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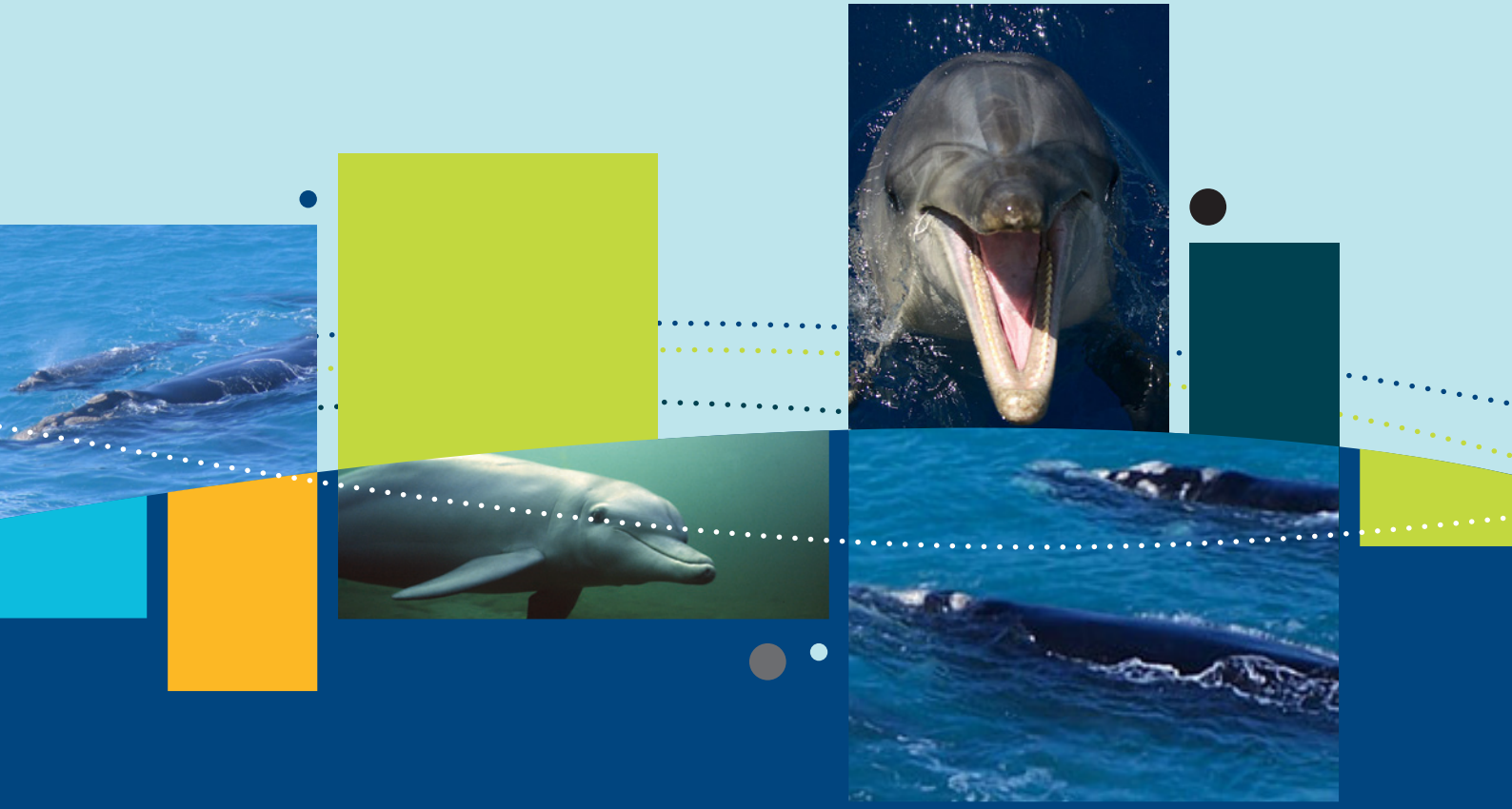

Species group report card —cetaceans

Supporting the marine bioregional plan for the South-west Marine Region

prepared under the *Environment Protection and Biodiversity Conservation Act 1999*

Disclaimer

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SPECIES GROUP REPORT CARD—CETACEANS

Supporting the marine bioregional plan for the South-west Marine Region
prepared under the *Environment Protection and Biodiversity Conservation Act 1999*

Report cards

The primary objective of the report cards is to provide accessible information on the conservation values found in Commonwealth marine regions. This information is maintained by the Department of Sustainability, Environment, Water, Population and Communities and is available online through the department's website (**www.environment.gov.au**). A glossary of terms relevant to marine bioregional planning is located at **www.environment.gov.au/marineplans**.

Reflecting the categories of conservation values, there are three types of report cards:

- species group report cards
- marine environment report cards
- heritage places report cards.

While the focus of these report cards is the Commonwealth marine environment, in some instances pressures and ecological processes occurring in state waters are referred to where there is connectivity between pressures and ecological processes in state and Commonwealth waters.

Species group report cards

Species group report cards are prepared for large taxonomic groups that include species identified as conservation values in a region; that is, species that are listed under Part 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and live in the Commonwealth marine area for all or part of their lifecycle. All listed threatened, migratory and marine species and all cetaceans occurring in Commonwealth waters are protected under the EPBC Act and are identified in the relevant marine bioregional plans as conservation values.

Species group report cards focus on species for which the region is important from a conservation perspective; for example, species of which a significant proportion of the population or an important life stage occurs in the region's waters.

For these species, the report cards:

- outline the conservation status of the species and the current state of knowledge about its ecology in the region
- define biologically important areas; that is, areas where aggregations of individuals of a species display biologically important behaviours
- assess the level of concern in relation to different pressures.

1. Cetaceans of the South-west Marine Region

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), all cetaceans (whales, dolphins and porpoises) are protected in Australian waters. Thirty-three species of cetacean protected under the EPBC Act are known to occur in the South-west Marine Region and a further nine species may occur infrequently in the region (Attachment 1).

