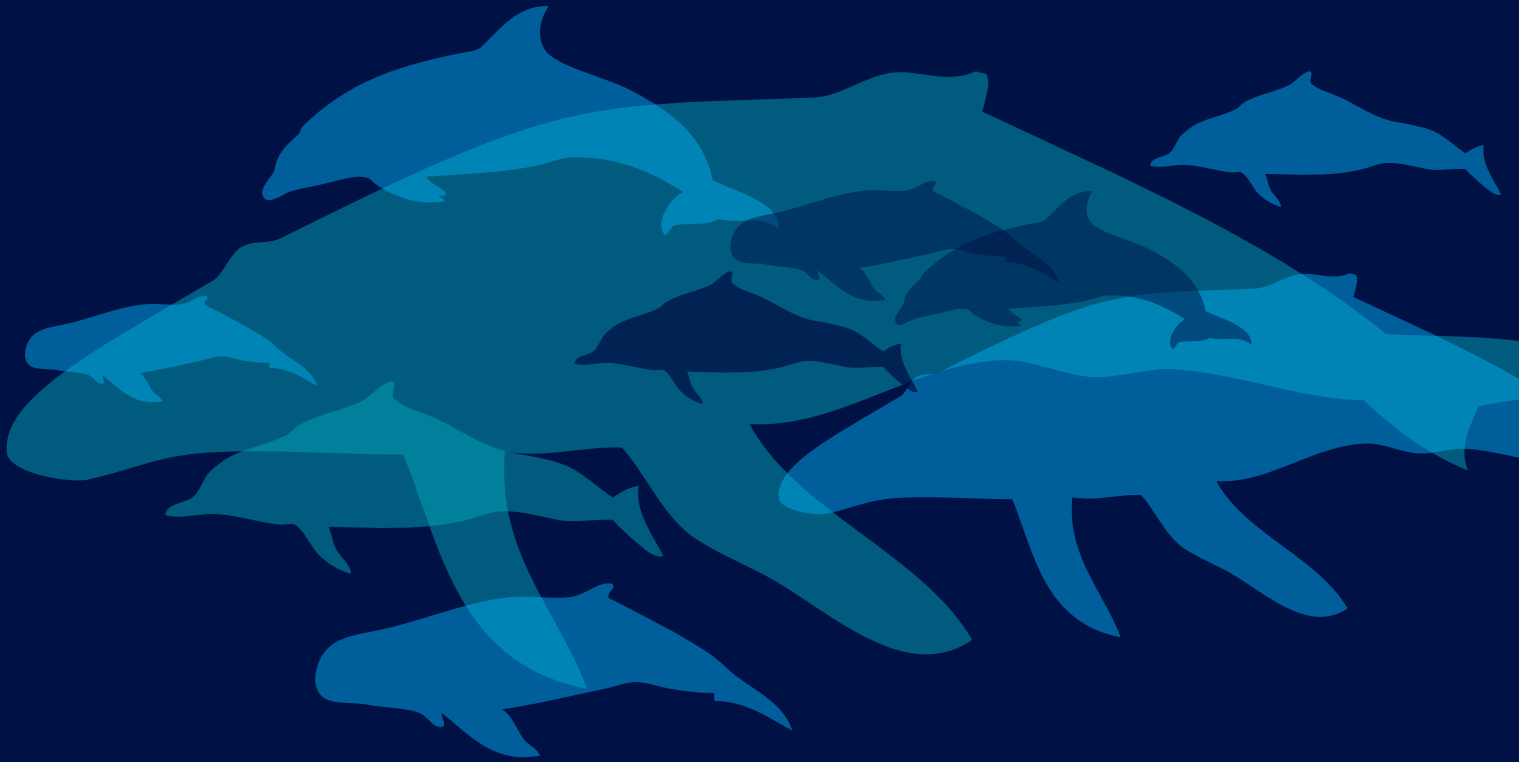




Australia's Last Great Whale Haven

Cetacean distribution and conservation
needs in the north-west marine region

November 2011



This report summarises the distribution and habitat requirements of cetacean species known to occur in the North-west Marine Region, identifies threats to their populations, highlights conservation needs and makes recommendations for research and management measures.

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Executive Summary

This report summarises the distribution and habitat requirements of all cetacean (whale, dolphin and porpoise) species known to occur in the North-West (NW) Marine Region, which extends three to 200 nautical miles offshore in Commonwealth waters from Kalbarri up to the Western Australian – Northern Territory border. The region boasts high species and habitat diversity, numerous threatened and migratory species, including the world's largest but still recovering population of humpback whales. This report identifies threats to cetacean populations in the region, highlights conservation needs and makes a number of recommendations for research and management measures.

A great whale haven

The NW Marine Region contains many areas of importance for individual cetacean species and species groups.

Overall 32 cetacean species have been recorded in the region, 21 of which occur regularly and a further 11 have been recorded occasionally. These include three inshore dolphins, eight pelagic dolphins, eight baleen whales and 13 toothed whales.

The four species considered most abundant include the Australian snubfin dolphin (a species only found in Australian waters), the Indo-Pacific humpback dolphin, the Indo-Pacific bottlenose dolphin and the humpback whale. However, other species are also regularly encountered during surveys, such as the pygmy blue whale, sperm whale, false killer whale and striped dolphin. Remaining species are encountered less frequently and there are still large knowledge gaps.

The bays and inlets of the Kimberley are home to a number of inshore dolphins. Humpback whales breed and calve in an area from Broome to the northern end of Camden Sound, and migrate through the waters off Quondong Point and James Price Point where high densities of dolphins have also been recorded. Quondong Point is a known aggregation site for blue whales. This area also attracts false killer whales and a number of dolphin species.

The region's islands and reefs – especially Barrow, Browse and the Montebello and Lacepede Islands, Ashmore and Scott Reefs and the Rowley Shoals – provide important habitat for the three most abundant dolphin species in the region. Truly oceanic species may be attracted to the waters over Wallaby Saddle, the Exmouth Plateau and the Scott Plateau; these have historically been known as aggregation areas for sperm whales, and might also provide feeding grounds for beaked whales.

Ashmore Reef is the site of records for 15 species of cetaceans. Scott Reef and the Rowley Shoals are thought to be important to blue whales, dwarf sperm whales and Cuvier's beaked whales.

Browse Island and surrounding waters may be one of the most significant habitats for cetaceans in the region; a recent survey documented unprecedented levels of co-occurring species of cetaceans in Australian waters. Cetaceans encountered in this area include Bryde's whales, potentially feeding humpback whales and pygmy blue whales, Antarctic minke whales, dwarf minke whales, short-finned pilot whales, melon-headed whales, false killer whales, pygmy killer whales and several species of oceanic dolphins.

Species recorded in the offshore habitats of the Kimberley include spinner, bottlenose and Indo-Pacific humpback dolphins, pilot, false killer, Bryde's, humpback and pygmy blue whales. Ningaloo periodically attracts species such as humpback, pygmy blue and minke whales, and bottlenose, Indo-Pacific humpback and Risso's dolphins.

There are a number of areas yet to be studied but likely to be important to cetaceans, including deepwater shelf break areas and canyon and seamount features. In general, knowledge about most species is lacking, and for many there is no information relating specifically to the NW Marine Region, hampering effective environmental protection. Some cetacean research is ongoing in the region, largely commissioned and funded by the oil and gas industry, but not all of the data resulting from these projects is available to the public or the scientific community.

Our last great whale haven under threat

A number of ongoing threats to cetaceans are present in the region. Many of these are associated with the activities of the oil and gas industry, including the cumulative effects of repeated or overlapping seismic exploration, shipping movements, the threat of spills and pollution, and production activities such as drilling. The high level of oil and gas activity increases the risk of a major oil spill in the region, such as the 2009 blowout from the Montara Wellhead Platform that affected approximately 90,000km² of the Timor Sea. The industry has obligations to minimise and mitigate their impacts on cetaceans in the region, but impacts are nevertheless likely to occur, as their activities overlap significantly with important cetacean habitats such as Exmouth Gulf, Ningaloo Reef, Barrow Island, Quondong Point and James Price Point, the Kimberley Coast, Browse Island, Scott Reef and Ashmore Reef. Other threats to cetaceans in the region come from fisheries, shipping and marine debris.

Inadequate protection for cetaceans

Through its Marine Bioregional Planning process, the Australian Government is proposing a North-west Commonwealth Marine Reserve Network that includes 10 marine reserves. However, only three of these are highly protected Marine National Parks, and only one of those three includes shallower parts of the marine environment which scientists report to be most threatened. The region is recognised globally for its cetacean species richness, but the Government's draft Bioregional Plan lists only four cetacean species as conservation priorities (humpback whales, Australian snubfin dolphin, Indo-Pacific humpback dolphin and Indo-Pacific bottlenose dolphin).

The proposed highly protected areas avoid current and proposed petroleum leases. Areas where multiple human uses intersect, especially the oil and gas industry, fisheries and shipping, are not destined for further protection. While the initial 'Areas for Further Assessment' process identified a number of the areas as having important habitats for cetaceans, the vast majority of these were not included as highly protected reserves in the network.

The Environment Protection and Biodiversity Conservation (EPBC) Act 1999, which is the foundation of the Bioregional Planning process, also includes other measures to regulate specific activities that can impact upon cetaceans. All species of cetaceans in the NW Marine Region qualify as matters of national environmental significance under the EPBC Act and are protected by the Australian Whale Sanctuary. Therefore, the Australian Government has considerable grounds on which to ensure that commercial interests in the region operate with integrity and transparency and have little or no impact on environmental assets such as cetaceans. The importance of the oil and gas industry's contribution to the region's and the nation's economy is not underestimated; however, the industry's activities must go hand in hand with a long-term environmental stewardship program that recognises the environment as one of Australia's most important assets.



Introduction

The North-west (NW) Marine Region includes Commonwealth waters (three to 200 nautical miles from shore) between Kalbarri (south of Shark Bay) and the Western-Australian (WA) – Northern Territory border. Species diversity in the region is high, and globally significant populations of internationally threatened species such as the humpback whale, flatback turtle and whale shark occur there in abundance.

The Region is characterised by an expansive shallow continental shelf, but also includes a large area of continental slope, the Cuvier and Argo abyssal plains, which are up to 5.8km deep, and numerous canyons and other seabed features⁶³. The marine environment is shaped by highly variable tidal regimes, frequent cyclones and complex currents, and combines tropical and sub-tropical flora and fauna. The primary ocean current in the region is the Indonesian Throughflow, which transports warm tropical water through the Indonesian Archipelago and effectively links the Pacific and Indian Oceans¹⁵⁴. The warm Leeuwin Current flows southward

through the region, carrying tropical water down the WA coast¹⁵⁴. The primary conservation values of the region are identified as its high species diversity, high-productivity areas around coral reefs and other undersea geomorphic features, numerous threatened and migratory species and existing protected places⁶³. The Australian Government’s proposed North-west Commonwealth Marine Reserve Network comprises 10 marine reserves but only three highly protected Marine National Park Zones, two of which extend over what is primarily abyssal plain and deep slope habitat (Figure 1).

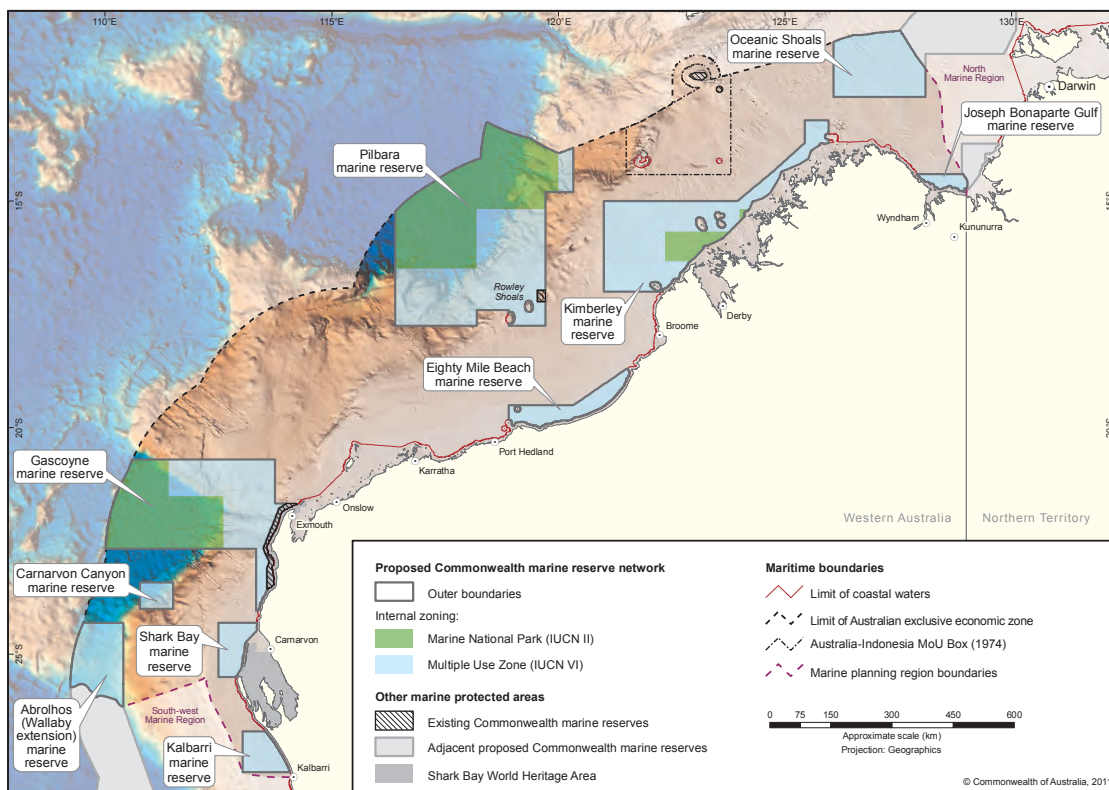


Figure 1. Map of the NW Marine Region with the currently proposed Commonwealth Marine Reserve Network. Source: DSEWPac, 2011.

The NW Marine Region is recognised globally for its cetacean species richness¹³⁹. According to existing databases, 32 cetacean species have been recorded in the NW Marine Region, 21 of which occur there regularly and a further 11 that, to date, have been recorded rarely. Further research is needed to confirm whether this latter group is actually rare in the region. Among the 21 species that frequent the region regularly, there are nine dolphins and 12 whales (Table 1). Their occurrence in the region varies, and the four species considered most abundant include the Australian snubfin dolphin (*Orcaella heinsohni*), the Indo-Pacific humpbacked dolphin (*Sousa chinensis*), the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) and the humpback whale (*Megaptera novaeangliae*). However, other species are also regularly encountered during surveys, such as the pygmy blue whale (*Balaenoptera musculus brevicauda*), sperm whale (*Physeter macrocephalus*), false killer whale (*Pseudorca crassidens*) and striped dolphin (*Stenella coeruleoalba*), but robust abundance estimates for these species will rely on more extensive research. All species are of international and national conservation significance, with the humpback whale, pygmy blue whale and fin whale listed as threatened under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999.

The Bioregional Profile for the North-west⁶³ noted that all cetaceans are nationally protected species. Experts agree that 21 species are regularly present in the region, but the Government's draft Bioregional Plan lists only four species (humpback whales, Australian snubfin dolphin, Indo-Pacific humpback dolphin and Indo-Pacific bottlenose dolphin) as having conservation significance in the region. Marine reserves were therefore designated with consideration for only these four species, and only one of three areas given highly protected (IUCN level II category) status overlaps with designated important habitats for these species (the Kimberley Marine Reserve, Figure 1). The reserves do not cater for the protection needs of all species of cetaceans listed for the NW, and in fact, largely miss the areas listed as important for the four species considered by the plan.

This report therefore aims to identify the cetacean species that occur in the NW Marine Region and, as far as existing information allows, describe their distribution and important habitats (areas of known or likely occurrence e.g. where sightings have been frequent or which contain obvious food sources or known breeding/calving grounds). It also aims to identify threats to their populations and highlight the priority conservation needs of cetaceans in the region so as to be able to improve protection measures, including the Government's draft Bioregional Plan and proposed Marine Reserve Network.



Cetaceans of the NW Marine Region

According to existing databases, 21 species of cetaceans occur regularly in waters of the NW Marine Region, and a further 12 are thought to occur in the region infrequently. The cetacean community includes three inshore dolphins, eight pelagic dolphins, eight baleen whales and 13 toothed whales (Table 1).

Populations of the inshore Australian snubfin dolphin, Indo-Pacific bottlenose dolphin and Indo-Pacific humpback dolphin are considered resident in the region, especially around the Buccaneer Archipelago, the area between Broome and Cape Leveque, Browse Island, Scott Reef, the Rowley Shoals and the Maret and Montilivet Island groups⁶². Humpback whales use the area between Pender Bay and Camden Sound as the breeding and calving area for the western Breeding Stock D, and the coastline south of Broome provides important travelling and resting habitat for their annual migration. Pygmy blue whales, fin whales, dwarf and Antarctic minke whales migrate through the region between southern waters and tropical breeding or feeding grounds and are likely to feed on persistent seasonal krill patches. Sperm whales, false killer whales, short-finned pilot whales and beaked whales are squid feeders and are typically associated with undersea features such as seamounts or canyons^{46, 137, 168}.

Mixed-species feeding schools, which may also associate with tuna and seabirds, include bottlenose, spinner, spotted, Risso's and rough-toothed dolphins and melon-headed and pilot whales that target small schooling fishes. Antarctic minke whales, spinner and striped dolphins are considered truly pelagic and are expected to spend most of their time offshore targeting small fish⁶¹. Southern right whales have been observed as far north as Exmouth, but very little is known about their use of the region¹⁷.

Discreet calving areas are unknown in Australian waters for most species except humpback whales, with most offshore dolphin species likely to give birth within their feeding ranges, and resident inshore dolphins breeding and calving in coastal waters. Killer whales prey on a number of the smaller species and humpback whale calves, and may follow the humpback whale migration to their breeding areas⁶².

Knowledge about most species is lacking, and for many there is no information relating specifically to the NW Marine Region. The only species that have been studied in the region are humpback whales, which follow a comparatively well-defined migration route, and inshore species such as the Australian snubfin dolphin, Indo-Pacific humpback dolphin and Indo-Pacific bottlenose dolphin. Cetacean research is currently ongoing in the region, largely commissioned and funded by the oil and gas industry¹⁴⁶, but the data from many of these projects is not available to the public or the scientific community. For instance, an extensive survey of biodiversity in the Browse Basin was recently conducted for the oil and gas industry that reportedly documented 15 species of co-occurring cetaceans and associated biota (Jenner C. pers. comm. 2011) – levels of co-occurrence previously never recorded in Australian waters.

Common species and important habitat

Australian snubfin dolphins are known to congregate in Roebuck Bay, although they are found regularly to Cape Londonderry and occasionally as far south as Exmouth. Their distribution is fragmented along the coast, and tends to be concentrated in areas with high habitat complexity and high prey density¹²⁷. This species preys opportunistically on coastal fish and cephalopods, and have been observed feeding together with threadfin salmon in the NW Marine Region. Groups of resident Australian snubfin dolphins have been recorded in Roebuck Bay, King Sound (south), Yampi Sound, Deception Bay, Prince Regent River, King George River/Cape Londonderry and the Ord River/Cambridge Gulf¹⁴⁶. Some groups may travel between coastal habitats to socialise and feed, as large groups have been observed travelling in Brunswick Bay and off Deception Bay and the Dampier Peninsula. They may also move up to 10km offshore¹³⁰.

Indo-Pacific humpback dolphins are thought to be resident in small areas along the NW Marine Region, with widely scattered populations as far south as Shark Bay. Main areas of occurrence are the waters off the Buccaneer Archipelago and from Cape Leveque to Broome, near tidal creeks in mangrove areas, in bays associated with islands, at the base of steep rock inclines, or coral reefs, in association with concentrations of prey^{127,130}. Regular sightings are made in the mangrove areas of the Pilbara coast, presumably associated with feeding and breeding areas (Jenner, C., pers. comm., 2011). Habitat use patterns have been found to change with tidal regimes⁷³, and this species may be found further offshore during flood events⁷². Habitat can overlap with that of the Australian snubfin dolphin. Critical habitat for foraging, feeding, breeding and calving has been identified in Roebuck Bay, Dampier Peninsula, King Sound north, Talbot Bay, Anjo Peninsula, Vansittart Bay, Napier, Broome Bay and Deception Bay.

Indo-Pacific bottlenose dolphins also have a primarily coastal distribution but are thought to prefer slightly deeper, clearer and more open water than the snubfin and humpback dolphins¹⁴¹. Roebuck Bay, the Maret Islands and Yampi Sound are important habitats for this species for feeding, breeding and calving. Resident groups are also known to occur at Browse Island, in the Rowley Shoals and around other island and reef complexes in offshore waters, where they may co-occur with common dolphins. The areas north of James Price Point and Pender Bay may also be important, as large groups have been spotted there¹⁴⁶. Indo-Pacific bottlenose dolphins prey primarily on benthic and reef-dwelling fish and cephalopods; in offshore waters they are thought to prey mostly on epipelagic and mesopelagic fish, cephalopods and sometimes benthic crustaceans¹⁴¹.

Humpback whales that migrate along the western coast of Australia belong to what is known as Breeding Stock D, which is distinct from the Breeding Stock E population that migrates along Australia's east coast¹³². Humpback whales migrate north into the waters of the NW Marine Region in early June each year⁹⁵. The main breeding and calving ground for this population lies between Broome and north Camden Sound (Figure 2)⁹⁷; this area is recognised as the northern-most calving ground for this species in the southern hemisphere⁶¹, and the largest in the world¹⁴⁸. The southern migration begins between August and September⁹⁷, and there are important resting places for females with calves in Exmouth Gulf and Shark Bay^{43,84,97}. The abundance of Breeding Stock D population was estimated at a maximum of just over 33,000 individuals in 2008, and is thought to be increasing at ~10% per year^{84,132,150}. Feeding is not thought to occur regularly during the migration, but some opportunistic feeding, perhaps by sexually immature whales has been recorded¹⁶⁶.

Humpback whales are the best-studied species of cetacean in the NW Marine Region, having attracted numerous surveys^{60,97,132,147,148}. Their migration corridor is generally thought to be narrow (mostly less than 100km) and close to the coast. This may vary between males (further offshore) and females with calves (closer inshore to avoid predation)⁶⁰. Important migration corridors include coastal waters off Quondong Point during the northern migration, Geraldton and the Abrolhos Islands^{9,148}. Almost 500 whales per day have been recorded moving through some of these corridors¹⁴⁸. The northern and southern migration routes diverge at the Perth Basin, Dampier Archipelago, Montebello Islands and Kimberley regions, with the northern migratory route located further offshore (Figure 3)^{97,148}.

