

# APPENDIX F4. PROFILES OF THREATENED SPECIES

## 1. Fisheries Management Act 1994

### a) Endangered species

#### Green sawfish (*Pristis zijsron*)

The following information was taken from the NSW Fisheries Scientific Committee's website ([www.fsc.nsw.gov.au](http://www.fsc.nsw.gov.au)), which provides profiles of species listed in the FM Act. Green sawfish have been recorded in the tropical Indo-West Pacific from eastern Australia and Papua New Guinea through to western India, with a disjunct population off Mozambique and eastern South Africa. In Australia, the species occurs mainly in the tropics from Broome to southern Queensland, with individuals found as far south as Sydney and a single record from Glenelg, South Australia. In NSW, specimens have been collected from Byron Bay in the north to Parramatta River in the south, plus an unofficial record from Jervis Bay. The species is thought to grow to approximately 7.3 m in length and has been reliably recorded at 5 m, with males maturing by 4.3 m. This is a species with low fecundity and it is thought that they may have up to 20 young. They feed on fishes and benthic invertebrates, using the saw as a club to stun schooling fishes such as mullet, and as a shovel to uncover benthic animals (Allen, 1989). Green sawfish have suffered a serious population decline in NSW. Prior to 1972, the species was regularly found in the shallow waters at the mouths of the Tweed, Clarence and Richmond Rivers and on outside ocean beaches such as Yamba. The last specimen from the Sydney region was taken in 1926. The causes of this decline are thought likely to include:

- bycatch in shallow water prawn trawling, and other netting methods in shallow water, as they would rarely have been returned to the water alive
- targeted harvest for flesh, fins and saws. The fins command a high price in the shark fin trade and the saws are used in traditional medicine and were sold as curios
- habitat degradation.

Sawfish are also listed as vulnerable under the EPBC Act 1999.

#### Grey nurse shark (*Carcharias taurus*)

Grey nurse sharks are found around the world in inshore waters, primarily in sub-tropical and temperate regions around the main continental landmasses, with the exception of the eastern coast of North and South America and Antarctica. Known key sites for grey nurse sharks or major aggregations of the species in NSW can be found at reefs off Port Stephens, Seal Rocks, Forster, Laurieton, Batemans Bay and South West Rocks. Relatively little is known about the migratory habits of Australian grey nurse sharks. There is evidence from Australian data that suggests migrational movement, probably in response to water temperatures, up and down the coast. At certain times of the year, grey nurse sharks aggregate according to sex. Males are predominant in southern Queensland during July to October, while a high proportion of sharks off central NSW at the same time of year is composed of females. Grey nurse sharks are often observed just above the seabed in or near deep sandy-bottomed gutters or rocky caves, in the vicinity of inshore rocky reefs and islands, generally between 15 m and 25 m. They have also been recorded in the surf zone, around coral reefs, and to

depths of around 200 metres on the continental shelf. The diet of the adult grey nurse shark consists of a wide range of fish, other sharks, squids, crabs and lobsters, and some observations also suggest that schools of grey nurse sharks can feed cooperatively by concentrating schooling prey before feeding on them (Environment Australia 2000a).

In Australia, two populations are thought to exist, one on the east coast and one on the west. The east coast population has been recorded from as far north as Mackay and extends south around the greater part of the southern half of the continent. On the west coast, the population extends as far north as the North West Shelf. They are still found within this general historical range, but the east coast population is thought to have declined considerably. During the 1960s and 1970s, spearfishers took large numbers of grey nurse sharks and reduced the population to a low level. Setlining by commercial fishers also continues to take a small number each year, and the beach meshing program was also responsible for catching large numbers of grey nurse sharks up until 1975. Despite protection since 1984 in NSW waters, the species has not shown an increase in population size. Current research (quarterly surveys from November 1998) indicates a much lower adult population size than when the species was recommended to be listed as a vulnerable species in NSW (early 1999), and the status of juvenile numbers in the sampled population is uncertain (www.fsc.nsw.gov.au, 1999). These factors were also largely responsible for its listing as a vulnerable species under the EPBC Act.

