

CHAPTER 3 CONSERVATION VALUES OF THE EAST MARINE REGION

Marine Bioregional Plans will identify those components of marine biodiversity and heritage that are recognised as conservation values by the Australian Government. Knowing what the conservation values for each Region are will help in making decisions about proposed developments and other ongoing activities.

For the purpose of marine bioregional planning, conservation values are defined as those elements of the Region that are either specifically **protected** under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the *Historic Shipwrecks Act 1976* (for further information on the legislative framework see appendix B), or have been identified through the planning process as **key ecological features** in the Commonwealth marine environment. Key ecological features are not specifically protected under the EPBC Act, although the marine environment as a whole is a matter of national environmental significance under the Act. Key ecological features are being identified as conservation values within Commonwealth waters to help inform decisions about the marine environment in any given Marine Region.

Matters specifically protected under Part 13 and Part 15 of the EPBC Act that are relevant to the marine environment of the Region are recognised as conservation values. These may include listed threatened, migratory and marine species, listed threatened ecological communities, cetaceans

(whales, dolphins and porpoises), World and National Heritage Places and Commonwealth marine reserves. Historic shipwrecks are also identified as conservation values by virtue of their protection under the *Historic Shipwrecks Act 1976*.

The marine conservation values identified in this section will be the subject of assessment during the development of the Draft East Marine Bioregional Plan to:

- understand the threats posed by current and emerging activities; and
- provide guidance for future decisions under the EPBC Act on potentially significant impacts on listed threatened and migratory species or the Commonwealth marine environment of the East Marine Region.

The nature and location of the conservation values will also be considered in the establishment of Marine Protected Areas as part of the National Representative System of Marine Protected Areas (see chapter 4). However, conservation values will not automatically be included in Commonwealth marine protected areas. In accordance with the Regional Specifications (chapter 4.2), only those marine conservation values for which spatial protection is both desirable and appropriate will be considered in developing the Marine Protected Area network for the Region.



South West Coringa Islet. Image courtesy of Australian Customs.



3.1 Key ecological features of the marine environment

Under the EPBC Act, the 'marine environment' of the Commonwealth marine area is a **matter of national environmental significance** (see Part 3, Division 1, Section 23 of the Act). This means that any action that will have, or is likely to have, a significant impact on the Commonwealth marine environment must be referred to the Minister for the Environment, Heritage and the Arts for assessment and approval. National guidelines have been developed to help in determining whether actions are likely to have a significant impact and these can be found at <www.environment.gov.au/epbc/protect>.

Key ecological features are those features of the marine environment that are not specifically protected under the EPBC Act, but are considered to be important or unique characteristics of the Region potentially deserving of conservation, monitoring or management. For the purpose of marine bioregional planning, key ecological features of the marine environment meet one or more of the following criteria:

- a species, group of species or a community with a regionally important ecological role (e.g. a predator, or a prey species that affects a large biomass or number of other marine species);
- a species, group of species or a community that is nationally or regionally important for biodiversity;
- an area or habitat that is nationally or regionally important for:
 - a) enhanced or high biological productivity (such as predictable upwellings),
 - b) aggregations of marine life (such as feeding, resting, breeding or nursery areas),
 - c) biodiversity and endemism; or
- a unique seafloor feature with known or presumed ecological properties of regional significance.

Within the East Marine Region, key ecological features have been identified from the important ecological features recognised for each of the provincial bioregions in chapter 2.1. The Australian Government has drawn on the best available information to select and describe key ecological features, including advice from scientists and technical experts, and published and unpublished literature and reports on the Region and adjacent areas. Important sources of information used to identify key ecological

features in the Region include the *Description of Key Species Groups in the East Marine Region*, *Ecosystems of the East Marine Region* and *Sedimentology and Geomorphology of the East Marine Region of Australia*, commissioned by the Department of the Environment, Water, Heritage and the Arts.

A scientific workshop was conducted in November 2007, bringing together marine scientists with specific experience and expertise in the Region. The workshop explored what is currently known about the ecosystems of the Region, and scientific understanding of likely interactions and ecosystem processes. The outcomes of the workshop and the commissioned reports mentioned above are available at <www.environment.gov.au/coasts/mbp/publications/east>.

Table 3.1 identifies key ecological features in the East Marine Region determined during the development of this Bioregional Profile, and summarises the rationale used to identify a specific feature as a conservation value in the Region (chapter 2 provides further context for understanding the role of different features in the ecosystem). The collection of further and finer-scale information during the next stage of the planning process will be used to improve our understanding of key ecological features in the Region, and to confirm and refine those features identified during the development of this profile. This information will underpin the analysis of the threats that the marine environment may face over the next 10 to 20 years. The Draft East Marine Bioregional Plan will include a refined list of key ecological features.

Nine key ecological features have been identified in the Region. These include four regionally significant features and five regionally important communities or habitats (table 3.1). Figures 3.1 and 3.2 provide location details for the features identified in table 3.1.



Black-tip reef sharks, Coral Sea. Photo: Mike Ball.