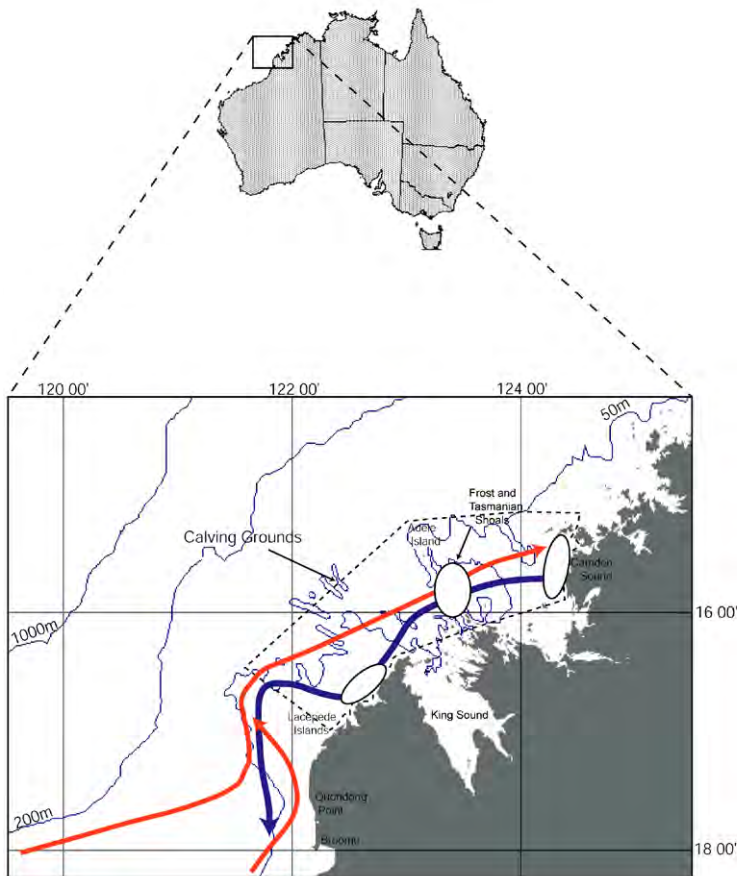


Figure 2. Positions of the Breeding Stock D humpback whale calving ground and migratory routes leading to and from the area. Circled areas have the highest concentrations of whales, and were the focus of the 1997 surveys. From Jenner et al. ⁹⁷

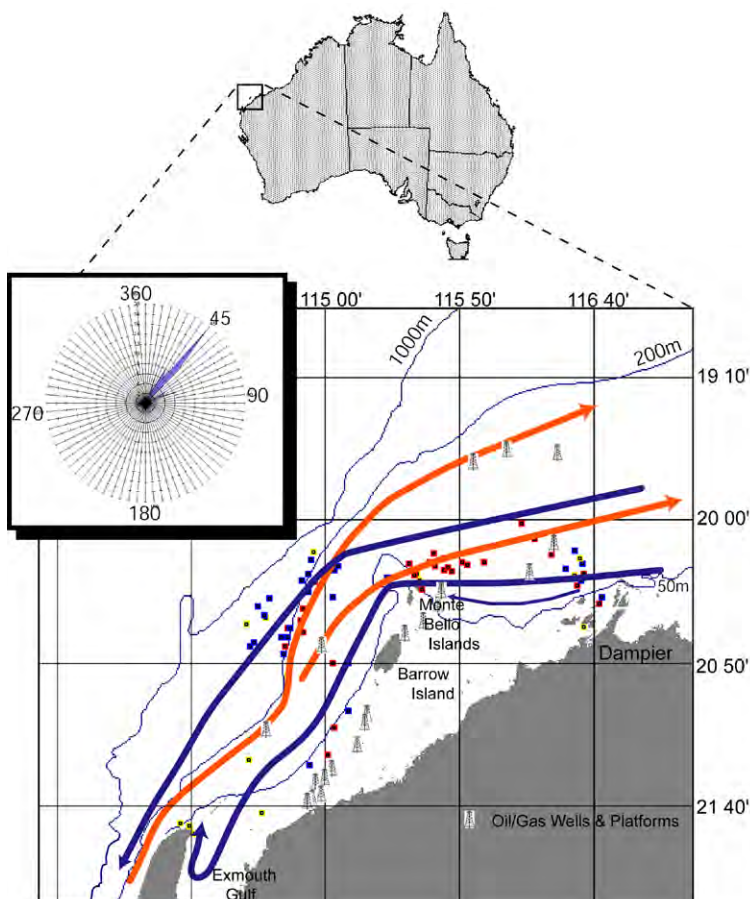


Figure 3. Assumed north and southbound migratory paths of humpback whales between Exmouth Gulf and the Dampier Archipelago. Inset charts are observed headings of northbound whales off NW Monte Bello Islands in June/July 1992. Sightings reported from the oil and gas industry between 1991 and 1996 are shown as red (northbound), blue (southbound) or yellow (milling) squares from Jenner et al. ⁹⁷.

Common bottlenose dolphins occur in the NW Marine Region in both their inshore and offshore forms⁹⁰. Records exist of pelagic populations, nearshore groups and residents of areas around oceanic islands. Their diet varies between inshore and offshore forms (fish or squid respectively) and with geographic location, and common bottlenose dolphins can associate with pilot whales, white-sided dolphins, spotted dolphins, rough-toothed dolphins, Risso's dolphins, false killer whales and humpback whales. In the NW Marine Region, important habitats for resident populations are Shark Bay and the Montebello and Barrow Islands.

Pelagic dolphins such as **Fraser's dolphins**, **Risso's dolphins** and **rough-toothed dolphins** are generally found in deep oceanic waters in association with upwelling, over geomorphic features such as seamounts and canyons or in places where islands or reefs abut deep water where productivity is enhanced^{59,137}. High site fidelity has been found in Risso's dolphins¹² and rough-toothed dolphins¹³ and the latter species has been sighted regularly around the Abrolhos Islands, the Rowley Shoals and Scott Reef (Jenner, C. pers. comm. 2011). In the NW Marine Region mixed-species schools of Fraser's dolphin, sperm whales, pilot whales, false killer whales, common bottlenose dolphins and spinner dolphins have been recorded¹⁴⁶ in the shelf edge waters of the Browse Basin. These species generally feed on a wide range of fish, squid and crustaceans from throughout the water column, and can dive to depths of 600 metres or more^{46,59,149,168}. Risso's dolphins have been recorded off the Kimberley coast in groups with sperm whales, short-finned pilot whales, bottlenose dolphins, common dolphins, striped dolphins, spotted dolphins, false killer whales and pygmy killer whales^{146,147,171}, and have been seen in the Rowley Shoals in large numbers. Rough-toothed dolphins have been recorded in the region in association with common bottlenose dolphins.

Three pelagic dolphins of the genus *Stenella* are found in the NW Marine Region, including the spotted, spinner and striped dolphin, but little is known of their exact distribution^{121,176}. They have been recorded at the shelf edge and shelf slope in the Browse Basin in large, mixed-species feeding schools with other cetaceans and in association with tuna and seabirds^{89,146}. Small, potentially resident groups have been observed resting in nearshore areas of the Kimberley coast on the lee side of bays and islands. Spinner dolphins were observed in high densities off James Price Point during recent surveys, forming schools of up to 100 individuals at least 5km from the shore¹⁴⁶. The striped dolphin is known to be abundant around Barrow Island. These species exhibit highly dynamic behaviour and can dive to depths of 200–300 metres to feed on small squid, shrimp and fish. Spinner dolphins were caught in large numbers by the Taiwanese gillnet fishery when it operated in the northern waters of the region⁸².

Regular visitors and potential residents

A number of species are expected to use the waters of the NW Marine Region as part of annual migration routes, potentially also resting or feeding in particular locations. Pygmy blue whales, for instance, are known to migrate between southern feeding grounds (the Perth Canyon and the Bonney Upwelling) and presumed breeding and calving grounds in Indonesian waters^{25,74}. Apart from the Bonney Upwelling and the Perth Canyon, oceanographic conditions favourable to pygmy blue whales exist along the southern coasts of Java, Sumbawa and Halmahere Island, Indonesia²⁵. Recent research has found little genetic differentiation between the Perth Canyon and Bonney Upwelling feeding aggregations, suggesting that both populations may use the same breeding areas⁷. A blue whale migration corridor is thought to exist between Scott Reef and Browse Island¹⁴⁸ and blue whales have been tracked travelling west of Scott Reef during their northern migration⁷⁴. Furthermore, North West Cape is used as a migratory waypoint, and upwellings near seamounts and canyons in the Browse Basin are likely feeding areas during migration to Indonesia^{25,121}. Pygmy blue whales have a thin layer of blubber compared with other migrating baleen whales, indicating that feeding during migration is necessary, and important feeding areas are likely to occur in the NW Marine Region⁶¹.

Historical whaling and sighting records suggest that the region provides important habitat to **sperm whales**. Male sperm whales use the region during migrations, while females are most probably resident year-round. This species is typically associated with topographic features such as canyon habitats and steep slopes¹³⁷. Wallaby Saddle, the Exmouth Plateau and the Scott Plateau are historically known as sperm whale aggregation areas. Canyon habitats over the Scott Plateau may also provide important feeding habitat for **Cuvier's beaked whales**^{110,121}. Cuvier's beaked whales, dwarf sperm whales and rough-toothed dolphins are considered indicators of high productivity and species richness¹²¹.

The productive waters around Browse Island are likely to be important to other species that use the NW Marine Region as a part of their migratory pathway, such as **Antarctic minke whales** and **short-finned pilot whales**, or whose distributional range falls within the region, such as **dwarf minke whales**, **false and pygmy killer whales** and **melon-headed whales**^{121,146,176}. Pygmy killer whales have been sighted along the Kimberley coast between Broome and Camden Sound during independent surveys⁴³. **Fin whales** may also migrate through the region, and **killer whales**, which can be transient predators⁴⁸, may follow the humpback whale migration to prey on calves¹⁴⁶. Killer whales have been recorded in the James Price Point migration corridor¹⁴⁶, but no specific information for the movements of these species in the region is currently available. A similar lack of information exists for **Bryde's whales**, which have been sighted in the region¹⁴⁸. This species has both inshore and offshore populations, and a resident inshore population may exist in the region. Bryde's whale calls are recorded regularly in the Bonaparte Gulf, in a pattern that suggests the whales travel through the area without aggregating or stopping¹¹¹.

Occasional sightings and inferred occurrence

A number of species have distributions that extend into the NW Marine Region, but little empirical information exists. Migratory species that are likely to travel into or through the region include **southern right whales**, **sei whales**, and **fin whales**; some or all of these species may have breeding, feeding and / or resting areas in the region¹⁴⁶. Southern right whales appear to be increasingly recorded in the region^{2,147}.

Other species may be resident for all or part of the year; based on their distribution and habitat requirements, it is highly likely that the region fulfils some degree of their habitat requirements. For instance, a number of beaked whale species are known in the region. Most beaked whales share similar aggregation areas, usually in deep oceanic habitats over significant undersea geomorphic features such as shelf breaks, canyons, seamounts and other locations that promote high productivity^{8,83} or sudden shifts in sea surface temperature¹⁷⁸. Therefore, while no specific records could be found, **Gray's beaked whales**, **gingko-toothed beaked whales** and **Blainville's beaked whales** are likely to be found in the NW Marine Region^{19,110,139}. Beaked whales are the least-known group of cetaceans, due to their offshore nature and deep diving behaviour¹⁶⁸, and misidentification is high^{44,49}.

Multi-species feeding aggregations may also attract **short-beaked** and **long-beaked common dolphins**, previously recorded in the region in medium water depths¹⁴⁶. **Pygmy sperm whales**, **dwarf sperm whales** and **long-finned pilot whales** may also migrate through the region or have permanent populations over the continental shelf or near oceanic islands. These species appear to prefer offshore habitats either on or beyond the edge of the continental shelf; long-finned pilot whales may be split into inshore and offshore populations. Greater knowledge of these species in the NW Marine Region would be highly beneficial in establishing the areas of highest use by the region's cetacean community.

Table 1. Species recorded as occurring in the NW Marine Region, including the frequency of occurrence where available.

Category	Species	Common Name	Occurrence in the NW Marine Region	Known or likely locations of importance	IUCN Red List	EPBC	CITES	CMS
Inshore dolphins	<i>Orcaella heinsohni</i>	Australian snubfin dolphin	Resides in the region throughout the year.	Resident populations in Roebuck Bay and Cape Londonderry, Deception Bay, George Water, Yampi Sound, Kuri Bay, Prince Regent River, Talbot Bay and Walcott Inlet, Beagle Bay, Pender Bay, Cambridge Bay along the Kimberley coast.	Near Threatened	Cetacean	Appendix I	Appendix II
	<i>Tursiops aduncus</i>	Indo-Pacific bottlenose dolphin	Resides in the region throughout the year.	Resident populations at Shark Bay and Barrow Island.	Data Deficient	Cetacean	Appendix II	Appendix II
	<i>Sousa chinensis</i>	Indo-Pacific humpback dolphin	Resides in the region throughout the year.	Resident populations at Ningaloo Reef, Montebello and Barrow Islands, Anjo Peninsula, Cone Bay, Deception Bay, Kuri Bay, Talbot Bay, Beagle Bay, Pender Bay, Cambridge Bay and Yampi Sound.	Near Threatened	Cetacean	Appendix I	Appendix II
Pelagic dolphins	<i>Delphinus delphis</i>	Short-beaked common dolphin	Thought to occur infrequently in the region.	None identified.	Least Concern	Cetacean	Appendix II	Appendix I
	<i>Tursiops truncatus</i>	Common bottlenose dolphin	Resides in the region throughout the year.	Resident populations at Shark Bay and Montebello and Barrow Islands. Seen from Cape Londonderry to the Lacepede Islands, and near Ashmore Reef.	Least Concern	Cetacean	Appendix II	Appendix II
	<i>Lagenodelphis hosei</i>	Fraser's dolphin	Thought to occur infrequently in the region.	None identified, seen near Ashmore Reef.	Least Concern	Cetacean	Appendix I	Appendix II
	<i>Grampus griseus</i>	Risso's dolphin	Data deficient. Have been observed.	None identified, observed in large numbers in the Rowley Shoals.	Least Concern	Cetacean	Appendix II	n
	<i>Steno bredanensis</i>	Rough-toothed dolphin	Data deficient. Possibly resident in the region throughout the year.	None identified. Seen in deep water off Scott Reef. Strandings recorded on Barrow Island.	Least Concern	Cetacean	Appendix II	n
	<i>Stenella attenuata</i>	Pantropical spotted dolphin	Data deficient. Probably resident in the region throughout the year.	None identified, seen near Ashmore Reef.	Least Concern	Cetacean	Appendix II	n
	<i>Stenella longirostris</i>	Spinner dolphin	Resides in the region throughout the year, one of the more common pelagic dolphins in the NW Marine Region.	High density in James Price Point area. Seen from Cape Londonderry to the Lacepede Islands, and near Ashmore Reef.	Data Deficient	Cetacean	Appendix II	Appendix II

Category	Species	Common Name	Occurrence in the NW Marine Region	Known or likely locations of importance	IUCN Red List	EPBC	CITES	CMS
	<i>Stenella coeruleoalba</i>	Striped dolphin	Resides in the region throughout the year.	Abundant in waters around Barrow Island.	Least Concern	Cetacean	Appendix II	n
Whales	<i>Megaptera novaeangliae</i>	Humpback whale	Important migration, calving and resting areas.	Resting areas in Shark Bay (particularly for females and calves on their southward migration), Exmouth Gulf, Montebello and Barrow Islands. Migration path between Point Cloates and North West Cape, in particular Quondong Point. Calving areas between Broome and the northern end of Camden Sound, in particular Buccaneer Archipelago to Adele Island, Collier Bay, Pender Bay. Unconfirmed sightings of humpback whales feeding have also been reported from waters around Browse Island which would be one of the few instances on record of humpback feeding outside Antarctic waters.	Least Concern	Vulnerable, Cetacean, Migratory	Appendix I	Appendix I
	<i>Balaenoptera bonaerensis</i>	Antarctic minke whale or darkshoulder minke whale	Region falls within presumed migration path between Antarctic and tropical areas.	None identified. Seen in offshore waters surrounding Browse Island.	Data Deficient	Cetacean, Migratory	Appendix I	Appendix II
	<i>Mesoplodon densirostris</i>	Blainville's beaked whale or densebeaked whale	Thought to occur infrequently in the region.	None identified.	Data Deficient	Cetacean	Appendix II	n
	<i>Balaenoptera musculus</i>	Blue whale or pygmy blue whale	Migrates through the region.	Quondong Point. Migration corridor thought to be between Scott Reef and Browse Island. Waters around Browse Island are likely to be a feeding area for blue whales migrating to Indonesia.	Endangered	Endangered, Cetacean, Migratory	Appendix I	Appendix I
	<i>Balaenoptera edeni</i>	Bryde's whale	Data deficient. Possibly resident in the region throughout the year.	None identified. Seen from Cape Londonderry to the Lacepede Islands. Recorded in Bonaparte Gulf.	Data Deficient	Cetacean, Migratory	Appendix I	Appendix II
	<i>Ziphius cavirostris</i>	Cuvier's beaked whale or goosebeaked whale	Data deficient. May migrate through the region.	None identified. May be associated with canyon habitats. Seen near Scott Reef, possible breeding and feeding over Scott Plateau.	Least Concern	Cetacean	Appendix I	n

Category	Species	Common Name	Occurrence in the NW Marine Region	Known or likely locations of importance	IUCN Red List	EPBC	CITES	CMS
	<i>Balaenoptera acutorostrata</i>	Dwarf minke whale	Region falls within the known range of tropical and temperate southern hemisphere waters.	None identified. Seen in offshore waters surrounding Browse Island.	Least Concern	Cetacean, Migratory	Appendix I	n
	<i>Kogia simus</i>	Dwarf sperm whale	Thought to occur infrequently in the region.	None identified. Recorded between Scott and Ashmore Reefs.	Data Deficient	Cetacean	Appendix II	n
	<i>Pseudorca crassidens</i>	False killer whale	Data deficient. May be resident in the region throughout the year.	None identified. Seen off Quondong Point, in offshore waters surrounding Browse Island and Ashmore Reef, and in waters from Cape Londonderry to the Lacepede Islands.	Data Deficient	Cetacean	Appendix II	n
	<i>Balaenoptera physalus</i>	Fin whale	Data deficient. Possibly migrates through the region.	None identified.	Endangered	Vulnerable, Cetacean, Migratory	Appendix I	Appendix I
	<i>Orcinus orca</i>	Killer whale, orca	May feed in the region (may prey on humpback whales).	May be associated with humpback aggregation areas. Collier Bay.	Data Deficient	Cetacean, Migratory	Appendix I	Appendix II
	<i>Peponocephala electra</i>	Melon-headed whale	Data deficient. May be resident in the region throughout the year.	None identified. Seen in offshore waters surrounding Browse Island and near Ashmore Reef.	Least Concern	Cetacean	Appendix II	n
	<i>Feresa attenuata</i>	Pygmy killer whale	Thought to occur infrequently in the region.	None identified. Seen along Kimberley coast.	Data Deficient	Cetacean	n	Appendix II
	<i>Kogia breviceps</i>	Pygmy sperm whale	Thought to occur infrequently in the region.	None identified.	Data Deficient	Cetacean	Appendix II	n
	<i>Globicephala macrorhynchus</i>	Short-finned pilot whale	Data deficient. Possibly resident in the region throughout the year, although species is generally nomadic.	None identified. Seen in offshore waters surrounding Browse Island. Seen from Cape Londonderry to the Lacepede Islands.	Data Deficient	Cetacean	Appendix II	n
	<i>Physeter macrocephalus</i>	Sperm whale	Females with young may reside in the region all year round. Males may migrate through the region.	May be associated with canyon habitats. Wallaby Saddle, Exmouth Plateau and Scott Plateau are historically known aggregation areas.	Vulnerable	Cetacean, Migratory	Appendix I	Appendix I

Category	Species	Common Name	Occurrence in the NW Marine Region	Known or likely locations of importance	IUCN Red List	EPBC	CITES	CMS
	<i>Mesoplodon ginkgodens</i>	Gingko-toothed beaked whale, Gingko-toothed whale or Gingko beaked whale	Thought to occur infrequently in the region.	None identified.	Data Deficient	Cetacean	Appendix II	n
	<i>Mesoplodon grayi</i>	Gray's beaked whale or Scamperdown whale	Thought to occur infrequently in the region.	None identified.	Data Deficient	Cetacean	Appendix I	n
	<i>Globicephala melas</i>	Long-finned pilot whale	Thought to occur infrequently in the region.	None identified.	Data Deficient	Cetacean	Appendix II	n
	<i>Balaenoptera borealis</i>	Sei whale	Thought to occur infrequently in the region.	None identified.	Endangered	Cetacean	Appendix II	Appendix I
	<i>Eubalaena australis</i>	Southern right whale	So far recorded only as far north as Exmouth.	None identified.	Least Concern	Endangered, Cetacean, Migratory	Appendix I	Appendix I

In summary, there are a number of areas of importance for individual species and for species groups in the NW Marine Region that are apparent from current literature. A number of further areas of importance for species known to exist in the region are likely but are not yet fully understood.

Important identified habitats are the bays and inlets of the Kimberley where a number of inshore dolphins coexist (although these are thought to live primarily in the State waters); an area from Broome to the northern end of Camden Sound where humpback whales breed and calve; the waters off Quondong Point and James Price Point where humpback whales migrate and high densities of dolphins have been recorded¹⁴⁶; and the Browse Basin, where a very high diversity of cetaceans has been encountered.

The region's islands and reefs – especially Barrow, Browse and the Montebello and Lacepede Islands, Ashmore and Scott Reefs and the Rowley Shoals – also provide important habitat for the three most abundant dolphins in the region. Truly oceanic species, in contrast, may be attracted to the waters over Wallaby Saddle, the Exmouth Plateau and the Scott Plateau; these have historically been known as aggregation areas for sperm whales, and might also provide feeding grounds for beaked whales.

The waters off Quondong Point are an important migratory corridor for humpback whales and a known aggregation site for blue whales; this area also attracts false killer whales and a number of dolphin species. Migratory waypoints for blue whales are the NW Cape (where krill is an abundant resource also utilised by whale sharks) and the ocean between Scott Reef and Browse Island. Scott Reef and the Rowley Shoals are thought to be important to blue whales, dwarf sperm whales and Cuvier's beaked whales¹²¹.

Browse Island and surrounding waters may be one of the most significant habitats for cetaceans in the NW Marine Region; surveys recorded the highest co-occurrence of cetaceans encountered in Australian waters. Cetaceans encountered in this area include feeding Bryde's whales, potentially feeding humpback whales and pygmy blue whales (although this observation is as yet unconfirmed), Antarctic minke whales, dwarf minke whales, short-finned pilot whales, melon-headed whales, false killer whales, pygmy killer whales and several species of oceanic dolphins (Jenner C. pers. comm. 2011). Ashmore Reef is the site of records for 15 species of cetaceans¹²⁰. Cetacean species recorded in the Kimberley region include spinner, bottlenose, Indo-Pacific humpback dolphins, pilot, false killer, Bryde's, humpback and pygmy blue whales. Ningaloo Reef periodically attracts species such as humpback whales, pygmy blue whales, minke whales, bottlenose dolphins, Indo-Pacific humpback dolphins and Risso's dolphins¹⁶⁰.

