake, Port Stephens, Hunter, Central Coast, Greater Sydney, Illawarra, Bateman's Bay and Far South Coast districts.

Key landed ports include Richmond, Clarence, Coffs Harbour, Hastings, Wallis Lake, Port Stephens, Hunter, North and South Sydney, Illawarra, Ulladulla and Bermagui.

In general, New South Wales' fisheries have reduced their total catch over recent years as quotas have been reduced to conserve stocks. The Ocean Trap and Line Fishery has seen a decrease in the number of fishers but has experienced a recent increase in the landed tonnage and GVP.

The Ocean Trawl Fishery has experienced an overall decline over recent years, although it has now stabilised and remains the most profitable of the New South Wales fisheries in the Region (Moore et al. 2007).



A collection of nets and buoys. Image courtesy of CSIRO.



**Table 5.5 New South Wales Fisheries in the East Marine Region**

Fishery	Management area	Species	Fishing method	Catch within bioregion (value)	Operators/businesses	Status *
Rock Lobster Fishery	NSW coast offshore to the 4000m isobath (approx. 60 to 80 nm offshore).	Eastern rock lobster	Trap/pot Hand collection (SCUBA or hookah prohibited)	In 2006: 52.2 t (A\$2.4m)	122 shareholders	Fully fished
Ocean Trap and Line Fishery	NSW coast offshore to the 4000 metre isobath (approx. 60 to 80 nm offshore).	Australian bonito, snapper, leatherjackets, yellowtail kingfish, grey morwong, blue-eye trevalla, spanner crabs, silver trevally, yellowfin bream, banded rock cod, gummy shark	Fish trap, spanner crab net, setline, trotline, driftline, poling, handline, jigging, dropline, trolling	In 2006: 1350 t (A\$11.5m)	478 fishing businesses	Of the 11 primary target species, 3 are considered to be growth overfished, 4 fully fished, 2 moderately fished and 2 undefined. Of the 14 secondary target species 10 are considered undefined, 1 recruitment overfished, 2 fully fished.
Ocean Trawl Fishery	NSW coast offshore to the 4,000 metre isobath between Barrenjoey Head and the Queensland border. From Barrenjoey Head to the Victorian border, the Commonwealth retains jurisdiction beyond 3 nm.	Eastern king prawn, school prawn, Royal red prawn, Balmain bugs, octopus, silver trevally, tiger flathead, sand flathead, southern calamari, school whiting, fiddler shark	Otter trawl (prawns & fish) and Danish seine	In 2006: 2100 t (A\$16.2 m)	271 fishing businesses	Of the 12 primary species (3 are considered growth overfished, fully fished, 3 undefined, 2 uncertain and 1 lightly fished). Of the 16 secondary species (9 are considered undefined, 5 fully fished, 1 growth overfished and 1 moderately fished)

\* Note that New South Wales fisheries use the following classification to indicate the status of fisheries: recruitment overfished; overfished; growth overfished; fully fished; moderately fished; lightly fished; uncertain; or undefined.

Source: (Moore et al. 2007)

The Rock Lobster fishery has gone through a period of fluctuation. Following a decline in stocks in the early 2000's catch quotas were reduced to allow stock recovery. In recent years the stock appears to be recovering so catch quotas have been increased. Despite an overall decrease

in effort, there has been an increase in landed tonnage and GVP in recent years. An increase in the price of lobster has had a role in improving profits for this fishery (Moore et al. 2007).

### Queensland Fisheries

The Queensland Government manages six fisheries that extend into the Region:

- East Coast Otter Trawl Fishery
- East Coast Stout Whiting Fishery
- East Coast Inshore Fin Fish Fishery
- Line Fishery
- Blue Swimmer Crab Fishery
- Spanner Crab Fishery

The Queensland fisheries operating in the Region are concentrated in coastal waters; however, the East Coast Otter Trawl extends beyond the Great Barrier Reef and out into the Coral Sea.

In 2006 the Queensland fisheries in the Region landed a catch of approximately 8863 tonnes valued at about

\$65 million. The East Coast Otter Trawl fishery is the most significant Queensland fishery in the Region followed by the East Coast Inshore Fin Fish Fishery. Table 5.6 outlines the area of operation, catch tonnage and GVP for Queensland Fisheries

Key home and landed ports in Queensland include Cairns, Innisfail, Townsville, Mackay, Gladstone, Bundaberg, Moolooaba, Brisbane and Southport.

The Queensland fisheries in the Region are generally characterised by a high level of latency and a declining number of boats actively fishing. Although there has been an overall decline in landed tonnage and GVP over the past ten years, the fisheries appear to have stabilised at present levels and further expansion is unlikely in the near future due to rising operational costs (Moore et al. 2007).

**Table 5.6 Queensland Fisheries in the East Marine Region**

Fishery	Management area	Species	Fishing method	Catch within bioregion (value)	Operators/businesses	Status *
Blue Swimmer Crab Fishery.	The fishery area extends along the entire Qld coastline.  Most catch is taken in inshore and continental shelf waters up to approximately 50 m depth, mainly in southern Qld, south of the Great Barrier Reef Marine Park	Blue swimmer crabs	Crab pots and collapsible traps	In 2006 875 t (A\$5.9 m) combined value for both crab fisheries	190 commercial boats accessing the fishery	N/A
Spanner Crab Fishery.	The fishery area covers inshore and offshore (>3 nm) waters off the Qld coast, from the NSW border to the NT border. Catch is concentrated in coastal waters up to 80 m depth between Yeppoon and the Qld–NSW border	Spanner crab	Crab pots, collapsible traps and dillies	In 2006 875 t (A\$5.9 m) combined value for both crab fisheries	504 licences	N/A



Table 5.6 Queensland Fisheries in the East Marine Region

Fishery	Management area	Species	Fishing method	Catch within bioregion (value)	Operators/businesses	Status *
East Coast Inshore Fin Fish Fishery.	The ECIFF area includes all tidal waters along QLDs east coast eastward of 142°09' E, near Crab Island (approximately 11° S), to the Qld —NSW border	Barramundi, king salmon, blue threadfin, grey mackerel and various sharks	A variety of net methods and hook and line	In 2005 5,437 t (A\$23 m)	499 net fishery and 1649 line fishery licenses	N/A
Line Fishery.	Includes all QLD waters out to limit of the QLD Offshore Constitutional Settlement boundary (approx 1540 30' E)	Flame snapper, ruby snapper, snapper, pearl perch, tragalin jew, coral trout, red throat emperor, spanish mackerel	A variety of hook & line methods	In 2006: 366 (t) (A\$3.6m)	3342 boats (includes commercial boats, endorsed tenders and charter boats)	N/A
East coast otter trawl.	The ECOTF is Queensland's largest commercial fishery, extending from the tip of Cape York to the QLD/NSW border. The majority of the fishery occurs in Commonwealth waters though the fishery is managed by QLD under OCS agreements with the Commonwealth	Tiger prawns, Endeavour prawns, red spot king prawns, banana prawns, and scallops	Otter Trawl and Beam Trawl	In 2006: 2185 t (A\$32 m) combined weight/value with East Coast Stout Whiting Fishery Stout Whiting Fishery for 2005 1,130t \$2.5 million	501 licences	N/A
East Coast Stout Whiting Fishery.	The fishery area, known as the T4 fishery region. It is defined in legislation as the area between the 20 and 50 fathom (36 and 90 m) depth contours. It operates from Sandy Cape to Caloundra	Stout whiting	Demersal otter trawl	In 2006: 2185 t (A\$32 m) combined weight/value with East Coast Otter Fishery Stout Whiting Fishery for 2005 1,130 t (A\$2.5 m)	5 licences	N/A

\* Queensland fisheries do not use a classification scale to describe the status of fisheries.

Source: (Moore et al. 2007)

### 5.2.2 Recreational and charter fishing

Recreational fishing and charter fishing is a popular outdoor activity in Australia with more than 3 million Australians believed to be participating in the sport annually contributing more than \$1 billion to the economy, which includes all direct and indirect expenditure by fishers on fishing equipment, licence fees, accommodation and travel costs associated with the activity. Although the majority of recreational fishing effort takes place from shore, as much as 4 per cent of recreational fishing is estimated to take place in Commonwealth waters (Henry and Lyle 2003).

According to the National Recreational and Indigenous Fishing Survey (2003) New South Wales (999 000) and Queensland (785 000) had the largest numbers of recreational fishers of all Australian states and territories. At the time of the survey, recreational fishing in New South Wales contributed about \$554 million to the economy and in Queensland, \$320 million (Henry and Lyle 2003). Figure 5.5 shows amount and location of fish caught by recreation fishermen in the Region and adjacent waters in 2001.