## **b) Vulnerable species**

### Black cod (*Epinephelus daemeli*)

Black cod are found on estuarine and inshore reefs and deeper offshore reefs in temperate and subtropical waters of the southeastern Pacific. In Australia, they are found from Queensland to Kangaroo Island, although they are rare and probably only represented by non-breeding migrants in more southern areas. Hence, they are found along the entire NSW coastline, which is also the centre of the species' Australian mainland distribution (Heemstra and Randall, 1993; Pogonoski *et al.*, In prep). Their maximum size is 1 - 2 metres in length, but are commonly only found up to 0.8 m (Hutchins and Swainston, 1986). Smaller fish are females, which change sex to become male at around 1 m in length (Pollard, unpublished). They are an aggressive, highly territorial species, and are usually found in association with caves, ledges or large underwater structures such as bridge pylons that they may occupy for life (Gill and Reader, 1992; Henrisson and Smith, 1994). Their numbers are reported to have declined significantly as a result of spearfishing pressure in the 1970s (Pogonoski *et al.*, In prep.). Lincoln Smith *et al.* (1989) reported that 137 black cod were caught in spearfishing competitions in NSW in 1976 alone. Their territorial and curious nature, combined with their slow movement, is thought to have made them an easy target and a prize catch by both line and spearfishers, although they are no longer thought to be targeted by either group of fishers. Commercial fishers still report occasional captures, particularly from deeper offshore reefs. Historical, anecdotal evidence suggests that a decline in abundance in the Sydney region occurred around 1900 when coastal towns became populous and fishing and shipping pressures increased (Roughley, 1951). Their slow growth and territoriality probably also prevents rapid recovery from decreases in population. Despite protection in NSW waters since 1983, there is no evidence of an increase in their abundance.

### Great white shark (*Carcharodon carcharias*)

White sharks are found worldwide in temperate, coastal waters but are rare in tropical waters. In Australia, they have been recorded from southern Queensland to northwestern Western Australia. There are no reliable estimates of the number of white sharks in Australian waters, but it is thought that the numbers of fish are decreasing. Based on data sets from the region between Port Stephens and

Wollongong, great whites appear to have suffered a population decline in NSW, with a reported decreases in annual catches in beach meshing from 1950s to 1990s, and less compelling evidence of decline from game-fishing landings (www.fsc.nsw.gov.au, 1998).

In many places around the world the white shark is a protected species (Environment Australia, 2000b). This happened first in South Africa in 1992, then in Namibia, the Maldives, and in Florida and California. This species is now protected in all Australian State and territorial waters. It is believed that a white shark of 5 – 6 m in length is likely to be 15 - 25 years old, and the most commonly encountered white sharks are between 3 - 4 m in length. Females mature at 4.5 - 5 m in length and males at probably less than 4 m, and as the fish matures, its diet changes. Fishes to about 2 metres normally eat squid and other fishes such as stingrays and other sharks. Adults eat seals, sea lions, dolphins and dead whales, although some will continue to eat fishes such as snapper. They have also been known to eat elephant seals, sea otters, turtles and sea birds. Great whites are also listed as vulnerable under the EPBC Act 1999.

### **c) Protected species - Section 19 (totally protected)**

#### Australian grayling (*Prototroctes maraena*)

Australian grayling are essentially a freshwater fish that inhabits coastal streams in southeastern Australia, including Tasmania. It is the only extant species in the family Prototroctidae, as the New Zealand grayling (*P. oxyrhynchus*) is presumed extinct. Australian grayling grow to about 300 mm or about six years, but are more common at around 250 mm. They form aggregations and spawn in freshwater between mid-May and mid-July, and many are thought to die shortly after spawning, at about 2 - 3 years of age. The larvae are apparently swept downstream to the estuary or the sea, and sub-adult fish, 55 - 75 mm in length, return to freshwater habitats six months later (Faragher, 1995). In the past, anglers often caught them during spawning aggregations, but they are now totally protected. Their diet includes small crustaceans, insects and their larvae and algae. Australian grayling appear to undergo long-term fluctuations in population abundance, with spawning success and larval survival governed by highly variable flows and unobstructed passage to the sea. These requirements are thought to have restricted their distribution to several river catchments on the far south coast of NSW (Faragher, 1995). It is also listed as vulnerable under the EPBC Act 1999.