Areas yet to be fully studied but likely to be important to cetaceans include deepwater shelf break areas, canyon and seamount features and other areas that have opportunistic or preliminary datasets indicating species presence. For example, aerial surveys conducted after the Montara oil spill³⁹ in a previously unsurveyed area recorded dolphins in all but four of the 16 sections of surveyed coastline, with the highest densities of dolphins in Collier Bay and between the WA-NT border and Vansittart Bay⁶⁵.

Cetacean research in the NW Marine Region

Published and available research on cetaceans in the NW Marine Region is scarce. Most research was historically focused on dolphin populations around the Shark Bay area⁸⁷, and on humpbacks in the same area⁸⁴. In recent years, the booming activity of the oil and gas industry has been coupled with increasing research; industry is currently thought to invest three to five times as much in cetacean research as the government is able to (Gales N. pers. comm. 2011).

Surveys are usually conducted as initial baseline or monitoring studies relating to specific projects with potential impacts on cetaceans and their habitats¹⁴⁸. Despite initial studies that identify presence/absence of species, there is little commitment to long term research that builds on initial datasets and examines the impacts of 20 year plus extractive projects.

In some cases the independence and completeness of initial baseline research is questionable, having been conducted in only winter months for example, and limited data has been made available to scientists and the public; it is crucial that this research be extended and open to review.

The Montara oil spill, which affected around 90,000km² of ocean and was the third-largest oil spill recorded in Australian waters³⁹, resulted in a number of surveys and monitoring studies^{64, 120}. These studies included aerial surveys along the affected coastline⁶⁵, but specific marine megafauna surveys were not conducted⁶⁴.



Threats

Oil and gas industry

The oil and gas industry is by far the largest economic contributor in Western Australia, including for cetacean research, and the industry's interests extend over almost all areas of the NW Marine Region. Major projects include the North West Shelf, Gorgon, Browse Basin, Wheatstone and Montara. These are administered by a combination of Australian and international companies. The industry has international and national obligations to minimise and mitigate their impacts on cetaceans in the region, but impacts are nevertheless likely to occur, as their activities overlap significantly with important cetacean habitats (Table 2, Figure 5).

Industry has variably contributed to baseline cetacean research depending on perceived or actual government directives towards particular projects where field surveys are deemed necessary. However, cetacean monitoring programmes that continue with the life of each development to assess long-term impacts are not yet conceived. Impacts on cetaceans or their prey resulting in permanent displacement (or displacement during the life of the project) may occur through cumulative effects of repeated or overlapping seismic exploration, shipping movements, the threat of spills and pollution, and production activities such as drilling.

The high level of oil and gas activity increases the risk of a major oil spill in the region. Large oil spills have catastrophic and long-term impacts on marine life³⁰. In fact, one major spill has already occurred in the region; in 2009 an oil and gas blowout occurred from the Montara Wellhead Platform, resulting in an oil slick that ultimately affected approximately 90,000km² of the Timor Sea^{39,120,176}. Once spilled into the marine environment, crude oil can cause a variety of lethal, sublethal and mechanical impacts on marine life, especially for marine mammals that need to spend time on the surface for breathing or feeding. Oil can affect cetaceans by blocking the digestive tract, acute poisoning by inhaled and ingested toxic compounds, and chronic poisoning via ingestion of components that have entered the food web¹⁷.

Oil pollution can also damage cetacean habitat, especially if it enters bays and inlets with resident populations of inshore dolphins, and deplete or contaminate food resources. Oil slicks may also initially attract fish, as they may confuse it with food, which can in turn attract seabirds and cetaceans¹⁷⁶. Resident cetaceans, such as Australian snubfin, Indo-Pacific bottlenose and Indo-Pacific humpback dolphins are likely to be more affected by oil spills and pollution than transient or migratory species⁶². However, in the NW Marine Region petroleum operations are expanding steadily into deeper waters, putting oceanic and migratory cetaceans at risk with little requirement for independent cetacean surveys, either short-term or long-term.

The areas of greatest potential impact of the oil and gas industry on cetacean populations in the NW Marine Region are where intense industrial activity overlaps with cetacean habitat (Table 2). The areas of greatest risk, given high activity levels and high sensitivity, are Exmouth Gulf, Ningaloo Reef, Barrow Island, Quondong Point and James Price Point, the Kimberley Coast, Browse Island, Scott Reef and Ashmore Reef (Figure 5).



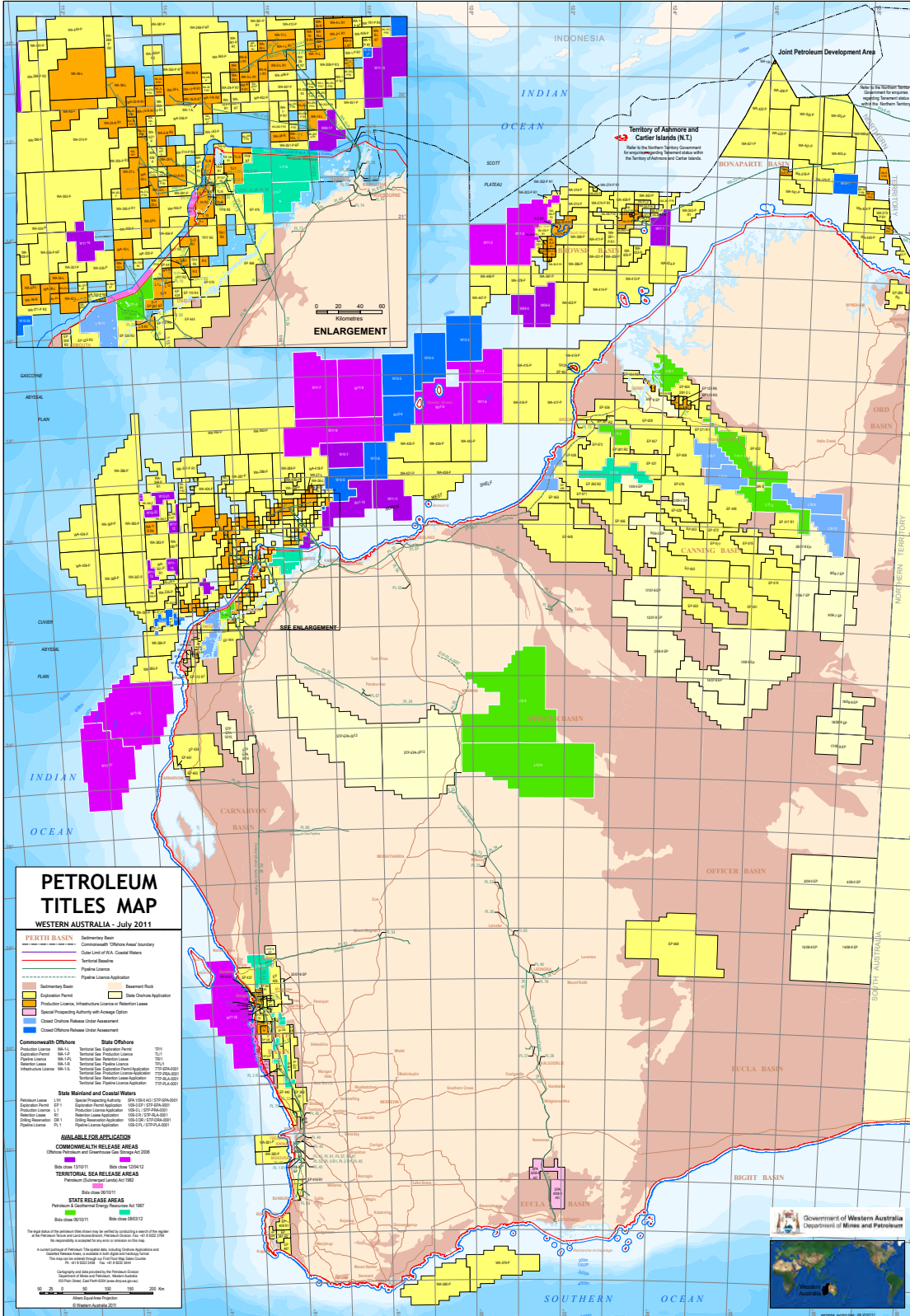


Figure 4. WA petroleum leases as of July 2011. Source: Government of Western Australia, Department of Mines and Petroleum.

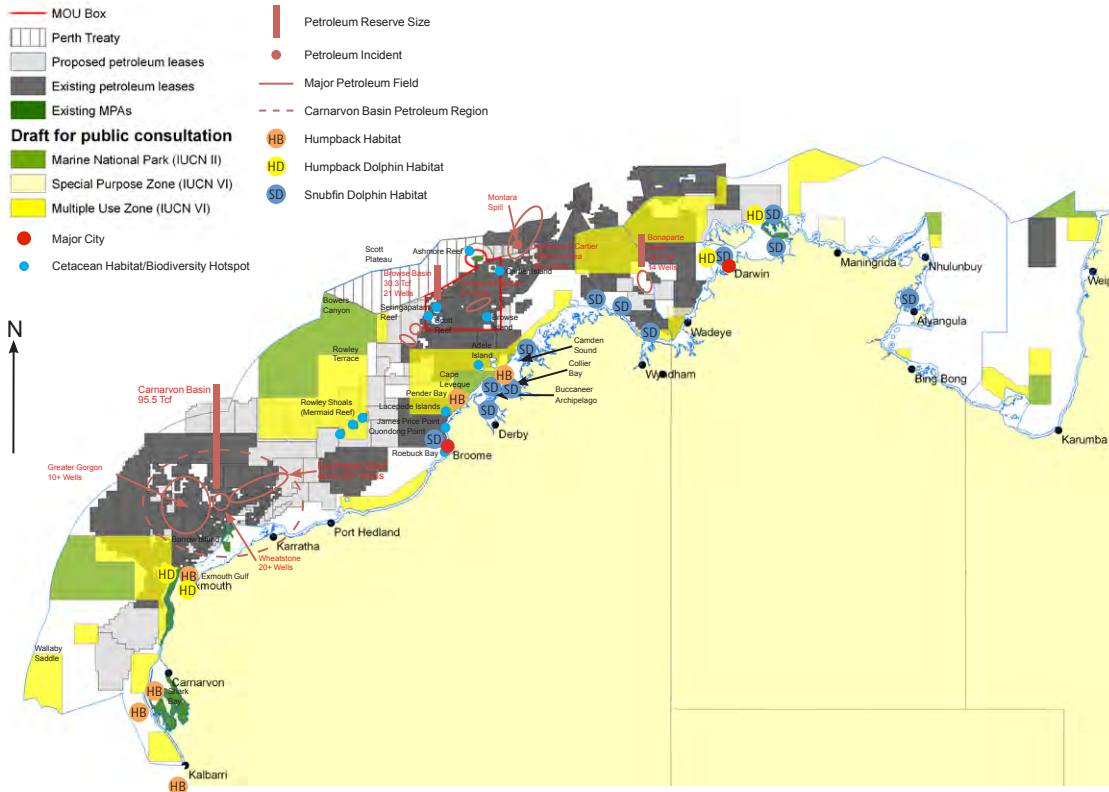


Figure 5. Areas of overlap between oil and gas interests, cetacean habitats and proposed marine reserves.
 Source: IFAW, HSI, WWF, Centre for Conservation Geography

Table 2. Cetacean habitat in proximity to petroleum activity. Source: IFAW and Save our Tropical Sealife Alliance ¹⁵³

Cetacean Habitat	Species Present	Proximate Leases / Petroleum Activity
Shark Bay	Humpback resting area, particularly for females and calves on their southward migration. Records exist of southern right whales. Resident populations of common and Indo-Pacific bottlenose dolphins.	W11-16 – Un-awarded permit W11-17 – Un-awarded permit
Exmouth Gulf	Humpback resting area, particularly for females and calves on their southward migration. Records exist of southern right whales. Resident populations of Australian snubfin dolphins and Indo-Pacific humpback dolphins.	WA-155-P R5 – Apache Permits Pty Ltd, BHP Billiton Petroleum (Australia) Pty Ltd, Inpex Alpha Ltd WA-255-P R2 – Woodside Energy Ltd, BHP Billiton Petroleum (Australia) Pty Ltd WA-271-P R2 – Mitsui E&P Australia Pty Limited, Woodside Energy Ltd WA-329-P – United Oil & Gas Pty Ltd WA-357-P – Inpex Alpha Ltd, Apache Northwest Pty Ltd WA-384-P – Shell Development (Australia) Proprietary Limited WA-385-P – Shell Development (Australia) Proprietary Limited WA-399-P – Apache Northwest Pty Ltd, Carnarvon Petroleum Limited, Jacka Resources Limited, Rialto Energy Limited WA-36-R – Mitsui E&P Australia Pty Limited, Woodside Energy Ltd WA-12-L – Mobil Australia Resources Company Pty Limited, BHP Billiton Petroleum (Australia) Pty Ltd WA-28-L – Mitsui E&P Australia Pty Limited, Woodside Energy Ltd WA-32-L – BHP Billiton Petroleum (Australia) Pty Ltd, Woodside Energy Ltd WA-35-L – Apache Permits Pty Ltd, Inpex Alpha Ltd WA-42-L – Apache PVG Pty Ltd, BHP Billiton Petroleum (Australia) Pty Ltd WA-43-L – Apache PVG Pty Ltd, Inpex Alpha Ltd, BHP Billiton Petroleum (Australia) Pty Ltd W11-15 – Un-awarded permit W10-23 – Un-awarded permit W10-24 – Un-awarded permit
Wallaby Saddle	Possible aggregation area for sperm whales. Likely habitat for oceanic cetaceans such as beaked whales.	W11-17 – Currently on offer
Barrow Island	Resting area for migrating humpbacks. Resident populations of common bottlenose and Indo-Pacific humpback dolphins. Records of rough-toothed dolphins, abundant spinner and striped dolphins.	WA-192-P R5 – Apache Northwest Pty Ltd WA-209-P R1 – Santos Offshore Pty Ltd, Apache Northwest Pty Ltd WA-214-P – Santos (BOL) Pty Ltd, Apache Northwest Pty Ltd WA-330-P – Strata Resources N.L., Octanex N.L. WA-323-P – Strata Resources N.L., Octanex N.L. WA-334-P R1 – Tap (Harriet) Pty Ltd, Apache Northwest Pty Ltd WA-391-P – OMV Australia Pty Ltd WA-452-P – Riverina Energy Ltd

Cetacean Habitat	Species Present	Proximate Leases / Petroleum Activity
		<p>WA-7-R R2 – BHP Billiton Petroleum (North West Shelf) Pty Ltd, BP Developments Australia Pty Ltd, CNOOC NWS Private Limited, Chevron Australia Pty Ltd, Japan Australia LNG (MIMI) Pty Ltd, Shell Development (Australia) Proprietary Limited, Woodside Energy Ltd</p> <p>WA-33-R R1 – Apache Oil Australia Pty Ltd, Pan Pacific Petroleum (South Aust) Pty Ltd, Santos (BOL) Pty Ltd</p> <p>WA-356-R – Apache Julimar Pty Ltd, Kufpec Australia (Julimar) Pty Ltd</p> <p>WA-25-L – Mobil Australia Resources Company Pty Limited, Tap West Pty Ltd, Eni Australia Limited</p> <p>W10-17 – Un-awarded permit</p> <p>W10-18 – Un-awarded permit</p> <p>W10-19 – Un-awarded permit</p>
Roebuck Bay	Important feeding area for Australian snubfin dolphins and other inshore dolphin species.	WA-417-P – Woodside Energy Ltd
Rowley Shoals	Mermaid Reef Class 1A Marine Reserve is located here. Habitat for Indo-Pacific bottlenose dolphins and Risso's dolphins.	<p>W10-3 – Un-awarded permit</p> <p>W10-4 – Un-awarded permit</p> <p>W10-5 – Un-awarded permit</p> <p>W10-6 – Un-awarded permit</p> <p>W11-4 – Currently on offer</p> <p>W11-5 – Currently on offer</p> <p>W11-6 – Currently on offer</p>
Quondong Point	Appears to be a migratory waypoint and high density area for northbound humpback whales as well as false killer whales, pygmy blue whales and a number of dolphin species.	WA-417-P – Woodside Energy Ltd
Lacepede Islands	Common bottlenose and spinner dolphins, false killer, Bryde's and short-finned pilot whales.	WA-419-P – Emerald Gas Pty Ltd
Adele Island	Within range of humpback calving habitat.	<p>WA-413-P – Hunt Oil Australia Permit 414 Holding Company Pty Ltd</p> <p>WA-414-P – Hunt Oil Australia Permit 414 Holding Company Pty Ltd</p>
Bowers Canyon	Connections between Scott Plateau and abyssal plain, likely habitat for oceanic species such as sperm whales and beaked whales.	<p>W11-2 – Un-awarded permit</p> <p>W11-3 – Un-awarded permit</p>
Scott Plateau	Historically a sperm whale aggregation area. Possible breeding and feeding area for beaked whales.	No petroleum activity in proximity
Kimberley Coast	The Kimberly coast from Broome to north of Camden Sound is the main calving area for the west Australian population of humpback whales. High concentrations of humpbacks are observed in Camden Sound and Pender Bay between June and September each year. Shallow coastal waters and estuaries along the Kimberley coast, particularly Beagle and Pender bays on the Dampier Peninsula and tidal creeks around Yampi Sound and between Kuri Bay and Cambridge Bay are important areas for Australian snubfin dolphins and Indo-Pacific humpback dolphins.	<p>WA-333-P – Braveheart Energy Pty Ltd, Braveheart Oil & Gas Pty Ltd, Braveheart Petroleum Pty Ltd, Braveheart Resources Pty Ltd, Browse Petroleum Pty Ltd, Moby Oil & Gas Limited</p> <p>WA-342-P R1 – Coldron Pty Ltd, Cornea Energy Pty Ltd, Cornea Oil & Gas Pty Ltd</p> <p>WA-424-P – IPM WA 424P Pty Ltd</p>

Cetacean Habitat	Species Present	Proximate Leases / Petroleum Activity
Browse Island	<p>Offshore waters surrounding Browse Island support a larger number of cetacean species than any other area on the Western Australian coast, including large pods of oceanic dolphins, pygmy killer whales, false killer whales, melon-headed whales, minke whales and pilot whales (C. Jenner pers. comm.). Upwellings around Browse Island are likely to be a feeding area for blue whales migrating to Indonesia. Unconfirmed sightings of humpback whales feeding have also been reported from waters around Browse Island. This observation is significant as humpbacks are currently known to feed mainly in Antarctic waters, but further investigation is necessary.</p>	<p>WA-274-P R1 – Chevron Australia (WA-274-P) Pty Ltd, Inpex Browse Ltd, Coveyork Pty Limited</p> <p>WA-285-P R2 – Inpex Browse Ltd, Total E&P Australia</p> <p>WA-344-P R1 – Inpex Browse Ltd, Total E&P Australia</p> <p>WA-371-P – Shell Development (Australia) Proprietary Limited</p> <p>WA-377-P – Nexus Energy WA377P Pty Ltd</p> <p>WA-413-P – Hunt Oil Australia Permit 413 Holding Company Pty Ltd</p> <p>WA-425-P – Hunt Oil Australia Permit 425 Holding Company Pty Ltd, Mitsui E&P Australia Pty Limited, SK Energy Co., Ltd</p> <p>WA-432-P – Mitsui E&P Australia Pty Limited, Woodside Energy Ltd</p> <p>WA-37-R – Inpex Browse Ltd, Total E&P Australia</p> <p>WA11-1 – Un-awarded permit</p>
Scott Reef	<p>Blue whales recorded migrating and feeding in waters surrounding Scott Reef. Also habitat for Risso's dolphin and rough-toothed dolphin, and Cuvier's beaked whale.</p>	<p>WA-275-P – BHP Billiton Petroleum (North West Shelf) Pty Ltd, BP Developments Australia Pty Ltd, Chevron Australia Pty Ltd, Shell Development (Australia) Proprietary Limited, Woodside Energy Ltd</p> <p>WA-302-P R1 – BHP Billiton Petroleum (North West Shelf) Pty Ltd</p> <p>WA-314-P – ConocoPhillips (Browse Basin) Pty Ltd, Karoon Gas Browse Basin Pty Ltd</p> <p>WA-315-P – ConocoPhillips (Browse Basin) Pty Ltd, Karoon Gas Browse Basin Pty Ltd</p> <p>WA-396-P – Mitsui E&P Australia Pty Limited, PTTEP Australasia (Ashmore Cartier) Pty Ltd, Toyota Tsusho Gas E&P Browse Pty Ltd, Woodside Energy Ltd</p> <p>WA-397-P – Mitsui E&P Australia Pty Limited, PTTEP Australasia (Ashmore Cartier) Pty Ltd, Toyota Tsusho Gas E&P Browse Pty Ltd, Woodside Energy Ltd</p> <p>WA-28-R R1 – BHP Billiton Petroleum (North West Shelf) Pty Ltd, BP Developments Australia Pty Ltd, Chevron Australia Pty Ltd, Shell Development (Australia) Proprietary Limited, Woodside Energy Ltd</p> <p>WA-29-R R1 – BHP Billiton Petroleum (North West Shelf) Pty Ltd, BP Developments Australia Pty Ltd, Chevron Australia Pty Ltd, Shell Development (Australia) Proprietary Limited, Woodside Energy Ltd</p> <p>WA-30-R R1 – BHP Billiton Petroleum (North West Shelf) Pty Ltd, BP Developments Australia Pty Ltd, Chevron Australia Pty Ltd, Shell Development (Australia) Proprietary Limited, Woodside Energy Ltd</p> <p>WA-31-R R1 – BHP Billiton Petroleum (North West Shelf) Pty Ltd, BP Developments Australia Pty Ltd, Chevron Australia Pty Ltd, Shell Development (Australia) Proprietary Limited, Woodside Energy Ltd</p> <p>WA-32-R R1 – BHP Billiton Petroleum (North West Shelf) Pty Ltd, BP Developments Australia Pty Ltd, Chevron Australia Pty Ltd, Shell Development (Australia) Proprietary Limited, Woodside Energy Ltd</p> <p>W11-2 – Un-awarded lease</p>

Cetacean Habitat	Species Present	Proximate Leases / Petroleum Activity
Ashmore Reef	Common bottlenose, pantropical spotted, spinner and Fraser's dolphins, dwarf sperm, melon-headed, false killer and pygmy killer whales.	<p>Ac/p22 – Sinopec Oil and Gas Australia (Puffin) Pty Limited, AED Oil Limited</p> <p>Ac/p36 – Finder Exploration Pty Ltd, Murphy Australia Oil Pty Ltd, PTTEP Australia Offshore Pty Ltd</p> <p>Ac/p37 – Apache NorthWEST Pty Ltd, Total E & P Pty Ltd</p> <p>Ac/p44 – Finder Exploration Pty Ltd, Perenco (SE) Australia Pty Ltd</p> <p>Ac/p45 – Finder Exploration Pty Ltd, Perenco (SE) Australia Pty Ltd</p> <p>Ac/p47 – Bengal Energy Ltd</p> <p>Ac/p48 – Woodside Energy Ltd, Mitsui E&P Australia Pty Ltd</p> <p>Ac/p49 – Silver Wave Energy Pte Ltd</p> <p>Ac/p52 – Sasol Petroleum Australia Limited, Finder Exploration Pty Ltd</p> <p>Ac11-1 – Un-awarded permit</p> <p>Ac11-2 – Un-awarded permit</p>

Note: P denotes exploration permit, R denotes Retention Lease, L denotes Production License.