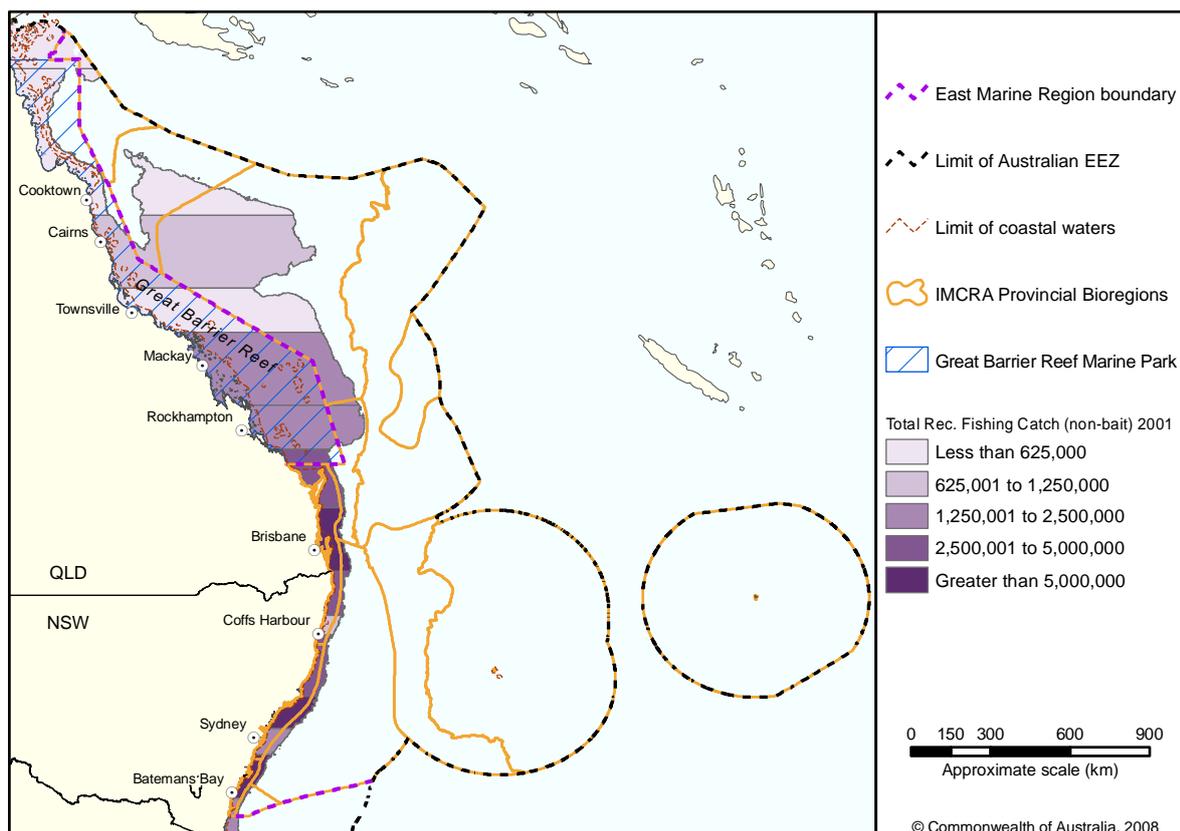
Although there are fewer fishers in the offshore environment of the Region, it is likely that offshore fishing contributes more per fisher to the economy than inshore fishing given the higher equipment and charter costs associated with fishing in the open ocean (Henry and Lyle 2003).

Charter fishing operators can provide vessels large enough to operate safely in the offshore environment of the Region and are commonly hired by recreational fishers who wish to take their pastime into deeper waters. Charter fishing is regulated in Queensland by the Department of Primary Industries and Fisheries and in New South Wales by the Department of Primary Industries. The charter fishing industry abides by industry codes of practice promoting the sustainable use of the marine environment.

Charter fishing activities can range from simple day trips out of port to weeks on a live-aboard vessel. A few enthusiastic recreational fishers have been known to use seaplanes to rendezvous with vessels far offshore and return to port after only a few days at sea.

Given the steady increase in boat registration numbers in both Queensland and New South Wales, it is reasonable to assume that there has been a proportional increase in the number of private boat owners entering the Region for recreational fishing close to the shore. In the 2006–07 financial year New South Wales recorded a 2% increase in recreational boat registrations with 213 387 vessels registered (NSW Maritime 2007). In Queensland, a 10% rise in recreational boat registrations was recorded in the 2003–06 period with the number of vessels surpassing 200 000 (Maritime Safety Queensland 2007).

**Figure 5.4** Number of fish caught by recreational fishermen in the East Marine Region and adjacent state waters in 2001



**Table 5.7 Common Offshore Recreational and Game Fish Target Species**

Albacore ( <i>Thunnus alalunga</i> )	Nannygai ( <i>Centroberyx affinis</i> )
Bar cod bass ( <i>Epinephelus ergastularius</i> )	Ocean jacket ( <i>Nelusetta ayraudi</i> )
Bass groper ( <i>Polyprion americanus</i> )	Pearl perch ( <i>Glaucosoma scapulare</i> )
Black marlin ( <i>Makaira indica</i> )	Porbeagle shark ( <i>Lamna nasus</i> )
Blue mackerel ( <i>Scomber australasicus</i> )	Sailfish ( <i>Istiophorus platypterus</i> )
Blue marlin ( <i>Makaira nigricans</i> )	Samson fish ( <i>Seriola hippos</i> )
Blue-eye trevalla ( <i>Hyperoglyphe antarctica</i> )	Skipjack tuna ( <i>Katsuwonus pelamis</i> )
Broadbill swordfish ( <i>Xiphias gladius</i> )	Snapper ( <i>Pagrus auratus</i> )
Cobia ( <i>Rachycentron canadum</i> )	Spanish and spotted mackerel ( <i>Scomberomorus</i> spp.)
Flathead ( <i>Platycephalus</i> spp.)	Striped marlin ( <i>Tetrapturus audax</i> )
Hammerhead shark ( <i>Sphyrna</i> spp.)	Teraglin ( <i>Atractoscion aequidens</i> )
Hapuka ( <i>Polyprion oxygeneios</i> )	Tiger shark ( <i>Galeocerdo cuvier</i> )
John dory ( <i>Zeus faber</i> )	Striped trumpeter ( <i>Latris lineata</i> )
Mahi mahi ( <i>Coryphaena hippurus</i> )	Wahoo ( <i>Acanthocybium solandri</i> )
Mako shark ( <i>Isurus</i> spp.)	Yellowfin tuna ( <i>Thunnus albacares</i> )
Mirror dory ( <i>Zenopsis nebulosus</i> )	Yellowtail kingfish ( <i>Seriola lalandi</i> )
Morwong ( <i>Nemadactylus</i> and <i>Cheilodactylus</i> spp.)	

Source: (Moore et al. 2007)

In New South Wales the key ports for game and recreational fishing are Sydney, Port Stephens, Coffs Harbour, Wollongong, Batemans Bay, Bermagui, Tweed Heads and Narooma. In Queensland the key ports for game and recreational fishing include the Gold Coast, Brisbane, Mooloolaba, Cairns, Port Douglas, Cooktown, Townsville, Rockhampton, the Whitsundays and Gladstone. These ports are home to a number of major game fishing tournaments (Moore et al. 2007).

Recreational fishing can impact on the environment through the direct removal of marine biomass. Although individual recreational fishers do not remove a significant number of fish, the combined impact of many fishers can result in localised depletions, particularly in popular fishing spots. Given there are so few fishers in the offshore environment of the Region, recreational fishing is unlikely to remove a significant amount of biodiversity from these waters. However, the incidental catch or injury of endangered species remains as a potential impact associated with this activity. Disturbance of cetaceans by boat users unfamiliar with guidelines for interacting with these animals may occur, but is unlikely in the deeper waters of the Region or in the case of professional charter boat operators. Table 5.7 lists species commonly targeted by recreational and game fishers.



Recreational fishing – Spanish mackerel. Image courtesy of the Great Barrier Reef Marine Park Authority for and on behalf of the Commonwealth of Australia.



Humpback whale and tourists, Hervey Bay. Photo: Mark Farrell.

### 5.2.3 Marine-based tourism

Although marine-based tourism is a significant industry in the Region, quantifying its economic contribution is exceptionally difficult. Tourism industry figures are typically drawn from the Tourism Satellite Account prepared by the Australian Bureau of Statistics. Unfortunately, these figures do not make a distinction between land-based and marine-based tourism activities so it is difficult to extract figures for only the marine component of the industry. It is even more difficult to separate out those activities that occur in the Region from those that occur in adjacent state waters or in the neighbouring Great Barrier Reef Marine Park.

There is debate about methodology used to derive the Tourism Satellite Account. Some experts believe that it does not reflect the nature of Australia's tourism industry and significantly overestimates its economic contribution (Productivity Commission 2005).

The Allen Consulting Group (2004) attempted to determine the value of marine-based tourism as part of a 2004 study of maritime industries. That report estimated that in 2002–03 marine-based tourism contributed \$11.3 billion to the Australian economy, that in New South Wales the industry was worth \$4.5 billion and that in Queensland the industry was worth \$2.2 billion.

By contrast the Great Barrier Reef Marine Park Authority (2007) reported that in 2006–07 marine tourism on the Great Barrier Reef alone contributed about \$6 billion to the economy.

Although it is not possible to derive accurate tourism figures for the Region, some broad observations can be made. Tourism is a significant industry in the waters off New South Wales and Queensland, contributing billions of dollars to the national economy. The majority of this contribution comes from activities in the Great Barrier Reef Marine Park or in state waters. Nevertheless, marine tourism activities do occur in the Region and are likely to make a significant contribution to the economy.

Some non-fishing tourism activities that occur in the Region include:

- snorkelling and scuba diving;
- whale watching; and
- cruising

#### **Snorkelling and Scuba Diving**

In 2005 approximately 393 000 snorkellers and 95 000 scuba divers visited Queensland and 159 000 snorkellers and 40 000 scuba divers visited New South Wales. The vast majority would be participating in these activities in state waters or in the Great Barrier Reef Marine Park,



however, these activities do occur in the Region also (Sinclair Knight Merz 2007).

Scuba diving and snorkelling are predominantly eco-tourism or heritage-based tourism activities with participants preferring locations that offer near pristine marine environments or interesting plane or boat wrecks. Some commercial and educational organisations have offered science-based tourism opportunities where divers and snorkellers participate in experiments or surveys.

Known scuba diving hotspots in the Coral Sea include the Osprey and Shark reefs. These activities also occur in Commonwealth Marine Reserves at the Solitary Islands, the Cod Grounds and Lord Howe Island. There is also diving in the more remote reserves of Coringa–Herald, Lihou and the Elizabeth–Middleton Reefs; however, the extreme isolation of these locations ensures that they are not often visited. Scuba diving and snorkelling occur in waters around Norfolk Island and it is likely that they also take place off other islands and shallow water seafloor features in the Coral Sea and in locations closer to the mainland.