Use of the region's marine habitats and resources varies among cetaceans. Baleen whales occurring in the region include regular visitors such as southern right, humpback and blue whales, as well as less commonly seen species such as fin, sei and pygmy right whales. Baleen whales use the region for calving (southern right), feeding (blue whale), and as a migration pathway (including resting areas) between their feeding and breeding areas (humpback whales). Toothed whales found in the region include sperm whales, killer whales and pilot whales. They feed on a wide range of prey including fish, squid and, in the case of killer whales, other marine mammals.

Beaked whales also occur in the region. Information is limited on the ecology of beaked whales, and most information about the species group has been gleaned from stranded specimens (MacLeod & Mitchell 2006). Beaked whales are generally found in deep water offshore around seamounts and canyons. They dive for long periods and are rarely observed. South-west Australia has been listed as one of the key areas for beaked whales worldwide, particularly Hector's, Andrew's and Cuvier's beaked whales (MacLeod & Mitchell 2006), while the most common beaked whale to strand in South Australia is the strap-toothed beaked whale (Kemper 2008).

This report card focuses on four species (blue, southern right, humpback and sperm whales) in the South-west Marine Region. These species are the focus of the report card as there is a relatively large amount of information on these species and the region is known to support biologically important behaviours (e.g. calving/nursing, migration, resting on migration, and foraging). While other species of cetacean feed, breed and calve in the region they are less well understood and are not discussed in this report card.

Blue whale

The taxonomy of blue whales (*Balaenoptera musculus*) is unclear but it is generally accepted that there are two subspecies in the Southern Hemisphere: Antarctic blue whales (*B. m. intermidia*) and pygmy blue whales (*B. m. brevicauda*). Antarctic blue whales are typically found south of 60° S and pygmy blue whales are found north of 55° S. As Antarctic blue whales feed predominantly in polar waters, and acoustic information indicates that Antarctic blue whales are likely to occur infrequently in the region, it has been suggested that the majority of blue whales sighted in Australian waters are pygmy blue whales (Branch et al. 2007). The following information is relevant to blue whales at the species level (*Balaenoptera musculus*), unless stated otherwise.

Antarctic blue whales are considered among the most endangered of all baleen whale populations (Clapham, Young & Brownell 1999). Branch, Matsuoka and Miyashita (2004) estimated a catastrophic decline in Antarctic blue whales due to whaling, from 239 000 individuals pre-whaling to 360 individuals by 1973. Recent estimates of Antarctic blue whale population size provide a circumpolar abundance estimate of 2280 (Branch 2008). There are no comparable data for pygmy blue whales, although they were whaled illegally after whaling bans were in place: an estimated 11 000 catches were undeclared to the International Whaling Commission (Mikhalev 2000).

Although there is not a population estimate available for pygmy blue whale in Australia, McCauley and Jenner (2010) used acoustic data to estimate abundance of the population of pygmy blue whales migrating south along the Western Australian coast. Their abundance estimate was based on acoustic data recorded in 2004 and provided an estimate of between 662 to 1559 whales.

The sighting rates of blue whales, (with the large majority probably pygmy blue whales), off southern and western Australia are among the highest recorded (Branch et al. 2007). It is likely that pygmy blue whales in the area from Tasmania west to Indonesia form one population (Branch et al. 2007). This hypothesis is supported by acoustic data, which indicates that blue whale calls from aggregations at the Bonney Upwelling (located in the South-east Marine Region) and the Perth Canyon are identical (McCauley et al. 2004). Also, by photo-identification matching, Jenner, Gill and Morrice (unpublished data) have demonstrated an interchange between the Bonney Upwelling and Perth Canyon.

The migratory habits of pygmy blue whales along the Western Australian coast are now reasonably well understood (see McCauley and Jenner 2010).On their northern migration pygmy blue whales come into the Perth Canyon in the period January to May and then head up the coast passing Exmouth in the period April through to August before continuing north, with animals known to frequent Indonesian waters. Their southern migration down the Western Australian coast is from October to late December.

Acoustic records from off Cape Leeuwin in July–October are exclusively for Antarctic blue whales, with no pygmy blue whale call types recorded there during this time of year (McCauley et al. 2004). However, acoustic records suggest only a small number of Antarctic blue whales are likely to be present in the region.

Blue whales, principally pygmy blue whales, use the region for migration, foraging, feeding and resting. Blue whale aggregations in Australian waters appear to be determined by the location of predictable, productive feeding grounds (e.g. the Bonney Upwelling and Perth Canyon).

The Perth Canyon is a seasonally important aggregation area where pygmy blue whales feed on krill at depths of 200–300 metres in the canyon from January to May (with feeding peaking in the area from March to May). Up to 40 blue whales have been sighted in a single aerial survey in the Perth Canyon; however, numbers vary from year to year.

The Eastern Great Australian Bight Upwelling/Kangaroo Island canyons are other important foraging habitats for pygmy blue whales between November and May (peaking in December). The first aerial survey in this area (2003–04) found up to 30 blue whales feeding in the area (Gill & Morrice 2008). Aerial surveys in 2003–04, 2004–05 and 2005–06 show that blue whale relative abundance in the eastern Great Australian Bight is highly variable both between and within seasons.

Geographe Bay is thought to be an important migratory habitat for pygmy blue whale from September to December, with cows and calves observed resting in the area. Relatively high numbers of blue whales have been observed annually in Geographe Bay, during October–December surveys, since 1994. Surveys in 2003 recorded more than 100 sightings (Burton 2003). No feeding behaviour has been observed in Geographe Bay; however, small calves are regularly seen. Most whales move slowly into the bay from the north and follow the shallow bathymetry around Cape Naturaliste to the west.