Noise Pollution

All cetacean species have a highly refined acoustic sense with which to monitor their surroundings. They use sound to navigate, locate prey and predators, announce location and territory, establish dominance, attract mates, and maintain group cohesion and social interactions^{44, 125, 159}. They are extremely sensitive to human-generated underwater noise such as dredging, construction, shipping, explosions and sonic detonations used in seismic surveys by the oil and gas industry^{17, 98}. Cetaceans affected by such acoustic disturbances can become stressed and disoriented, and the impacts can have long-term sublethal consequences. Injury to their sensory systems or disease may result^{44, 58}. There are numerous ongoing projects in the NW Marine Region that will result in noise from ship movements, blasting and other construction and maintenance activities, many of them for extended periods^{151, 174}. The cumulative effects of these activities are likely to impact negatively on the health, behaviour, extent of occurrence or area of occupancy of all species in areas of development or increased shipping.

Perhaps the greatest impact of underwater noise comes from seismic surveys during oil and gas exploration, where seismic 'air-guns' are used to generate a rapid release of air under high pressure to obtain a geological profile of the sea floor and substrate^{47, 163}. This type of seismic activity has been shown to cause baleen whales such as humpback whales to deviate from migration routes, or has led to their displacement from important breeding and calving areas. This displacement may have long-term effects on reproductive success¹¹³. Extremely close encounters may damage cetaceans' ears⁵³. Responses to excessive noise include avoidance, changes in swimming speed and direction, changes in feeding behaviour, alarm behaviours and altered calling patterns^{58, 113}. Cetaceans are dependent on a certain level of acoustic quality within their habitat to perform their normal functions; excessive noise is likely to limit their ability to adequately use their acoustic habitat³⁷. Beaked whales may be at particular risk, as any alteration to their deep diving patterns in response to noise may increase their risk of decompression illness^{12, 44}. Current monitoring methods are considered inadequate for detecting beaked whales and protecting them from adverse effects of anthropogenic noise⁴⁴.

Shipping

A number of busy ports operate along the NW coastline, and shipping traffic is increasing, both along the major shipping routes (Figure 6) and by more complex vessel movements associated with the growing offshore oil and gas industry⁶². There are nine major government-managed ports in the region, the three largest of which are Dampier (3404 vessel movements in 2006/07), Port Hedland (888 vessel movements in 2006/07) and Broome (393 vessel movements in 2006/07). Additionally, there are eight ports managed by private companies. A new port facility is proposed for James Price Point associated with the Browse Basin LNG development, which will result in up to 2,700 shipping movements per year in an area that is still relatively free of heavy vessel traffic and serves as an important whale nursery.

Death and injury from vessel strike is the most direct potential impact of shipping to cetaceans. Impacts to wildlife and habitats can occur from direct collisions between marine organisms and ships' hulls or propellers. Collisions with commercial ships are likely to be fatal for cetaceans¹⁷. Most commonly-reported species include fin whales, right whales, humpback whales and sperm whales¹⁰⁷, all of which have been recorded in the region. The effects of ship strikes on cetacean populations will be most pronounced where shipping and recreational boating coincide with important habitats, such as calving and nursing sites, and along migration routes.

The risk of ship strike is likely to increase as shipping movements and cetacean numbers (e.g. humpback whale abundance) continue to increase in the region^{38,62}. Speed appears to be an important factor, with significant increases in fatal injuries from ships travelling at 14 knots or above¹⁰⁷. Recent modelling studies predicted a significant reduction in lethal ship strikes at speeds below 10 knots¹⁷⁹. Recreational boating is also increasing in the region, and boat strikes to inshore dolphins are recorded with greater frequency^{62,180}. Collisions between vessels and cetaceans are likely to be much more frequent than reported, making an accurate estimate of the total number of ship strikes difficult. Better compliance with boating regulations and reporting requirements is necessary as a step towards understanding the scale of the problem and the development of mitigation measures.

Further risks from shipping activities include changes in behaviour and habitat use where shipping traffic coincides with cetacean populations¹²³, garbage and marine debris, noise pollution, the potential for an oil or large chemical spill and marine pest incursions from ballast water and hull fouling.

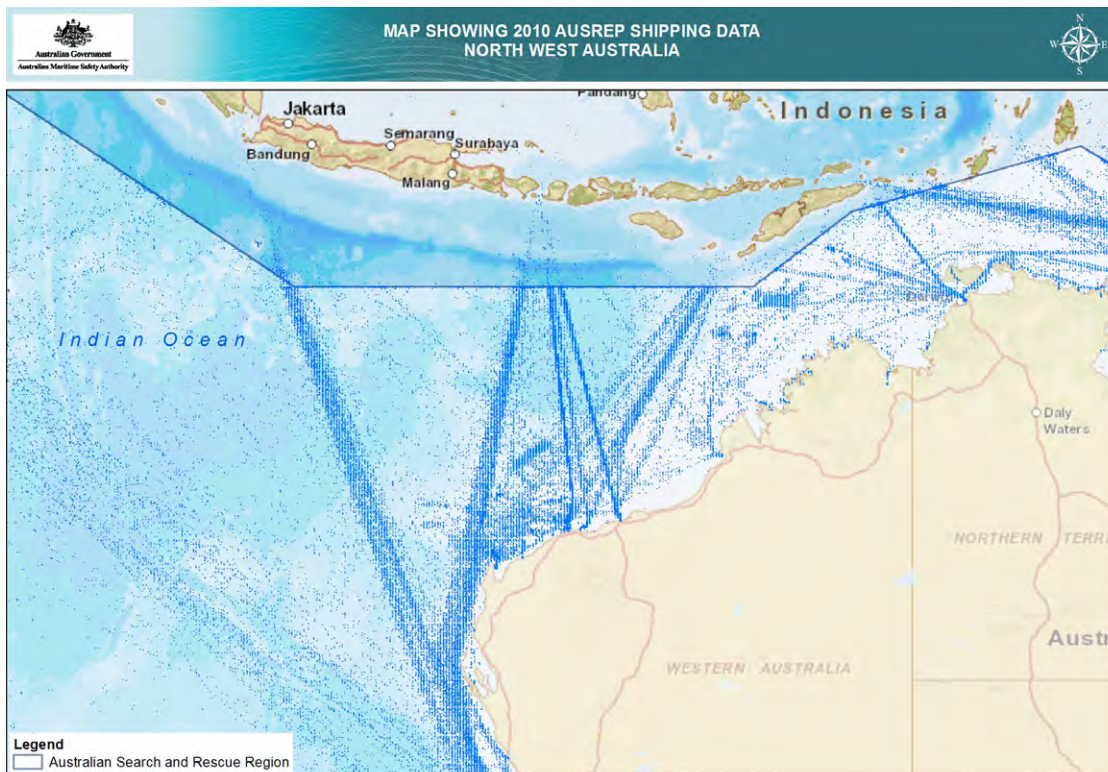


Figure 6. Shipping routes in the NW Marine Region. Source: AMSA 2010

Pollution

Marine pollution through the input of chemicals or nutrients is usually most pronounced near urban development and industrial ports, and therefore has the greatest potential impact on inshore species. It is thought that cetaceans that predominantly utilise coastal waters are more susceptible to high levels of chemical pollutants than offshore species^{80,104}. However, pollutants can also enter the water from ships and from offshore oil production facilities, both of which are increasing in the region. Due to their relatively high position in marine food webs, cetaceans are prone to accumulating heavy metals, pesticides, herbicides, nutrients and sediments in their tissues^{106,161}. Over time, heavy loads of bioaccumulated toxins can cause immune suppression, illness (including cancer), impaired fertility, reduced fecundity and increased mortality^{62,99,170}.

Fisheries

Cetaceans may be harmed through interactions with fisheries, especially in areas where cetacean aggregations coincide with high fishing activity. Impacts on cetaceans may occur primarily through interaction with fishing gear, especially large nets, trawlers and longlines. Inshore dolphins are especially prone to capture and drowning in nets, and larger cetaceans may become entangled in abandoned or discarded fishing gear. Toothed whales may interact with longlines or recreational line fishing (especially gamefishing) through active depredation of the catch¹¹⁴. There are 14 Commonwealth-managed fisheries currently recording catch in the NW Marine Region, and 12 fisheries operating in State waters adjacent to the region. Many of the fisheries are managed jointly by the Australian Fisheries Management Authority (AFMA) and by the West Australian Department of Fisheries. Fisheries that may impact on cetaceans in the Commonwealth waters of the NW Marine Region include the Western Deepwater Trawl Fishery, the North West Slope Trawl Fishery, the Western Tuna and Billfish Fishery and the Northern Prawn Fishery, the Pilbara Fish Trawl Fishery, the Mackerel Fishery, the Northern Shark Fishery and the Pilbara and Northern Demersal Trap Fisheries^{54,172}. The highest levels of fishing activity overall occur around Shark Bay and the Exmouth Gulf, off Broome, the coast between Karratha and Dampier and the northern Kimberley (Figure 7).

The incidental capture and drowning of cetaceans in gillnets and on longlines in Australian waters is poorly documented¹⁷. Thousands of dolphins were captured by the Taiwanese gillnet fishery in the Arafura and Timor Seas before its operations were shut down⁸². Humpback whales are at risk of entanglement in fishing nets while on their annual migration, particularly by lost or discarded driftnets, or "ghost nets". The threat of bycatch is thought to be greatest for bottlenose, Indo-Pacific bottlenose, Fraser's, Australian snubfin and Indo-Pacific humpback dolphins⁶². At a population level, high bycatch rates can result in an overall decline in reproductive output⁴⁵. Currently, the Pilbara Trawl Fishery is known to capture dolphins, but dolphin excluder devices are expected to reduce the bycatch^{3,172}. However, the level of cetacean bycatch and the identity of the species affected in the region are largely unknown.

Fisheries can also regionally deplete prey species, such as fish and squid that may form an important part of cetaceans' diets^{21,128}. This is especially detrimental for species that have narrow habitat requirements, such as inshore dolphins¹²⁸, and those with specialised dietary requirements, such as top-level predators. On the other hand, discarded catch can create an artificial source of food that some populations may become dependent on³⁴.

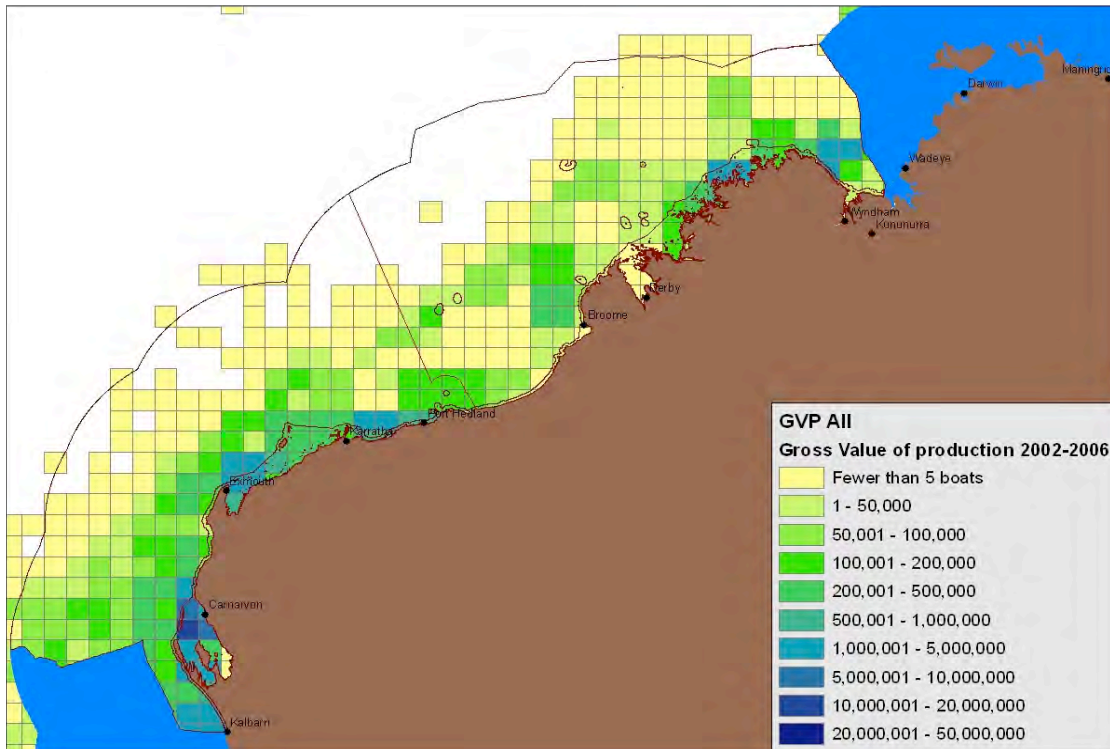


Figure 7. Fishing activity in the NW Marine Region. Source: Centre for Conservation Geography, Bureau of Rural Sciences Atlas of Australian Marine Fishing and Coastal Communities.

Habitat Degradation

Coastal development and building activities associated with shipping and the oil and gas industry cause alterations to coastal habitats that may be detrimental to inshore dolphins, and to other species that periodically use inshore habitats (e.g. humpback whales). Dredging and pile driving are likely to be common forms of disturbance in the shallow areas of the NW Marine Region. This can cause major and permanent modification of environments, and can remove important benthic communities associated with cetacean food resources¹⁷. The expansion of port facilities for the petroleum and mining industries are of special concern, as they are modifying habitat important to resident inshore dolphins and breeding humpbacks in various locations. Resident or breeding cetacean populations may be displaced by habitat alteration; species that occur in fragmented populations along the coast (e.g. some inshore dolphin species) can be especially affected^{130,144}.

Plastic Debris

Plastic marine debris may enter the marine environment from land, ship-based sources or offshore oil production facilities. The impact of plastic debris on marine wildlife is causing increasing concerns worldwide¹⁶⁵. The injury or death of cetaceans through the ingestion of, or entanglement in, plastic debris is considered a key threatening process in Australian waters⁵⁵. All cetacean species are thought to be affected by the threat of plastic debris, and in northern Australian waters derelict fishing gear has been recorded as a major threat to marine life³². Worldwide, 177 marine species are known to ingest marine debris¹⁵⁷. In a population of 161 snubfin dolphins in Roebuck Bay, 52 individuals had markings consistent with injuries from fishing gear and a further 14 had markings resulting from fishing gear interactions and vessel strike¹⁸⁰.

Discussion

Cetaceans and the Bioregional Plan

Cetaceans that frequent the NW Marine Region are poorly protected under the Australian Government's proposed Bioregional Plan and the accompanying proposed marine reserve network does little to adequately protect areas of known importance for most cetacean species. The Plan focuses on four species of cetaceans: the three species of inshore dolphin and humpback whales. Concerns arise over two major points: firstly, the plan effectively ignores the other species known or expected to occur in the region. Secondly, the plan does little to protect even these four species. The majority of the proposed reserves are IUCN category VI, the lowest level of protection available, allowing multiple use or, in other words, "business as usual". Most of the highly protected areas (IUCN category II) are relegated to oceanic waters underlain by abyssal plains. There is only one highly protected area, within the Kimberley Marine Reserve, placed specifically to protect the humpback whale calving grounds; however, the boundary proposed does not reflect the extent of the biologically important area for this species indicated by the Jenner⁹⁷ survey.

The proposed highly protected reserves stand out as avoiding areas that are currently under or proposed to be under petroleum leases (Figure 5). No additional protection is proposed for areas surrounding the existing small Commonwealth marine reserves in the region, such as around Ningaloo Reef, Mermaid Reef, Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve. The areas where multiple human uses intersect, especially the oil and gas industry, fisheries and shipping, are not destined for further protection.

The plan identifies 23 regional priorities for the NW Marine Region, including 12 conservation features and 11 pressures on the environment. The conservation feature regional priorities include the three inshore dolphins and humpback whales, as well as other ecological features and the existing Commonwealth Reserves. The 11 pressures identified are all relevant to cetaceans in the region, and include climate change, noise pollution, physical habitat modification, human presence at sensitive sites, marine debris, invasive species, light pollution, the extraction of living resources, bycatch in fisheries, collision with vessels and changes to hydrological regimes⁶³. The priorities exclude all offshore cetaceans and habitats which have been found to be important to them, such as the Browse Basin.

It may be that the plan only acknowledges the three inshore dolphins and humpback whales because they are the most studied species, and threats to their populations can be determined with more certainty than for other species. Many of the threatening processes are concentrated around coastal areas where these species are commonly found. The fact that inshore dolphins are resident in small areas puts increased pressure on them compared with species that move more widely. However, offshore species may also display high site fidelity, as shown for rough-toothed dolphins in Hawaii¹³; impacts on these habitats may also damage local populations.

Priority Areas and Areas for Further Assessment

Areas for Further Assessment identified by the Government earlier during the bioregional planning process (therefore preceding the proposed Reserves), appear to more adequately encompass representative examples of the range of biodiversity and ecosystems within the NW Marine Region. There were seven Areas for Further Assessment in the NW Marine Region (Figure 8). Most of these areas are recognised as having significant habitat for cetaceans. Important habitats for pelagic dolphins are known in the Abrolhos Extension: Kalbarri Area, the Gascoyne Area, the Pilbara North Area and the Kimberley North Area. Humpback whales are recognised within the Gascoyne Area. The Abrolhos Extension: Wallaby Area includes the Wallaby Saddle, which is known to be an aggregation area for pelagic cetaceans, including sperm whales. The Kimberley Area is recognised for a number of values, including the humpback whale breeding grounds, the high diversity found around Scott Reef, Browse Island and offshore from Quondong Point, while the Kimberley North Area extends the habitat of the humpback breeding area.

Existing Legislation

The overarching federal legislation that provides for the protection of cetaceans in Australian waters is the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999. There are a number of provisions with relevance to cetacean conservation including the creation of the Australian Whale Sanctuary and marine protected areas, protections afforded to matters of national environmental significance, the listing of species under the Act as threatened and migratory, and the listing of critical habitat.

All species of cetaceans in the NW Marine Region are protected under the Australian Whale Sanctuary and are further protected from harm by virtue of being components of the Commonwealth marine environment which is considered a matter of national environmental significance. Ten species are additionally considered matters of national environmental significance due to being listed as threatened and / or migratory.

Under the EPBC Act, all actions that have, will have, or are likely to have a significant impact on a matter of national environmental significance must be approved by the Commonwealth Minister for the Environment. Plans for undertaking such an action trigger the need for a 'referral' to the Commonwealth Minister for the environment by the entity seeking to undertake the activity, which then requires assessment and approval under the EPBC Act.

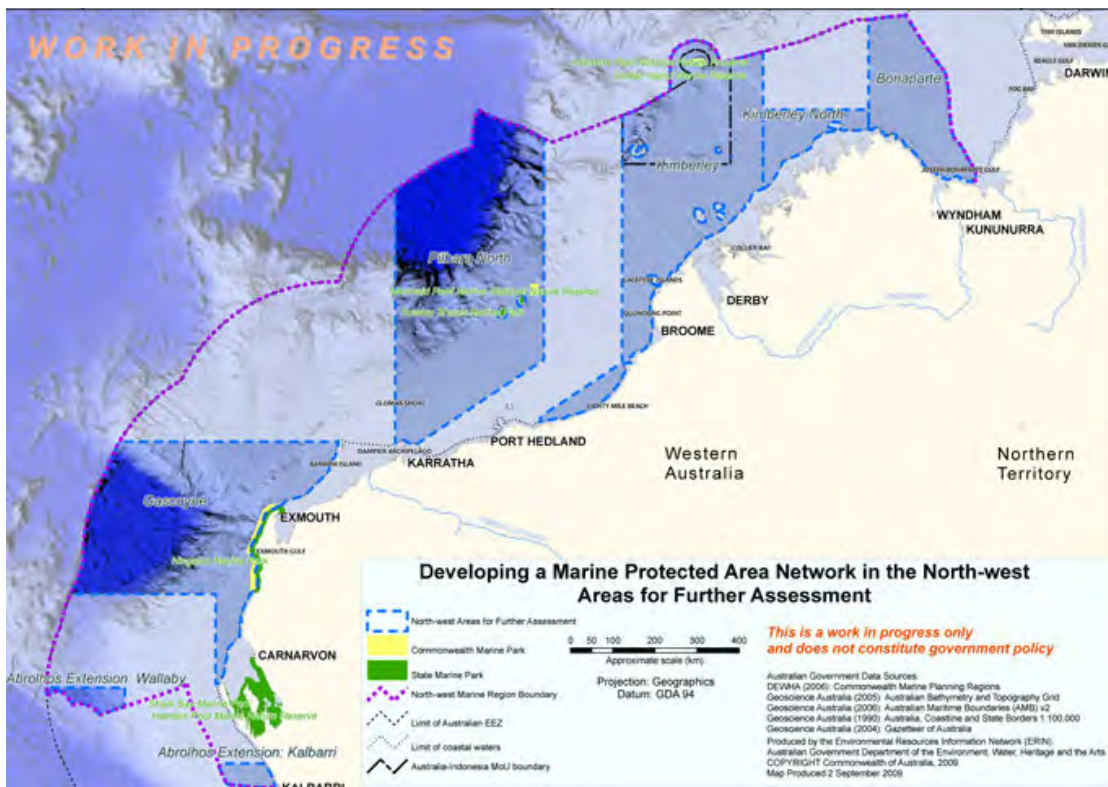


Figure 8. Areas for Further Assessment for the development of a Commonwealth Marine Reserves Network in the NW Marine Region. From DEWHA⁵⁶.

In addition, there are a series of policy statements, plans and guidelines developed under the auspices of the EPBC Act with relevance to cetacean conservation. These include species-specific recovery plans, action plans, general guidelines on matters of national environmental significance and guidelines on specific activities such as seismic surveys and whale and dolphin watching.

In the NW, the oil and gas industry undertakes activities that pose the greatest potential risk to cetaceans. In addition to legislation specific to these industries, the policy statement under the EPBC Act that relates directly to seismic surveys (DEWHA 2008a) seeks to: 1) provide practical standards to minimise the risk of acoustic injuries to whales in the vicinity of seismic survey operations; 2) provide a framework that minimises the risk of biological consequences from acoustic disturbance from seismic surveys to whales in biologically important habitat areas or during critical behaviours; and 3) provide advice to proponents of offshore seismic operations on their legal responsibilities under the EPBC Act. However, in its current form the policy statement gives cause for the following concerns:

- Wherever seismic surveys and cetaceans overlap there will be considerable potential for harm. It seems significant that to date, no referrals for seismic surveys have ever been refused approval and only one was determined to be a controlled action.
- Seismic surveys may be carried out over many weeks and cover large areas and it is viewed as desirable when cetaceans avoid the survey area. However, this may mean that they are effectively excluded from large tracts of important habitat during the duration of the survey or for longer periods. Conversely, if whales remain within an area during seismic surveys they may suffer considerable stress without showing any measurable behavioural response. Additionally, the cumulative impacts of development are never considered; each development is considered separately and thus the impacts on whale migration are not assessed over the entire migration pathway.
- The EPBC Act policy statement dictates the minimisation of harm based on the best available science; however, the science around seismic surveys is far from conclusive⁴⁷ and risk reduction is uncertain.
- While the policy statement makes many recommendations for seismic survey proponents to minimise interactions with and disturbance of cetaceans⁵⁵, very little, if anything, in the policy is mandatory. Where surveys are instructed to follow the recommendation in the policy of using trained marine mammal observers, there is rarely provision for a minimum number of observers to maximise the possibility of detecting whales throughout the survey period. The policy does not recommend the use of passive acoustic monitoring in all surveys even though for some species, such as sperm whales, and for surveying at night, this would be a much more effective detection method. While current guidelines advise against seismic surveys in places and during times of breeding, calving, resting and feeding, there is no actual prohibition on surveys in such circumstances.
- The standard procedure if a whale is spotted within the specified range is 'shut down'. However, the best that can be achieved by shut down procedures based on the use of marine mammal observers to detect whales is to limit the risk of individual animals within the specified range being exposed to levels of sound that cause physical injury. These procedures do nothing to protect whales at greater distances than within the shut down zone from stress and disturbance from the seismic activity. Where shut downs do occur, the following restart also results in more noise being generated in total and so some impacts will be increased.
- The guidelines in the policy statement only apply to large whales to the exclusion of smaller dolphins and porpoises, despite the observed reactions of these smaller species to acoustic disturbances⁹⁸.