Impacts associated with these activities include damage to fragile environments such as coral reefs (by accidental collision of divers and by vessels anchoring) and stress and avoidance behaviour of species coming into contact with humans. Removal of animals by spearing or by hand is considered to be recreational fishing and is discussed in section 5.2.2.

### **Whale and Dolphin Watching**

Whale and dolphin watching activities occur in many locations along the New South Wales and Queensland coastlines. Although the majority of whale watching activities occur in state waters, it is not uncommon for whale watching vessels to follow animals into the waters of the Region. It is difficult to determine how much whale watching occurs in the Region itself, as the location of whale watching sites varies from season to season.

The International Fund for Animal Welfare conducted a study of commercial whale watching activities in 2003 (IFAW 2004) in which it identified a total of 43 operators in Queensland and 28 in New South Wales. Despite there being fewer operators, 319 706 people went on whale watching in New South Wales compared with 140 133 people in Queensland.

The study estimated that the total direct expenditure on whale watching activities in Queensland and New South Wales was \$21.4 million in 2003.

The impacts of whale and dolphin watching include the disturbance of animals by the noisy presence of people and passing boats and aircraft. Extreme cases of disturbance can result in behavioural changes, displacement from normal habitat areas and reduced breeding success. To minimise any distress to the animals, the *Australian National Guidelines for Whale and Dolphin Watching* (Department of the Environment and Heritage 2005) were developed by the Commonwealth and agreed to by all Australian state and territory governments. The Guidelines form the basis of appropriate laws and regulations relating to whale and dolphin watching in each relevant jurisdiction.

For more information on the guidelines see <[www.environment.gov.au/coasts/publications/whale-watching-guidelines-2005.html](http://www.environment.gov.au/coasts/publications/whale-watching-guidelines-2005.html)>

### **Cruising**

The cruise ship industry has been experiencing a period of growth over the past decade and has been recognised as the fastest-growing segment of Australia's tourism industry for much of that period. The general trend has been for cruise ships to visit an increasing number of ports and for cruise ships visiting Australia to be bigger.

In the 2006–07 financial year, the total direct and indirect national economic impact of the cruise shipping industry was \$376 million. Economic impact is defined as the expenses, employment, income and value-adding to other industries generated by crew and passenger expenditure. This represents a decrease of 7.8% compared to the previous year despite the general upwards trend in the industry. The total economic impact in waters off New South Wales was \$94.7 million and for waters off Queensland it was \$69.9 million (Cruise Down Under 2007).

Willis Island, a small island in the middle of the Coral Sea, is of particular interest to the cruise shipping industry in the Region. Willis Island has a meteorological research station with a staff of scientists and is the only permanently populated island in the Coral Seas Islands Territory. Under Australian law, Willis Island is considered to be outside of Australia for the purposes of the *Customs Act 1901*. This special status means that cruise ships visiting Willis Island can consider the voyage as an international journey, and crew and passengers are therefore entitled to claim duty-free and GST free concessions. The cruise ship company can also purchase supplies for the voyage, including fuel, free of duty or GST (Commonwealth of Australia 2007a).

As a result of these concessions cruise companies will often include Willis Island as a destination on domestic Australian cruises, allowing Australian passengers to take

advantage of duty-free provisions. In practice, cruise ships anchor offshore of Willis Island for just a few hours before continuing with the voyage: passengers do not generally disembark.

Impacts specific to cruise shipping include the potential discharge of very large quantities of untreated sewage from vessels although modern vessels now have sophisticated effluent treatment equipment. Although most cruise ship destinations are in coastal waters outside of the Region, vessels do anchor off some of the Coral Sea islands and Norfolk Island, and passengers do sometimes go ashore. Passenger activities may have an impact on fragile environments (Sinclair Knight Merz 2007).

In addition to these industry-specific impacts, cruise ships also have the same impacts on the environment as any other large vessel, as discussed in more detail in the section 5.2.4.

#### 5.2.4 Ports and shipping

Shipping is a vital industry and is the primary form of transport for international freight to and from Australia and around the world. In the 2006–07 financial year the

total sea freight trade (the value of imports added to exports) for Australia was over \$275 billion. Ports adjacent to the Region handled almost 45% of Australia's trade or about \$123 billion. Sydney was the largest trading port adjacent to the Region (also the largest in Australia) with more than \$54 billion in trade, followed by Brisbane (third largest in Australia) with more than \$30 billion (Bureau of Infrastructure Transport and Regional Economics 2007b).

Approximately 38 million tonnes of cargo were imported through ports adjacent to the Region and about 271 million tonnes were exported. The largest importing port adjacent to the Region by weight was Sydney with more than 15 million tonnes of cargo, followed by Brisbane with 12 million tonnes. In terms of exported weight, the largest ports adjacent to the Region are Hay Point (86 million tonnes), Newcastle (82 million tonnes), Gladstone (55 million tonnes), Port Kembla (14 million tonnes) and Abbot Point (11 million tonnes). These ports are all industrial ports that export high volumes of raw minerals, most notably coal (Bureau of Infrastructure Transport and Regional Economics 2007b).

The most commonly imported cargoes into Australia included machinery, cars and petroleum products. Commonly exported cargoes included coal, iron ore, petroleum, meat

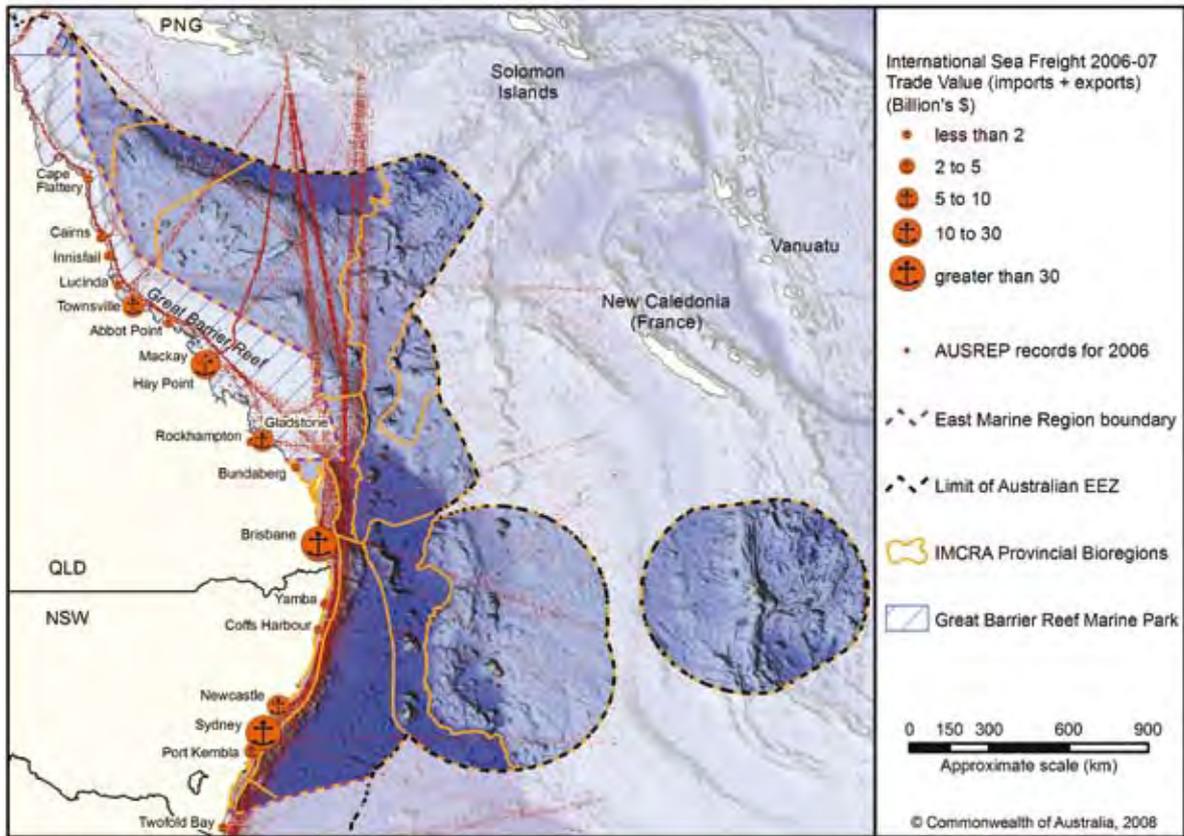
**Table 5.8 The value and weight of imports and exports from ports adjacent to the East Marine Region**

Port	Value Import (\$ 000's)	Value Export (\$ 000's)	Total Trade (\$ 000's)	Tonnes Import	Tonnes Export
<b>Queensland</b>					
Brisbane	20 373 322	10 368 789	30 742 111	12 025 169	9 236 437
Hay Point	-	10 422 866	10 422 866	-	86 371 140
Gladstone	588 767	6 685 612	7 274 379	25	26
Townsville	1 093 761	1 093 761	2 187 522	4 064 398	3 562 012
Cairns	344 891	492 610	837 501	349 847	331 895
Abbot Point	-	789 138	789 138	-	11 155 370
Mackay	305 382	455 213	760 595	472 003	1 181 969
Lucinda	-	246 707	246 707	-	591 750
Innisfail	-	207 238	207 238	-	504 950
Bundaberg	5 827	55 994	61 821	851	139 419
Other Ports Qld	319	34 339	34 658	63	1 791 102
<b>New South Wales</b>					
Sydney	42 916 202	11 255 703	54 171 905	15 687 719	4 731 959
Newcastle	606 919	6 577 014	7 183 933	1 144 133	82 482 288
Port Kembla	384 862	3 872 485	4 257 347	2 103 394	13 927 745
Coffs Harbour	342	1 234	1 576	25	26
Other Ports NSW	241	7 836	8 077	248	4 535

Source: (Bureau of Infrastructure Transport and Regional Economics 2007b)



Figure 5.5 Shipping lanes in the East Marine Region and the International Sea Freight Trade Value of ports in state waters adjacent to the Region



and aluminium (Bureau of Infrastructure Transport and Regional Economics 2007a).