Southern right whale

In 1997, the International Whaling Commission (2001) estimated that 17 per cent, or approximately 1200, of the global southern right whale (*Eubalaena australis*) population occurred in Australia (based on a global abundance of 7 000). Currently, the southern right whale population is increasing at or close to the maximum biological rate. The total current Australian population is approximately 2 400 individuals (Bannister 2009).

Shore-based and pelagic whaling in the early to mid-1800s reduced the southern right whale population off Australia to a remnant population. Low-level catches continued until at least the 1930s, principally in pelagic whaling operations. A take of 3 368 southern right whales by the former Soviet Union in the period 1950–71 (Tormosov et al. 1998; Yablokov 1994), despite international protection, is likely to have prevented significant recovery until more recent decades. The recovery of the species is not yet assured as the current population is likely to be less than 10 per cent of pre-exploitation abundance (IWC 2001). In addition, recovery in severely and rapidly depleted populations is likely to be affected by a loss of genetic diversity, making the species more vulnerable, for example, to a random disease event (IWC 2001).

Southern right whales migrate from their summer feeding grounds in the Southern Ocean to calve and breed in warmer coastal waters. Southern right whales are seasonally present off the Australian coast between about May to November, and have been recorded in the coastal waters of all Australian states except the Northern Territory (Bannister, Kemper & Warneke

1996). The entire coastline from Kangaroo Island westward and south of the Perth Canyon is thought to be an important migratory pathway for the southern right whale. Principally they are found aggregating adjacent to the region, in state waters around the southern coastline off southern Western Australia and far west South Australia.

The main calving areas adjacent to the South-west Marine Region (based on observations of mothers with very young calves in multiple years) currently known for southern right whales include:

- Western Australia—Doubtful Island Bay (including the Point Ann to Point Charles area), Israelite Bay area, Twilight Cove, Flinders Bay, Albany to Cape Riche area and Yokinup Bay to Cape Arid area
- South Australia—Head of Bight, Fowlers Bay and Encounter Bay (DEH 2005a).

Southern right whales exhibit a strong tendency to return to the same breeding location (Bannister 1990; Burnell 1999; Payne 1986). This is particularly evident for reproductively mature females: Burnell (1999) reported that 92 per cent of reproductively mature females showed a tendency to return to the Head of Bight calving area. Approximately 85 per cent of calves born at the Head of Bight also exhibited fidelity to their birthing location (Burnell 1999). Individuals make long-distance coastwise movements within a breeding season (Burnell 2001; Burnell & McKenna 1996), and movement of reproductively mature females between the breeding grounds has been recorded (Australian Marine Mammal Centre 2009). While southern right whales can be considered a highly mobile species, the tendency for individuals to return to the same location may limit or delay dispersal.

Humpback whale

Humpback whales (*Megaptera novaeangliae*) were heavily exploited through commercial whaling in all areas where they are known to have been abundant. The exact figure of how many whales were killed is uncertain (Baker & Clapham 2004; Yablokov 1994). It is thought that 95 per cent of the overall population was eliminated (Johnson & Wolman 1985).

It is generally recognised that the Australian populations appear to be growing consistently at about 10 per cent per year (Bannister & Hedley 2001; Bryden, Kirkwood & Slade 1990; Chaloupka & Osmond 1999; Paterson, Paterson & Cato 2001, 2004). Current estimates for the Australian west coast population is currently estimated to be 21 750 (Hedley, Bannister & Dunlop 2009).

Humpback whales migrate annually between their summer feeding grounds in Antarctica to their tropical and subtropical breeding grounds in winter. During migration, individuals travel alone or in temporary aggregations of generally non-related individuals (cow–calf pairs being the exception) (Valsecchi et al. 2002). The exact timing of the migration period can vary from

year to year depending on water temperature, sea ice, predation risk, prey abundance and the location of the feeding ground (DEH 2005b). In general, humpback whales are sighted in southern Australian waters in May and migrate slowly up the east and west coasts. By October, most whales have started their southward migration and sightings are rarer after November.

Humpback whales migrate through coastal areas between Esperance and Kalbarri. Along parts of their migratory route there are narrow corridors and bottlenecks resulting from physical barriers where the majority of the population passes close to shore (that is within 30 kilometres of the coastline) (DEH 2005b). In the South-west Marine Region such narrow migratory corridors appear to be found in the following three areas:

- waters between the Houtman Abrolhos Islands and the coast near Geraldton
- waters from Geographe Bay to Rottnest Island
- waters to the east of Augusta.

Resting areas are used by cow-calf pairs and attendant males during the southern migration. Sheltered bays appear to be opportunistically used for this purpose. There is some debate amongst scientists about resting areas for the species in the South-west Marine Region, as typically the species is observed resting in protected, shallow coastal waters. However, Geographe Bay is considered to be a resting area for the species.

Recent satellite tracking data collected by the Australian Marine Mammal Centre, however, also indicates that some humpback whales on the west coast of Australia migrate well offshore.

Sperm whale

Assessments of sperm whale (*Physeter macrocephalus*) abundance have historically been based on the analysis of whaling data. More recently, surveys have been done in 24 per cent of the sperm whales' global habitat and have produced population estimates of 300 000–450 000 (Whitehead 2002). Although these estimates are based on extrapolating surveyed areas to non-surveyed areas, without a systematic survey design, these are probably the best available and most current estimates of global sperm whale abundance (National Marine Fisheries Service 2006).

In contrast, an estimate of the pre-whaling (1712) sperm whale population size is approximately 1 267 000 individuals (Whitehead 2002). This suggests that the current population is about 32 per cent of the pre-whaling level and is therefore considerably depleted. The greatest sperm whale catches have occurred since the 'modern' era of whaling with engine-powered whaling vessels, harpoon guns and other technical aids, but have almost ceased since the 1986 International Whaling Commission moratorium on commercial whaling. Despite the high level of take (approximately 900 000), the sperm whale remains the most abundant of the large whale species. Given that current and potential threats to the sperm whale are limited, it is likely that the global population of sperm whales is increasing.