The policy statement and the guidelines need to be updated to provide more effective protection for cetaceans from the impacts of seismic surveys, particularly given the rapid expansion of oil and gas exploration and production in the region. Figure 9 shows seismic survey tracts conducted in the Browse Basin up until 2008. This represents just one small area of the region but is illustrative of the amount of survey activity taking place.

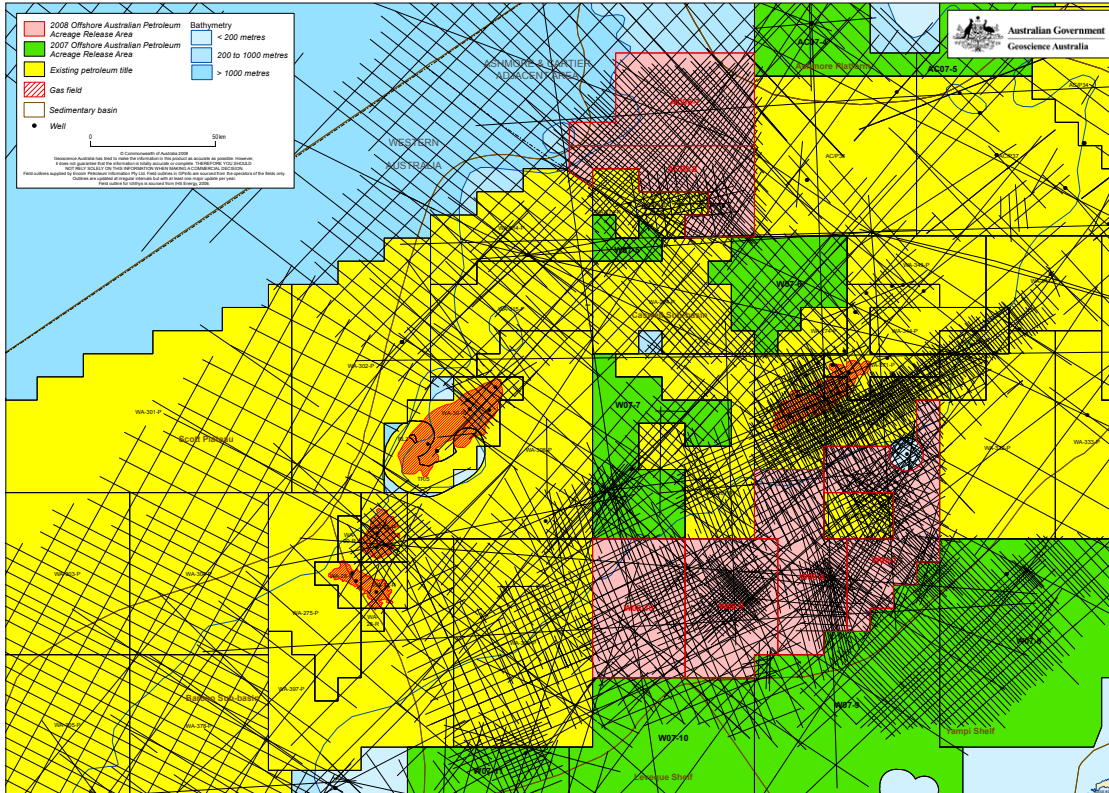


Figure 9. A map of the Browse Basin area showing seismic survey activity (black lines). Source: Geoscience Australia 2008.

In addition to the EPBC Act, petroleum resource exploration and exploitation is also governed by the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (OPGGGS) Act 2006. This legislation and associated regulations provide a framework for the development and operation of environment plans for offshore petroleum activity. The OPGGGS (Environment) Regulations 2009 aim to ensure that offshore petroleum activity is carried out in a manner consistent with the principles of ecologically sustainable development and that the development of an environment plan has appropriate environmental performance objectives and standards, measurement criteria to assess the plan's performance, an implementation strategy and reporting arrangements.

The environment plans required by the regulations must describe the existing environment that may be affected by the activity, as well as any relevant cultural, social and economic aspects of the environment that may be affected. This involves details of the particular relevant values and sensitivities of that environment, the environmental impacts and risks for the activity and an evaluation of all the impacts and risks.

Plans are submitted to the appropriate regulatory body for approval. There is no formal system for public consultation on environment plans, although each plan must include details of any consultation undertaken. However, who is consulted and when they are consulted is at the discretion of the plan's author. Only once a plan has been approved is a summary submitted for public disclosure, but not public comment.

Recommendations

Future Research

Effective environmental protection in the NW Marine Region is hampered by large knowledge gaps. Very little is known about the species composition and distribution of cetaceans in the region, and even less is known about some of their habitats, especially in deep offshore waters.

Preliminary surveys funded by the oil and gas industry have begun to assess the species composition, abundance, distribution and movement of cetaceans in the region; this research must continue and be expanded to include long-term monitoring of relevant cetacean populations and to examine long-term impacts of specific facilities.

All industry-funded cetacean data should be made publicly available to allow independent analyses. The importance of the industry's contribution to the national economy is not underestimated; however, the industry's activities must go hand in hand with a long-term environmental stewardship program that includes long-term and transparent scientific research rather than a simple box-ticking exercise at the beginning of each project.

In order to allow fully informed decisions about future exploitation of the region, surveys associated with individual developments must sit within a strategic and independent research program designed to assess the region's marine biodiversity. Clearly such a program will have significant costs attached to it and these should not be carried by government alone. Coordinated industry involvement and funding would be key to the successful implementation of such a strategy.

Future research on cetaceans in the NW Marine Region should focus on:

- Distribution and abundance of individual species;
- Behaviour and biological properties of individual species;
- Critical habitat for key species, including food web dynamics and habitat use;
- Changes in habitat use and the size of breeding and nursery areas with changing population size;
- Migration, seasonal and diurnal movement;
- Monitoring programs in sensitive areas across all months of the year;
- Incorporating results of research on the impacts of oil spills on cetaceans into adaptive management and mitigation plans on an ongoing basis;
- Assessment and development of, and innovation in, impact mitigation strategies. In particular the relative risk reduction for all proposed mitigation measures should be quantified wherever possible;
- Recognising that all human-generated noise will have some impacts, research should be focussed on reducing noise inputs into the marine environment. For seismic surveys, this would include better analysis and processing methods so that less powerful sources are required and ensuring that surveys are conducted in the most efficient way possible to reduce the number of air-gun blasts.

Species Prioritisation

The Bioregional Plan should include all 32 cetacean species recognised as frequenting the NW Marine Region as conservation priorities. All species require more research and protection. However, until such a time as the knowledge base is improved and as all species have not been recorded in the same densities, IFAW recommends an interim prioritisation scheme for species in the NW Marine Region. Immediate and high priority species should have their habitat protected through the establishment of strictly protected marine reserves or other means. High and medium priority species should be the focus of targeted surveys to establish their occurrence with more confidence. Medium and low priority species should be the focus of any future amendments to conservation and mitigation policies, pending a better understanding of these species in the NW Marine Region.

Immediate priority

(Known to use the NW Marine Region as permanent or critical feeding and / or breeding habitat. Seen commonly during surveys):

- Australian snubfin dolphin
Orcaella heinsohni
- Indo-Pacific bottlenose dolphin
Tursiops aduncus
- Indo-Pacific humpback dolphin
Sousa chinensis
- Common bottlenose dolphin
Tursiops truncatus
- Humpback whale
Megaptera novaeangliae
- Pygmy blue whale
Balaenoptera musculus brevicauda

High priority

(Known to use the NW Marine Region as permanent or critical feeding and / or breeding habitat, or migrates through the region. Seen frequently during surveys):

- Risso's dolphin *Grampus griseus*
- Rough-toothed dolphin
Steno bredaensis
- Pan-tropical spotted dolphin
Stenella attenuata
- Spinner dolphin *Stenella longirostris*
- Striped dolphin *Stenella coeruleoalba*
- False killer whale *Pseudorca crassidens*
- Killer whale *Orcinus orca*
- Sperm whale *Physeter macrocephalus*
- Bryde's whale *Balaenoptera edeni*

Medium priority

(Has been recorded in the NW Marine Region, small population likely to travel through or reside in the region):

- Fraser's dolphin *Lagenodelphis hosei*
- Antarctic minke whale
Balaenoptera bonaerensis
- Cuvier's beaked whale *Ziphius cavirostris*
- Dwarf minke whale
Balaenoptera acutorostrata
- Dwarf sperm whale *Kogia simus*
- Fin whale *Balaenoptera physalus*
- Melon-headed whale
Peponocephala electra
- Pygmy killer whale *Feresa attenuata*
- Short-finned pilot whale
Globicephala macrorhynchus
- Long-finned pilot whale
Globicephala melas
- Short-beaked common dolphin
Delphinus delphis

Low / longer-term priority

(Expected to occur in the NW Marine Region based on presence of adequate habitat):

- Southern right whale *Eubalaena australis*
- Pygmy sperm whale *Kogia breviceps*
- Blainville's beaked whale
Mesoplodon densirostris
- Ginkgo-toothed beaked whale
Mesoplodon ginkgodens
- Gray's beaked whale *Mesoplodon grayi*
- Sei whale *Balaenoptera borealis*

Further research may change our understanding of species abundance and distribution in the region or the importance of the region's habitats; this prioritisation scheme will need to change accordingly.

Habitat Protection

More than the animals themselves, it is cetaceans' habitats that are at risk in the NW Marine Region. The conservation of cetaceans requires the safeguarding of their habitats, both coastal and pelagic¹²⁸. The proposed areas to be included as highly protected marine reserves do not offer adequate protection for species in the region. The marine reserves network of highly protected areas should be extended to include areas of recorded high cetacean density and diversity, including at least:

- waters off Exmouth Gulf, Ningaloo Reef and Shark Bay;
- waters offshore from Quondong Point;
- waters surrounding Browse Island including the nearest continental slope;
- waters surrounding Scott Reef including the nearest continental slope;
- waters surrounding the Rowley Shoals;
- waters surrounding Barrow Island;
- the currently proposed Abrolhos (Wallaby Extension) Commonwealth Marine Reserve;
- waters surrounding the existing Commonwealth Marine Reserves of Ashmore Reef and Cartier Island and Mermaid Reef;
- waters of the proposed Kimberley Reserve, to more adequately cover the humpback calving grounds.

When prioritising habitats to include for protection, the guiding principles set forth by Ross et al.¹⁴⁵ should be considered, including the presence of sufficient food, appropriate physical habitat features, adequate size and connectivity to other habitats, adequate protection for reproductive and socially significant activities, consideration of temporal dynamics and anthropogenic threats, and the provision of the precautionary principle and adaptive management where information is lacking.

Mitigation Plans

Where the establishment of further highly protected areas is not feasible, IFAW recommends a clear, overarching set of guidelines for the mitigation of potential impacts across all areas of the NW Marine Region identified as important for cetaceans. These mitigation guidelines must improve upon existing guidelines for all industries operating in the region and cover the full range of their activities. IFAW advocates for the implementation of the following protocols:

Seismic surveys:

- Effort should be focused on reducing the overall number and length of surveys and reducing noise levels of those that do take place. Surveys should be better planned and data shared to avoid duplication and minimise air-gun blasts.
- Where surveys do proceed, the existing guidelines⁵³ should be subject to immediate and ongoing review on the basis of new information regarding best practice. Requirements such as data collection, presence of adequate marine mammal observers, and the additional use of passive acoustic monitoring should be made mandatory.
- Temporal restrictions on seismic surveys should be mandatory in seasonally important cetacean habitats (calving grounds and resting areas during the breeding and calving season) which have not been declared highly protected areas.
- The guidelines should be extended to include all species of cetaceans.

Ship movements:

- Vessels should avoid sensitive areas wherever possible.
- Ship routing measures and the use of shipping corridors through recognised sensitive areas should be used, as is the case in other parts of the world. This could be undertaken through the designation of a Particularly Sensitive Sea Area in the most vulnerable and important habitats, under the auspices of the International Maritime Organisation.
- Guidelines should be developed for reducing the risk of ship strike from activities requiring vessel movements through sensitive habitats. These could include carrying trained marine mammal observers while in transit, the use of night vision technology, speed restrictions, and passive acoustic monitoring/warning systems.
- Further work is required by Government and industry to improve compliance with mandatory reporting requirements for vessel strikes.

Oil and gas operations:

- No further petroleum acreage should be released, nor decisions made on current leases open for bidding or under assessment, unless independent surveys for evidence of important cetacean habitat(s) have been conducted and results made publicly available for assessment. For existing exploration and production leases, no disruptive events should be allowed to proceed unless such surveys have been conducted and reviewed.
- Existing oil and gas regulations regarding the production of environment plans should be revised to provide a formal mechanism for independent public scrutiny of plans to ensure stringent provisions are in place to reduce impacts in sensitive areas.
- Long-term extractive projects should be coupled with long-term cetacean monitoring programs.

Fisheries:

- In many cases, bycatch reduction measures are already being implemented for trawling, netting and longline fisheries. However, better species-level recording, more transparent reporting and further research is required to determine the potential for further reductions in bycatch.

There are enormous challenges in balancing conservation and human needs in the NW marine environment. The current draft of the NW Marine Bioregional Plan and the accompanying proposed marine reserves must be improved to find this balance, and ensure cetacean conservation is presented as a real and achievable objective for all species present in the region. While still allowing for reasonable human use, the conservation, mitigation and research approaches taken by the oil and gas industry require greater scrutiny because of their longer term implications for how the marine environment is protected. To fully implement the precautionary principle, the burden of proof must be shifted so that conservation actions are not dependent upon prior evidence of environmental damage. The proper application of the precautionary principle is the only means to ensure a long-term future for cetaceans and their habitats, without jeopardising the economic prosperity of the local and broader community.



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Appendix 1 – Species Profiles

Note: Unless otherwise indicated, population status estimates are from DSEWPaC ⁶¹ and IUCN ⁹¹.

Australian snubfin dolphin

Family Delphinidae	Scientific Name <i>Orcaella heinsohni</i>
Distribution and migration Found only in waters off the northern half of Australia, from Broome (17° 57' S) on the west coast to the Brisbane River (27° 32' S) on the east coast. Extend across the shallow Sahul Shelf, and can be found to 23km offshore. Separate from populations in Asia. Only a single record exists outside Australia from Daru, Papua New Guinea ²⁰ . Higher densities are found along the Queensland coast; they may occur in small, localized populations. Systematic boat-based surveys have been conducted in Cleveland Bay, Hinchinbrook, Princess Charlotte Bay, Ninian Bay and Bathurst Bay, north-east Queensland.	Habitat Occur mostly in protected shallow waters close to the coast, associate with specific features and feeding habitats less than 20m deep and close to river and creek mouths. Occasional vagrants may venture upstream and offshore. Share similar habitat preferences with Indo-Pacific Humpback Dolphins, with these two species potentially sympatric (occurring in the same areas) throughout most of their Australian range.
Diet and behaviour Prey includes fish of the families Engraulidae, Clupeidae, Chirocentridae, Anguillidae, Hemirhamphidae, Leiognathidae, Apogonidae, Pomadasyidae, Terapontidae and Sillaginidae. Feeding primarily occurs in shallow waters (less than 20m) close to river mouths and creeks.	Reproduction Sexual maturity: 2m, age unknown. Maximum age: 28 years, maximum lengths of 2.70m (males), 2.30m (females). Potential predators: large tiger sharks (<i>Galeocerdo cuvier</i>) and bull sharks (<i>Carcharhinus leucas</i>). Socialise year round in Cleveland Bay; may mate year round. Gestation may last 14 months, calves seen year round.
Information from the NW Region Found in the shallow coastal waters and estuaries along the Kimberley coast. Beagle and Pender Bays on the Dampier Peninsula and tidal creeks around Yampi Sound and between Kuri Bay and Cape Londonderry are important areas.	Population status ~100 individuals in Cleveland Bay, north-east Queensland ¹⁵⁰ . Queensland population is likely to be in the thousands, Australia-wide not more than 10,000. Populations threatened by boat traffic, pollution, incidental capture in gillnets, including shark nets, overfishing of prey and habitat degradation. Future population declines likely.
Sources: Beasley et al. ²⁰ , DEWHA ⁵⁴ , DEWHA ⁵⁵ , DEWR ⁵⁷ , DSEWPaC ⁶¹ , Gribble et al. ⁷⁹ , Hale ⁸⁰ , Jefferson et al. ⁹⁴ , Parra ¹²⁷ , Parra et al. ¹³⁰ , Ross ¹⁴⁴ , Stacey and Arnold ¹⁶²	

Indo-Pacific bottlenose dolphin

Family Delphinidae	Scientific Name <i>Tursiops aduncus</i>
Distribution and migration Distributed continuously around the Australian mainland. Indian Ocean bottlenose dolphins are known to occur in four main regions around Australia: eastern Indian Ocean, Tasman Sea, Coral Sea, and Arafura/Timor Seas. Movement patterns variable, include year-round residency in small areas, long-range movements and migration.	Habitat Restricted to inshore areas such as bays and estuaries, nearshore waters, open coast environments, and shallow offshore waters including coastal areas around oceanic islands. Associate with Indo-Pacific humpback dolphins and humpback whales.
Diet and behaviour African scad (<i>Trachurus delagoae</i>), striped threadfin (<i>Polydactylus plebeius</i>), <i>P. olivaceum</i> , <i>Pagellus bellotti</i> , Pacific mackerel (<i>Scomber japonicus</i>), slender conger (<i>Uroconger lepturus</i>), Kaup's arrowtooth eel (<i>Synaphobranchus kaupii</i>), plain cardinalfish (<i>Apogon apogonides</i>), yellowtail emperor (<i>Lethrinus crocineus</i>), blacktail snapper (<i>Lutjanus fulvus</i>), common cuttlefish (<i>Sepia officinalis</i>), broadclub cuttlefish (<i>S. latimanus</i>), bigfin reef squid (<i>Sepioteuthis lessoniana</i>), and squid (<i>Loligo</i> spp.). Mainly feed individually, but may take advantage of human activities such as feeding behind trawlers.	Reproduction Sexual maturity: 9–11 years (females), 11–15 years (males), maximum age: 40. Calving peaks in spring and summer or spring and autumn. Gestation lasts about 12 months. Inter-birth interval (period between pregnancies) is about three to six years.
Information from the NW Region Roebuck Bay, Maret Islands and Yampi Sound are important habitats for feeding, breeding and calving. Resident groups are also known to occur at Browse Island, Rowley Shoals and other island and reef complexes in offshore waters, where they may co-occur with common dolphins. Populations of Indian Ocean bottlenose dolphins in the Arafura/Timor Sea are listed on Appendix II of Convention of Migratory Species (CMS). Significant predation by tiger sharks in Shark Bay.	Population status 102 individuals in Jervis Bay, 140 in Port Stephens, 350 in Moreton Bay, 900 off North Stradbroke Island, and about 2,000–3,000 in Shark Bay, Western Australia. Populations threatened by direct and indirect catches by fisheries, intentional killing, live capture, pollution, competition with fisheries and tourism.
Sources: Bejder et al. ²² , Chilvers and Corkeron ^{34,35} , Connor et al. ⁴⁰ , Culik ⁴⁶ , DEWHA ⁵⁴ , DEWHA ⁵⁵ , DEWR ⁵⁷ , DSEWPac ⁶¹ , Gowans et al. ⁷⁸ , Hale et al. ⁸¹ , Harwood and Hembree ⁸² , Heithaus ⁸⁷ , Jefferson et al. ⁹⁴ , Möller et al. ¹¹⁶ , Möller et al. ¹¹⁷ , Preen et al. ¹⁴⁰ , Ross ¹⁴⁴ , RPS ¹⁴⁶	

Indo-Pacific humpback dolphin

Family Delphinidae	Scientific Name <i>Sousa chinensis</i>
Distribution and migration Occurrence in Australia linked to the warm eastern boundary current along the northern coastline from Exmouth Gulf on the west coast (25°S) to the Queensland/NSW border region on the east coast (34°S). Few records between the Gulf of Carpentaria in the north and Exmouth Gulf in the west. Known localities in Queensland include the Great Barrier Reef Marine Park; Moreton Bay; the lower reaches of the Brisbane River, and adjacent offshore waters. Long-shore movements over substantial distances are possible. Considered to be migratory.	Habitat Inhabit shallow coastal, estuarine, and occasionally riverine habitats, in tropical and subtropical regions. Usually occurs close to the coast, generally in depths of less than 20m, but they have been seen 55km offshore in shallow water. No apparent preference for clear or turbid waters.
Diet and behaviour Opportunist-generalist feeders, wide variety of coastal and estuarine-associated fishes, also reef, littoral and demersal fish species. May feed in association with prawn trawlers.	Reproduction Sexual maturity: ~10 years (females), ~13 years (males), maximum age: 40 years. Birth rate between 4.8% and 6.5%. Minimum mortality rate to one year of age is about 20%, and recruitment rate to age one year is less than 4%. Mortality from sharks is significant. Spring and summer peaks in calving. Gestation lasts between 10 and 12 months, calving interval three years. No calving areas are known in Australian waters. Length and weight at birth 0.97–1.08m and around 14kg respectively. Generation length about 18 years.
Information from the NW Region Critical habitat for foraging, feeding, breeding and calving have been identified in Roebuck Bay, Dampier Peninsula, King Sound north, Talbot Bay, Anjo Peninsula, Vansittart Bay, Napier Broome Bay and Deception Bay. Several groups appear to be resident within Ningaloo Reef.	Population status Total population size in Australian waters is unknown. Estimates of 34–54 individuals in Cleveland Bay and 119–163 in Moreton Bay, Queensland ^{128,130} . Populations threatened by habitat deterioration.
Sources: Culik ⁴⁶ , Bannister et al. ¹⁷ , DEWR ⁵⁷ , DSEWPac ⁶¹ , Gowans et al. ⁷⁸ , Hale ⁸⁰ , Jefferson et al. ⁹⁴ , Parra et al. ^{128,129} , Ross ¹⁴⁴ , RPS ¹⁴⁶	