The Region includes some major shipping routes that are an important link in the global shipping lanes between Europe and Asia. The major shipping lane in the Region follows the eastern coast of Australia from the south before splitting into two directions near Fraser Island. One arm continues directly North through the Coral Sea, and on towards south-east Asia. The other travels the inner route of the Great Barrier Reef, a path that follows the narrow strip of water between the coastline and the reef itself. Vessels sailing this passage are required under the *Great Barrier Reef Marine Park Act 1975* to take on board a Commonwealth licensed pilot for the leg of the journey between Hydrographers Passage and Cape York (Australian Reef Pilots Pty Ltd 2007).

The Australian Maritime Safety Authority maintains the Australian Ship Reporting System (AUSREP) and requires certain commercial vessels within the Australian Search and Rescue Region to report their location at least once every 24 hours to improve the safety of life at sea. By plotting the reported location of vessels over the period of a year it is possible to determine which areas of the East Marine Region have the high levels of shipping activity associated with shipping lanes (see figure 5.5).

There are a number of environmental impacts or potential impacts associated with all shipping in the Region. Shipping traffic is rising in all Australian waters increasing the chances of collisions, running aground and other accidents such as the loss of cargo at sea. Oil spills and other toxic chemicals lost overboard in such incidents can have serious consequences for the environment depending on the nature of the cargo and the location of the incident. Chemically inert cargoes lost overboard, such as shipping containers or garbage, contribute to marine debris pollution and in some cases can cause navigation hazards (Sinclair Knight Merz 2007). The discharge of sewage (treated or otherwise) can also have implications for environmental quality.

Increasing traffic also increases the possibility of accidental collision with marine animals such as turtles, dugongs and cetaceans. Figures are not available for the number of such strikes that occur in the Region, however there are numerous reports in adjacent waters of small boats colliding with animals and some animals have been observed with scarring consistent with propeller strike. Given the size of some of the larger ships navigating the sea lanes of the Region, it is unlikely that a collision with wildlife would be noticed or reported (Sinclair Knight Merz 2007).



Customs boat. Image courtesy of Australian Customs.

Shipping is also a potential vector for the introduction of marine pests into Australian waters, either through biofouling or the exchange of ballast water. Biofouling occurs when a pest attaches itself to the hull of a vessel and is carried to another port. Ballast water taken on by empty cargo ships in a port may draw pest species into the ballast tanks which are then expelled with the ballast water when the ship arrives at its destination port (Sinclair Knight Merz 2007).

Management of the risks associated with shipping is governed by a number of national and international agreements and industry codes of conduct. Australia's commitments under the international *Convention for the prevention of Pollution from Ships 1983 (MARPOL)* are met by the *Protection of the Sea (Prevention of Pollution from Ships) Act 1973* and the *Navigation Act 1912*. Oil and chemical spill response in the Region is implemented by the Australian Maritime Safety Authority using the *National Plan to Combat Pollution to the Sea by Oil and Other Noxious and Hazardous Substances*. There is a high level of national collaboration between jurisdictions and the shipping and ports industry on marine pollution and oil spill response matters in Australia. Australia is currently working with the International Maritime Organization (IMO) to address the issue of ship strikes on cetaceans.

### 5.2.5 Border protection activities

Both the Australian Customs Service (ACS) and the Australian Defence Force (ADF) make widespread use of the East Marine Region while undertaking their duties. The range of activities includes national security, surveillance, interception and legal action (Forbes 2002) as well as supporting environmental management and research initiatives in places like Commonwealth marine reserves.

The ADF also undertakes other tasks such as:

- preparedness and contingency planning;
- fisheries and (where applicable) environmental law enforcement;
- search and rescue;
- hydrographic assessments; and
- oceanographic data management.

#### **Border Protection Command**

In order to address security threats in Australia's maritime environment the Federal Government, in March 2005, directed the establishment of the Joint Offshore Protection Command (JOPC). In 2006 JOPC, in line with an expanded mandate from Government, was re-named as Border



Protection Command (BPC). BPC is a multi-agency organisation staffed with officers from the Australian Customs Service, the Australian Defence Force, the Australian Fisheries Management Authority, and the Australian Quarantine Inspection Service. BPC uses assets assigned to it by the ACS and ADF to counter security threats in Australia's maritime domain. The eight security threats, identified by Government, are illegal activity in protected areas, illegal exploitation of natural resources, marine pollution, prohibited imports and exports, unauthorised maritime arrivals, compromise to bio-security, piracy, robbery or violence at sea, and maritime terrorism.

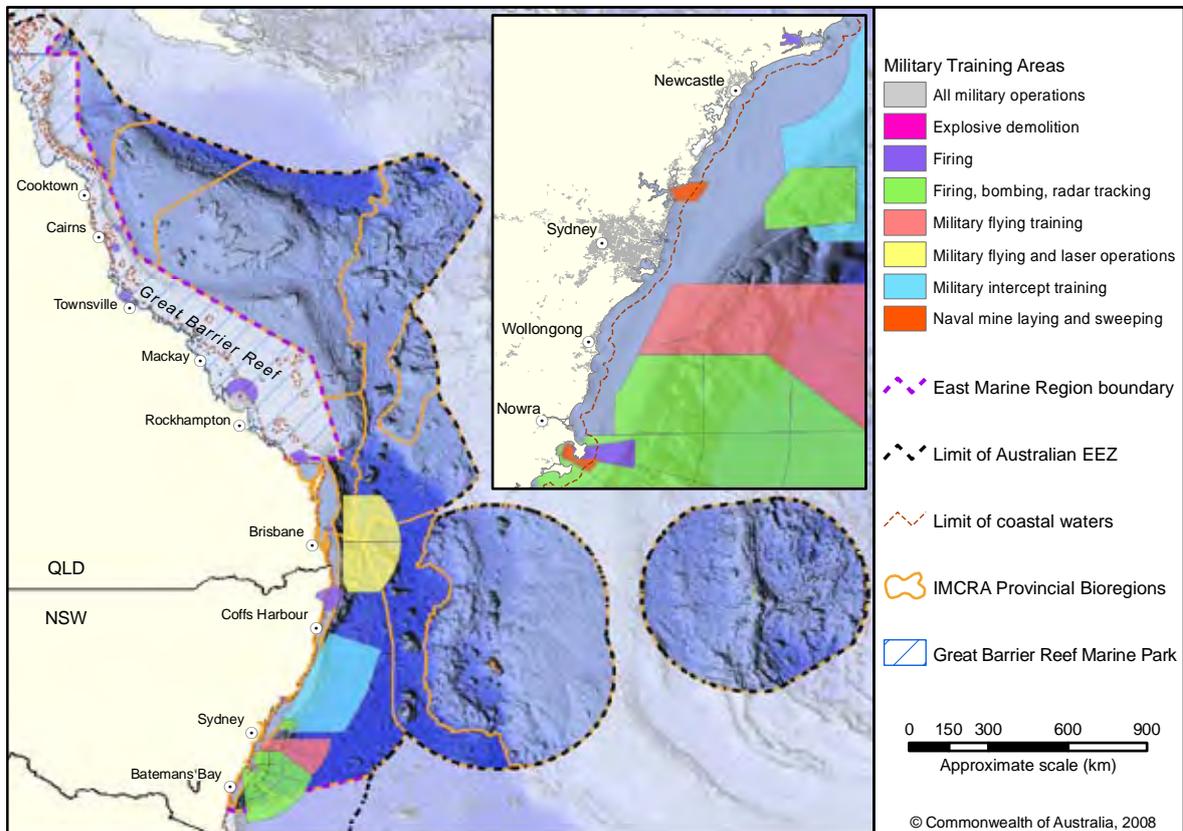
**Regional Defence Activities**

The Australian Defence Force (ADF) conducts a range of training, research activities, and preparatory operations in the East Marine Region in support of ships and aircraft stationed at bases in various locations along the east coast of Australia. Major home port bases for east coast Royal Australian Navy (RAN) ships and aircraft include Fleet Base East (destroyers and support ships) and HMAS Waterhen (minehunting vessels) in Sydney, HMAS Albatross in Nowra (aircraft) and HMAS Cairns in Cairns (Hydrographic, maritime patrol and support vessels). Training and support establishments are located in Sydney,

Wollongong and Jervis Bay. Royal Australian Air Force (RAAF) establishments at Richmond, Williamstown and Amberley support flying operations and crew training activities in the Region.

Primary training locations include the East Australia Exercise Area off the south coast of New South Wales, RAAF flying training areas and air-to-air ranges off the north coast of New South Wales, and the Shoalwater Bay Defence Training Area, on the central Queensland coast. Additionally, there are a number of smaller practice areas in the Region that cater to specific training requirements. Defence activities in these training areas include general ship and aircraft training, including seamanship, flight training, demolition, use of explosives, weapons firings, use of radar, sonar, sonobuoys, flares, sensors and other equipment. All Defence activities in the Region are subject to assessment under the ADF Maritime Activities Environmental Management Plan, supported by planning guides and procedural tools, including threat assessments for prospective activities, and notification of relevant marine bodies and ocean users about impending activities. In addition, Defence activities that are considered likely to impact upon matters of national environmental significance are assessed and considered for referral under the EPBC Act.

**Figure 5.6 Defence training areas in the East Marine Region**



Major exercises are conducted infrequently in the Region. These exercises are subjected to additional environmental assessment. Exercise Talisman Saber is held biennially off eastern Australia in the Coral Sea, involving Australian and United States armed forces. The exercises focus on operational level warfare with fictional scenarios including ground, air and marine activities, and typically involve around 30 ships, 100 aircraft and 20 000 personnel. Effective environmental management is a major consideration involving a rigorous environmental risk assessment process (Sinclair Knight Merz 2007). On occasions, RAAF aircraft from other bases train in the Region and regular larger scale air exercises potentially with international participants are held in the Region.