Figure 3.1 Key ecological features (1-5) of the Region

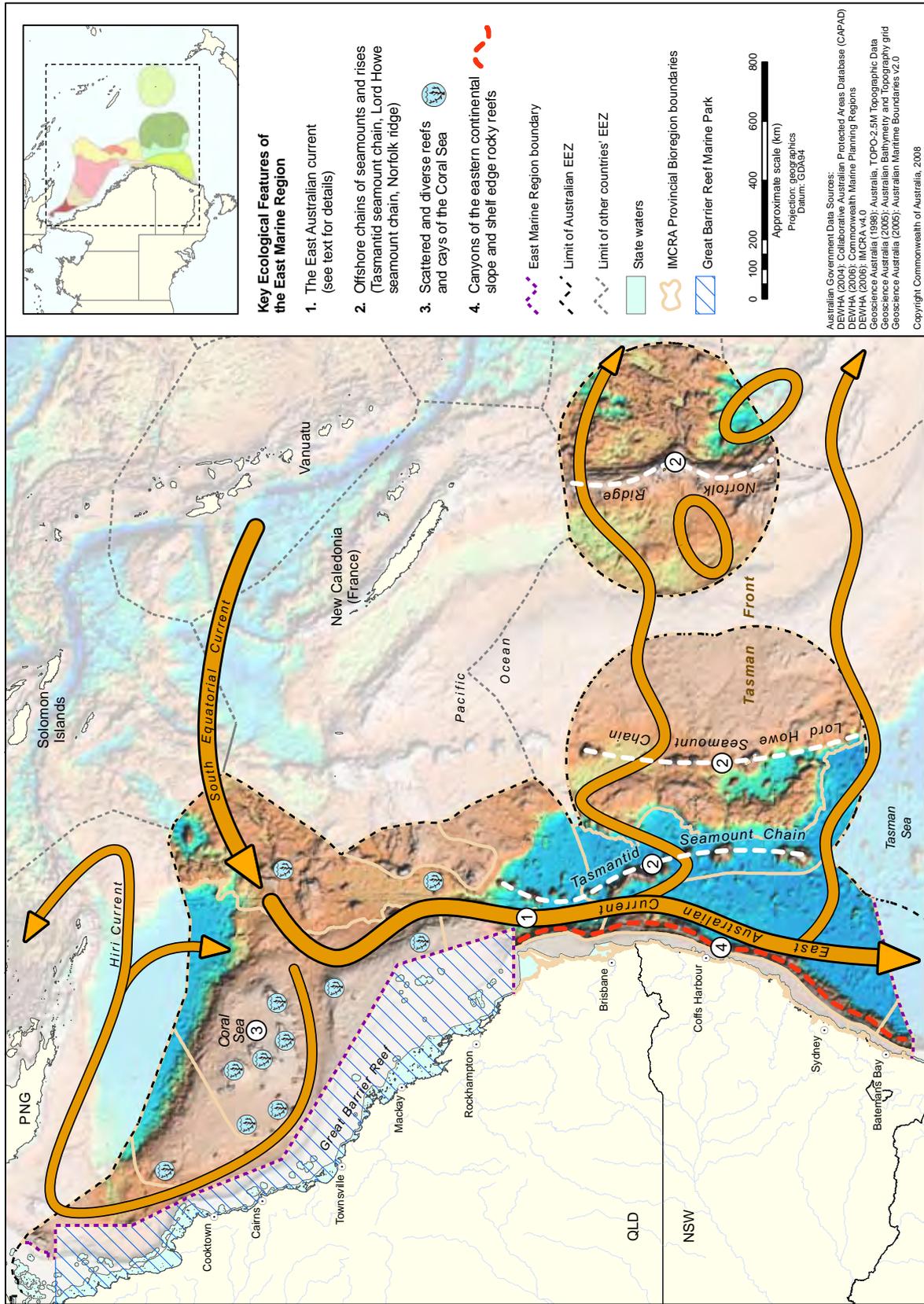


Figure 3.2 Key ecological features (6-9) of the Region

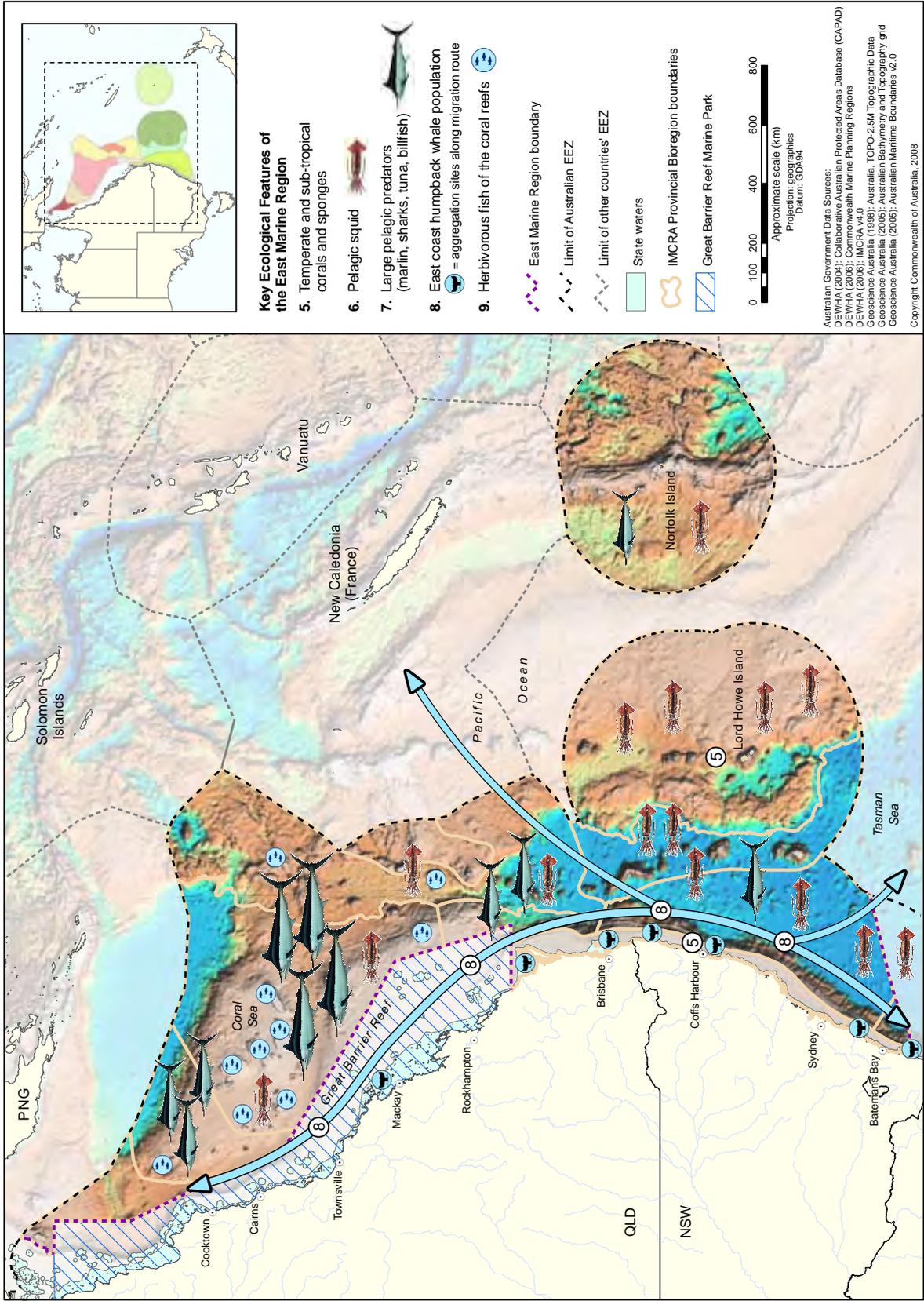


Table 3.1 Key ecological features of the Region

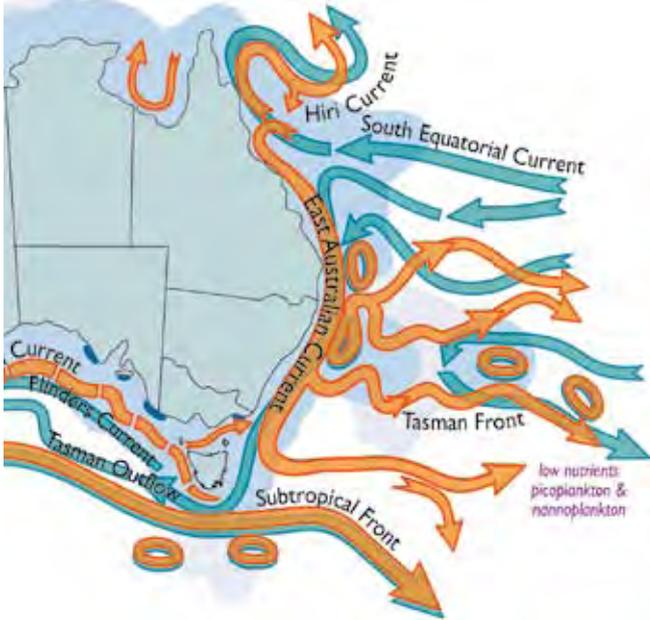
Key ecological features	Provincial bioregions (IMCRA v.4.o)	Rationale
REGIONALLY SIGNIFICANT FEATURES		
<p>1 The East Australian Current</p>	<p>All</p>	<p>Important ecological role; enhanced biological productivity; important for biodiversity; aggregations of marine life</p> <p>The most obvious pelagic feature in the East Marine Region is the East Australian Current (EAC), an iconic oceanographic feature that originates in the north of the region and migrates south.</p> <p>The EAC is formed by the westerly flowing Southern Equatorial Current, which moves into the East Marine Region from the Pacific Ocean through the Coral Sea. It hits the continental shelf between 130S and 220S latitude where it bifurcates into the northward flowing Hiri Current and the much larger EAC.</p> <p>The EAC and its associated gyres and eddies that peel off into the Tasman Sea along the way, is the primary process whereby low-nutrient warm waters are delivered to southern coastal waters and to the outlying Lord Howe and Norfolk Islands to drive the abundance, distribution and dispersal of pelagic and shelf-slope demersal organisms.</p> <p>Towards the southern extent of the East Marine Region, the warm EAC collides with the cold Tasman Front, creating an eddy field that is an iconic and ecologically significant feature of the East Marine Region. Large eddies* can be semi-permanent features that migrate eastwards and can have the effect of trapping and transporting plankton and creating transient fronts and conditions that can attract pelagic fish and other species, including predators and seabirds.</p> <p>The EAC causes upwelling where it moves away from the coast at places like Cape Byron, Smoky Cape and Sugarloaf Point in NSW, drawing nutrient rich water from a depth of 200 m or more.</p> <p>The EAC is the largest ocean current close to the coast of Australia. It is strongest in summer, peaking in February, and weakest – by as much as half its peak flow – in winter, its energy dissipating east of Tasmania. By comparison, the Leeuwin current off Western Australia carries a quarter as much water when peaking in May-June.</p>  <p>Image courtesy of CSIRO Marine Research.</p>



Table 3.1 Key ecological features of the Region

Key ecological features	Provincial bioregions (IMCRA v.4.0)	Rationale
<p>2 Offshore chains of seamounts and rises (including the Tasmantid Seamount Chain, Lord Howe Seamount Chain and Norfolk Ridge).</p>	<p>Kenn Transition, Kenn Province, Tasman Basin Province, Lord Howe Province, Norfolk Island Province</p>	<p>Unique seafloor feature; important ecological role; high biodiversity and endemism; enhanced biological productivity; feeding, resting, breeding and nursery aggregations</p> <p>Seamounts are underwater mountain ranges and pinnacles, the peaks of which rarely reach the surface. Deep ocean currents can concentrate nutrients around seamounts resulting in abundant marine life. These habitats can contain rich deep-sea coral reefs and sponge fields inhabited by unique fauna that is often peculiar to the area. Seamounts are also known to provide aggregation sites for deep-water fin-fish, including orange roughy.</p> <p>Running north-south in the East Marine Region, at approximately 155°E longitude, is the Tasmantid Seamount Chain, a prominent chain of submarine volcanoes extending into the Tasman Basin (Harris et al. 2005).</p> <p>Included in this chain, moving southward, are Fraser Seamount, Recorder Seamount, Moreton Seamount, Brisbane Guyot and the Britannia Guyots, incorporating Queensland Guyot, Stradbroke Guyot, Stradbroke Seamount, Derwent-Hunter Guyot, Barcoo Bank and Taupo Bank. All these features are flat-topped, with the northern seamounts rising from the seabed to summit at water depths of 150 to 400 m (Harris et al. 2005). The southern seamounts are deeper: Stradbroke Seamount rises to 900 m water depth, while Barcoo Bank is at 1400 m water depth (Harris et al. 2005).</p> <p>The Tasmantid Seamounts form a unique deep-sea environment, characterised by substantially enhanced currents and a fauna that is dominated by suspension feeders such as corals (Richer de Forges et al. 2000). Seamounts are an iconic marine habitat that provides topographical structure across the continental slopes and abyssal plains of the deep sea, altering oceanic circulation patterns with local upwellings, turbulent mixing and closed circulation cells.</p> <p>Further east, the Lord Howe seamount chain extends to the north as shallow banks and reefs and to the south as several small seamounts. At its southern end the chain includes Lord Howe Island, an eroded basaltic volcano. These submerged mountains were most likely formed as the result of the Indo-Australian Plate moving northward over a static hotspot of volcanic activity. The Lord Howe seamount chain supports the southernmost coral reefs in the world (Speare 2004).</p> <p>Further east again, the Norfolk Ridge is a contiguous north-south feature at depths of 1000 to 2000 m connecting New Zealand, Norfolk Island and New Caledonia with seamounts and other elevated features at 500–1000 m depth**.</p>
<p>3 The assemblage of scattered and diverse reefs and cays of the Coral Sea</p>	<p>Northeast Transition, Northeast Province, Kenn Transition</p>	<p>Important ecological role; important for biodiversity; feeding, resting, breeding and nursery aggregations</p> <p>An assemblage of atoll-like reefs occurs on a deep shelf (the Queensland and Marion plateaus) between Australia and New Caledonia in the Coral Sea. These coral reefs and atolls sit in very deep clean water and are under the influence of strong oceanic waves and cyclones. Some reefs have coral cays, which are all uninhabited except for a weather station on Willis Island. The reefs are remote from any land influences which has effectively protected them against many of the pressures facing near-shore reefs.</p> <p>The isolated, relatively pristine reefs support resident, or at least narrow home-range species that are often site-attached. Biological communities, for example demersal fish assemblages appear to be distinct from those of the Great Barrier Reef (Oxley et al. 2003, Byron and Thompson 2001)</p>