Common bottlenose dolphin

Family Delphinidae	Scientific Name <i>Tursiops truncatus</i>
Distribution and migration Not well known in Australian waters, but there are records for Queensland, NSW, Tasmania, South Australia and south-western Western Australia. Usually found offshore in waters deeper than 30m but also appear to be found in some coastal waters. Bottlenose dolphins inhabiting high latitudes may exhibit seasonal migration related to changes in water temperature and prey availability.	Habitat Found in tropical and temperate waters, inhabit inshore areas such as bays, lagoons, fjords and estuaries, and nearshore (open coast) and offshore environments, including the coast of oceanic islands. Tend to inhabit offshore waters in Australia. Known to associate with pilot whales, white-sided, spotted, rough-toothed and Risso's dolphins, and humpback and right whales.
Diet and behaviour Inshore bottlenose dolphins feed mainly on a variety of fish and invertebrates from both the littoral and sub-littoral zones, while offshore animals feed primarily on mesopelagic fish and oceanic squids. Tend to feed individually, but cooperative feeding is also observed. They are known to take advantage of human activities for herding fish and feeding. They have been observed to herd schools of mullets towards fishermen with nets, to feed behind trawlers and around purse seine nets, and to collect discarded fish or steal fish from nets.	Reproduction Sexual maturity: 5–13 years (females), 8–12 years (males). Maximum age: 50 years (females) and 40 years (males). Calving may peak in spring and summer or spring and autumn. Gestation is about 12 months. The mating system is believed to be promiscuous. Calving interval: 3–6 years.
Information from the NW Region A population of bottlenose dolphins comprised of both <i>T. truncatus</i> and <i>T. aduncus</i> mtDNA haplotypes (genetic types) have been reported for Shark Bay, Western Australia. This suggests historical hybridisation or incomplete lineage sorting of the mtDNA control region of these two species. Bottlenose dolphins in this area resemble <i>T. aduncus</i> in their morphology (elongated rostrum and presence of ventral spotting in sexually mature individuals). Most common dolphin caught by the Taiwanese gillnet fishery. Resident populations also at Montebello and Barrow Islands. Seen from Cape Londonderry to the Lacepede Islands, and near Ashmore Reef.	Population status Minimum worldwide estimate is 600,000. Hybrids with other species are known. Populations threatened by incidental catches in gillnet and purse-seine fisheries, pollution and habitat degradation. Several contaminants have been reported at high levels in bottlenose dolphins, including DDT, PCBs and heavy metals.
Sources: Bannister et al. ¹⁷ , Berens McCabe et al. ²³ , DEWR ⁵⁷ , DSEWPac ⁶¹ , Gales et al. ⁷⁵ , Gowans et al. ⁷⁸ , Hale et al. ⁸¹ , Hoelzel et al. ⁹⁰ , Jefferson et al. ⁹⁴ , Kemper ¹⁰³ , Mustoe ¹²⁰ , Ross ¹⁴⁴	

Humpback whale

Family Balaenopteridae	Scientific Name <i>Megaptera novaeangliae</i>
Distribution and migration Annually migrate between summer feeding grounds in Antarctica to tropical breeding grounds in winter. West coast population and east coast population known as Group D and Group E. West and east coast humpback whale populations genetically distinct, but song analysis has shown links between the west and east coast populations. Multiple surveys in Australian waters. Sighted in southern Australian waters in May and migrate slowly up the east and west coasts. Southward migration initiated by October.	Habitat Migrate along coastal waters, but can be found offshore. Narrow corridors and bottlenecks along migratory route from physical and other barriers (within 30km of the coastline): WA: Geraldton/ Abrolhos Islands, Point Cloates - North West Cape; Qld: east of Stradbroke Island and Moreton Island; NSW: Cape Byron. Resting areas during southern migration: WA: Exmouth Gulf, Shark Bay, Geographe Bay, Houtman Abrolhos Islands; Qld: Whitsundays, Hervey Bay, Moreton Bay, the Swain Reefs complex, Bell Cay, Palm Island Group; NSW: Twofold Bay.
Diet and behaviour Feeding primarily occurs in summer in Antarctic waters south of about 55°S with krill (in particular <i>Euphausia superba</i>) forming the major part of their diet. Euphausiid density is higher where topographic and physical features interact to entrap or entrain swarms. Peak feeding season is mid-January to February. Opportunistic feeding may occur during migration. Often forage alone and use 'lunge feeding' and 'bubble feeding'.	Reproduction Sexual maturity: 4–8 years. Maximum age: 48 years (likely to be longer). Calves vulnerable to predation by killer whales, may die from parasites or disease. Breeding peaks in the winter, gestation period 11–12 months. Lactation 10–12 months. Calving interval: 2.4 years. Currently known calving areas: WA: Southern Kimberley between Broome and the northern end of Camden Sound; Qld: Great Barrier Reef complex between ~14°S and 27°S; less frequently, along the migratory pathways.
Information from the NW Region NW Marine Region critical for WA migrating population; breeding and calving grounds between Broome and Camden Sound, June–September. Females with calves stop to rest in Exmouth Gulf and Shark Bay. Ongoing major studies of Humpback Whales in WA: CWR, DEC & WWR boat based and aerial surveys; WAM aerial surveys; CWR, DEC & WAM photo-ID, Edith Cowan University, CWR genetic analysis.	Population status Appear to be growing ~10% per annum. West coast population is still at less than 60% and the east coast population at less than 40% of their estimated abundance before the whaling era. West coast population: estimate of maximum absolute abundance in 2008 of 33,333, ~9.7% increase per annum ^{B4, 85, 150} .
Sources: Bannister et al. ¹⁷ , Chaloupka et al. ³³ , Clapham et al. ³⁶ , Corkeron and Connor ⁴¹ , DEH ⁵² , DEWHA ⁵⁴ , DEWR ⁵⁷ , DSEWPac ⁶¹ , Double et al. ⁶⁰ , Gill and Burton ⁷⁶ , Hedley et al. ^{84, 85} , Jefferson et al. ^{93, 94} , Jenner and Jenner ^{95, 96} , Jenner et al. ⁹⁷ , Naessig and Lanyon ¹²² , Noad et al. ¹²⁴ , Paxton et al. ¹³² , Salgado Kent et al. ¹⁵⁰ , Valsecchi et al. ¹⁶⁹ , Watkins and Schevill ¹⁷⁵	

Pygmy blue whale

Family Balaenopteridae	Scientific Name <i>Balaenoptera musculus brevicauda</i>
Distribution and migration Most continental shelf and coastal waters used only for migration and opportunistic feeding. Key areas of significance are the Perth Canyon in WA, and the Bonney Upwelling and adjacent upwelling areas of SA and Vic. Other important areas of aggregation include Geographe Bay and Quondong Point and the upwellings around Browse Island. Anecdotal feeding areas offshore of Eden and Merimbula, NSW (especially during October) and the continental shelf from Rottnest Island to Northwest Cape. Powerful migratory travellers. Current data does not fully represent the Australian status.	Habitat Habitat is variable, aggregations around high productivity and upwelling. The Bonney Upwelling in relatively shallow shelf waters enriched by seasonal cold water upwelling driven by south-east winds. In the Perth Canyon the southward flow of the Leeuwin Current causes eddies, downwelling and compensating upwelling over the steep-sided canyon. Breeding likely to occur in tropical areas of high productivity. Possible wintering areas include the Indonesian archipelago and the waters adjacent to island groups of the south-west Pacific.
Diet and behaviour Feed on krill. In the Bonney Upwelling, major prey is the krill <i>Nyctiphanes australis</i> . Relative abundance of <i>N. australis</i> linked to the timing of the Bonney Upwelling, which is active between November and May. In the Perth Canyon, the main prey is <i>Euphausia recurva</i> , found during daylight hours at depths of 200–500m, vertically migrating to surface waters at night. In the Bonney Upwelling, blue whales lunge feed at or near the surface; but may dive to feed. In the Perth Canyon, they regularly dive to 200–500m.	Reproduction Sexual maturity: 7–10 years of age. Maximum age may be nearly 100 years. Subject to predation by killer whales, sharks and parasites, infection and disease. Mating system unknown. Breeding in winter and early spring. Gestation: 11 months, calves 6–7m at birth. Weaning age ~7 months, 16m. Calving interval: 2–3 years. Breeding areas may lie in deep water adjacent to tropical island groups with high productivity. Thin blubber may not allow them to fast for prolonged periods.
Information from the NW Region Perth Canyon aggregation likely to feed opportunistically along the continental shelf break as far north as the Abrohlos Islands. Other important areas of aggregation / migratory waypoints include Geographe Bay and Quondong Point, and the upwellings around Browse Island are likely feeding areas during migration to Indonesia.	Population status No reliable population size in the Australian region possible. Many aggregation areas are still unknown. Considered among the most endangered of all baleen whale populations. Surveys recorded 671 whales off southern Australia ¹⁰² . Estimate of population size and rate of increase uncertain; population may be in the 1000s, possibly between 10% and 50% of pre-exploitation abundance (T. Branch pers. comm.)
Sources: Attard et al. ⁷ , Branch et al. ²⁵ , Clapham et al. ³⁶ , DEH ⁵⁰ , DEWHA ⁵⁴ , DEWR ⁵⁷ , DSEWPaC ⁶¹ , Gill et al. ⁷⁷ , Jefferson et al. ⁹⁴ , Kato et al. ¹⁰² , McCauley et al. ¹¹² , Morrice et al. ¹¹⁹ , RPS ¹⁴⁶	

Risso's dolphin

Family	Scientific Name
Delphinidae	<i>Grampus griseus</i>
Distribution and migration Recorded from all states except Tasmania and the Northern Territory. Stranding records from about 23°S to 39°S. Fraser Island has the only suspected 'resident' population in Australia. Not well surveyed in Australian waters, distribution primarily assumed from beach-cast animals.	Habitat Occur mainly on steep sections of the upper continental slope, usually in waters deeper than 1000m, in tropical and warm temperate latitudes. Frequently move over the continental slope. Regularly seen with pilot whales, striped dolphins and common dolphins.
Diet and behaviour Feeds in pelagic waters primarily on pelagic and neritic squid, some octopus and possibly fish. May rely primarily on eye-sight; > 70% of prey are luminous or have photophores. Lives in groups of 25 to several hundred individuals, but they may also be solitary. Sometimes swim in 'echelon formation', lined up abreast at evenly spaced intervals, possibly a useful prey-hunting tactic. Dives are long and deep.	Reproduction Weight and length at birth: 59kg, 1.1–1.5m. Length at weaning: < 2.12m; length at sexual maturity: 2.6–3.0m. Maximum weight > 230kg, maximum age > 17 years, maximum length 4.1m. Calving interval and mating season unknown; gestation period is ~1 year. No calving areas are known in Australian waters.
Information from the NW Region Likely to be associated with steep sections of the continental slope off Scott Reef and Browse Island. Observed in large numbers in the Rowley Shoals.	Population status Population size is unknown; not considered rare. Approximately 175,000 individuals occur in the eastern tropical Pacific ¹⁷³ , with similarly high densities in all areas where surveys have been conducted. The species is therefore potentially abundant in Australian waters. Ongoing incidental captures and directed takes are the most likely cause of potential future population decline, although no quantitative data are available.
Sources: Bannister et al. ¹⁷ , Corkeron and Van Parijs ⁴² , DEWR ⁵⁷ , DSEWPaC ⁶¹ , Frantzis and Herzing ⁷⁰ , Harwood and Hembree ⁸² , Jefferson et al. ⁹⁴ , Perrin and Reilly ¹³⁴ , Ross ¹⁴⁴ , Wade and Gerrodette ¹⁷³	

Rough-toothed dolphin

Family	Scientific Name
Delphinidae	<i>Steno bredanensis</i>
Distribution and migration Recorded from Western Australia (Barrow Island), the Northern Territory, Queensland and southern New South Wales. Believed to be uncommon throughout their range, but difficulties in identification could mean that abundance is underestimated. Not well surveyed in Australian waters, distribution primarily assumed from beach-cast animals. Not known to migrate. Group strandings have been recorded outside Australia. Three animals stranded together on Barrow Island, Western Australia in 1971.	Habitat Inhabits pelagic and oceanic waters in waters exceeding 25°C. Regularly seen with pilot whales, bottlenose dolphins, and occasionally with spotted and spinner Dolphins.
Diet and behaviour Diet includes pelagic octopus, squid and reef fish, with larger fish taken in deep water. Feeds in groups of 10–20 up to several hundred individuals. Notorious for stealing bait and fish off fishing lines.	Reproduction Sexual maturity: 14 years, 2.25m (males), 10 years, 2.20m (females). Physical maturity: ~16 years. The maximum age: 32 years, maximum weight: 155kg. Length at birth: ~1.0m. No information on the age or length at weaning. Calving interval and season, mating season, and gestation period are all unknown. No calving areas are known in Australian waters. Generation length: ~20 years.
Information from the NW Region Possibly resident in the region throughout the year. Seen in deep water off Scott Reef. Strandings recorded on Barrow Island.	Population status Population size unknown, not considered rare with approximately 150,000 individuals thought to occur in the eastern tropical Pacific ¹⁷³ . Potentially abundant in Australian waters, and certainly likely to exceed 10,000 mature individuals. No population trends have been calculated.
Sources: Baird et al. ¹³ , Bannister et al. ¹⁷ , Culik ⁴⁶ , DEWR ⁵⁷ , DSEWPaC ⁶¹ , Harwood and Hembree ⁸² , Jefferson et al. ⁹⁴ , Mustoe and Edmunds ¹²¹ , Perkins and Miller ¹³³ , Perrin and Reilly ¹³⁴ , Ross ¹⁴⁴ , Struntz et al. ¹⁶⁴ , Wade and Gerrodette ¹⁷³	

Pantropical spotted dolphin

Family Delphinidae	Scientific Name <i>Stenella attenuata</i>
Distribution and migration Recorded off the Northern Territory, Western Australia down south to Augusta, Queensland and NSW. Generally deeper than 200m but also on the continental shelf. Not well surveyed in Australian waters, distribution primarily assumed from incidental sightings, plus beach-cast and bycatch reports. Seasonal north-south movements and inshore/offshore movements known from other areas, but not for Australian waters.	Habitat Inhabit both near-shore and oceanic habitats in tropical and warm temperate seas. Also found on the shelf and along the continental slope, indicating that they may use neritic habitat as well.
Diet and behaviour Feed mainly on small epipelagic and mesopelagic fish, and squids, but can take nemertean worms and crab larvae. Diet varies with region and reproductive state. Lactating females eat a greater proportion of fish than squid, presumably because the former is higher in calorific value. Diet overlaps with that of yellowfin tuna, leading to close association between these species and sea birds. Has resulted in large numbers of dolphins taken as bycatch by purse seiners.	Reproduction Sexual maturity: 12–15 years, 1.9–2.0m (males), 10–12 years, 1.8–2.0m (females). Maximum age: 50 years. Predators include humans, sharks, killer whales, false killer whales, and pygmy killer whales. Calves are born at 0.8–0.9m, and wean at 1–3 years. Calving interval: 2–4 years. Mating season diffuse, with peaks in spring and autumn. Gestation lasts 11.2–11.5 months. No calving areas are known in Australian waters.
Information from the NW Region Probably resident in the region throughout the year, recorded in Taiwanese gillnet catch. Seen near Ashmore Reef.	Population status Population size unknown, but not considered rare. May be split into near-shore and oceanic populations. No population trends identified. Purse seine fishery major threatening process for population.
Sources: Ballance and Pitman ¹⁴ , Bannister et al. ¹⁷ , Culik ⁴⁶ , DEWR ⁵⁷ , DSEWPaC ⁶¹ , Gowans et al. ⁷⁸ , Harwood and Hembree ⁸² , Jefferson et al. ⁹⁴ , Mustoe ¹²⁰ , Perrin and Reilly ¹³⁴ , Reilly ¹⁴² , Ross ¹⁴⁴ , Scott and Chivers ¹⁵⁶ , Wade and Gerrodette ¹⁷³	

Spinner dolphin

Family Delphinidae	Scientific Name <i>Stenella longirostris</i>
Distribution and migration Records exist from Western Australia, as far south as Bunbury (33°19' S), the Northern Territory (records of bycatch in the Arafura and Timor sea gillnet fishing industry 1981–85), Queensland and NSW. Not well surveyed in Australian waters, offshore distribution primarily assumed from incidental sightings, plus beach-cast and reported by-caught animals. Not known to be migratory, but seasonal movement and range extensions linked to oceanographic features (e.g. Leeuwin Current).	Habitat Primarily pelagic, possibly neritic in some regions. Occur in tropical, subtropical and occasionally temperate waters. Associate with tuna, pantropical spotted dolphins and sea birds under certain oceanographic conditions, such as well-defined, shallow, pelagic habitats about 100m deep. Pelagic and nearshore forms exist. In northern Australia, appear to be more closely associated with shallow water (less than 50m depth).
Diet and behaviour Pelagic dolphins feed on pelagic fish (mostly myctophids), squids and shrimps from depths greater than 250m. May undertake long-term movements in response to changing availability of prey. Food-related diurnal movements, heading offshore at dusk to feed on deep-living organisms that migrate towards the surface at night. Stomach contents from northern Australia contained reef-living and benthic organisms. Diet overlaps with that of yellowfin tuna, leading to close association between these species and sea birds. Has resulted in large numbers of dolphins taken as bycatch by purse seiners.	Reproduction Sexual maturity: > 6 years, 1.5m (males), 4 years, 1.4m (females) in northern Australia. Maximum age: 22 years. Natural predators include sharks and several other cetaceans, including killer whales, false killer whales, pygmy killer whales and short-finned pilot whales. Parasitism may be a major factor in natural mortality. Calves born at 0.7–0.8m, and wean at 1–3 years. Calving interval 2–3 years. Gestation 9–11 months, no mating and calving seasons known. No calving areas are known in Australian waters.
Information from the NW Region In October 2007 a survey conducted by the National Cetacean Sightings Program observed a pod of 30 spinner dolphins 120km north-west of Barrow Island (20°09' S and 114°24' E), Western Australia. One of the more common pelagic dolphins in the NW Marine Region; most common dolphin caught by the Taiwanese gillnet fishery. High density in James Price Point area. Seen from Cape Londonderry to the Lacepede Islands, and near Ashmore Reef.	Population status Population unknown, but not considered rare. Potentially abundant in Australian waters. Appear split into near-shore and oceanic populations. No population trends can be calculated.
Sources: Ballance and Pitman ¹⁴ , Bannister et al. ¹⁷ , Culik ⁴⁶ , DEWHA ⁵⁴ , DEWR ⁵⁷ , DSEWPac ⁶¹ , Gowans et al. ⁷⁸ , Harwood and Hembree ⁸² , Jefferson et al. ⁹⁴ , Mustoe ¹²⁰ , Mustoe and Edmunds ¹²¹ , Perrin and Reilly ¹³⁴ , Perrin et al. ¹³⁵ , Perrin et al. ¹³⁶ , Reilly ¹⁴² , Ross ¹⁴⁴ , Wade and Gerrodette ¹⁷³	

Striped dolphin

Family Delphinidae	Scientific Name <i>Stenella coeruleoalba</i>
Distribution and migration Four or five stranding records known from Western Australia, including from Augusta, probably related to the southward flow of the warm Leeuwin Current. Two records from NSW, and two from southern Queensland. Not well surveyed in Australian waters, distribution is primarily assumed from beach-cast animals. Not known to migrate.	Habitat Inhabits pelagic and oceanic waters, in waters temperatures > 25°C. Most frequently found in deep waters (> 1000m) with large seasonal changes in surface temperature and thermocline depth and with seasonal upwelling. Common and striped Dolphins tend to frequent the same areas, and may be seen with spotted and spinner dolphins, pilot whales and Risso's Dolphins.
Diet and behaviour Prey is small (<300mm length), and includes mesopelagic fish, shrimp and squid. Gregarious, usually seen in schools of a few hundred up to several thousand. May feed at depths of about 200 m or may take prey species that normally live at such depths when they come to surface at night.	Reproduction Sexual maturity: 11–12 years (declined from 9.7 years (1956 cohort) to 7.2 years (1970 cohort) in females off Japan, thought to be in response to decrease in numbers caused by the fishery. Length at physical maturity: 15–20 years (males), 13–18 years (females). Maximum age: 58 years. The calving interval ~4 years, with an annual pregnancy rate of 25%, and an ovulation rate of 0.401. The mating season unknown, and the calving season is prolonged. Gestation lasts about 12 months. Calves are born between 0.8 and 1.0m in length, and wean at 15–36 months and 1.7m in length. No calving areas are known in Australian waters.
Information from the NW Region Resides in the region throughout the year. Abundant in waters around Barrow Island.	Population status Population size unknown, but not considered rare. 635,000 to 2,251,300 occur in the eastern tropical Pacific ¹⁷³ . Potentially abundant in Australian waters. No population trends can be calculated.
Sources: DSEWPac ⁶¹ , Bannister et al. ¹⁷ , Calzada et al. ²⁹ , Culik ⁴⁶ , DEWR ⁵⁷ , Forcada and Hammond ⁶⁸ , Frantzis and Herzing ⁷⁰ , Gowans et al. ⁷⁸ , Jefferson et al. ⁹³ , Jefferson et al. ⁹⁴ , Perrin and Reilly ¹³⁴ , Reilly ¹⁴² , Ross ¹⁴⁴ , Wade and Gerrodette ¹⁷³	

False killer whale

Family Dephinidae	Scientific Name <i>Pseudorca crassidens</i>
Distribution and migration Widely recorded through strandings in each of the coastal states. Not well surveyed in Australian waters, distribution primarily assumed from incidental sightings, plus beach-cast animals. Migration not well documented but may move from warmer, southern waters in winter to cooler, northern waters in summer, possibly in response to prey distribution. Trends in strandings suggest seasonal movement inshore or along the continental shelf on the southern and south-eastern coasts between May and September. Travelling speeds generally three to six knots, may reach 10 knots.	Habitat Preference for tropical (i.e. 22–32°C) to temperate (i.e. 10–20°C) oceanic waters. Deep, offshore or coastal waters. Approach land only where the continental shelf is narrow, possibly attracted to zones of enhanced prey abundance along the continental slope.
Diet and behaviour Eat fish and cephalopods, but may attack other small cetaceans including humpback whale calves. Opportunistic feeders, adaptable foraging behaviours in a range of habitats. Have been seen travelling in line formation in herds up to 300 individuals, distributed over an area 5km long and 800m wide. Propensity to steal bait and catch from longlines and sport fishing gear.	Reproduction Sexual maturity: 8–14 years, 4–4.5m (males), 3.5m (females). Maximum age possibly ~57 years (males), 62 years (females). Prone to mass stranding, which can result in the death of whole herds, one per 2.5 years since 1970, 20–250 whales, average ~100. Gestation ~15 months, size at birth 1.2–1.9m, weaning: 18–24 months. Calving interval 6.9 years. Mating and calving throughout the year, no known seasonal pattern, no calving areas known for Australian waters.
Information from the NW Region May be resident in the region throughout the year. Recorded from Quondong Point, off Browse Island, off Ashmore Reef and from Cape Londonderry to the Lacedpede Islands.	Population status No population estimates available in Australian waters, occur in low abundance. Total number of mature individuals in Australian waters may be < 10,000.
Sources: Bannister et al. ¹⁷ , Culik ⁴⁶ , DEWR ⁵⁷ , DSEWPac ⁶¹ , Harwood and Hembree ⁸² , Jefferson et al. ^{93,94} , Perrin and Reilly ¹³⁴ , Ross ¹⁴⁴ , RPS ¹⁴⁶ , Watson et al. ¹⁷⁶	