Sperm whales tend to inhabit offshore areas with a water depth of 600 m or more, and are uncommon in waters less than 300 m deep (NOAA 2006). Female sperm whales are generally found in deep waters (at least 1 000 m). Female and young male sperm whales appear to be restricted to warmer waters north of about 45° S in the Southern Hemisphere, while adult males travel to and from colder waters of Antarctica (Bannister, Kemper & Warneke 1996). Immature males will stay with females in tropical and subtropical waters until they begin to slowly migrate towards the poles, at anywhere between the ages of 4 and 21 years old.

Concentrations of sperm whales are found where the seabed rises steeply from great depth, and are probably associated with concentrations of major food in areas of upwelling (Bannister, Kemper & Warneke 1996). In the South-west Marine Region, it is thought the species is likely to forage along the shelf-break. Sperm whales seem to be concentrated in a narrow area only a few miles wide at the shelf edge off Albany, Western Australia, moving westwards through the year (Bannister, Kemper & Warneke 1996). They have been observed foraging in waters over the Perth Canyon and over the Albany canyons group. Sperm whales are also known to occur in waters along the shelf break of the eastern Great Australian Bight, and waters to the south of Kangaroo Island, and are presumed to be foraging in these areas. Bremer Canyon is a place where sperm whales and killer whales are known to aggregate (Riggs, 2011)

Biologically important areas

Biologically important areas (BIAs) are areas are areas that are particularly important for the conservation of the protected species and where aggregations of individuals display biologically important behaviour such as breeding, foraging, resting or migration. The presence of the observed behaviour is assumed to indicate that the habitat required for the behaviour is also present. Biologically important areas have been identified for some EPBC Act listed species found in the South-west Marine Region, using expert scientific knowledge about species' distribution, abundance and behaviour in the region. The selection of species was informed by the availability of scientific information, the conservation status of listed species and the importance of the region for the species. The range of species for which biologically important areas are identified will continue to expand as reliable spatial and scientific information becomes available.

Based on available information, biologically important areas have been identified for the blue whale, southern right whale, humpback whale and sperm whale. Behaviours that have been used to define these for cetaceans include aggregating, resting, foraging, migrating, breeding and calving (Table 1). Biologically important areas are included in the South-west Marine Region Conservation Values Atlas (**www.environment.gov.au/cva**).

Table 1. Cetaceans for which biologically important areas have been defined in the South-west Marine Region

Species	Conservation status	Behaviour
Pygmy blue whale (*Balaenoptera musculus*)	Endangered, migratory, cetacean	Foraging, migrating, resting
Southern right whale (*Eubalaena australis*)	Endangered, migratory, cetacean	Aggregating, migrating, calving
Humpback whale (*Megaptera novaeangliae*)	Vulnerable, migratory, cetacean	Resting, migrating
Sperm whale (*Physeter macrocephalus*)	Migratory, cetacean	Foraging

2. Vulnerabilities and pressures

Vulnerabilities

During the early 1800s, whaling was an important industry in the region. Semi-permanent camps were set up on Eyre Peninsula, Kangaroo Island, the Esperance area of Western Australia and as far north as Shark Bay, to target a range of the larger species. Overexploitation and dramatic declines in whale numbers eventually led to the demise of the industry. Australia's last whaling station, at Cheynes Beach near Albany, closed in 1978. In 1979, Australia adopted a pro-conservation policy, putting a permanent end to whaling in Australian waters.

Although a global moratorium on commercial whaling has been in place since 1986, populations of all species are still below pre-whaling estimates—most are considerably so. Two populations of targeted species have been recovering—the southern right whale and the west coast population of the humpback whale are increasing at rates close to their biological capacities. While not a current threat to most species, whaling is still listed as the most threatening anthropogenic activity in all five threatened cetacean recovery plans under the EPBC Act.

The life history characteristics of cetaceans make them susceptible to a range of pressures in the marine environment. They are long-lived animals that are generally slow to reach sexual maturity and have low fecundity (e.g. only producing one calf at a time and not necessarily calving every year). For example, female southern right whales do not reach sexual maturity until five or six years of age and generally have one calf at three-year intervals. In addition to these traits, many species travel relatively long distances to reach resting, foraging and breeding areas. Consequently, cetaceans are considered susceptible to anthropogenic impacts, as evidenced by the devastating impact that past commercial whaling had on populations of cetaceans in the region.

Analysis of pressures

On the basis of current information pressures have been analysed for the four cetacean species discussed in this report card. A summary of the pressure analysis for cetaceans is provided in Table 2. Only those pressures identified as *of concern* or *of potential concern* are discussed in further detail below; no pressures have been assessed as *of concern* for these four species in the South-west Marine Region. An explanation of the pressure analysis process, including the definition of substantial impact used in this analysis is provided in Part 3 and Section S1.1 in Schedule 1 of the plan.

Table 2: Outputs of the cetacean species pressure analysis for the South-west Marine Region

Note: To maintain uniformity among all bioregions, this table has been added subsequently to the review by independent experts.

Pressure	Source	Species			
		Blue whale	Humpback whale	Southern right whale	Sperm whale
Sea level rise	Climate change				
Changes in sea temperature	Climate change				
Changes in oceanography	Climate change				
Ocean acidification	Climate change				
Chemical pollution/ contaminants					
Nutrient pollution					
Changes in turbidity					
Marine debris	Aquaculture infrastructure Fishing boats Land-based activities Oil rigs Renewable energy infrastructure Shipping Urban development Vessels (other)				
Noise pollution	Aquaculture infrastructure Defence/surveillance activities Onshore and offshore construction Onshore and offshore mining operations Renewable energy infrastructure Seismic exploration Shipping Urban development Vessels (other)				

Legend of concern of potential concern of less or no concern

Table 2 continued: Outputs of the cetacean species pressure analysis for the South-west Marine Region

Note: To maintain uniformity among all bioregions, this table has been added subsequently to the review by independent experts.