In addition, the ADF may conduct hydrographic survey operations, search and rescue, surveillance, and interdiction activities at any time in the East Region in support of

Government priorities. For example, Operation Resolute involves ocean patrols and law enforcement activities targeting illegal activity in the Region.

## 5.2.6 Offshore oil and gas exploration and production

At the time this report was written, no major offshore oil and gas activity occurred in the Region. Offshore areas within the Region are largely under-explored although locations exist where reserves may occur (see table 5.9). Data are available for the Nambour Basin and the Sydney Basin, however there is no current activity in either of these locations (Quinn et al. 2005).

Australian oil and gas resources include crude oil, condensate, liquefied petroleum gas and natural gas. Exploration and production can be an expensive process

**Table 5.9 Offshore basins with potential oil and gas reserves in and adjacent to the East Marine Region**

Basin	Offshore Area (km <sup>2</sup> )	Details/Prospectivity
Capricorn Basin	45 000	Mostly within the Great Barrier Reef Marine Park where exploration is prohibited. The offshore basin is poorly explored with three wells having been drilled (all dry) and no exploration since 1968.
Clarence Moreton Basin	1 000+ (offshore extent poorly known)	A possible offshore extension of the onshore basin. The Solitary Islands Marine National Park and Reserve nearby. Offshore basin lies under a whale migration path. One offshore survey conducted, 2 of 30 onshore wells flowed sub-economic gas, basin has abundant oil-prone organic matter. No offshore wells.
Eastern Plateau	31 000	Midway between Queensland and Papua New Guinea. The plateau is surrounded by troughs and is free of terrigenous sediments.
Lord Howe Rise	1 500 000	Recognised as having long term hydrocarbon potential. Potentially prospective sedimentary basins underlie much of western half and eastern flank.
Lorne Basin	?	Unknown if extends offshore and if so, based on onshore information, prospectivity is probably very low.
Maryborough Basin	15 500	Basin offshore and onshore. Five onshore wells (all dry except for gas shows in one). None offshore. The offshore Maryborough Basin underlies whale migration paths for several months of the year and includes the Fraser Island National Park.
Nambour Basin	2500 (poorly known)	Offshore and onshore. The offshore basin lies under a whale migration path for several months of the year. One petroleum well on an offshore island. Unlikely to contain commercial quantities of hydrocarbons.
Papuan Basin	7000 (only partly within Region)	One exploration well within Australia. The Queensland extension lies mostly within Torres Strait and the Great Barrier Reef Marine Park, so is considered to be within a very sensitive area.
Sydney Basin	28 000	Offshore and onshore. The offshore basin lies under a whale migration route for several months of the year. 115 onshore wells and zero offshore.
Townsville Basin	13 000	The western part of the Townsville Basin lies within the Great Barrier Reef Marine Park, in which petroleum exploration activity is prohibited. The rest of the basin is also in a sensitive area due to the proximity of the Park. No wells have been drilled.

Source: (Geoscience Australia 2003)



Figure 5.7 Oil and gas exploration permits in the East Marine Region

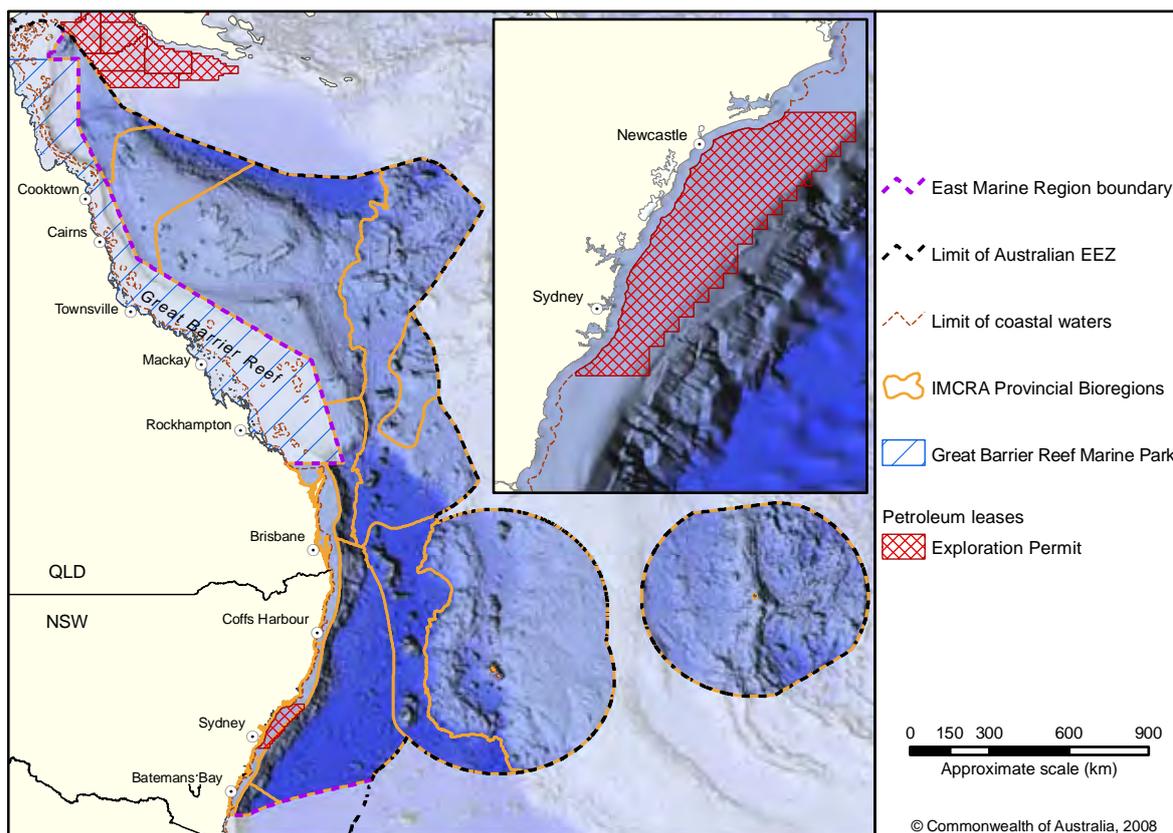


Table 5.10 Possible impacts of oil and gas exploration and extraction on the environment

Issue	Possible Impacts
Ship movements	May cause sedimentation at coastal facilities from propeller disturbance, introduction of invasive species from ballast water release, disposal of produced and process waters that may have raised salinity and hydrocarbons, collisions at sea, potential to alter animal movements and oil spills.
Seismic surveys	Sound waves might cause mortality, sublethal injuries or modify feeding or mating activity of marine mammals, fish and other organisms. Evidence suggests the seismic sound waves do alter the behaviour of some species and may cause damage to the hearing organs. Whales have also been known to avoid noise associated with surveys even at a distance of 7–12 km (Australian State of the Environment Committee 2001, McCauley et al 2000).
Drilling rig placement	Possible localised damage from the placement of rig.
Drilling	Modifications to the benthic faunal communities even up to 11 months after drilling (Currie and Isaacs 2005), drill cuttings discharged overboard, increased suspended sediments in the water column, drilling fluids containing harmful constituents potentially released into environment.
Anchoring	Localised physical damage.
Platform placement	Habitat disturbance, however platforms may act as artificial reef attracting marine and bird life. The decommissioning of the equipment may involve only the partial removal of platform which may be left to act as an artificial reef.
Emissions and discharges	Formation water with hydrocarbon traces at an elevated temperature released into environment, cumulative effects on organisms from long exposure to low levels of particular hydrocarbons, greenhouse gas emissions (mostly carbon dioxide and methane) are released but exploration and production combined contribute only 3% to Australia’s emissions.
Sewage	Elevated water column nutrients may increase the numbers of some organisms.
Oil spills	Smothering and toxic effects for organisms and cascading impacts along the food chain.

Source: (Sinclair Knight Merz 2007)

because petroleum resources are extremely difficult to find and exploit (Australian Institute of Petroleum 2002). Nonetheless, identification of more resources is essential to the growth of the industry. Exploration in offshore waters is very important considering offshore drilling contributes approximately 85% of Australia's approximately \$15 billion petroleum production industry (Ward and Butler 2006).

Economic contributions from the oil and gas industry within the Region will depend largely on the outcome of the recent exploration of the Lord Howe Rise and the success of drilling by the company Bounty Oil and Gas NL off the coast of Sydney. Seismic investigations indicate that there are potential recoverable gas reserves in excess of 1.2 trillion cubic feet offshore in the Sydney area. If successful, this well is expected to provide enough gas to meet Sydney's needs for the next decade (MEC Resources 2006).

Historically, petroleum exploration and production activities have had very little environmental impact but there are risks of future impacts if exploration and production activities are not managed carefully (Australian State of the Environment Committee 2001). With respect to East Marine Region, the risk of environmental impacts is low due to the lack of production and minimal exploration activities. Table 5.10 summarises the potential hazards and impacts associated with petroleum exploration and recovery.

### 5.2.7 Offshore mineral exploration

No major offshore mining or exploration is currently taking place within the Region but two major offshore extraction operations are currently taking place in Australian waters. One is a sand dredging operation in Moreton Bay directly adjacent to the Region, the other is a lime-sand dredging operation off Fremantle, Western Australia (McKay et al. 2005).

Seafloor mining was pioneered in the 1970s, primarily to access manganese nodules and the nickel, copper and cobalt they contain (McDonald 2005). Due to the difficulty and expense of operating in the offshore environment, the feasibility of seafloor mining depends largely on the discovery of minerals that have a high value.