Killer whale, orca

Family Delphinidae	Scientific Name <i>Orcinus orca</i>
Distribution and migration Recorded from all states, with concentrations reported around Tasmania. Macquarie Island appears to be a key locality. May occur in severely fragmented populations. Not well surveyed in mainland Australian waters, distribution primarily assumed from incidental sightings, plus beach-cast animals. Known to make seasonal movements, and probably follow regular migratory routes related to movements of their prey. May travel 125–200km per day while foraging.	Habitat Oceanic, pelagic and neritic regions, in both warm and cold waters. May be more common in cold, deep waters, but most often seen along the continental slope and on the shelf in Australia. Habitat difficult to categorise due to cosmopolitan nature. Use of different habitats has been linked to behavioural requirements and the movements of prey.
Diet and behaviour Top-level carnivores, diet varies seasonally and regionally. Reports of attacks on dolphins, young humpback whales, blue whales, sperm whales, dugongs and Australian sea lions. Smaller prey includes fish and squid. High plasticity and specialisation in foraging behaviour, including diverse pack-hunting strategies and scavenging. Depredation of fish off longlines has been recorded throughout their range. Can associate with seabirds during feeding.	Reproduction Sexual maturity: 16 years, 5.2–6.2m (males), 10 years, 4.6–5.4m (females). Maximum age: ~40 years. Natural mortality ~5% per year. Matrilineal groups are the basic unit of social organisation. Calving interval 3–8 years. Mating occurs all year round, gestation lasts 12–17 months. No calving areas are known in Australian waters.
Information from the NW Region May be associated with humpback aggregation areas. Seen in Collier Bay.	Population status Minimum worldwide estimate of around 50,000. Total number of mature animals in Australian waters may be < 10,000. Lack of taxonomic resolution and abundance and distribution data; no definitive assessment of the number of subpopulations of killer whales in Australian waters. Populations may be transient. No key localities known in continental Australian waters.
Sources: Andrews et al. ⁴ , Baird and Dill ¹⁰ , Bannister et al. ¹⁷ , Culik ⁴⁶ , Dahlheim and White ⁴⁸ , DEWHA ⁵⁴ , DEWHA ⁵⁵ , DEWR ⁵⁷ , DSEWPaC ⁶¹ , Ford et al. ⁶⁹ , Gowans et al. ⁷⁸ , Hickie et al. ⁸⁸ , Hodges and Woehler ⁸⁹ , Jefferson et al. ^{93,94} , Kemper et al. ¹⁰⁴ , Pitman and Ensor ¹³⁸ , Ross ¹⁴⁴ , Silber et al. ¹⁵⁸	

Sperm whale

Family Physeteridae	Scientific Name <i>Physeter macrocephalus</i>
Distribution and migration Recorded from all Australian states. Females and young restricted to warmer waters, older males travel to and from colder waters and to Antarctica. Inter-oceanic movements more prevalent among males. Concentrated in a narrow area a few miles wide at shelf edge off Albany, WA, moving westwards through the year. May occur in severely fragmented populations. Not well surveyed in mainland Australian waters. Key localities in Australia: Cape Leeuwin to Esperance, WA; south-west of Kangaroo Island, SA; deep waters off the Tasmanian west and south coasts; southern NSW, deep water off Stradbroke Island, Qld.	Habitat Cosmopolitan; tend to inhabit offshore areas at depth of 600m or more, uncommon in waters less than 300m deep. Females found in deep waters (=> 1000m) of low latitudes. Concentrations found where the seabed rises steeply from great depth, associated with concentrations of major food and upwelling. Males begin migration towards poles at 4–21 years old. Older males remain south of ~45°S, may return to warm water breeding area.
Diet and behaviour Major food is oceanic cephalopods, frequently taken at depth. May take octopuses, rays, sharks and teleosts. Very deep and prolonged divers, can feed throughout the entire water column. Forage mainly on or near the bottom, often ingesting stones, sand, sponges, and other non-food items. Feed regularly throughout the year, consume ~3.0–3.5% of body weight daily. May use echolocation to scan for prey; may detect squid visually; may search randomly by swimming with mouths open, may use white lips to attract prey into open mouth. Depredation of fishing longlines common. Can associate with seabirds during feeding.	Reproduction Sexual maturity 18–21 years, 11.0–12.0m (males), 7–13 years, 8.3–9.2m (females). Maximum age can > 60 years. Strandings common. Subject to predation and harassment by killer whales, false killer whales, pilot whales and large sharks. May suffer from bone necrosis as a result of decompression sickness. Mating season is prolonged, from late winter to early summer. Calves may be born in tropical and temperate waters November – March. Gestation: 14.5–16.5 months, lactation: 18 months, may suckle for 13 years. Matrilineal groups with communal caring for calves. Calving interval 4–6 years. No specific calving localities in Australian waters.
Information from the NW Region Females with young may reside in the region all year round. Males may migrate through the region. May be associated with canyon habitats. Wallaby Saddle, Scott Plateau are historically known aggregation areas.	Population status Global population estimated in the 100,000s. No population estimates available for Australian waters. Total number of mature animals may be < 10,000. Based on a generation length of 26.5 years, ~two-thirds reduction in the global pre-whaling stock size over the past three generations. Global population slowly recovering.
Sources: Arnbom et al. ⁵ , Bannister et al. ¹⁷ , Culik ⁴⁶ , DEWHA ⁵⁴ , DEWHA ⁵⁵ , DEWR ⁵⁷ , DSEWPaC ⁶¹ , Evans and Hindell ⁶⁶ , Gowans et al. ⁷⁸ , Hodges and Woehler ⁸⁹ , Jefferson et al. ^{93,94} , Lyrholm et al. ¹⁰⁸ , McPherson and Nishida ¹¹⁴ , Moore and Early ¹¹⁸ , Pirotta et al. ¹³⁷ , Whitehead ¹⁷⁷	

Bryde's whale

Family Balaenopteridae	Scientific Name <i>Balaenoptera edeni</i>
Distribution and migration Occur in temperate to tropical waters, oceanic and inshore, on the 20°C isotherm. Recorded from all Australian states except the Northern Territory. Not well surveyed within Australian waters, distribution primarily assumed from incidental sightings, beach-cast animals, and whaling data for all areas. No evidence of large-scale movements of the inshore form. The offshore form may migrate seasonally, heading towards warmer tropical waters during the winter, possibly to allow breeding and calving in lower latitudes. Move in close association with their prey.	Habitat Pelagic. Coastal form limited to the 200m isobar, resident or moving along the coast with availability of prey. Offshore form found in deeper water (500m to 1000m), extensive migrations between subtropical and tropical waters during the winter months. Short dive times, averaging 1.27 minutes but potentially lasting 9 minutes. No specific feeding or breeding grounds off Australia.
Diet and behaviour Opportunistic feeder. Coastal and offshore forms may be distinguished by prey preferences. Coastal form feeds on schooling fishes, such as pilchard, anchovy, sardine, mackerel, herring and others. Larger offshore form feeds on euphausiids, copepods and pelagic red crabs (Pleuroncodes), plus cephalopods. Swim through and engulf 'boils' of fish herded by other species. Found with flocks of sea birds, other cetaceans, seals and sharks. Feeding is year round, several times a day, estimated requirement of 4% of body weight daily, (600–660kg).	Reproduction Maximum age: > 50 years. Offshore form sexual maturity: 11.0–11.4m (males), 11.6–11.8m (females), inshore form sexual maturity: 11.3–11.5m (females), 10–10.4m (males). Sexual maturity at 7–9 years. Mortality rate ~3% for Southern Hemisphere unexploited stocks. Inshore forms breed and give birth throughout the year, offshore form protracted breeding and calving season during winter. 2-year reproductive cycle: 11–12 months gestation, 6 months lactation, 6 months resting. Calves are ~3.4m. Generation length ~ 20 years.
Information from the NW Region Possibly resident in the region throughout the year. Seen from Cape Londonderry to the Lacepede Islands. Recorded in Bonaparte Gulf.	Population status No population estimates available. Australian inshore stocks probably small (estimated at 582 ± 184 animals). Total number within Australian waters < 10,000.
Sources: Bannister et al. ¹⁷ , Best ²⁴ , DEWR ⁵⁷ , DSEWPaC ⁶¹ , Jefferson et al. ⁹⁴ , McCauley ¹¹¹ , Ross ¹⁴⁴ , RPS ¹⁴⁶ , Silber et al. ¹⁵⁸	

Fraser's dolphin

Family Delphinidae	Scientific Name <i>Lagenodelphis hosei</i>
Distribution and migration Found in oceanic waters north of 30°S and deeper than 1000m. Strandings have been recorded in Western Australia (2), Queensland (1), northern NSW (3) and Victoria (1 in Corio Bay at 38°S). Not well surveyed in Australia, distribution primarily assumed from beach-cast animals.	Habitat Inhabits pelagic and oceanic habitats in subtropical, tropical and, occasionally, temperate waters. Often found in waters characterised by a stable, shallow mixed layer and thermocline ridging, as well as upwelling areas.
Diet and behaviour Feeds on mesopelagic fish, squid and crustaceans. May selectively feed on larger prey. Some recorded prey are deep-sea or benthic species, suggesting that Fraser's dolphin either feeds at depth (250–500m) or when prey surface at night. Vertical or daily movement could increase the susceptibility to incidental capture in high-seas driftnets.	Reproduction Sexual maturity: 7–10 years; 220–230cm (males), 5–8 years; 210–220cm (females). Life expectancy > 16 years. Calving and conception may occur during the summer months. Calves born ~1m in length after an inferred gestation period of 10–12 months. There are no known calving areas in Australian waters. Generation length: ~ 15 years.
Information from the NW Region Thought to occur infrequently in the region. Seen near Ashmore Reef.	Population status The population in the eastern tropical Pacific has been estimated at a maximum of 289,300 animals ¹⁷³ . Potentially abundant in Australian waters, considered likely to exceed 10,000 mature individuals. Population threatened by capture in fishing nets.
Sources: Culik ⁴⁶ , Bannister et al. ¹⁷ , DEWHA ⁵⁴ , DEWHA ⁵⁵ , DEWR ⁵⁷ , DSEWPaC ⁶¹ , Jefferson et al. ⁹⁴ , Mustoe ¹²⁰ , Robinson and Craddock ¹⁴³ , Ross ¹⁴⁴	

Antarctic minke whale or darkshoulder minke whale

Family Balaenopteridae	Scientific Name <i>Balaenoptera bonaerensis</i>
Distribution and migration Recorded from all States except the Northern Territory. Distribution up the west coast of Australia is currently unknown. May migrate up to 8°S. Not well surveyed within mainland Australian waters, distribution is primarily assumed from incidental sightings and beach-cast animals. Extensive migration between the summer Antarctic feeding grounds and winter sub-tropical to tropical breeding grounds. Suggestion that sexual segregation occurs in Antarctic whaling grounds.	Habitat On the winter breeding grounds, Antarctic minke whales appear to occupy pelagic waters exceeding 600m depth. During the summer, they head for higher latitudes to feed.
Diet and behaviour Mature Antarctic minke whales feed primarily on the Antarctic krill (<i>Euphausia superba</i>), smaller krill species (<i>E. spinifera</i> and <i>E. crystallorophias</i>) and occasional copepods. They do not appear to feed much whilst in the breeding grounds of lower latitudes (<20% off South Africa, <3% off Brazil), although diet remains krill-based. Unlikely to require deep diving to forage. Can feed in association with seabirds.	Reproduction Sexual maturity: 8 years, 7.3m (males), 7–8 years, 7.9m (females). Maximum age may exceed 50 years. Natural mortality: predation by killer whales (<i>Orcinus orca</i>). Mating from June through December, peak in August and September. Gestation: 10 months, calving peaks late May and early June. Twins (0.56%) and triplets (0.03%) may occur. Birth length 2.8m, growth ~1cm per day. Weaning: 4–5 months, 5.7m. 14 month calving cycle. Rate of calf mortality unknown. Generation length ~15 years.
Information from the NW Region Region falls within presumed migration path between Antarctic and tropical areas. Seen off Browse Island.	Population status No population estimates are available for Australian waters. No information on population trends. Large scale continued whaling may reduce the population size in future.
Sources: Bando et al. ¹⁵ , Bannister et al. ¹⁷ , DEWR ⁵⁷ , DSEWPac ⁶¹ , Hodges and Woehler ⁸⁹ , Jefferson et al. ⁹⁴ , Ross ¹⁴⁴ , Zerbini et al. ¹⁸¹	

Cuvier's beaked whale or goosebeaked whale

Family Ziphiidae	Scientific Name <i>Ziphius cavirostris</i>
Distribution and migration Known from 31 strandings (to 1994), mostly from January to July, suggesting some seasonality of occurrence. Not well surveyed, distribution assumed from limited incidental sightings, plus beach-cast animals.	Habitat Mostly oceanic species, confined to waters within the 10°C isotherm and the 1000m bathymetric contour. Rarely found close to mainland shores, except in submarine canyons or in areas where the continental shelf is narrow and coastal waters are deep. May be found from the continental slope to the abyssal plain, in waters ranging from well-mixed to highly stratified.
Diet and behaviour Feed primarily on oceanic squid, such as <i>Mesonychoteuthis hamiltoni</i> , histioteuthid squids and families <i>Mastigoteuthidae</i> , <i>Onychoteuthidae</i> and <i>Vampyroteuthidae</i> . May be opportunistic. Feed primarily by suction, making it susceptible to plastic ingestion. Mid-water dives more frequent during daytime, potentially to avoid surface predators. May leave gouges on the seabed while feeding.	Reproduction Sexual maturity: ~11 years, ~5.5m. Sexual dimorphism in maximum age: males 47 years, females 28 years. Killer whales and cookie-cutter sharks (<i>Isistius</i> sp.) may be main predators. Other causes of natural mortality may include disease. Length at birth 2.70m. Physical maturity: 5.9–6.13m. Mating and calving inferred all year round. No calving areas known for Australian waters.
Information from the NW Region May migrate through or reside in the region, probably associated with canyon habitats and steep sections of the continental slope. Seen near Scott Reef, possible breeding and feeding over Scott Plateau.	Population status Population of 20,000 estimated for eastern tropical Pacific ¹⁷⁵ . Not considered abundant in Australia, as sightings and strandings are rare. Animals from Australian waters represent the South Pacific regional group.
Sources: Auster and Watling ⁸ , Baird et al. ¹² , Bannister et al. ¹⁷ , Barlow et al. ¹⁹ , Culik ⁴⁶ , Dalebout et al. ⁵⁴ , DEWHA ⁵⁵ , DEWHA ⁵⁷ , DEWR ⁶¹ , DSEWPac ⁶⁷ , Ferguson et al. ⁹⁴ , Jefferson et al. ¹⁰⁹ , MacLead and D'Amico ¹²¹ , MacLeod et al. ¹⁴⁴ , Mustoe and Edmunds ¹⁵² , Ross ¹⁶⁸ , Santos et al. ⁶ , Tyack et al. ¹⁷	

Dwarf minke whale

Family Balaenopteridae	Scientific Name <i>Balaenoptera acutorostrata (subsp.)</i>
Distribution and migration Occur as far north as 11°S in the western Pacific off Australia and likely occur up the west coast to similar low latitudes. Southern distribution extends down to 41°S. Restricted to near-shore areas. Not well surveyed within Australian waters, distribution assumed from incidental sightings and beach-cast animals. Mature animals may move into lower latitudes during winter.	Habitat Occupy primarily coastal habitats in tropical and warm temperate waters between 7°S and 41°S throughout the Southern Hemisphere. No specific feeding or breeding grounds discovered off Australia.
Diet and behaviour Probably feeds on the plankton species <i>Euphausia similis</i> and myctophid fishes.	Reproduction Sexually mature males and females range from 6.71–7.10m and 6.40–7.60m, respectively. Maximum age: 60 years. Predators include large sharks. Probable birth length: 2m, gestation: 10 months. Breeding grounds may be in lower latitudes. Generation length: ~15 years.
Information from the NW Region Region falls within the known range of tropical and temperate southern hemisphere waters. Seen off Browse Island.	Population status Populations of the dwarf minke whale are considered to be stable and secure in Australian waters. Population size unknown.
Sources: Arnold et al. ⁵⁷ , Bannister et al. ⁶¹ , DEWR ^{93,94} , DSEWPaC ¹³¹ , Jefferson et al. ¹⁴⁶ , Pastene et al. ¹⁷ , RPS ⁴⁶	

Dwarf sperm whale

Family Physeteridae	Scientific Name <i>Kogia simus</i>
Distribution and migration Strandings recorded from Western Australia, South Australia, Tasmania, NSW and the Northern Territory, with only one live sighting report from South Australia. Not well surveyed; Australian distribution primarily assumed from beach-cast animals. Probably does not migrate extensively.	Habitat Pelagic habitats in temperate to tropical waters, prefers warmer waters than the pygmy sperm whale. Over or near the edge of the continental shelf, while the pygmy sperm whale lives in oceanic waters beyond the edge of the shelf.
Diet and behaviour Feeds in deep water on cephalopods and, less often, on deep-sea fishes and crustaceans. Histioteuthid and lycoteuthid squids are important prey for dwarf sperm whales, and small cuttlefishes were a prime food resource in a few mother-calf pairs.	Reproduction Sexual maturity: 4.5 years, 2.15m (females), 2.9 years, 1.97m (males). Physical maturity: 11 years, 2.5m (females), 15 years, 2.6m (males). Maximum age: 21.5 years (females), 17 years (males), maximum length: 2.86m (females), 2.62m (males). Able to store large volumes of dark faecal liquid in the rectum, which can be ejected in a long stream when fleeing danger or disturbance. Breeding and calving unknown. Mating may occur in summer, 9.5 month gestation, calving in spring. Calves are born at 1.05m, 14 kg. Weaning at 6 months, 1.3m. Ovulation rate 0.65/year and calving interval 1–2 years.
Information from the NW Region Thought to occur infrequently in the region. Recorded between Scott and Ashmore Reefs.	Population status Not considered abundant in Australian waters as sightings and strandings are rare. The species therefore potentially includes < 10,000 mature individuals within Australian waters.
Sources: Bannister et al. ⁵⁴ , Culik ⁵⁷ , DEWHA ⁶¹ , DEWR ⁹⁴ , DSEWPaC ¹²¹ , Jefferson et al. ¹⁴⁴ , Mustoe and Edmunds ¹⁵⁵ , Ross ¹ , Scott and Cordaro ¹⁷	

Fin whale

Family Balaenopteridae	Scientific Name <i>Balaenoptera physalus</i>
Distribution and migration Strandings in small numbers reported from Western Australia, South Australia, Victoria and Tasmania. Nine fin whales taken during the whaling season in WA between 1912 and 1937 and three in the whaling seasons of 1953, 1956 and 1959. Sighted inshore near the Bonney Upwelling in summer and autumn. Acoustics heard off the Rottneest Trench, WA, between January and April. No systematic surveys in Australian waters. Migration routes and location of winter breeding grounds uncertain. Segregated by sex and age during migration.	Habitat Australian Antarctic waters important feeding grounds. Bonney Upwelling area a potentially important feeding ground. Widely distributed in both hemispheres between latitudes 20–75°. Common in temperate waters.
Diet and behaviour Feed intensively in high latitudes and may also feed in lower latitudes. Feed on planktonic crustacea, some fish and cephalopods (crustaceans). Lunge or skim feed at or near the surface. Known to dive to 230m to feed. Fin whales are killed by ship strike more than any other whale. Acoustic pollution (from activities such as commercial and recreational vessel noise, and seismic survey activity) may degrade habitat important to the survival of fin whales.	Reproduction Sexual maturity: 6–10 years, 19.2m. Maximum age may approach 100 years. Subject to predation by killer whales, shark species, smaller parasites, infection and disease. Breeding peaks in winter, gestation is 11.25 months, lactation 6–7 months. Mean calving interval is 2–3 years. No known mating or calving areas in Australian waters.
Information from the NW Region Possibly migrates through the region.	Population status Reliable population estimates not currently possible. Stocks were depleted by commercial whalers (the north-east Pacific population is estimated at 32–44% of pre-exploitation stock).
Sources: Agler et al. ⁵⁰ , Bannister et al. ⁵⁷ , DEH ⁶¹ , DEWR ^{93,94} , DSEWPac ¹¹⁹ , Jefferson et al. ¹⁷⁵ , Morrice et al. ¹⁷ , Watkins and Schevill ²⁶	

Melon-headed whale

Family Delphinidae	Scientific Name <i>Peponocephala electra</i>
Distribution and migration Recorded from Western Australia, Queensland (mass stranding of 53 animals), NSW (mass strandings of 150–250 animals at Crowdy Head, and seven animals at Point Plomer) and the Northern Territory (mass stranding of 40 animals at Elcho Island). Probably occur across the northern half of Australia, north of 35°S. Not well surveyed in Australian waters, distribution assumed from incidental sightings, plus beach-cast animals, for all areas. Probably present in their ranges year-round.	Habitat Mainly equatorial waters warmer than 25°C. Most sightings of melon-headed whales are from the continental shelf seaward, and around oceanic islands. Sightings suggest that the oceanic habitat of this species is primarily in upwelling modified and equatorial waters.
Diet and behaviour Feed on pelagic squid and mesopelagic fish, occasionally crustaceans. Feeding probably takes place deep in the water column. Known to regularly constitute mixed groups with other species of cetaceans, including Fraser's dolphins, rough-toothed dolphins and bottlenose dolphins. By driving fish towards the water's surface, melon-headed whales provide feeding opportunities for some seabirds.	Reproduction Sexual maturity 16.5 years, 2.44m (males), 11.5 years, 2.35m (females). Physical maturity: 13.5 years. Maximum age may be > 30 years, maximum length ~2.75m. Regular mass strandings reported from around the world. Necropsies of mass strandings report high parasite loads. Some evidence of a calving peak in July and August. In the Southern Hemisphere, calving may peak between August and December. Calves born at 1m in length, gestation ~1 year. No calving areas known in Australian waters.
Information from the NW Region Offshore waters surrounding Browse Island support a larger number of cetacean species than any other area on the Western Australian coast, including large pods of oceanic dolphins, melon-headed whales, pygmy killer whales, false killer whales, minke whales and pilot whales. Also seen near Ashmore Reef.	Population status Estimate of 45,400 for the eastern tropical Pacific ¹⁷³ . No population estimates available for Australian waters. Total number of mature animals within Australian waters may be > 10,000, considering the large group sizes recorded off the coast.
Sources: Bannister et al. ²⁷ , Brownell Jr. et al. ⁴⁶ , Bryden et al. ⁵⁴ , Culik ⁵⁵ , DEWHA ⁵⁷ , DEWHA ⁶¹ , DEWR ⁹⁴ , DSEWPac ¹⁰⁴ , Jefferson et al. ¹²⁰ , Kemper et al. ¹³⁴ , Mustoe ¹⁴⁴ , Perrin and Reilly ⁶¹ , Ross ¹⁷	