Pressure	Source	Species			
		Blue whale	Humpback whale	Southern right whale	Sperm whale
Light pollution					
Physical habitat modification	Dredging (and/or dredge spoil) Onshore construction Urban/coastal development				
Human presence at sensitive sites					
Nuisance species					
Extraction of living resources					
Bycatch	Commercial fishing				
Oil pollution	Oil rigs Onshore and offshore mining operations Shipping Vessels (other)				
Collision with vessels	Fishing Shipping				
Collision/ entanglement with infrastructure	Aquaculture infrastructure Renewable energy infrastructure				
Disease					
Invasive species					

Legend of concern; of potential concern; of less or no concern

Changes in sea temperature–climate change

Changes in sea temperature have been assessed as *of potential concern* to blue whales through changes in distribution associated with the availability of suitable habitat. Sea temperatures have warmed by 0.7 °C between 1910–1929 and 1989–2008, and current projections estimate that ocean temperatures will be 1 °C warmer by 2030 (Lough 2009). South-west Western Australia is considered one of three hotspots in the Indian Ocean where rising temperature trends exceed the Indian Ocean basin average (Feng, Weller & Hill 2009). Changes in sea temperature are likely to result in changes to zooplankton communities with implications for dependent species, such as the blue whale (Richardson, McKinnon & Swadling 2009). The blue whale is the only one of the baleen whales assessed that feeds in the region.

Changes in oceanography–climate change

Changes in oceanography have been assessed as *of potential concern* to blue, southern right, humpback and sperm whales, through impacts on distribution associated with the availability of suitable habitat and prey (e.g. breeding and feeding). The Leeuwin Current's southward flow has weakened slightly since 1970 (Feng, Weller & Hill 2009). The recovery plans 2005–10 for Australia's threatened whales: humpback, southern right, blue, fin and sei indicate that some habitat may become unsuitable for feeding or calving (DEH 2005a, 2005b, 2005c) due to changes in the distribution of prey. For example, the selection of calving sites may be influenced by factors such as ocean currents and water temperature and, given the possible changes in oceanography, existing calving sites may become smaller in size or rendered unsuitable in the future (DEH 2005a, 2005b, 2005c).

Ocean acidification–climate change

Driven by increasing levels of atmospheric carbon dioxide and subsequent chemical changes in the ocean, acidification is already underway and detectible. Since pre-industrial times, acidification has lowered ocean pH by 0.1 units (Howard et al. 2009). Furthermore, climate models predict this trend will continue, with a further 0.2–0.3 unit decline by 2100 (Howard et al. 2009).

Ocean acidification has been assessed as *of potential concern* to blue, southern right, humpback and sperm whales through impacts on prey availability. There are no observed impacts of climate change on zooplankton in Australian waters. However, based on knowledge of impacts elsewhere, Australia is likely to start losing calcifying zooplankton from its southern waters (Richardson, McKinnon & Swadling 2009). Recent research on the effects of ocean acidification on Antarctic krill has found that increased levels of carbon dioxide kill their embryos (Kawaguchi et al. 2010). The Southern Ocean is expected to be severely affected by ocean acidification, with cold water readily taking up carbon dioxide. Southern Ocean carbon dioxide levels at depths could rise to 1 400 parts per million by the year 2100 (Kawaguchi et al. 2010). As Antarctic krill is the key species of the Southern Ocean ecosystem, effects of such increases in carbon dioxide would be widespread, including affecting baleen whales that visit Australian waters.

Marine debris

Marine debris has been assessed as *of potential concern* for southern right, blue, humpback and sperm whales. Plastic garbage washed or blown from land into the sea, fishing gear abandoned by recreational and commercial fishers, and solid non-biodegradable floating materials (such as plastics) disposed of by ships at sea are all considered to be harmful marine debris. Plastic bags are known to contribute to the death of cetaceans. In addition, whales can become entangled in derelict fishing gear such as lost nets and pots. The impact of entanglement in marine debris is difficult to measure, because animals may die at sea and not be detected.

Marine debris is listed as a key threatening process under the EPBC Act because of the threat it poses to all marine life, especially to species listed as threatened under the EPBC Act. The Australian Government has developed a threat abatement plan that provides a coordinated national approach to prevent and mitigate the effects of harmful marine debris on vertebrate marine life (DEWHA 2009). This threat abatement plan lists a number of cetaceans, including southern right, blue and humpback whales as being adversely affected by ingestion of or entanglement in harmful marine debris (DEWHA 2009). Whale recovery plans for humpback, southern right, blue, fin and sei whales (DEH 2005a, 2005b, 2005c) identify entanglement in derelict fishing gear and ingestion of plastics at sea as pressures.

Based on recorded strandings and sightings of the four whale species, the ingestion of marine debris causes deaths most frequently in sperm whales, while entanglement is recorded most often in humpback whales (Ceccarelli 2009). There is limited information about the distribution and quantity of marine debris in the region. Deaths of southern right whales in the region involving entanglement, most commonly in discarded fishing gear, appear to be increasing relative to the number of carcasses reported (Kemper et al. 2008).

Noise pollution

Noise pollution from a wide range of activities including shipping, seismic survey, sonar, industrial activities and naval exercises has been assessed as *of potential concern* to blue, southern right, humpback and sperm whales. There is growing concern that man-made noise impacts marine life, particularly cetaceans, because it may result in physical and/or behavioural effects on these species (DEWHA 2008a). All sources of man-made noise in the region—shipping, marine infrastructure construction and operation, and seismic surveys—are predicted to increase (Clifton et al. 2007). Defence naval exercises also occur in the region. Guidelines under the EPBC Act are in place to mitigate the effect of noise generated by seismic surveys on whales; similarly, the Royal Australian Navy implements operational procedures to minimise environmental impacts.