Table 3.1 Key ecological features of the Region

Key ecological features	Provincial bioregions (IMCRA v.4.0)	Rationale
<p>3 The assemblage of scattered and diverse reefs and cays of the Coral Sea continued...</p>		<p>The Queensland Plateau is situated off Cairns and covers some 165 000 km² (Harris et al. 2003). Approximately half of the plateau surface lies in waters less than 1000 m deep and living reefs occur over 10–50 percent of its surface (Davies et al. 1989). The reef habitats of the Coringa–Herald and Lihou Reef National Nature Reserves support marine benthic flora and fauna that are distinct from those of the Great Barrier Reef. A diverse range of marine algae, sponges, soft and hard corals, crustaceans, starfish, sea urchins, sea cucumbers, and fish have been recorded within the Reserves. The Green Turtle (<i>Chelonia mydas</i>) breeds in the Reserves and a number of species of dolphins and whales are known to occur in the area.</p> <p>The Marion Plateau is situated off the central Queensland coast in the Mackay–Rockhampton region. The plateau covers an area of 36 808 km² and lies in the warm tropical waters of the Coral Sea at depths of 100 to 600 m. It includes two major reefs: Marion Reef (in the north) and Saumarez Reef (in the south) that are the largest of the several small drowned reef-like features on the plateau (Symonds et al. 1983).</p>
<p>4 Canyons of the Eastern Continental Slope and shelf edge rocky reefs</p>	<p>Central Eastern Transition, Central Eastern Province</p>	<p>Unique seafloor feature; important ecological role; enhanced biological productivity</p> <p>The eastern continental slope – which extends from Hervey Bay in Queensland to Bermagui in New South Wales (the southern extent of the East Marine Region) – encompasses a large number of canyons (although not in the density of those in the Southeast Marine Region).</p> <p>The canyons on the eastern slope are topographic features that are believed to favour high biodiversity or endemism. They are also areas of topographically-induced upwelling.</p> <p>The canyons of the eastern slope are of two general types: those that have developed wide ‘box’ heads in the mid slope at approximately 1500 m (e.g. Newcastle Canyon), and those like Sydney Canyon that have linear segments, few tributaries and have their heads in the upper slope. The Newcastle Canyon and box canyons off Jervis Bay also have small, narrow tributary canyons that have incised the upper slope to the shelf break.</p> <p>Canyons are important influences on faunal abundance and composition along the continental shelf and slope. Fisheries along the coast associate good fishing conditions with cold currents at depths, with the most productive grounds clustered around canyons or other abrupt topographical features such as promontories, seamounts and bluffs (Brewer et al. 2007).</p> <p>Canyons channel upwelling water over the slope and shelf, while seasonal downwelling may reverse the flow through these structures (Prince 2001). Winter cooling enhances the difference in density between the coastal and oceanic waters and produces pronounced downwelling in these topographic features, e.g. Tweed Canyon. Generally associated with low nutrient regimes, downwelling of coastal waters may play an important role in breaking down shelf-edge fronts, displacing deeper oceanic slope water and consequently pushing relatively nutrient-rich water towards the photic zone. These topographic features, therefore, create hotspots of productivity for the main commercial shelf-based fisheries (abalone, lobster, scallops, shark, squid, prawn and tuna) and many oceanic predators, including seabirds.</p> <p>Deep sea or submarine canyons are known to occur in the north of the East Marine Region where the Queensland Plateau drops into the Coral Sea Abyssal Basin, and also in the Cape Province bioregion. Here the canyons are very sparse, in much deeper water, and the faunal assemblages associated with these deep sea canyons are not well known (Brewer et al. 2007).</p>



Table 3.1 Key ecological features of the Region

Key ecological features	Provincial bioregions (IMCRA v.4.0)	Rationale
REGIONALLY IMPORTANT COMMUNITIES AND HABITATS		
5 Temperate (reef) corals and sponges.	Lord Howe Province, Central Eastern Shelf Transition	<p>Important ecological role; important for biodiversity</p> <p>The hermatypic corals[#] are a critical species group in the temperate reefs of the East Marine Region since they are ‘reef-building’ i.e. they produce much of the calcium carbonate which makes up the reefs. While calcium carbonate is laid down by a variety of reef organisms, it is likely that without corals, these reefs would cease to exist. With a greatly reduced calcium carbonate production the reefs would be susceptible to erosion from physical (e.g. wave action) and biological (e.g. boring molluscs) processes and, in the longer term, would be unable to keep pace with rising sea levels. Corals also form much of the ‘habitat’ on reefs, providing shelter and food for a wide range of invertebrates and fish.</p> <p>Outside of the tropics, opportunities for reef building are limited by water temperature, reduced day length in winter, and available calcium carbonate for skeleton formation (Kleypas et al. 1999). Hermatypic coral diversity gradually decreases with latitude to 31°S, after which no further reefs exist and only a small number of coral species occur. The southern limit of reef development is seen at Lord Howe Island; however, many hermatypic coral species are present in non-reef environments in coastal areas such as Moreton Bay (Qld) and the Solitary Islands (NSW) and a few species exist right down to the southern limit of the East Marine Region. Ahermatypic corals are present in deeper waters throughout the East Marine Region continental shelf, slope and offslope regions, to well below the limit of light penetration.</p> <p>Unlike some other marine invertebrate phyla, there are no apparent latitudinal gradients of sponge species richness from temperate to tropical waters, with both having patchy mosaics of very rich and poor faunas. Ecologically, sponges are a highly significant component of temperate reef ecosystems as they are:</p> <ul style="list-style-type: none"> • generally the most efficient seawater filtering recyclers • the dominant primary producers in some marine systems (Wilkinson 1983) • the predominant bioeroders and recyclers of calcium carbonate back into the system in coralline habitats (Schönberg and Wilkinson 2001) • important refuges for many small invertebrates and microbes (Wilkinson 1984b, Wilkinson 1984a) • used as protection by fish and larger invertebrates. <p>The Solitary Islands</p> <p>The Solitary Islands region contains the southernmost extensive coral communities in coastal eastern Australia (Zann 2000). Tropical coral larvae are transported by the East Australian Current, possibly from the southern Great Barrier Reef and the subtropical reefs in south-east Queensland and far northern New South Wales. However, it is likely there is also some local recruitment of subtropical species from within the region.</p>