#### Eastern blue devil (*Paraplesiops bleekeri*)

Eastern blue devils are recorded from coastal waters of southern Queensland to southern NSW, and seem common only south of Sydney to Ulladulla (Kuiter, 1993). They grow to 40 cm in length and inhabit rocky reefs in both estuaries and offshore, from 3 - 30 m in depth. Eastern blue devils are totally protected.

#### Elegant wrasse (*Anampses elegans*)

Elegant wrasse are recorded from the southwestern Pacific, generally from central to southern NSW, Lord Howe Island, Easter Island and northern New Zealand. Juveniles are found in weeds in coastal bays and harbours, larger juveniles in small aggregations on coastal and estuarine rocky reefs and adults usually deeper to about 30 m (Kuiter, 1993). They feed on a variety of invertebrates and algae. Females often occur in aggregations of up to 80 or more fish, in contrast to the singular, territorial males, and grow to about 30 cm. Elegant wrasses are totally protected.

#### Estuary cod (*Epinephelus coioides*)

Estuary cod are found on estuarine and inshore reefs along the NSW coastline from about Sydney northwards (Heemstra and Randall, 1993; Pogonoski *et al.*, In prep.). They are reasonably

territorial, but have been found in a wide variety of estuarine and marine habitats: within NSW estuaries, they are most likely to occur around drop-offs or in caves (Pogonoski *et al.*, In prep.). Estuary cod grow to about 1 metre in length (Kuitert, 1993), and although they were probably never abundant in NSW estuaries, are considered vulnerable to a variety of fishing pressures including demand for the live fish trade (Pogonoski *et al.*, In prep.). Consequently, they are totally protected in NSW waters.

#### Queensland groper (*Epinephelus lanceolatus*)

The Queensland groper is fairly similar to the estuary cod, and has a similar range and habitat preference within NSW (Pogonoski *et al.*, In prep.). They do, however, grow to a much larger size of up to 3 metres (Kuitert, 1993). Queensland groper is totally protected within NSW waters for similar reasons to those applicable to the estuary cod.

#### Weedy seadragon (*Phyllopteryx taeniolatus*)

Seadragons are a member of the family Syngnathidae, which also includes seahorses and pipefishes. An unusual feature of this family of small fishes is that the male broods the young, which leave the brood pouch at a relatively advanced stage (Kuitert, 1993). Weedy seadragons are found on estuarine and inshore reefs along the NSW coastline north to about Port Stephens (Hutchins and Swainston, 1986). Their preferred habitat appears to be the interface between kelp beds and sand (Kuitert, 1993). Their maximum size is about 45 cm (Kuitert, 1993). The species is quite common in its preferred habitat and population numbers are not thought to have declined (Pogonoski *et al.*, In prep.), however, due to its vulnerability to over-collecting for the aquarium trade, it is totally protected within NSW waters.

### **d) Protected species - Section 20 (protected from commercial fishing)**

#### Australian bass (*Macquaria novemaculeata*)

Australian bass are primarily a freshwater fish, found in coastal rivers, lakes and estuaries along the entire NSW coastline (Pollard and Growns, 1993). They occur from as far north as Fraser Island off Queensland, to Wilsons Promontory in Victoria. Adults migrate downstream to breed in estuaries during winter, with spawning success and subsequent recruitment linked to flooding (Harris, 1986). They feed on prawns, fishes, molluscs and insects. Australian bass are a prized sportfish among anglers and are protected from commercial exploitation in NSW. Populations have declined in the face of previous harvesting of spawning aggregations, river regulation (affecting both fish passage and the frequency of flooding), and catchment alteration (Harris, 1984; Pollard and Growns, 1993).