Data on the location and productivity of mineral deposits in Australia have been obtained primarily by private companies, and through reconnaissance surveys undertaken by federal and state geoscience agencies (McKay et al. 2005). The main focus of these explorations and mining activities has been the extraction of construction material, heavy mineral sands and high value deposits of gold and diamonds (McKay et al. 2005). Minerals potentially available

for extraction from the sea bed include carbonate sands, sulphides rich in copper, gold and zinc located around hydrothermal vents, and phosphate and manganese nodules. Many of these minerals are located in the Region and adjacent State waters. However as the bioregion has not been subjected to systematic mineral exploration, little is known of the full extent of mineral occurrences, and mineral potential is virtually unknown.

In the past, the cost of extracting and treating the resources has outweighed their commercial value, but this situation is changing as new technologies are discovered and developed. Recently, minerals obtained from hydrothermal fields have shown economic prospects equal to or even higher than terrestrial mines (McDonald 2005) and Nautilus Minerals Inc will commence seabed mining of seabed base metals in Papua New Guinea waters near the Region in 2009.

As the only mineral extraction operation in the vicinity of the Region occurs in Queensland state waters, there are no direct impacts on the Region itself.

### 5.2.8 Aquaculture

With the majority of commercially fished species in the Region being classified as fully or over exploited by fisheries management authorities, there is increasing pressure on wild fisheries to deliver profitable catches. It has become apparent that commercial fishing alone cannot provide for the increased worldwide demand for seafood. Globally, Australia ranks around 55th in seafood production, despite having the third largest fishing zone in the world.

Australia's fisheries are not as productive or as abundant compared with many other parts of the world. With ever-increasing population, demand for seafood is outstripping supply. Aquaculture has been suggested as a sustainable method of commercial production of fish, molluscs, crustaceans and marine plants although there is no consensus as to whether this is achievable.

There are no major aquaculture operations currently within the Region. The major aquaculture industries in waters adjacent to the Region include the farming of scallops, prawns, edible oysters and silver perch. The economic contribution of marine-based aquaculture in Queensland and New South Wales is difficult to distinguish as figures for both land-based and marine-based aquaculture are amalgamated in industry reports. Queensland aquaculture production generally has a higher value than New South Wales production, although this may be attributed to the size of the prawn industry. The value of prawn production



was highest for the period 2003–04 with a value in excess of \$53 million.

Aquaculture is a rapidly developing industry in Australia and worldwide, representing approximately 35 per cent of the total value of Australian fisheries production of \$2.13 billion (ABARE 2007b). Aquaculture worldwide has a growth rate of 11 per cent per year and is worth an estimated \$US56.5 billion dollars (Department of Primary Industries 2005).

Comprehensive research programs are currently being conducted with the view to increasing the contribution of aquaculture to the fishing industry in Australia (Department of Primary Industries 2005). Specific research programs include:

- hatchery and breeding technologies for oysters and molluscs;
- technologies and systems for finfish breeding and farming; and
- fish feeds and feeding.

### 5.2.9 Sea dumping

Dumping at sea has been a common practice as it was perceived to minimise the impacts of land-based waste disposal on population centres in a time when there was not much awareness of potential environmental impacts. Additionally, waste disposal at sea may have also been a cheaper and less regulated alternative to land-based waste management.

The *Beaches, Fishing Grounds and Sea Routes Protection Act 1932* was enacted in response to pollution of beaches in major coastal cities and uncontrolled dumping resulting in obstruction of shipping passages. Under the Act, the Federal Government designated fourteen dumping grounds isolated from major shipping routes. Permits were required for the dumping of vessels and permission was required from the Director of Quarantine for the dumping of organic waste or garbage (Plunkett 2003).

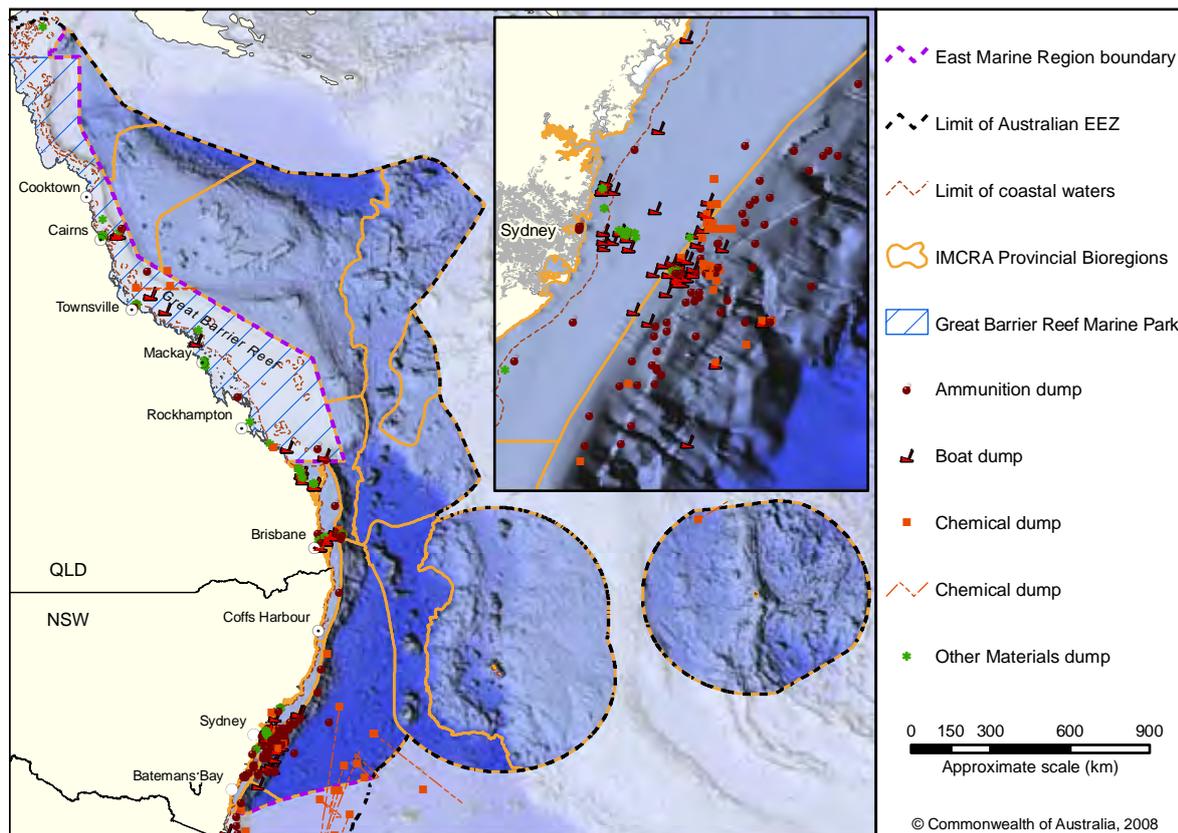
In recent years, the practice of dumping at sea has been further regulated by the Australian Government to minimise environmental degradation and protect human health. As a signatory of the international *Convention on the Prevention of Sea Dumping of Wastes and Other Matter 1972* (The London Convention) the Australian Government introduced the *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act) to increase regulation of sea dumping in Australian waters, including those surrounding Australia’s seven external territories (Plunkett 2003).

**Table 5.11 Materials dumped in the East Marine Region**

Description	Sites in the East Marine Region
Arsenic Solution	1
Black Liquor	1
Carbonate/Cyanide	1
Caustic Soda	1
Chemical Warfare Agent	3
Chlorinated Hydrocarbons	14
Contaminated Hydrocarbons	2
Cyanide	6
Cyanide Residue	4
Cyanogen Bromide	1
Electric Plating Vats	1
Exhaust Valves	4
Hydrocarbons	21
Medical Stores	1
Medical Stores/ Sulphur Drugs	1
Methyl Parathion	1
Mustard Gas	3
Mustard Gas Cylinders	1
Phosphorous Trichloride	2
Phosphorous Oxychloride	1
Polymerised Ethylene Oxide	1
Pyrotechnics	1
Rapidech Crystallised Chemicals	1
Sheep Dip	1
Sodium	1
Sodium Exhaust Valves	2
Solvents	1
Spent Caustic Soda	12
Spent Sulphuric Akulation Acid	3
Sulphonamides & Antihistamines	1
Toxic Sludge	1
Unknown	4
White Spirit/ Perchloroethylene	1

Source: (Sinclair Knight Merz 2007)

Figure 5.8 Sea dumping sites in the East Marine Region



The London Convention (1972) was updated by the 1996 Protocol which is much more restrictive and lists materials permitted to be dumped under Annex 1 (International Maritime Organization 2002). Permissible materials include:

- dredge material;
- sewage sludge;
- fish waste, or material resulting from industrial fish processing operations;
- vessels and platforms other than structures made at sea;
- inert, inorganic geological material;
- organic material of natural origin; and
- bulky items, primarily comprising iron, steel, concrete and other similar chemically-harmless materials for which the concern is the physical impact – generally limited to circumstances where there is no other practical disposal option, e.g. for small islands having isolated communities.

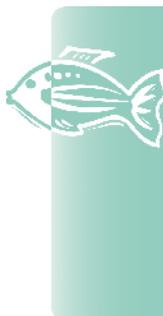
Permits for the disposal of any of the above-listed materials must be obtained before dumping takes place. Permits are most commonly issued for dumping of uncontaminated dredge spoil (Plunkett 2003). Table 5.11 lists some of the materials that have been dumped in the East Marine Region.

Regulations apply to the two broad waste disposal solutions: land-based disposal and dumping at sea. Marine pollution can result from land-based disposal including sewage outflows, flows of industrial by-products, and stormwater runoff, which can potentially affect the water quality of coastal and marine environments, especially sensitive reef systems in the tropical waters off Queensland. Dumping of waste at sea can also have significant localised environmental implications depending on the nature of the material being dumped, the location and depth in which it is dumped and oceanic conditions (Plunkett 2003).