Table 3.1 Key ecological features of the Region

Key ecological features	Provincial bioregions (IMCRA v.4.0)	Rationale
5 Temperate (reef) corals and sponges continued...		<p>Lord Howe Island</p> <p>While sparse coral growth may be present at other areas farther south, Lord Howe Island is regarded as the world's southernmost locality exhibiting a well-developed barrier coral reef community and associated lagoon (Allen et al. 1976). Many of the species that have been recorded from waters of Lord Howe Island are extremely rare in that area, and may have resulted from chance recruitment of only a few larvae which did not establish a self-seeding population (Harriott et al. 1993). There is some debate as to whether Lord Howe Island reefs are reliant on replenishment of larvae from the Great Barrier Reef or from local brooding corals (Veron and Done 1979, Harriott 1992).</p>
6 Pelagic squid	All	<p>Important ecological role</p> <p>Squid are the dominant cephalopod^{##} in the open pelagic environment over the continental shelves, slopes and in the open ocean, including the deep sea. Squid are voracious eaters, all are predators and cannibalism is not uncommon. In the marine food web they serve as both important predators and prey. While they prey on many fish, crustacean and cephalopod species, they in turn serve as important prey for a variety of vertebrate predators such as oceanic birds, sharks, tuna, billfish, seals and cetaceans.</p> <p>Squid are important in the food pyramids of our eastern oceans. Squid play a central role in many pelagic food webs by linking the massive biomass of micronekton, particularly myctophid fish, to many oceanic predators, including seabirds.</p> <p>Characterised by short life spans and fast growth rates, squid may respond more readily to changes in the environment and the trophic structure than any other mid-trophic-level organism in the open ocean (Olsen and Young 2006).</p> <p>In this Region, the Southern Squid Jig Fishery operates south of latitude 24° 30' S. The marine species targeted is the arrow squid. Catches are mainly taken between Queenscliff and Portland, off the Victorian coastline and south of Kangaroo Island, off the South Australian coast with some historical activity reported from the waters around Tasmania. Squid is also taken as bycatch in the South East Trawl Fishery.</p> <p>Due to ecological interactions and lack of knowledge about the lifecycles and interdependences of the different species, sustainable management of squid fisheries is particularly challenging. Overharvesting could be disadvantageous from both economic and conservation viewpoints. For example, the direct contribution of squid to fisheries could be less valuable than their indirect contribution through ecological enhancement of fish production and production of species of non-consumptive value (Hunsicker et al. 2006).</p>
7 Large pelagic predators (sharks, tuna and billfish)	All	<p>Important ecological role</p> <p>Pelagic predators occupy one of the largest ecosystems on the planet – the surface and water column of the open ocean.</p> <p>While pelagic predators range throughout the East Marine Region, the East Australian Current is a major avenue of connectivity between the northern and southern parts of the Region. Aggregations of pelagic predators are often found around seamounts, which provide refugia for prey species and consequently feeding locations for associated pelagic predators (Richer de Forges et al. 2000, Hixon and Beets 1993, Norse and Crowder 2005).</p>



Table 3.1 Key ecological features of the Region

Key ecological features	Provincial bioregions (IMCRA v.4.0)	Rationale
<p>7 Large pelagic predators (sharks, tuna and billfish) continued...</p>		<p>Some of the large pelagic predators that occur in the East Marine Region include tuna, billfish (e.g. swordfish and marlin) and sharks. These species are often at the end of long food chains, where they have a crucial role in maintaining and determining the health of ecosystems. Top predators that are migratory or disperse widely have the potential to transfer energy across wide areas (Zainuddin et al. 2006). Thus, they may be important connections between mostly separate foodwebs.</p> <p>Tunas, billfish and sharks are valuable species economically and socially, representing high value to both commercial and recreational fishers in the East Marine Region.</p> <p>In the Coral Sea, seasonal increases in the abundance of pelagic predators – billfish in particular – forms the basis of a significant recreational and commercial fishery. Indeed, Kenn Reef and Wreck Reef are areas where game fishing charters fish for large pelagic predators such as billfish, tuna and giant trevally.</p> <p>One large pelagic predator is the black marlin <i>Makaira indica</i>, which is distributed throughout the tropical and sub-tropical Indian and Pacific Oceans and generally near landmasses. Black marlin spawning aggregations in the Cairns-Lizard Island region between September to December, are important as the only recognised spawning events for this species. Between January and March black marlin are found along the continental slope off New South Wales and during April to August, they move to waters of the Solomon Islands and eastern Papua New Guinea. Juvenile black marlin spend the early stages of growth on the Great Barrier Reef before migrating out into the Pacific Ocean.</p> <p>The black marlin in the north-western Coral Sea are thought to be part of much larger stocks which inhabit the Western and Central Pacific Ocean. Black marlin can live to 20 years or more, grow to 4.5 metres long and weigh 700 kilograms. Mature female black marlin are larger than the males, which grow to maximum of 250 kilograms.</p> <p>References:</p> <p>Russell, M. and Walsh, A. (unpublished) <i>Billfish and Swordfish in the Great Barrier Reef Marine Park Game Boat Fishery - A compendium of information and basis for the development of policies and strategies for the conservation of target game boat fishery species</i>. Great Barrier Reef Marine Park Authority, Townsville.</p> <p>Speare, P. 2009, AIMS Research – <i>Black Marlin</i>, <http://www.aims.gov.au/pages/research/marlin/black/pages/bm-00.html> accessed 23/03/2009.</p>
<p>8 The East Coast Humpback whale population</p>	<p>All except for Norfolk Island Province and Lord Howe Province</p>	<p>Resting, breeding and nursery aggregations</p> <p>Each year, between April and November humpback whales can be seen migrating along the east coast of Australia. These animals undertake an annual migration of 10 000 km between the waters of the Southern Ocean where they feed on krill and the warmer waters of their calving grounds in the Great Barrier Reef.</p> <p>The majority of humpbacks migrate north from June to August and south from September to November. The exact timing of the migration period can change from year to year and may be influenced by a number of factors including water temperature and prey abundance. Typically, groups of young males lead the migration of the majority of humpbacks while pregnant cows and cow/calf pairs follow behind.</p>

Table 3.1 Key ecological features of the Region

Key ecological features	Provincial bioregions (IMCRA v.4.o)	Rationale
8 The East Coast Humpback whale population continued...		<p>At a maximum of 16 m in length, the humpback whale isn't the largest of the whales that occurs in Australian waters but it is arguably the most iconic. Australians have a particularly strong affinity with this species whose acrobatic displays and ease of recognition have made it popular with the whale watching industry.</p> <p>It is not uncommon to see humpback whales from a beach or headland along the Australian east coast between April and November. For a closer encounter, whale watching operators take people out on the water and closer to the migration path of humpback whales. Whale watching boats operate out of many coastal towns along the east coast including Eden, Sydney and Byron Bay in New South Wales and the Gold Coast and Hervey Bay in Queensland.</p>
9 Herbivorous fish of coral reefs	All except for Tasman Basin Province, Central Eastern Shelf Province, South-east Shelf Transition, and Southeast Transition	<p>Important ecological role</p> <p>Herbivorous fish form a functional group that is significant for maintaining the ecological resilience of coral reefs to disturbances. Herbivorous fish along with sea turtles and a range of other organisms graze on algae on coral reefs and help maintain the domination of corals. The decline in the abundance of sea turtles over the East Marine Region has emphasised the importance of herbivorous fish as the primary grazers of algae on coral reefs.</p> <p>The removal of herbivorous fish from coral reefs in other areas of the world has led to a regime shift from a coral-dominated reef system to an algae-dominated reef system. Once this shift occurs it may be very difficult to reverse (McCook 1999).</p> <p>A regime shift from coral-dominated to algae-dominated reefs in Australian waters would mean major losses in biodiversity, ecosystem function, tourism values, and loss of habitat for key fishery species. Maintaining the diversity and abundance of herbivorous fish on coral reefs is also important for the recovery of coral reefs from disturbances such as coral bleaching events, fertiliser run-off, cyclones, and crown-of-thorns starfish outbreaks. With herbivorous fish, disturbed coral reefs may recover over a space of 5–20 years, but without herbivorous fish the system can quickly become dominated by algae beds which may be irreversible (McCook 2008).</p> <p>Some of the key families of herbivorous fish that occur on coral reefs in the East Marine Region include members of the families Scaridae (Parrotfish); Acanthuridae (Surgeonfish); Pomacentridae (Damselfish); and Siganids (Rabbitfish); Kyphosidae (Chubs); and Ehippidae (Batfish). These species are not targeted as food species in Australia, although some fish are taken by spearfishers and marine aquarium fishers. There is an Asian seafood market for these fish which has put pressure on their survival on reefs in other areas (Hughes et al 2003; Berkes et al 2006).</p>

* Ocean eddies can be 200 km across, rotating mainly anti-clockwise at up to four knots at the edge, and can be more than 1 km deep and have a life of up to a year.

** A joint Australian–New Zealand survey, NORFANZ, was carried out in 2003, to identify the biodiversity and endemism of the benthic seamount fauna on the Norfolk Ridge. During this survey, 516 species of fish and macroinvertebrates were recorded, 36 percent of which were new to science and potentially endemic to this region (Williams et al, 2006).

Hermatypic ('reef building') corals contain and depend upon zooxanthellae (algae) for nutrients. Ahermatypic corals do not contain zooxanthellae, and rely mainly on plankton for nutrients. They are generally smaller than hermatypic corals and often solitary.

Cephalopods include octopus, cuttlefish, nautilus and squid.



3.2 Nationally protected species

Species listed under the EPBC Act are commonly referred to as ‘protected species’ because it is an offence to kill, injure, take, trade, keep or move a listed species without authorisation. Under the EPBC Act, species can be listed as threatened, migratory, cetaceans or marine:

- *Threatened species* – are those species that have been identified as being in danger of becoming extinct;
- *Listed Migratory species* – are those species that are listed under:
 - the *Convention on the Conservation of Migratory Species of Wild Animals 1979* (also known as the CMS or Bonn Convention);
 - the *Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment 1974* (JAMBA);
 - the *Agreement between the Government of Australia and the Government of the People’s Republic of China for the Protection of Migratory Birds and their Environment 1986* (CAMBA);
 - the *Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds 2007* (ROKAMBA); or
 - any other international agreement, or instrument made under other international agreements approved by the Minister for the Environment, Heritage and the Arts².
- *Cetaceans* (including whales, dolphins and porpoises) – all species of cetacean are protected under the EPBC Act to ensure their long-term conservation;
- *Listed Marine Species* – species belonging to taxa that the Australian Government recognises as requiring protection to ensure their long-term conservation (in accordance with Section 248 of the EPBC Act). Listed marine species occurring in the Region include:
 - sea snakes (families Elapidae and Colubridae);
 - marine turtles (families Cheloniidae and Dermochelyidae);
 - fur seals (family Otariidae);
 - seahorses, pipefish, pipe horses and sea dragons (family Syngnathidae); and
 - birds (seabirds, shorebirds, waterbirds and a number of other coastal or migratory birds that occur naturally in marine environments).