Anthropogenic noise may affect cetaceans by masking sounds that are vital for their essential activities and behaviours, including navigation, identifying the location of prey and predators, announcing location and territory, establishing dominance, attracting mates, and maintaining group cohesion and social interactions (Richardson et al. 1995; Simmonds, Dolman & Weilgart 2004). Noise pollution can also modify behaviour through attraction and avoidance to sound. Close exposure to noise can cause temporary or permanent physical injury.

Oil and gas exploration and other geophysical surveys involve the use of seismic 'air-guns', which generate a rapid release of air under high pressure to obtain a geologic profile of the sea floor and substrate. This activity creates the noise signal that can have physical and behavioural effects on some species of cetaceans (DEWHA 2008a). For example, it may cause baleen whales (e.g. humpback and blue whales) and large toothed whales (e.g. sperm whales) to detour away from migration routes or from feeding or breeding areas. Extremely close encounters may damage their ears. The EPBC Act Policy Statement 2.1 provides guidance on the implications of seismic surveys for cetaceans (DEWHA 2008b).

The Western Australian Exercise Area (WAXA) extends over the Perth Canyon, which is known to be an important seasonal feeding aggregation area for pygmy blue whales. The Department of Defence conducts a range of activities that create noise in the WAXA, such as the use of active sonar to locate targets and the use of live ammunition. The Department of Defence operates in accordance with an environmental management plan, supported by planning guides and procedural tools, aimed at mitigating impacts on the marine environment and marine species.

Shipping is a major activity in South-west Marine Region, transporting goods through the region and to and from ports in the region. Shipping traffic in the region is predicted to increase (Clifton et al. 2007), particularly in line with new port improvements and developments earmarked for Albany and Oakajee (near Geraldton). In other parts of the world where the issue has been investigated, the increased traffic of faster and larger ships has led to rising concerns over associated effects on cetaceans (e.g. Hatch et al. 2007).

Physical habitat modification

Habitat modification has been assessed as being *of potential concern* to southern right whales. Inshore habitat degradation is considered a threat to the recovery of southern right whales because this species uses inshore areas for calving, some of which are close to populated centres (DEH 2005a). Swimming further to avoid degraded habitat might compromise reproductive success. This pressure is greater for the small proportion of southern right whales that calve east of Adelaide, because of the higher population density and use of coastal areas along the south-east of Australia. However, coastal and inshore habitat degradation is also *of potential concern* in south-western Australia, due to the anticipated expansion of coastal infrastructure and urban development (Clifton et al. 2007).

Bycatch

Bycatch has been assessed as being *of potential concern* to humpback, southern right and sperm whales. Southern right whales may be particularly vulnerable to entanglement in the ropes and lines associated with trapping crustaceans in coastal waters (Kemper 2008). The number of southern right whale mortalities involving entanglement appears to be increasing relative to the number of carcases reported (Kemper et al. 2008). The likelihood of entanglement may increase as the southern right whale population recovers. There have also been reports of sperm and humpback whales being entangled in fishing gear (Kemper et al. 2008), and interactions are likely to increase as the populations of these species recover.

Oil pollution

Australia has a strong system for regulating industry activity that is the potential source of oil spills and this system has been strengthened further in response to the Montara oil spill. While oil spills are unpredictable events and their likelihood is low based on past experience, their consequences, especially for threatened species at important areas, could be severe. Chemicals used to disperse oil pollution can themselves be toxic to marine life (AMSA 2011).

Oil pollution has been assessed as *of potential concern* to blue, southern right, humpback and sperm whales. The intensity and distribution of activities implicated in oil spills – such as oil production and transport – are likely to increase in the region. Baleen whales are particularly vulnerable to oil pollution as the oil is likely to stick to the baleen plates while whales filter-feed on plankton and krill near oil slicks (AMSA 2010). Where an oil spill coincides with calving and nursing events, it may affect breeding success (DEH 2005a, 2005b, 2005c). Southern right whales are listed as endangered and the effects of an oil spill, particularly in calving areas, could interfere with the recovery of the species.

Collision with vessels

Collision with vessels has been assessed as *of potential concern* for blue and southern right whales, with reference to locations where their biologically important areas overlap with shipping lanes). Southern right whales are particularly vulnerable to vessel collision because they spend about half of each year in coastal waters where human activities are often intense. Fatal strikes by ships have been recorded in the region, involving southern right and blue whales (Kemper et al. 2008; Australian Government 2007). The relative importance of this source of mortality is unknown, but it is not likely to impact the species at the population level; however, it is possible that a number of events are undetected, especially those that occur well offshore (Kemper 2008). A review of ship strike records around the world (but not including Australia) found that, in some areas and for small populations, ship strikes are a significant source of mortality (Laist et al. 2001). Shipping traffic, particularly of large vessels, is expected to increase (Clifton et al. 2007), and shipping routes in the region overlap with some biologically important areas for these species.

Collision or entanglement with infrastructure

Collision or entanglement with infrastructure has been assessed as *of potential concern* to southern right whales as the nature of the interaction can be fatal. The species is particularly susceptible because it spends about half of each year in coastal waters, where human activities are more intense (Kemper et al. 2008). Interactions between southern right whales and fish farm cages have been reported (Kemper et al. 2003; Kemper 2008). The relative importance of this source of mortality is not known, but it is not likely to be significant at present; however, marine aquaculture and renewable energy infrastructure in the region are predicted to increase. Open-ocean aquaculture and commercial-scale offshore renewable energy technologies are emerging industries, and entail uncertainties regarding their potential scale, technology and impacts (Dolman, Green & Simmonds 2007).