Pygmy killer whale

Family Delphinidae	Scientific Name <i>Feresa attenuata</i>
Distribution and migration Known from strandings in NSW and Western Australia. Not well surveyed within Australian waters, distribution primarily assumed from incidental sightings, plus beach-cast animals, for all areas. No data is available on pygmy killer whale movements in Australian waters, but limited evidence suggests this species does not migrate.	Habitat Inhabit warm tropical and subtropical waters, generally 18°C or warmer. It is unknown whether they are pelagic (open ocean) or neritic (over the continental shelf), but it is thought that they are the former. They are rarely seen close to shore unless around oceanic islands.
Diet and behaviour Squid and fish are both eaten by this species; mainly squids of the families Onychoteuthidae and, especially, Ommastrephidae. Seen in mixed species groups, such as Fraser's dolphin, they are known to prey on other cetaceans, and elicit a fright reaction from other species in captivity. Predator of other cetaceans including <i>Stenella</i> species and the common dolphin. Can store large volumes of dark faecal liquid in the rectum, which is ejected in a long stream when fleeing danger or disturbance. This dark fluid is also used to camouflage a calf in potential danger.	Reproduction Physical maturity: 2.31m. Sexual maturity: 2.16m (males), < 2.21m (females). Maximum age: over 14 years, maximum length: 2.6m. Known to strand singly. Heavy infestations of stomach nematodes and stomach ulcers can occur. Length at birth: 0.8m, no data on weaning or calving intervals. Similarly, no information exists on mating season, gestation period, calving season or calving areas.
Information from the NW Region May be resident in the region throughout the year. Seen in offshore waters surrounding Browse Island and near Ashmore Reef, and off the Kimberley coast.	Population status Estimate of 38,900 for the eastern tropical Pacific ¹⁷³ . No population estimates are available in Australian waters, considered to be in low abundance and occur in group sizes less than 50 individuals. Total number of mature animals in Australian waters probably < 10,000.
Sources: DSEWPac ⁴⁶ , Bannister et al. ¹⁴⁴ , Culik ⁵⁷ , Ross ¹³⁴ , DEWR ^{93,94} , Perrin and Reilly ¹⁷³ , Jefferson et al. ¹⁷ , Wade and Gerrodette ⁴⁶	

Short-finned pilot whale

Family Delphinidae	Scientific Name <i>Globicephala macrorhynchus</i>
Distribution and migration Tropical (22–32°C) to temperate (10–22°C) oceanic waters, approaching coastal seas. Stranding events recorded from all states and the Northern Territory. Not well surveyed within Australian waters, distribution primarily assumed from incidental sightings, plus beach-cast animals, for all areas. Generally nomadic, with no known migration patterns. Short-term north-south and inshore-offshore movements presumably related to prey movements or incursions of warm water. May be found in significantly shallower water during winter (depth 375m) than summer (800m).	Habitat Prefer deep water and occur mainly at the edge of the continental shelf, and over deep submarine canyons. May also approach coastal seas. Outside Australia, seasonal inshore and offshore movements of known groups occur, apparently in response to abundance and spawning of prey.
Diet and behaviour Feed mainly on squid, cuttlefish, octopus and some fish. Distribution and movements of short-finned pilot whales appear to be regulated by prey availability. In particular, inshore-offshore movements are probably determined by the timing of squid spawning (found inshore during squid season). May feed on vertically migrating prey, with deep dives at dusk and dawn following prey migrations, and near-surface foraging at night. The deepest dives recorded (typically 600–800m for a maximum of 27 minutes) during the day.	Reproduction Sexual maturity: 14.6 years, 4.0–5.0m (males), 9 years, 2.9–3.6m (females). Maximum age: 46 years (males), 63 years (females). Mass strandings occur. Gestation: 14.9 months, birth weight and length: 55kg and 1.4m. Weaning occurs at approximately two years, suckling may continue for up to 15 years, suggesting complex social structure. Females breed for an average of 24 years, produce an average 4–5 calves. Mating occurs all year round, resulting in a diffusely seasonal calving period, with peaks in spring and autumn in the southern hemisphere. Mating system is polygynous. No calving areas are known for Australian waters.
Information from the NW Region Seen in offshore waters surrounding Browse Island, and from Cape Londonderry to the Lacedpede Islands.	Population status No population estimates available for Australian waters, generally considered to be in relatively high abundance. No population trends can be calculated due to a paucity of survey data.
Sources: Bannister et al. ⁵⁷ , Culik ⁶¹ , DEWR ^{93,94} , DSEWPac ¹⁰¹ , Jefferson et al. ¹¹⁴ , Kasuya and Marsh ¹¹⁵ , McPherson and Nishida ¹³⁴ , Mintzer et al. ¹⁴⁴ , Perrin and Reilly ¹⁷ , Ross ⁵⁷	

Long-finned pilot whale

Family Delphinidae	Scientific Name <i>Globicephala melas</i>
Distribution and migration Widely recorded in waters off southern Australia, and at Macquarie and Heard Island. Sightings and strandings recorded in all Australian States and Territories. Not well surveyed within Australian waters, distribution primarily assumed from incidental sightings, plus beach-cast animals, for all areas. Some individuals live permanently either offshore or inshore, while others make seasonal migrations, moving inshore in summer and autumn and offshore in winter and spring. Usually travel in groups of around 10–50 individuals and up to several hundred and occasionally of over 1,000 individuals. May travel over large distances at high speeds.	Habitat May be found near all the major land masses and in oceanic waters. Inhabit temperate (10–20°C) and subantarctic (1–8°C) deep oceanic waters and zones of higher productivity along the continental slope, apparently venturing into the shallower waters of the shelf (<200m) in pursuit of favoured prey.
Diet and behaviour Likely to feed on squid at bathymetric upper slopes and canyons. Preferred species include <i>Sepioteuthis australis</i> , <i>Nototodarus gouldi</i> , <i>Sepia apama</i> and <i>Enoploteuthis galaxias</i> . Tend to bunch up when travelling and spread out when feeding. Feed mostly at night, dives may last for 18 minutes or more and be down to 828m depth. Feeding technique involves sucking prey into the mouth and down the digestive tract. Can associate with seabirds while feeding.	Reproduction Sexual maturity: 4–5m, 17 years (males), 3–4m, 5–15 years (females). Maximum recorded age: 46 years (males), 59 years (females). Prone to mass stranding, with the close relatedness within pods and social cohesion of the group exacerbating consequent mortality. Gestation period: 12 months, birth length: 1.78m, weight 74–79kg, but can be smaller. Weaning: 23–27 months, Calving interval: 3–4 years. Mating occurs in spring and summer, > 85% of calves born between September and March. No calving areas are known for Australian waters.
Information from the NW Region Unlikely to occur in the region.	Population status No population estimates available for Australian waters. Likely to occur in relatively high abundance in higher latitudes.
Sources: Bannister et al. ⁶¹ , DEWR ⁷⁵ , DSEWPaC ⁸⁶ , Gales et al. ⁸⁹ , Heide-Jørgensen et al. ⁹⁴ , Hodges and Woehler ¹⁰⁰ , Jefferson et al. ¹⁴⁴ , Kane and Marshall ⁴⁶ , Ross ¹⁷	

Short-beaked common dolphin

Family Delphinidae	Scientific Name <i>Delphinus delphis</i>
Distribution and migration Offshore waters off all Australian states and territories, rarely seen in northern Australian waters. One cluster occurs primarily in the southern south-eastern Indian Ocean and another in the Tasman Sea.	Habitat Usually found where surface water temperatures are 10°C – 20°C, inhabited by small epipelagic fishes such as anchovies and sardines. Medium water depths over the continental shelf. Travel over specific ocean features such as seamounts, ridges and escarpments. Associate with striped, bottlenose and Risso's dolphins, and minke, sei and Bryde's whales.
Diet and behaviour Feed mainly on epipelagic schooling and mesopelagic fishes and squids, but also on other cephalopods and crustaceans. Diet may vary with season as well as region. In the eastern tropical Pacific, common dolphins feed in association with tuna.	Reproduction Sexual maturity: 7–12 years (males), 6–7 years (females), Maximum age: 22 years. Calving year-round with peaks in spring and autumn. Gestation is ~10–11 months, interbirth interval ~ 1–3 years. No specific calving areas in Australia are known. Generation length ~ 10–15 years, but may vary regionally.
Information from the NW Region Thought to occur infrequently in the region.	Population status No estimates of population size or trends in Australian waters. Species threatened by catch in gillnets, purse seine nets and anti-predator nets, pollution, habitat degradation, environmental changes (such as increase in water temperatures), and competition with fisheries. High loads of contaminants, and histological abnormalities have been reported in common dolphins.
Sources: Culik ⁵⁷ , Bannister et al. ⁶¹ , DEWR ⁶⁸ , DSEWPaC ⁷⁰ , Forcada and Hammond ⁷⁸ , Frantzis and Herzing ⁹⁴ , Gowans et al. ⁹² , Jefferson et al. ¹³⁴ , Jefferson and Van Waerebeek ¹⁴² , Perrin and Reilly ¹⁴⁴ , Reilly ² , Ross ¹⁶	

Southern right whale

Family Balaenidae	Scientific Name <i>Eubalaena australis</i>
Distribution and migration Seasonally present on the Australian coast between May and November. Recorded in the coastal waters of all Australian states except the Northern Territory. Principally found around the southern coastline off southern Western Australia and far west South Australia, but occur anywhere between Sydney and Perth, including off Tasmania. Sightings in northern waters are relatively rare, but there have been records from Exmouth on the west coast and Moreton Bay, Stradbroke Island and Hervey Bay on the east coast. The species distribution and abundance in winter breeding habitat well surveyed. Migrate seasonally between higher latitudes and mid latitudes (can cover >3000km), pathways not well known.	Habitat Migratory and feeding areas poorly studied. Females with new-born calves prefer shallow water. Feeding ground habitat likely to be related to oceanographic and bathymetric (depth measurement) parameters and ecological processes affecting prey concentration. A multi-scale study of Australian coastal habitat preference is underway utilising existing and new distribution and movement datasets and historic information. Feeding areas may be in deeper offshore waters from sub-Antarctic areas to locations south of 60°S. Migratory habitat parameters are unknown.
Diet and behaviour Feed on euphausiids and copepods, with a latitudinal variation in diet. North of 40°S mainly copepods, replaced by krill south of 50°S. Feeding grounds probably lie between 32°S and 65°S. Feeding principally during the summer, may extend into spring and autumn. Skim feeding at the surface with mouths open, capturing prey items against the baleen. Foraging dives shallow, consistent dives to a depth of 80–175m. Feeding areas coincident with oceanographic fronts.	Reproduction Age at sexual maturity: 6+ years (females); males unknown. Maximum age may be 50+ years. Natural mortality unknown for adult whales, possibly low. May be vulnerable to killer whales during migration and in high latitudes. One calf at 3–year intervals. Calf production rate of 0.275 calves per year per mature female. High fidelity for mating and calving grounds at mid to lower latitudes, occupied during austral winter and early-mid spring. Polygamous mating occurs. Gestation ~355 days. Calf growth rate 2.78 (0.71cm per day), weaned within 12 months. Factors influencing the selection of coastal breeding habitat in Australia are currently being investigated.
Information from the NW Region Occur infrequently in the region, sighted in Shark Bay and off Exmouth.	Population status Current population estimate for Australian waters ca 3,500. Increasing by 7% off Australian southern coast (Cape Leeuwin, WA- Ceduna, SA) ¹⁶ .
Sources: Allen and Bejder ^{17,18} , Bannister ²⁸ , Bannister et al. ³¹ , Burnell and Bryden ³⁶ , Carroll et al. ⁵¹ , Clapham et al. ⁵⁷ , DEH ⁶¹ , DEWR ⁷¹ , DSEWPac ⁹⁴ , Freeman ¹⁰⁷ , Jefferson et al. ¹⁶⁷ , Laist et al. ¹⁷⁵ , Tormosov et al. ¹¹ , Watkins and Schevill ¹⁷	

Pygmy sperm whale

Family Physeteridae	Scientific Name <i>Kogia breviceps</i>
Distribution and migration Two reported sightings and 82 strandings in Australia. Stranded animals reported for all states except the Northern Territory. Reported to stay in deeper water off the continental shelf, not as close inshore as dwarf sperm whales. Not well surveyed, Australian distribution assumed from incidental sightings, plus beach-cast animals. May migrate from the coast to the open sea in summer, but movement patterns unconfirmed.	Habitat Pelagic (open-ocean) temperate to tropical waters around the world. May occur predominately beyond the edge of the continental shelf, while the dwarf sperm whale lives over or near the edge of the shelf.
Diet and behaviour Feeds in deep water (650–1100m) on cephalopods and, less often, on deep-sea fishes and shrimps. Almost nothing known of behaviour and ecology, particularly feeding behaviour. May use echolocation to find and identify prey. Can store large volumes of dark faecal liquid in the rectum, which is ejected in a long stream when fleeing danger or disturbance. This dark fluid is also used to camouflage a calf in potential danger.	Reproduction Sexual maturity: 5 years, 2.62m (females), 2.42m (males). Physical maturity: ~14 years, 3.0m (females), 12.5 years, 2.8m (males). Maximum age 22.4 years, maximum length 3.28m. Life expectancy may exceed these estimates. Strand relatively frequently, often as cow/calf pairs. Breeding areas and habitat presumed to be oceanic. Calving inferred to occur in winter after 11 month gestation, mating season April – September. Ovulation rate 0.9/year, calving interval 1 year.
Information from the NW Region Thought to occur infrequently in the region.	Population status The size of the Australian population is unknown. However, in areas where they frequently strand, members of the genus <i>Kogia</i> are considered to be one of the most common species to come ashore.
Sources: Baird et al. ²¹ , Bannister et al. ⁴⁶ , Beatson ⁵⁴ , Culik ⁵⁷ , DEWHA ⁶¹ , DEWR ⁹⁴ , DSEWPaC ¹⁴⁴ , Jefferson et al. ¹⁵⁵ , Ross ⁸ , Scott and Cordaro ¹²	

Blainville's beaked whale or densebeaked whale

Family Ziphiidae	Scientific Name <i>Mesoplodon densirostris</i>
Distribution and migration Stranding records exist from northern and southern Australia (at 40–50°S in Tasmania), except in South Australia and the Northern Territory, data insufficient to infer seasonal occurrence or migration. Blainville's beaked whale strandings on the Australian west and east coasts may be linked to the Leeuwin and East Australian currents.	Habitat Found from the continental slope to the abyssal plain, often associated with canyons or seamounts, in waters ranging from well-mixed to highly stratified. Prefer tropical (22–32°C) oceanic regions, in waters ranging from 700–1000m deep, but often adjacent to much deeper waters of 5000m. More pelagic than other ziphiids, but may occur in shallower water around tropical oceanic islands.
Diet and behaviour Diets consist of mid- and deep-water squid and fish. Lacking functional gripping teeth, prey may be seized and disabled using the hard edges of the mandibles and the rostral palate, although a 'suction capture system' has been hypothesised based on adaptations of the mouth and tongue. Diving durations of 20–45 minutes have been reported, after which groups of animals remain together. Mid-water dives more frequent during daytime, potentially to avoid surface predators. May leave gouges on the seabed while feeding.	Reproduction Sexual maturity: 8–9 years, 4.5m. Maximum age unknown, but for other beaked whales recorded age is between 27 and 39. Scarring frequent with age, possibly by cookie-cutter sharks (<i>Isistius</i> sp.), may be vulnerable to predation by killer whales and false killer whales. Internal parasites include nematodes (eg. <i>Anisakis</i> sp.) and acanthocephalans (<i>Bolbosoma vasculosum</i>) found in the stomach and intestine. Tusk-like teeth of males used as weapons during agonistic encounters. Breeding areas and habitat unknown, presumed to be oceanic. Calving inferred to occur in summer. Length at birth > 1.9m and 60kg, length at weaning < 2.4m. Calving interval unknown.
Information from the NW Region Thought to occur infrequently in the region.	Population status Population size unknown, one of the more widespread and common beaked whales in tropical oceans. Not considered abundant in Australian waters.
Sources: Auster and Watling ¹⁷ , Baird et al. ¹⁹ , Bannister et al. ⁴⁶ , Barlow et al. ⁴⁹ , Culik ⁵⁷ , Dalebout et al. ⁶¹ , DEWR ⁶⁷ , DSEWPaC ⁸³ , Ferguson et al. ⁹⁴ , Hazen et al. ¹⁰⁹ , Jefferson et al. ¹⁴⁴ , MacLead and D'Amico ¹⁶⁸ , MacLeod et al. ⁸ , Ross ¹⁷ , Tyack et al. ¹⁹	

Ginkgo-toothed beaked whale, Ginkgo-toothed whale or Ginkgo beaked whale

Family Ziphiidae	Scientific Name <i>Mesoplodon ginkgodens</i>
Distribution and migration Only recently been confirmed as occurring in Australia through four stranding events in NSW and Vic. Distribution assumed from limited cetacean surveys and incidental sightings, plus beach-cast animals, for all areas. May have group sizes of 1–15 individuals.	Habitat Prefer temperate (10–20°C) and tropical (22–32°C) deep (several km) oceanic waters. Presumed to feed at depth on mid- and deep-water squid and fish. Frequent shelf-edge habitats, associated significantly with canyon habitats, submarine escarpments and seamounts.
Diet and behaviour Diet assumed to be mid- and deep-water squid and fish, as is recorded for other members of this family. Active predators and presumed to be strong swimmers capable of deep dives in pursuit of prey, but the mode of capture is not known. May leave gouges on the seabed while feeding.	Reproduction Sexual maturity 4.8m (males), 4.5m (females). Maximum recorded age for related species is 27–39 years. Natural causes of mortality thought to include predation, disease and effects associated with 'old age'. Areas and habitats used for breeding presumed to be oceanic. Females give birth to a single calf, 2.0–2.5m. Calving interval 3–4 years.
Information from the NW Region Thought to occur infrequently in the region.	Population status No information is available on population size in Australian waters. Not considered abundant as sightings and strandings are rare. In the eastern tropical Pacific Ocean, <i>Mesoplodon</i> beaked whales had a mean density of 2.96 individuals per 1000km ² ¹⁷³ .
Sources: Auster and Watling ⁵⁷ , Bannister et al. ⁶¹ , Barlow et al. ⁶⁷ , DEWR ⁹⁴ , DSEWPaC ¹⁰⁹ , Ferguson et al. ¹¹⁰ , Jefferson et al. ¹⁴⁴ , MacLeoad and D'Amico ⁸ , MacLeod et al. ¹⁹ , Ross ¹⁷	

Gray's beaked whale or Scamperdown whale

Family Ziphiidae	Scientific Name <i>Mesoplodon grayi</i>
Distribution and migration Known from 48 strandings along the Australian coast, including WA, SA, Vic, Tas, and NSW. Second most commonly stranded beaked whale in Australia after the strap-toothed beaked whale. Not well surveyed, distribution assumed from incidental sightings, plus beach-cast animals, for all areas. Majority of strandings in Australia have occurred December – April, suggesting seasonal movement inshore and possibly to lower latitudes for females to give birth.	Habitat Found in deep (several km) oceanic waters of temperate (10–20°C) to subantarctic (1–8°C) regions. Presumed to feed at depth on mid- and deep-water squid. Associated with canyon and shelf edge habitats, submarine escarpments and seamounts. May be found from the continental slope to the abyssal plain, in waters ranging from well-mixed to highly stratified.
Diet and behaviour Feed primarily on deep-water cephalopods (e.g. <i>Histioteuthis</i> spp., <i>Taoniss</i> spp. and <i>Gonatus</i> spp.) with most prey caught at depths of 200m or more. Active predators and presumed to be strong swimmers capable of deep dives in pursuit of prey, but the mode of capture is not known. May leave gouges on the seabed while feeding.	Reproduction Sexual maturity ~4.5m, but other life history characteristics are unknown. Maximum recorded age for all other beaked whales 27 – 39. Natural causes of mortality in beaked whales may include predation, disease and effects associated with 'old age'. Breeding areas and habitat are unknown, but stranding data suggest these may be in shallower water over the continental shelf from late spring through summer. Calves are born from summer to autumn. Length at birth: 2.1m, weaning: 3.6m, 1 year. Calving interval at least 3–4 years.
Information from the NW Region Thought to occur infrequently in the region.	Population status The second most commonly stranded ziphiid in Australia, especially in southern WA and Tasmania ¹⁷ .
Sources: Auster and Watling ⁵⁷ , Barlow et al. ⁶¹ , Bannister et al. ⁶⁷ , DEWR ⁹⁴ , DSEWPaC ¹⁰⁵ , Ferguson et al. ¹⁰⁹ , Jefferson et al. ¹⁴⁴ , Kemper et al. ¹⁷ , MacLeod and D'Amico ⁵⁰ , MacLeod et al. ⁵⁷ , Ross ⁶¹	

Sei whale

Family Balaenopteridae	Scientific Name <i>Balaenoptera borealis</i>
Distribution and migration Infrequently recorded in Australian waters. No systematic surveys in Australian waters. Sighted opportunistically during aerial surveys for blue whales in the Bonney upwelling. The movements and distributions unpredictable and not well documented. May have the same general pattern of migration as most other baleen whales, although a little later and to lower latitudes.	Habitat Australian Antarctic waters and temperate, cool mainland waters are important feeding grounds. Sightings in the Bonney Upwelling area indicate that this area may be an important feeding ground. Breeding occurs in tropical and subtropical waters.
Diet and behaviour Feed intensively between the Antarctic and subtropical convergences, mature animals may feed in higher latitudes. Feed on copepods and amphipods, including krill (<i>Euphausia superba</i>). Feed by swimming horizontally near the surface skimming pelagic crustaceans unlike other rorquals. Side lunge feeding has been observed in Antarctica. Sink rather than dive.	Reproduction Sexual maturity: 6–8 years, 12.9–13.9m (males), 7.5–8.35 years, 13.8–14.4m (females). Maximum length: 19.5m female, maximum age 65. Natural mortality rates probably (instantaneous mortality) 0.063–0.070 (males), 0.084–0.088 (females). Breeding season April – August, Gestation: 10.5–12.5 months. Ovulation rate 0.63–0.68, true pregnancy rate 0.41–0.43. There are no known mating or calving areas in Australian waters.
Information from the NW Region Thought to occur infrequently in the region.	Population status No reliable estimates of population size. Insufficient information to describe population structure. Populations severely depleted by commercial whalers in the past; minimum estimate of 165,168 killed in the Southern Hemisphere.
Sources: Bannister et al. ⁹⁴ , DEH ¹¹⁹ , DEWR ¹²⁶ , DSEWPaC ¹⁷⁵ , Jefferson et al. , Morrice et al. , Parker , Watkins and Schevill	



Image credits

Aerial view Lacedpedes

Photo: Kimberley Media

Humpback cow and calf

Photo: Kimberley Media

Bottlenose dolphin and calf

Photo: Kimberley Media

Humpback cow and calf breaching

Photo: Kimberley Media

Fin whale spout

Photo: IFAW

Sperm whales

Photo: IFAW

West Atlas Rig Montaro

Photo: Kimberley Media

Australia's Last Great Whale Haven

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