Species can also be listed under more than one category; for instance albatrosses and some marine turtles are listed as threatened species, migratory species and marine species.

All protected species are also included under Part 13A of the EPBC Act which regulates the international movement of wildlife and wildlife products, including the:

- export of Australian native species other than those identified as exempt;
- export and import of species included in the appendices to the *Convention on International Trade in Endangered Species on Wild Fauna and Flora 1973* (CITES); and
- import of live plants and animals that (if they became established in Australia) could adversely affect native species or their habitats.

Under the EPBC Act species listed as ‘threatened’ or ‘migratory’ are matters of national environmental significance. Species listed in the extinct or conservation dependent categories are not matters of national environmental significance under the EPBC Act. Proposals for activities that will, or are likely to have, a significant impact on matters of national environmental significance must be referred to the Minister for the Environment, Heritage and the Arts for approval.

Significant Impact Guidelines – Matters of National Environmental Significance has been published to advise proponents on when referrals should be submitted for approval. These guidelines provide advice about the kinds of actions likely to have a significant impact on threatened and migratory species. The guidelines also provide specific advice about the kinds of actions likely to have a significant impact on the Commonwealth marine environment. Under these guidelines for the Commonwealth marine environment, any actions that will, or are likely to, ‘have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (e.g. breeding, feeding, migratory behaviour, life expectancy) and spatial distribution’ are identified as actions that should be referred for approval. The guidelines are available at <www.environment.gov.au/epbc/protect>.

Species listed under the EPBC Act are also protected from adverse interactions with commercial fishing operations. Under the EPBC Act all fisheries managed under Commonwealth legislation, and State-managed fisheries that have an export component, must be assessed to ensure that fisheries are managed in an ecologically sustainable way. These fisheries assessments are conducted using the *Guidelines for the Ecologically Sustainable Management of Fisheries*. These guidelines specify that fisheries must be conducted in a manner that does not threaten by-catch species and that ‘avoids mortality of, or injuries to, endangered, threatened or protected species’.

² Further information on the CMS, JAMBA, CAMBA and ROKAMBA is provided in Appendix A

Further information about fisheries assessments carried out under the EPBC Act is available at <www.environment.gov.au/coasts/fisheries/publications/assessments.html>.

The EPBC Act includes other forms of protection for listed species to ensure that human activities do not threaten their survival in the wild (see appendix B for further information and relevant links).

3.2.1 Protected species in the East Marine Region

The East Marine Region is an important area for many species that are protected under the EPBC Act. Many of the species listed under the EPBC Act are also protected under State and Territory legislation; for instance, marine turtles are protected under the EPBC Act, and under Queensland and New South Wales legislation.

There are 106 species protected under the EPBC Act that are known to occur in the Region: 37 species listed as threatened, 82 as migratory, 30 cetaceans and 71 listed as marine³ (table 3.2). In addition, there are other species that may infrequently occur in the Region. Species that may infrequently occur in the Region are defined as those that:

- are accidental visitors to the Region; or
- are considered as species that may occur in the Region on the basis of available information about their range.

Appendix C lists all species protected under the EPBC Act that are known to occur and all that may infrequently occur in the Region. Note that, at the time of completing this Bioregional Profile (2008), there are no species known to have become extinct in the Region.

Protected species group report cards have been prepared for each of the broad taxonomic groups listed under the EPBC Act that are known to occur in the Region (appendix D). The report cards identify the threatened and migratory listed species that are known to occur in the Region, describe their ecology, identify the important areas for them within the Region, explain what processes and activities pose a threat to their continued survival and identify how these threats are being mitigated. The report cards also point to relevant references and research for further reading. The report cards are available on the internet at <www.environment.gov.au/coasts/mbp/east> and will be updated as new information becomes available. Protected species group report cards are available for sharks, bony fish (including seahorses, pipefish, pipehorses and sea-dragons), reptiles (marine turtles and sea snakes), seabirds, pinnipeds (fur seals, seals and sea lions) and cetaceans (whales, dolphins and porpoises) occurring in the East Marine Region.

³ Species can be listed in more than one category under the EPBC Act. For instance, the Humpback Whale is listed as a cetacean, a threatened species (Vulnerable), and a migratory species.

Table 3.2 Number of protected species known to occur in the Region by broad taxonomic group (as of February 2008)

Threatened Species					Migratory Species	Cetaceans (whales, dolphins & porpoises)	Listed Marine Species
	Critically Endangered	Endangered	Vulnerable	Conservation Dependent			
Sharks	1		2		2		
Bony Fish				1			All sygnathids
Reptiles (marine turtles and seasnakes)		2	4		6		6 turtle species and all seasnakes
Seabirds	1	4	17		63		63
Pinnipeds (fur seals, seals and sea lions)							2
Cetaceans		2	3		11	30	
	37				82	30	71





Grey nurse shark. Photo: David Harasti.

Important areas for species listed as ‘threatened’ or ‘migratory’ under the EPBC Act (i.e. those protected species that are matters of national environmental significance) have been identified to assist in understanding the factors that may impact on their conservation during development of the Draft East Marine Bioregional Plan. There are areas within the East Marine Region that have been recognised as important sites for national protected species. The coastal lands and State waters adjacent to the Region contain many areas known to be important for protected species. Table 3.3 describes the known breeding, nursery, calving, feeding and resting areas, and other known aggregation sites within and adjacent to the Region that are important for listed threatened and migratory species. These areas were identified on the basis of available information and expert advice for:

- Sharks: nursery grounds and feeding areas
- Fish (orange roughy): aggregations
- Reptiles (marine turtles): foraging areas
- Seabirds: rookeries and known feeding areas are identified
- Pinnipeds (seals, fur seals and sea lions): breeding colonies and surrounding waters
- Cetaceans (whales, dolphins and porpoises): feeding, calving and resting areas on migratory routes in the Region.

Further important areas may be identified for species protected under the EPBC Act during the next stage of the planning process, as more detailed information about the Region and the current and potential threats to protected species becomes known. The Draft East Bioregional Plan will include any important areas that are identified.

Table 3.3 Important breeding, feeding and resting areas for species listed as threatened or migratory under the EPBC Act

Important Areas	Species and rationale
Inshore waters off New South Wales and southern Queensland	<p>Critical habitat – grey nurse shark Specific critical habitat locations adjacent to the Region at Byron Bay, Brooms Head, Solitary Islands, South West Rocks, Forster, Seal Rocks, Port Stephens, Sydney, Bateman’s Bay and Narooma are known key aggregation sites for grey nurse sharks. The Cod Grounds off Laurieton and Pimpernel Rock near the Solitary Islands are the two critical habitat locations within the East Marine Region. Critical habitat sites in Queensland adjacent to the Region exist off Moreton and Stradbroke Islands and Rainbow Beach.</p> <p>Juvenile habitat – white shark Areas adjacent to the Region off Garie beach, Wattamolla and Port Stephens. Newcastle (New South Wales) and some areas off southern Queensland appear to be seasonally important for juvenile white sharks.</p>
Upper-mid slope of the continental shelf off central and southern New South Wales	<p>Aggregation area – Harrison’s, endeavour and southern dogfish and orange roughy spawning areas</p>
Islands and reefs within the Coral Sea	<p>Nesting and foraging area – marine turtles One of eight Australian and south-west Pacific green turtle populations are identified as regularly nesting on the islets of the Coringa–Herald National Nature Reserve. The hawksbill turtle occasionally uses these locations for nesting.</p> <p>Nesting and foraging area – seabirds The islets and coral reefs in the Coral Sea Islands Territory including the RAMSAR-listed Coringa–Herald and Lihou Reef National Nature Reserves.</p>
Montague Island and Steamers Head off New South Wales	<p>Foraging areas and haul-out sites – Australian and New Zealand fur-seals Although Montague Island and Steamers Head fall within the waters managed by the New South Wales Government, they are immediately adjacent to the East Marine Region and are the only haul-out sites for Australian and New Zealand fur-seals within close proximity to the Region. Seals using these haul-out sites are known to forage in the waters of the Region.</p>
The Great Barrier Reef, Whitsunday islands, Hervey Bay, Stradbroke Island, Cape Byron, Coffs Harbour, southern coast of NSW	<p>Calving area and migration route – whales The Great Barrier Reef which is adjacent to the Region is a calving ground for humpback whales. Also adjacent to the Region, the Whitsunday islands, Hervey Bay, Stradbroke Island, Cape Byron, Coffs Harbour and the southern coast of New South Wales are key localities for humpback whales as aggregation and resting areas along their eastern migration route. The northern Great Barrier Reef is a key locality for dwarf minke whales to aggregate in winter.</p>
Lord Howe Island and Elizabeth and Middleton Reefs	<p>Seabird nesting and foraging, unique marine assemblages Lord Howe Island is managed by the New South Wales Government but is an important nesting site for seabirds that forage in the Region. The waters around Lord Howe Island and the nearby Elizabeth and Middleton Reefs are Commonwealth Reserves protected under the EPBC Act. These Reefs – the southern-most open-ocean platform coral reefs in the world – contain a unique mix of rare fish such as the black cod, maori wrasse and galapagos sharks</p>



Hawksbill turtle. Photo: Paradise Ink.