Sea dumping sites in the Region can be categorised into four broad groups:

- ammunitions sites;
- boat dumping sites;
- chemical dumping sites; and
- miscellaneous waste sites.

There are a total of 471 ocean waste disposal sites in the 14 provincial bioregions that comprise the Region. Most of these sites are concentrated in the shelf provinces (see figure 5.8). The Central Eastern Province has the highest number of ocean disposal sites including the highest number of ammunition, boat and chemical dumping areas,



### Sydney Deepwater Sewage Outfalls

As Australia's most populated city, Sydney generates massive volumes of effluent putting significant pressure on the aging infrastructure of the city. Each day, approximately 1.2 billion litres of wastewater passes through a system of 30 sewage treatment plants. About 1 billion litres a day, or the equivalent of 1000 Olympic swimming pools, passes through three deepwater outfalls off the coast from North Head, Bondi and Malabar (Sydney Water 2007).

Wastewater discharged from these outfalls has been subject to 'high rate primary' treatment. Ordinary primary treatment of sewage involves the removal of solid debris using filter screens and settling tanks. High rate primary treatment removes fewer solids because of the faster than normal treatment process. The effluent passing through the deepwater outfalls contains a relative high level of sewage because treatment processes remove only about half of the suspended solid material entering the treatment plants. This sewage is dispersed in an effluent plume between 1.7 and 3.7 km from shore in water between 60 and 80 m deep (Pritchard et al. 1996).

Effluent plumes leaving the outfalls are rapidly diluted and are subject to a number of oceanographic variables. The prevailing winds and currents drive effluent plumes in a south or south-westerly direction, following the coast toward the Illawarra region. Although heavily diluted, traces of effluent have been found as far as 40 km south of the outfalls (offshore of Stanwell Park) (Wilson et al. 1995).

The waters off the coast of Sydney are also subject to stratification, a process where the water column settles into distinct layers of different temperature waters. When there is a large difference in temperature between the surface and deeper waters, the effluent plume becomes trapped about 30 metres below the surface. It is estimated that those plumes will surface between 15 and 19 per cent of the time (Wilson et al. 1995).

After the outfalls became operational, the Sydney Deepwater Outfalls Environmental Monitoring Program conducted an extensive analysis on the behaviour and impact of effluent discharged from the outfalls. Although there was some decline in the populations of some marine

species, overall there appeared to be little impact on the environment around the outfalls (Scanes et al. 1996). This has been supported by the ongoing monitoring program conducted by the Sydney Water Corporation (Sydney Water 2007).

According to the National Pollution Inventory, in the financial year ending 30 June 2006, the Malabar Sewage Treatment Plant was recorded as the facility emitting the largest volume of ammonia (5 300 000 kg), nitrogen (6 500 000 kg) and phosphorus (1 300 000 kg) into the Australian marine environment (National Pollutant Inventory 2007)

The volume of wastewater passing through Sydney's deepwater outfalls is comparable with other global population centres in North America and Europe (Phillip 1995).

The Sydney sewerage system is managed by the Sydney Water Corporation. Sydney Water is licensed to run and maintain this infrastructure by the NSW Department of the Environment and Climate Change (DEC) under the *Protection of the Environment Operations Act 1997*. The licences set conditions for how the sewerage system is to be managed and determines what penalties will be applied in the event that there is a breach of the Act (Department of Environment and Climate Change 2008). Sydney Water reports any breaches of the Act in its annual report.

Despite the outfalls having a good environmental record the fact remains that the outfalls are a major source of pollution. The community remains concerned about the possible impacts of the outfalls and as a result they are subject to a strict monitoring and licensing program. Considerable investment has been made in upgrading the city's wastewater infrastructure with the aim of reducing impacts on the environment.

Although it is extremely rare for effluent to pass into the waters of the East Marine Region itself, the close proximity of the outfalls and the high volume of effluent passing through them make the outfalls a matter of interest for the Regional Profile.



Cruise ship – a luxury cruise ship enters the Port of Newcastle for day excursions by passengers to the nearby Hunter Valley. Image courtesy of the Newcastle Port Corporation.

while the Central Eastern Shelf Province has the highest number of miscellaneous dump sites in the Region. There are no registered sites in the Cape Province, Kenn Province, Kenn Transition, Tasman Basin Province or Lord Howe Province. There is one chemical dump site in the Norfolk Island Province, however sea dumping defined under the *Environment Protection (Sea Dumping) Act 1983* is not permitted off Norfolk Island (Plunkett 2003). Management of waste generated on the island generally involves incineration.

Potential impacts of ocean waste disposal on the marine environment include localised effects on water quality and destruction of habitat. Impacts of ocean waste disposal also extend to humans who may ingest contaminated seafood or snag dumped material through trawling. Another impact which mostly occurred before sea dumping sites were charted was ship collisions with dumped material (Plunkett 2003).

To combat the issues that arise from land-based pollution, the Federal Government developed *Australia's National Programme of Action for the Protection of the Marine Environment from Land Based Activities* (Department of the Environment and Heritage 2006). The program builds upon the *National Cooperative Approach to Integrated Coastal Zone Management* (Natural Resource Management Ministerial Council 2006). Management of impacts arising from waste dumped at sea is more difficult due to the limited data available about dumping events in the past and their

locations. The Australian Government now keeps a database of dump sites and permits issued (Plunkett 2003).

Dumping sites are now all charted to minimise incidence of snagging by trawlers and ship collisions. In addition, the 1996 Protocol to the London Convention (1972) provides further regulation on the nature of materials allowed to be dumped at sea, so helping to minimise the environmental impacts of ocean waste disposal.

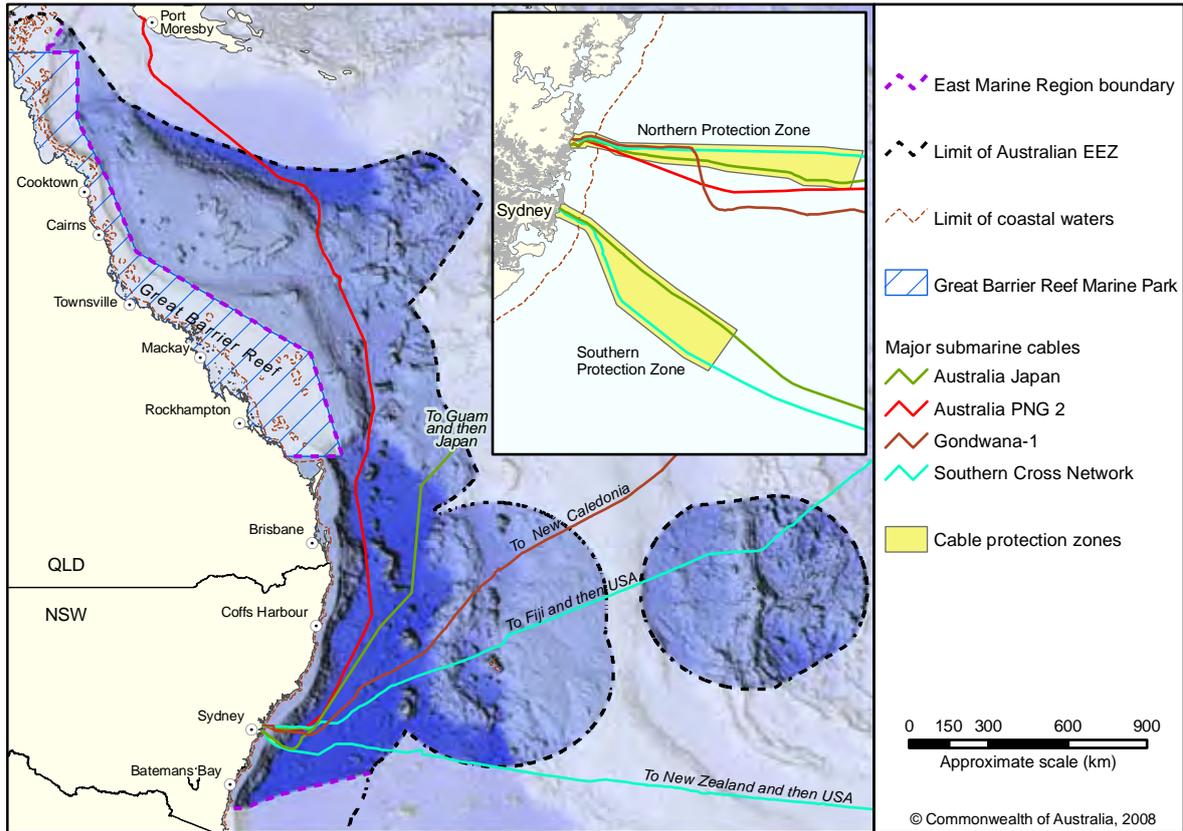
### 5.2.10 Submarine cables

Communications cables are the only form of submarine cable within the Region. They include cables of national significance and several out-of-service cables.

Three operational cables dissect the East Marine Planning Region, being the Australia–Japan Cable, the Southern Cross Cable and the Tasman 2 Cable. The first two support most of the voice and data traffic and are vital to Australia's national infrastructure. Because submarine cables are vulnerable to damage by commercial fishing activities such as trawling by large vessels, potentially leading to significant data and financial losses and serious delays in the flow of information to and from Australia, the government introduced the *Telecommunications and Other Legislation Amendment (Protection of Submarine Cables and Other Measures) Act 2005*. This has allowed the Australian Communications and Media Authority (ACMA) to propose protection zones over those



Figure 5.9 Major submarine cables in the East Marine Region



cables of national significance, effectively prohibiting or restricting activities that may cause damage to cables one nautical mile either side of the cable.