3. Relevant protection measures

The Australian Whale Sanctuary was established under the EPBC Act to protect all whales and dolphins in Australian waters. The Australian Whale Sanctuary comprises the Commonwealth marine area and covers all of Australia's Exclusive Economic Zone which generally extends out to 200 nautical miles from the coast and includes the waters surrounding Australia's external territories such as Christmas, Cocos (Keeling), Norfolk, Heard and Macdonald Islands. Within the Australian Whale Sanctuary it is an offence to kill, injure or interfere with a cetacean. Severe penalties apply to anyone convicted of such offences. More information about the Australian Whale Sanctuary can be found at **www.environment.gov.au/coasts/species/cetaceans/conservation/sanctuary.html**

Alongside the EPBC Act, a broad range of sector-specific management measures to address environmental issues and mitigate impacts applies to activities that take place in Commonwealth marine areas. These measures give effect to regulatory and administrative requirements under Commonwealth and state legislation for activities such as commercial and recreational fishing, oil and gas exploration and production, port activities and maritime transport. In some instances, as in the case of shipping, these measures also fulfil Australia's obligations under a number of international conventions for the protection of the marine environment from pollution and environmental harm.

Protection and conservation measures administered under the EPBC Act and that are relevant to the conservation values described in this Report Card are listed below.

EPBC Act conservation plans and action plans

- Southern Right Whale Recovery Plan 2005–2010 (DEH 2005a)
- Humpback Whale Recovery Plan 2005–2010 (DEH 2005b)
- Blue, Fin and Sei Whale Recovery Plan 2005–2010 (DEH 2005c)
- Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Marine Life (DEWHA 2009)
- Action Plan for Australian Cetaceans (Bannister, Kemper & Warneke 1996)
- Australian National Guidelines For Whale And Dolphin Watching (DEH 2006)
- EPBC Act Policy Statement 2.1: Interaction between offshore seismic exploration and whales (DEWHA 2008b)
- Great Australian Bight Marine Park (Commonwealth waters), includes a marine mammal protection zone that aims to provide protection for southern right whales.

International measures

Australia is a signatory to the following international agreements for the conservation of cetaceans:

- International Whaling Commission (IWC)—**www.iwcoffice.org/commission/convention.htm**
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)—**www.cites.org**
- Convention on the Conservation of Migratory Species of Wild Animals (CMS)—**www.cms.int**
- Convention on Biological Diversity (CBD)—**www.cbd.int/convention**.

For more information on conservation listings under the EPBC Act, and related management objectives and protection measures, visit the following sites:

- **www.environment.gov.au/coasts/species/marine-species-list.html** (listed marine species)
- **www.environment.gov.au/epbc/protect/species-communities.html** (listed threatened species)
- **www.environment.gov.au/epbc/protect/migratory.html** (listed migratory species)
- **www.environment.gov.au/cgi-bin/sprat/public/sprat.pl** (species profile and threats database).

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ATTACHMENT 1: CETACEAN SPECIES OCCURRING IN THE SOUTH-WEST MARINE REGION

Table A1: Cetacean species known to occur in the South-west Marine Region

Species (common name/scientific name)	Conservation status
Pygmy blue whale, Antarctic blue (*Balaenoptera musculus*)[1]	Cetacean, endangered, migratory—listed under CITES (Appendix I) and CMS (Appendix I)
Southern right whale (*Eubalaena australis*)	Cetacean, endangered, migratory—listed under CITES (Appendix I) and CMS (Appendix I)
Fin whale (*Balaenoptera physalus*)	Cetacean, vulnerable, migratory—listed under CITES (Appendix I) and CMS (Appendix I and II)
Humpback whale (*Megaptera novaeangliae*)	Cetacean, vulnerable, migratory—listed under CITES (Appendix I) and CMS (Appendix I)
Sei whale (*Balaenoptera borealis*)	Cetacean, vulnerable, migratory—listed under CITES (Appendix I) and CMS (Appendix I and II)
Antarctic minke whale, dark-shoulder minke whale *(Balaenoptera bonaerensis)*	Cetacean, migratory—listed under CITES (Appendix I) and CMS (Appendix II)
Bryde's whale (*Balaenoptera edeni*)	Cetacean, migratory—listed under CITES (Appendix I) and CMS (Appendix II)
Killer whale, orca (*Orcinus orca*)	Cetacean, migratory—listed under CITES (Appendix II) and CMS (Appendix II)
Pygmy right whale (*Caperea marginata*)	Cetacean, migratory—listed under CITES (Appendix I) and CMS (Appendix II)
Sperm whale (*Physeter macrocephalus*)	Cetacean, migratory—listed under CITES (Appendix I) and CMS (Appendix I and II)
Andrew's beaked whale (*Mesoplodon bowdoini*)	Cetacean
Arnoux's beaked whale (*Berardius arnuxii*)	Cetacean
Cuvier's beaked whale, goose-beaked whale (*Ziphius cavirostris*)	Cetacean
Gray's beaked whale, scamperdown whale (*Mesoplodon grayi*)	Cetacean

Species (common name/scientific name)	Conservation status
Hector's beaked whale (*Mesoplodon hectori*)	Cetacean
Shepherd's beaked whale, Tasman beaked whale (*Tasmacetus shepherdi*)	Cetacean
Strap-toothed beaked whale, strap-toothed whale, Layard's beaked whale (*Mesoplodon layardii*)	Cetacean
True's beaked whale (*Mesoplodon mirus*)	Cetacean
Dwarf sperm whale (*Kogia simus*)	Cetacean
Pygmy sperm whale (*Kogia breviceps*)	Cetacean
False killer whale (*Pseudorca crassidens*)	Cetacean
Minke whale, dwarf minke whale (*Balaenoptera acutorostrata*)	Cetacean
Southern bottlenose whale (*Hyperoodon planifrons*)	Cetacean
Long-finned pilot whale (*Globicephala melas*)	Cetacean
Short-finned pilot whale (*Globicephala macrorhynchus*)	Cetacean
Bottlenose dolphin (*Tursiops truncatus*)	Cetacean
Common dolphin (*Delphinus delphis*)	Cetacean
Long-snouted spinner dolphin (*Stenella longirostris*)	Cetacean
Risso's dolphin, grampus (*Grampus griseus*)	Cetacean
Southern right whale dolphin (*Lissodelphis peronii*)	Cetacean
Spotted bottlenose dolphin, Indo-Pacific bottlenose dolphin (*Tursiops aduncus*)	Cetacean
Spotted dolphin, pantropical spotted dolphin (*Stenella attenuata*)	Cetacean
Striped dolphin, euphrosyne dolphin (*Stenella coeruleoalba*)	Cetacean