Australian fur seals. Image courtesy of CSIRO.

3.3 Protected Places

The Australian Government has responsibility for the conservation of Australia’s natural, Indigenous and historic heritage including the management of protected places on World, National and Commonwealth Heritage Lists and the Register of National Estate. Protected places likely to occur in the marine environment include Marine Protected Areas and historic shipwrecks.

Within, or immediately adjacent to, the East Marine Region there are six Commonwealth Marine Protected Areas, two World Heritage Properties⁴, three National Heritage Places⁵, two internationally important wetlands, and there are likely to be hundreds of historic shipwrecks⁶.

The Great Barrier Reef Marine Park is the largest living organism in the world, stretching for over 2000 km and containing the world’s largest collection of coral reefs. It is a Marine Park, a World Heritage Property and a National Heritage Place. More information on the Great Barrier Reef, including its zoning, is available at: <www.gbrmpa.gov.au>.

3.3.1 Marine Protected Areas

The history of Marine Protected Areas in Australia’s (Commonwealth) waters extends back to 1975 when the Great Barrier Reef Marine Park was established. In the following decades, a number of additional Marine Protected Areas were declared, each nominated because they contained conservation features identified as being of particular significance. In the East Marine Region, there are six Commonwealth Marine Protected Areas from Coringa–Herald Marine Park in the north to Lord Howe Island Marine Park in the south (figure 3.4). A brief description of these is given below.

In addition, there are a number of marine reserves in State waters adjacent to the East Marine Region. For instance, the New South Wales Government has protected six areas along its coastline, including; Cape Byron Marine Park, Solitary Islands Marine Park, Port Stephens–Great Lakes Marine Park, Jervis Bay Marine Park, Batemans Marine Park, as well as the Lord Howe Island Marine Park, to conserve marine biological diversity, marine habitats and ecological processes.

⁴ The Great Barrier Reef Marine Park and Fraser Island are immediately adjacent to the East Marine Region.

⁵ The Great Barrier Reef Marine Park, Fraser Island, and Kingston and Arthurs Vale Historic Area (KAVHA) Norfolk Island are immediately adjacent to the East Marine Region.

⁶ Any as yet undiscovered shipwrecks older than 75 years are protected under the *Historic Shipwrecks Act 1976*.

Coringa–Herald National Nature Reserve

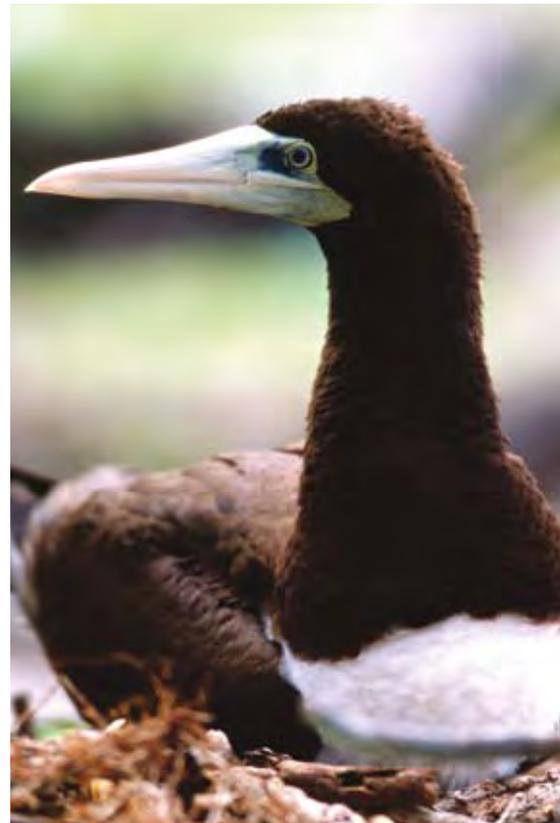
The Coringa–Herald National Nature Reserve lies in the Coral Sea, about 400 km east of Cairns.

Coringa–Herald National Nature Reserve is 100 km from Lihou Reef National Nature Reserve: collectively they are known as the Coral Sea National Nature Reserves. They lie in a remote oceanic environment on the Coral Sea Plateau, which is separated from the Great Barrier Reef by an area of deep water known as the Queensland Trough.

The islands in the Coringa–Herald National Nature Reserve include the only forested cays in the entire Coral Sea Islands Territory. During the breeding season, large concentrations of migratory seabirds congregate on the small isolated islands. The reserve also contains near pristine and internationally significant reef ecosystems, cays and important undisturbed habitat for nesting green turtles.

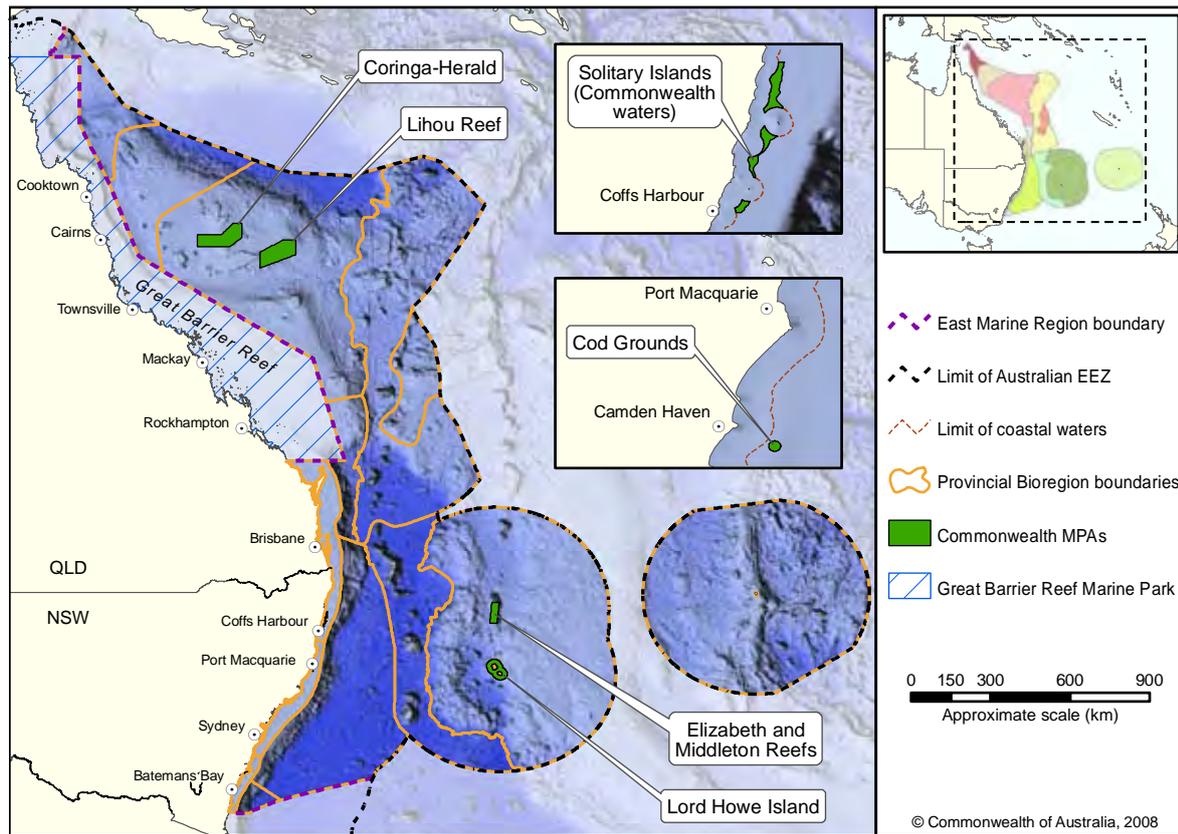
Proclamation date	16 August 1982
Size	885 261 ha (8 852 km ²)
IUCN category	Ia (<i>Strict Nature Reserve</i>)
Provincial Bioregion	Northeast Province

Further information on the Coringa–Herald National Nature Reserve is available at <www.environment.gov.au/coasts/mpa/coringa/index.html>.



Brown booby. Photo: Fusion Films.

Figure 3.3 Marine Protected Areas of the East Marine Region



Lihou Reef National Nature Reserve

The Lihou Reef National Nature Reserve is located in the Coral Sea, some 630 km ESE of Cairns. The reserve comprises about 8440 km² of seabed and a horseshoe-shaped reef system containing 18 cays.