All three operational cables within the East Marine Planning Region are linked to Sydney (see figure 5.9). The Australia– Japan Cable links Sydney to Guam and Japan and has been in service since December 2001. It divides into two about 150 km off the NSW coast with branches landing on the southern and northern sides of Sydney. The Southern Cross Cable consists of two cable routes, one linking Sydney to USA via New Zealand and the other linking Sydney to the USA via Fiji.

The Australia–Japan Cable and the Southern Cross Cable are cables of national significance leading to ACMA proposing protection zones above them (ACMA 2006). The Tasman 2 cable is a 2195 km-long communications cable that has been operational between Sydney and Auckland since March 1992. It is not considered a cable of national significance. Sixteen other cables are located within the Region, none of which are in service.

Australia’s submarine communications cables carry approximately 99% of the international voice and data traffic and are estimated to be worth more than \$5 billion yearly to the national economy (ACMA 2006). Australia’s

bandwidth use tripled in the period between 2004 and 2006 to 157 gigabytes per second (GB/s).

The Australia–Japan Cable and the Southern Cross Cable network are considered to be of particularly high economic value due to the linkages with Japan, the United States and New Zealand, some of Australia’s most significant trading partners (ACMA 2006).

While there is limited information on the effect of laying and maintaining submarine cables, evidence suggests some installation methods could potentially cause adverse effects on the near shore environment including geomorphic alterations and seagrass loss (Austin et al. 2004). However, it is envisaged that with the introduction of cable protection zones, a secondary benefit would include the protection of marine organisms through the exclusion of fishing and other activities that impact on habitats. In addition, older, obsolete and unburied submarine cables attract a variety of species through the provision of habitat and may be utilised in artificial reef construction (Wagner 1994).

Submarine telecommunication cables are typically 69 mm in width and weigh about 10 000 kg per kilometre (Johnson 2008). Optical fibres are sealed inside a copper sleeve that is resistant to deepwater environmental effects and cables are typically dual-armoured with layers of protective steel



Scientists work on the deployment of the towed stereo video camera array, which is capable of working at depths of over 1500m, from the RV Southern Surveyor. Image courtesy of CSIRO.

wires. A negative-buoyancy material is often added to the cables to ensure that they will rest on the seabed (Alwayn 2004).

### 5.2.11 Emerging industries and research

Australia's marine resources provide a number of opportunities for emerging industries due to the vastness of the ocean and its high biodiversity, including biodiscovery and renewable energy.

#### **Marine biodiscovery**

Biodiscovery is the investigation of biological resources such as plants and animals, for properties or characteristics that have a commercial value or some other wider application. Products such as drugs, agrichemicals and industrial enzymes may be created from biological resources and used in a number of applications (Prime Minister's Science Engineering and Innovation Council 2005).

Marine organisms have few physical defence mechanisms and therefore protect themselves by chemical means. As such, many organisms produce venoms, antifouling agents and other biochemical agents that may be utilised for commercial and biomedical applications (Volkman 1999). Their discovery may result in better vaccines, faster diagnosis of diseases, better quality foods and more environmentally friendly products. Sea sponges and other

invertebrates, as well as marine algae, have been some of the most common sources for extracts used in pharmaceuticals.

#### **Renewable Energy**

Australia relies heavily upon non-renewable energy sources to provide electrical power to the population. As the consumption of fossil fuels including oil, gas and coal continues, the availability of hydrocarbons required for power generation is reduced and the emission of greenhouse gases increases. Consequently government and industry are investing in energy from renewable sources for future generations. Renewable energies such as wind, solar, wave, tidal, biomass and hydro energy have also become increasingly popular due to concerns about greenhouse gas emissions that are linked with causing climate change.

Marine-based renewable energy in and around the East Marine Region is currently limited to the coastal environment within state waters of New South Wales. Australia's first wave energy system has been installed at the breakwater wall at Port Kembla near Wollongong. The Port Kembla Wave Energy Plant, incorporating a wave energy generator developed by Energetech Australia Pty Ltd (now Oceanlinx Limited), has proved highly successful, with connection to the main power system forecast for the near future. Trials have shown the turbine system capable of producing 1 GWh of electricity per year.



### 5.3 Indigenous activities

Traditionally, the Indigenous people managed the marine environment through rights and responsibilities granted to them by their laws and customs and through an intimate knowledge of the ocean environment. This knowledge protected marine ecosystems from over-exploitation and ensured the sustainable use of marine resources.

The Indigenous people approached the management of oceans resources in a very different manner to the European settlers. The subsistence economy of the Indigenous people involved taking only enough from the environment to provide for the needs of the family and community, rather than the industrial scale removal of fish for commerce and trade. Although current fisheries management practice has impacted on the ability of the Indigenous people to access traditional foods in this manner, fish remains a major source of protein for coastal Indigenous communities (Barnett and Ceccarelli 2007).

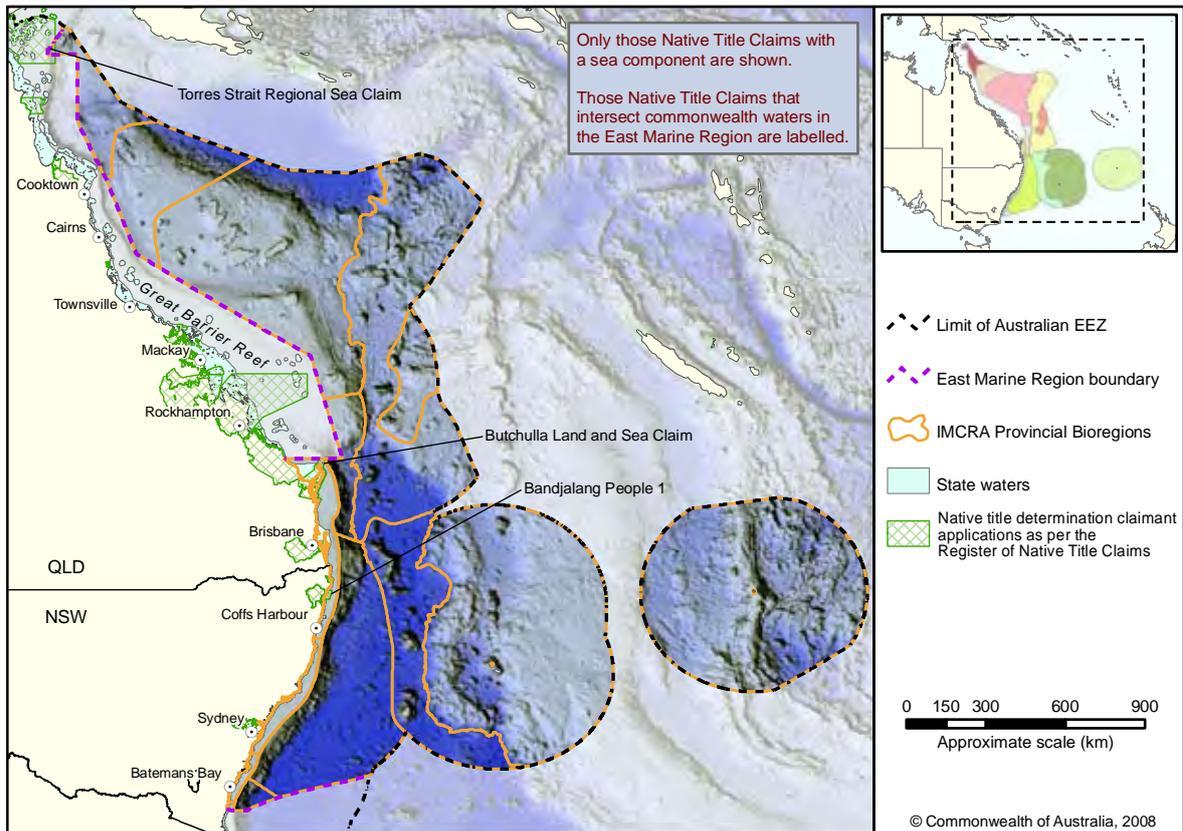
The primary Indigenous resource use in the offshore environment of the Region is fishing. There are few comprehensive surveys of Indigenous fishing activities available. The National Recreational and Indigenous Fishing Survey 2003, and another survey have been conducted in the vicinity of the Region. This other survey in far north

Queensland found that 93.3 per cent of the local Indigenous community participated in fishing activities. About five per cent of that activity took place more than five kilometres offshore in the Great Barrier Reef Marine Park. Although none of this activity took place within the Region, it does demonstrate that the Indigenous people use and access resources in offshore environments (Barnett and Ceccarelli 2007).

Other important species that are traditionally collected in and around the Region and are used by the Indigenous people for cultural or subsistence purposes include shellfish, crabs, lobsters, prawns, turtles, seals, dugongs and mutton birds (Barnett and Ceccarelli 2007).

Aside from utilising the resources of the sea, Indigenous people have a strong cultural connection to the marine environment. Traditional stories and oral histories relating to the waters in and around the Region have been documented and speak of a strong spiritual connection with the sea, describing ancestral origins from sea animals, flooded ancestral sites and the totemic relationship with species such as whales, dolphins and turtles. The exact nature of such traditions vary between different Indigenous communities of the east coast of Australia, however it is clear that the waters of the Region are culturally important to Indigenous people (Barnett and Ceccarelli 2007).

Figure 5.10 Native title claims in waters adjacent to the East Marine Region



Coastal Indigenous peoples of the Region consider their sea country to encompass waters from the coastline to the horizon and sometimes beyond (see appendix B for a description of the native title regime in Australia). There are 27 active native title determination claimant applications as per the Schedule (Federal Court), 24 of which have been entered onto the Register of Native Title Claims. Three of the registered native title determination claimant applications include Commonwealth waters of the East Marine Region, and the other registered and active native title determination claimant applications include sea<sup>12</sup> adjacent to the East Marine Region.

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<sup>12</sup> Sea includes any waters beyond the Australian coastline (mean high water mark).



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#### Map data

#### Figures 5.1 and 5.10

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