CITES = Convention on International Trade in Endangered Species of Wild Fauna and Flora;
CMS = Convention on the Conservation of Migratory Species of Wild Animals

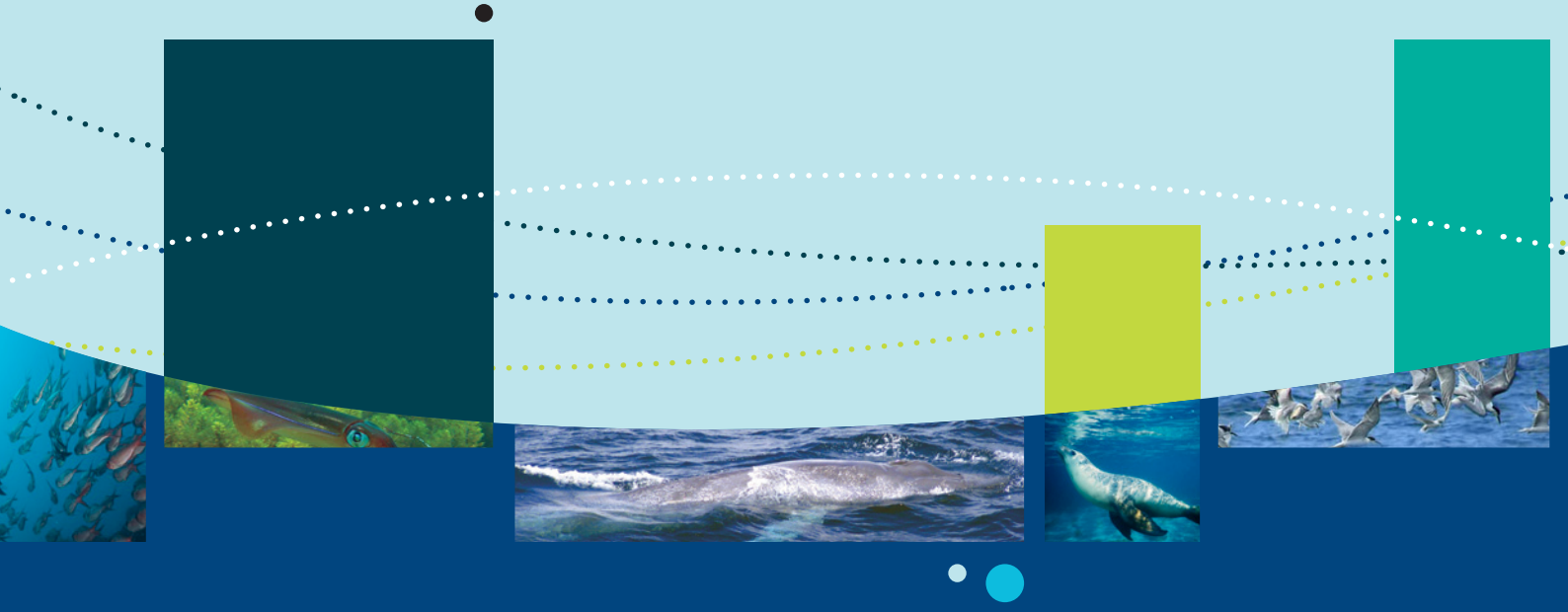
1 The taxonomy of blue whales is unclear; however, it is generally accepted that there are two subspecies in the Southern Hemisphere: the 'true' Antarctic blue whale, *Balaenoptera musculus intermedia*, and the pygmy blue whale, *B. m. brevicauda*. Both subspecies are thought to occur in the South-west Marine Region, although their respective distributions are uncertain. One notable difference is that during the Southern Hemisphere summer, 'true' blues are usually found south of 60° S, while 'pygmy' blues are usually found north of 55° S. Blue whales are listed under the EPBC Act at the species level; however, where possible, we distinguish between subspecies. Where subspecies cannot be identified, both subspecies are referred to collectively as 'blue whales'.

Table A2: Cetacean species known to occur in the South-west Marine Region on an infrequent basis

Species (common name/scientific name)	Conservation status
Dusky dolphin (*Lagenorhynchus obscurus*)	Cetacean, migratory—listed under CITES (Appendix II) and CMS (Appendix II)
Spectacled porpoise, spectacled dolphin (*Phocoena dioptrica*)	Cetacean, migratory—listed under CITES (Appendix II) and CMS (Appendix II)
Blainville's beaked whale, dense-beaked whale (*Mesoplodon densirostris*)	Cetacean
Ginkgo-toothed beaked whale, gingko-toothed whale, gingko beaked whale (*Mesoplodon ginkgodens*)	Cetacean
Melon-headed whale (*Peponocephala electra*)	Cetacean
Omura's whale (*Balaenoptera omurai*)[2]	Cetacean
Pygmy killer whale (*Feresa attenuata*)	Cetacean
Rough-toothed dolphin (*Steno bredanensis*)	Cetacean
Fraser's dolphin, Sarawak dolphin (*Lagenodelphis hosei*)	Cetacean

CITES = Convention on International Trade in Endangered Species of Wild Fauna and Flora;
CMS = Convention on the Conservation of Migratory Species of Wild Animals

2 There is some contention as to whether *Balaenoptera omurai* is a distinct species.



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