Lihou Reef National Nature Reserve is 100 km from Coringa-Herald National Nature Reserve in a remote oceanic environment on the Coral Sea Plateau, separated from the Great Barrier Reef by an area of deep water known as the Queensland Trough.

The Lihou Reef National Nature Reserve is the largest reef structure in the Coral Sea. It is best known for its:

- pristine environmental condition;
- shelf-edge oceanic reef;
- rich and diverse marine flora and fauna, including potentially undescribed species;
- spectacular and unusual underwater topography;
- internationally significant populations of breeding seabirds; and
- undisturbed habitat for nesting green turtles.

The reef habitat supports marine benthic flora and fauna that are distinct from those of the Great Barrier Reef.

A diverse range of marine algae, sponges, soft and hard corals, crustaceans, starfish, sea urchins, sea cucumbers, and fish have been recorded within the Reserve. The green turtle breeds in the Reserve and a number of species of dolphins and whales are also known to occur in the area.

Proclamation date	16 August 1982
Size	842 896 ha (8 428 km ²)
IUCN category	1a (Strict Nature Reserve)
Provincial Bioregion	Northeast Province

Further information on the Lihou Reef National Nature Reserve is available at <www.environment.gov.au/coasts/mpa/lihou/index.html>.



Anne Cay, Lihou Reef National Nature Reserve. Image courtesy of Australian Customs.



Solitary Islands Marine Reserve (Commonwealth Waters)

Solitary Islands Marine Reserve (Commonwealth Waters) is located 600 km NNE of Sydney, between Coffs Harbour and Plover Island. It is adjacent to the Solitary Islands Marine Park (New South Wales) and extends from the 3 nautical mile State limit seaward to the 50 m depth contour. It encompasses the waters, seabed and subsoil beneath the seabed to a depth of 1000 m. The Park is 710 km² in area with the Reserve covering a further 160 km².

Most of the Reserve is a General Use Zone (IUCN category VI) with two special management zones in the northern section of the Reserve – a Sanctuary Zone (IUCN category Ia – strict nature reserve), and a Habitat Protection Zone (IUCN category IV – habitat/species management area).

The Solitary Islands Marine Reserve protects and conserves a relatively undisturbed, distinct and species-rich ecosystem associated with open ocean, subtidal reef and soft substrate habitats.

Pimpernel Rock is the most significant feature in the Reserve. It is a submerged pinnacle that rises from the seabed to within a few metres of the surface, providing habitat for benthic communities, pelagic fish, grey nurse sharks, black cod, and marine turtles.

The Reserve is located in a mixing zone between tropical and temperate environments, and many species are at, or close to, either their southern or northern geographical limits.

Proclamation date	3 March 1993
Size	16 000 ha (160 km ²)
IUCN category	Includes three Zones as follows: Sanctuary Zone – IUCN Category Ia (79 ha or 0.79 km²) Habitat Protection Zone – IUCN Category IV (3746 ha or 37 km²) General Use Zone – IUCN Category VI (11 930 ha or 119 km²)
Provincial bioregion	Central Eastern Shelf Transition

Further information on the Solitary Islands Marine Reserve (Commonwealth Waters) is available at <www.environment.gov.au/coasts/mpa/solitary/index.html>.

Elizabeth and Middleton Reefs Marine National Nature Reserve

Elizabeth and Middleton Reefs Marine National Nature Reserve is located in the Tasman Sea approximately 600 km east of Coffs Harbour. The reserve includes two separate reefs, Elizabeth Reef and Middleton Reef.

Elizabeth Reef is at latitude 29° 56'S and longitude 159° 05' E. Middleton Reef is at latitude 29° 27' S and longitude 159° 07' E.

Elizabeth and Middleton Reefs, together with reefs around Lord Howe Island 150 km to the south, are regarded as the southernmost coral reefs in the world. Their location where tropical and temperate ocean currents meet contributes to an unusually diverse assemblage of marine species.

Elizabeth and Middleton Reefs are on the peaks of volcanic seamounts. There are more than 20 such peaks in the Tasman Sea, but few rise above sea level. At high tide, when the Elizabeth and Middleton Reefs are almost totally submerged, they appear as only rings of white breakers, except for a small sand cay at Elizabeth Reef.

The reefs are among the few last remaining strongholds of the black cod. The black cod is widely distributed throughout most habitats at Elizabeth and Middleton Reefs, which are also the southernmost limit of the Queensland Groper.

Proclamation date	23 December 1987
Size	187 726 ha (1877 km ²)
IUCN category	Habitat Protection Zone - Category II, Sanctuary Zone - Category Ia
Provincial bioregion	Lord Howe Province

Further information on the Elizabeth and Middleton Reefs Marine National Nature Reserve is available at <www.environment.gov.au/coasts/mpa/elizabeth/index.html>.



Elizabeth Reef. Photo: Richard Chesher Ph.D.



Lord Howe Island Group. Photo: Ian Hutton and the Department of the Environment, Water, Heritage and the Arts.

Lord Howe Island Marine Park (Commonwealth Waters)

The Lord Howe Island Marine Park (Commonwealth Waters) is located in the Tasman Sea, some 700 km north-east of Sydney.

The perimeter of the Lord Howe Island Marine Park roughly corresponds to the 1800 m depth contour that follows the base of the seamounts that underlie Lord Howe Island and Ball’s Pyramid. The sea area of the Park is 300 510 ha and includes the sea-bed to a depth of 100 m.

Lord Howe Island and Ball’s Pyramid are part of a chain of seamounts that are the remnants of a once-extensive volcanic system active in the late Miocene. The Island is part of the State of New South Wales and is surrounded by State waters (out to 3 nautical miles) and Commonwealth waters out to a distance of 200 nautical miles.

The Commonwealth marine park complements the existing State marine park and World Heritage Area and extends protection to the deeper water environment, benthic habitats and attendant flora and fauna.

The primary objective of the Park is to protect the seamount system and its conservation values of marine biodiversity, habitats and ecological processes. Such

protection ensures the long-term maintenance of the high quality marine environment important to the Island’s tourism industry, as well as the traditions and lifestyle of the local community.

Due to its distance from any large landmass, the Island’s marine ecosystem is largely in an undisturbed, natural state. The alternating influences of warm and cool currents create a transition zone between temperate and tropical regions that contributes to an unusual mix of tropical, sub-tropical and temperate marine fauna and flora and a high level of endemism.

Proclamation date	21 June 2000
Size	300 500 ha (3005 km ²)
IUCN category	Habitat Protection Zone - Category IV, Sanctuary Zone - Category Ia
Provincial bioregion	Lord Howe Province

Further information on the Lord Howe Island Marine Park (Commonwealth Waters) is available at <www.environment.gov.au/coasts/mpa/lordhowe/index.html>.



Cod Grounds Commonwealth Marine Reserve

The Cod Grounds Commonwealth Marine Reserve is located about four nautical miles off Laurieton in New South Wales.

The Cod Grounds Commonwealth Marine Reserve was declared to protect important habitat of the critically endangered grey nurse shark. The Reserve has been declared an IUCN Category 1a (no take) Sanctuary Zone for 1000 m radius from a point at 152° 54' 37" E, 31° 40' 52" S (an area of about 300 ha).

The area known as the Cod Grounds is a series of underwater pinnacles which is a significant aggregation site for the grey nurse shark. The Cod Grounds provide prime habitat for the sharks which are often observed in large numbers in or near deep sandy-bottomed gutters between the Cod Ground pinnacles. The Cod Grounds support a larger proportion of female grey nurse sharks than at other aggregation sites surveyed off the New South Wales coast and also provide habitat for prey species preferred by the grey nurse shark.

Proclamation date	10 May 2007
Size	Approximately 300 ha
IUCN category	IUCN Category 1a (Sanctuary zone)
Provincial bioregion	Central Eastern Shelf Province

Further information on the Cod Grounds Commonwealth Marine Reserve is available at <www.environment.gov.au/coasts/mpa/cod-grounds/index.html>.

3.3.2 Australia’s World, National and Commonwealth Heritage

Australia has long recognised the importance of preserving its rich and diverse natural and cultural heritage and was one of the first signatories to the *Convention Concerning the Protection of the World Cultural and Natural Heritage* (‘World Heritage Convention’).

As of March 2008, 17 Australian properties were on the World Heritage List⁷, one of which, the Lord Howe Island Group, occurs within the East Marine Region. Two other properties, the Great Barrier Reef and Fraser Island, occur immediately adjacent to the East Marine Region.

⁷ There are 11 convict sites (known as the Australian Convict Sites) that make up Australia’s 2008 World Heritage nomination to UNESCO. One of these sites is the Kingston and Arthur’s Vale Historic Area on Norfolk Island.

The significance of Lord Howe Island and its marine environment was recognised by its addition to the UNESCO World Heritage List in 1982. Some of the World Heritage values of the Lord Howe Island group specific to the marine environment include:

- the unusual combination of tropical and temperate marine flora and fauna, including many species living at their distributional limits, reflecting the extreme latitude of the coral reef ecosystems which comprise the southernmost true coral reefs in the world;
- the diversity of marine benthic algae species, including at least 235 species of which 12 per cent are endemic;
- the diversity of marine fish species, including at least 500 species of which 400 are inshore species and 15 are endemic;
- the diversity of marine invertebrate species, including more than 83 species of corals and 65 species of echinoderms of which 70 per cent are tropical, 24 per cent are temperate and 6 per cent are endemic.

Australia’s national heritage comprises exceptional natural and cultural places which help give Australia its national identity. Such places are a living and accessible record of the nation’s evolving landscapes and experiences and reveal the richness of Australia’s extraordinarily diverse natural heritage.

The National Heritage List has been established comprising natural, historic and Indigenous places that are of outstanding national heritage value. Each place on the List is assessed by the Australian Heritage Council for national heritage values then protected and managed under a range of Commonwealth powers. A place entered on the National Heritage List is a National Heritage place.

As of June 2008, 79 Australian places were on the National Heritage List, one of which, the Lord Howe Island Group, is within the East Marine Region. Three other places, the Great Barrier Reef, Fraser Island, and Kingston and Arthurs Vale Historic Area (KAVHA) Norfolk Island, are immediately adjacent to the East Marine Region.

The Commonwealth Heritage List is a list of natural, Indigenous and historic heritage places owned or controlled by the Australian Government. These include places connected to defence, communications, customs and other government activities that also reflect Australia’s development as a nation. A number of historic and natural heritage places on Norfolk Island are on the Commonwealth Heritage List.



Kingston and Arthurs Vale Historic Area, Norfolk Island. Photo: Mark Mohell and the Department of the Environment, Water, Heritage and the Arts.

Further information on Australia’s World, National and Commonwealth Heritage is available at <www.environment.gov.au/heritage>.

3.3.3 Wetlands of International Importance

Wetlands include swamps, marshes, billabongs, lakes, saltmarshes, mudflats, mangroves, coral reefs, fens, peatlands, or bodies of water – whether natural or artificial, permanent or temporary. Water within these areas can be static or flowing, fresh, brackish or saline.

Wetlands are vital to Australia. They protect our shores from wave action, reduce the impacts of floods, absorb pollutants and provide habitat for animals and plants.

The Convention on Wetlands of International Importance was signed in 1971 in the small Iranian town of Ramsar⁸. The broad aims of the convention are to halt the worldwide loss of wetlands and to conserve, through wise use and

management, those that remain. It encourages the designation and protection of sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity.

Under the Ramsar Convention a wide variety of natural and human-made habitat types, ranging from rivers to coral reefs, can be classified as wetlands.

There are currently (February 2008) 65 Australian wetlands listed under the Ramsar Convention, covering approximately 7.5 million hectares, two of which occur within the East Marine Region. These are the Coral Sea Reserves (Coringa–Herald and Lihou Reefs and Cays), and Elizabeth and Middleton Reefs Marine National Nature Reserve.

Further information about wetlands and Australia’s Wetlands of International Importance is at <www.environment.gov.au/water/environmental/wetlands>.

⁸ Since then, the Convention on Wetlands has taken the common name Ramsar Convention.





Monrey Frontier wreck on Middleton Reef. Photo: Director of National Parks.

3.3.4 Historic Shipwrecks

Australia has a rich maritime history which dates back to the arrival of Aboriginal people some 60 000 years ago. It includes later visits by Macassans – Indonesians from the trading centre of Macassar in Java – who came to fish Australia’s northern waters for trepang (sea cucumbers).

In the 17th century, Europeans, including the Dutch, English, French, Spanish and Portuguese began arriving on the coast of the southern continent, having braved extraordinary distances in small sailing boats. The flow of ships to and from Australia has grown enormously since that time, but not without difficulties, and at times, disasters.

Today, the waters off Australia’s coasts bear testament to this shipping heritage, holding fast to more than 6500 wrecks. Few of us will ever see them, but each has its own unique story and forms an important part of our heritage.

While information about the location of shipwrecks is often approximate - as the positions of many wrecks are unknown or estimated, there are likely to be hundreds of historic shipwrecks that occur within the East Marine Region.

A more precise figure on the number of historic shipwrecks in the East Marine Region will not be available until late 2008, pending the completion of a major program between the Department and the state historic shipwreck agencies, to update Australia’s National Shipwrecks database <www.environment.gov.au/heritage/shipwrecks/database.html>.

Historic shipwrecks are recognised and protected under the *Historic Shipwrecks Act 1976* that protects historic wrecks and associated relics found in waters from the low water mark to the edge of the continental shelf. Under the Act, all wrecks more than 75 years old are protected, together with their associated relics regardless of whether their actual locations are known. The Minister for the Environment, Heritage and the Arts can also make a declaration to protect any historically significant wrecks or articles and relics that are less than 75 years old.

The Act aims to ensure that historic shipwrecks are protected and maintained for their heritage values, and for recreational and educational purposes. It also regulates activities that may result in the damage, interference, removal or destruction of an historic shipwreck or associated relic. Under the Act:

- anyone who finds a shipwreck or relics associated with a shipwreck is required to give notification of the location as soon as practicable to the Minister for the Environment, Heritage and the Arts; and
- historic relics must not be removed, or the physical fabric of a wreck disturbed, unless a permit has been obtained.

The Act also provides for protected zones to be declared around wrecks that are at particular risk of interference. Permits are required to enter protected zones, which can extend up to a radius of 800 m from the site of the wreck.

Further information about historic shipwrecks can be found at <www.environment.gov.au/heritage/shipwrecks>.

3.4 Consideration of pressures on regional conservation values

There are a range of pressures currently impacting or likely to impact upon conservation values in the Region. While appendix D describes some of the threats relevant to species listed under the EPBC Act, it is in the next stage of the bioregional planning process – development of the Draft Bioregional Plan – that threats to all conservation values will be considered in detail.

Australia’s marine biodiversity is under increasing pressure from many uses of the marine environment, such as fisheries, shipping, petroleum and mineral extraction, tourism and recreation. Pressures from changing land use, including agricultural and urban run-off and coastal development, also exists. Increasing population globally, regionally and locally result in increasing threats to biodiversity and pressures on resources.

Australia’s oceans have been the subject of significant recent research activity but large gaps in our knowledge remain. Based on available knowledge, Australia’s marine biodiversity is probably in better condition than that of many other countries, however, there are significant concerns about decline in some key species and localised impacts on habitats and conditions.

Despite limitations in knowledge of what resources exist and their current condition and pressures, there is evidence of a cumulative decline in marine biodiversity. A number of threatening processes are causing declines in habitats, changes in ecosystems and loss of species. Key pressures on marine biodiversity include climate change, resource use, land-based impacts, marine biosecurity, and marine pollution.

You can find an overview of the types of pressures impacting on marine biodiversity in the ‘Coasts and Oceans’ chapter of the 2006 *State of the Environment Report* at <www.environment.gov.au/soe/2006/publications/report/coasts.html>.

Chapter 6 of this Bioregional Profile contains more information about how and when in the process, stakeholders’ input will be sought to inform the development of the Draft Plan.



A catch of orange roughy. Image courtesy of CSIRO.



Climate change impacts on marine life

Climate change is expected to have considerable impact on marine life and marine ecosystems. There will inevitably be flow-on implications for human societies and economies, particularly those in regional Australia highly dependent on the marine environment and its resources.

Evidence concerning impacts on Australian waters is sparse, mainly due to a lack of historical long-term data collection. Little modelling has been conducted to predict future changes in Australian marine ecosystems and this remains a critical gap; however, valuable information on climate change impacts and adaptation in the marine environment can be found in the 2006 CSIRO report *Impacts of Climate Change on Australian Marine Life* <www.greenhouse.gov.au/impacts/publications/marinelifelife.html>.

Three general findings emerged from the study:

- although particular factors such as temperature stand out as prominent drivers of observed changes in Australia’s marine flora and fauna, it is the combined effects of climate and oceanographic factors that will shape Australia’s marine life in the future;

- Australia’s marine life is currently affected strongly by stressors such as fisheries, coastal run-off and pollution. The ecological effects of these stressors will serve to reduce ecosystem resilience to climate change so that an integrated and adaptive management approach is required to deal with these combined effects; and
- both monitoring of time series data and modelling of climate change impacts in Australia’s marine ecosystems are extremely limited at present. Such activities are crucial components of policy and management strategies.

While it reported on the impacts of climate change for a specific location, the report, *Climate Change and the Great Barrier Reef: A Vulnerability Assessment* <http://www.gbrmpa.gov.au/corp_site/info_services/publications/misc_pub/climate_change_vulnerability_assessment/climate_change_vulnerability_assessment> is a useful resource for the East Marine Region since similar habitats and species are found in the Coral Sea, Lord Howe Island and South East Queensland. This vulnerability assessment provides substantial detail on the full range of climate change impacts for all components of tropical marine ecosystems and identifies management (including planning) recommendations for adaptation strategies.



Coral bleaching and a white-tip reef shark, Back Reef Anne Cay, Lihou Reef. Photo: Mike Emslie, Australian Institute of Marine Science and the Department of the Environment, Water, Heritage and the Arts.

Key references and further readings

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Map Acknowledgements

Figures 3.1, 3.2 and 3.3

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Lord Howe Island Group. Photo: Ian Hutton and the Department of the Environment, Water, Heritage and the Arts.