#### Blue groper (*Achoerodus viridis*)

The blue groper is a marine fish that inhabit inshore rocky reefs along the entire NSW coastline (Kuitert, 1993). Their young recruit to sheltered habitats that provide physical structure, including estuarine seagrass beds (Gillanders, 1999). Larger juveniles are common around sheltered rocky reefs within the lower reaches of marine-dominated estuaries, and appear to gradually move out to inshore reefs as they grow (Gillanders, 1999). They are a popular angling species, attaining at least 1.2 metres in length (Kuitert, 1993). Populations appeared to decline sharply in the 1960s because of fishing pressure, and although significant recovery has occurred in recent years, the species remains protected from spearfishing and commercial exploitation within NSW in view of its curious behaviour and popularity with SCUBA divers (Smith *et al.*, 1996).

#### Estuary perch (*Macquaria colonorum*)

The estuary perch has a similar distribution and biology to that of the Australian bass but it prefers slightly more saline waters, and is therefore more likely to be found in upper estuarine/brackish water rather than freshwater areas (Merrick and Schmida, 1984). Spawning occurs in saltwater areas of estuaries when temperatures reach 14.5 - 16°C. Each female releases several hundred thousand eggs that float to the surface, where hatching occurs 2 - 3 days later. The diet of larger fish consists of prawns, worms, bivalve molluscs and fishes (Allen, 1989). In view of its similarity to the bass, the estuary perch is subject to the same bag and size limits, and is also protected from commercial exploitation in NSW.

## 2. Threatened Species Conservation Act 1995

Unless otherwise specifically referenced, the following species profiles were obtained from the website of the NSW National Parks and Wildlife Service, at [www.npws.nsw.gov.au/2001](http://www.npws.nsw.gov.au/2001). The profiles for marine turtles and dolphins were obtained from the website of Environment Australia, at [www.environment.gov.au](http://www.environment.gov.au), respectively.

### a) Endangered species

#### *Birds*

##### Beach stone-curlew (*Esacus magnirostris*)

Beach stone-curlews are exclusively coastal and have been recorded around the north coast of Australia and associated islands from Onslow in Western Australia to the Nambucca River in NSW, and rarely southwards to Forster (Marchant and Higgins, 1993). They have largely disappeared from the southeastern part of its former range and are now rarely recorded on ocean beaches in NSW. They prefer open, undisturbed beaches, islands, reefs and estuarine intertidal sandflats and mudflats with mangroves nearby. They also frequent river mouths, offshore sandbars associated with coral atolls, reefs and rock platforms and coastal lagoons. They forage at low tide in search of crabs and other marine invertebrates. Threats to the species include loss of habitat due to residential and industrial development, human disturbance through beach-combing, boating and 4WD vehicles, predation by raptors, cats and dogs, nest destruction by pigs or high tides, and nest desertion.

##### Bush stone-curlew (*Burhinus grallarius*)

Bush stone-curlews are widespread in the north and northeast of Australia (Marchant and Higgins, 1993). This species has largely disappeared from the southern part of its former range, probably because of extensive clearing of woodlands. Records indicate that the species was once common throughout eastern NSW, but it is now restricted to populations at Gosford, Port Macquarie, Grafton, Port Stephens and Karuah. They prefer lightly timbered open forest and woodlands, particularly of casuarina, eucalyptus, acacia or polycarpa. They are occasionally recorded in mangroves and saltmarsh, especially when bordered by casuarinas, and have been recorded nesting within saltmarsh (Marchant and Higgins, 1993). They feed on insects, molluscs, centipedes, crustaceans, spiders, frogs, lizards, snakes and some vegetation and seeds (Marchant and Higgins, 1993). Threats to the species include loss of habitat due to residential and industrial development, intense cultivation, small subdivision, overgrazing and burning (Marchant and Higgins, 1993).

##### Little tern (*Sterna albifrons*)

Little terns are migratory or partly migratory seabirds. They occur from Shark Bay in Western Australia, around northern and eastern Australia, to the east coast of Tasmania and around to the Gulf

of St Vincent in South Australia. In NSW, a second population of the subspecies *sinensis* predominantly occurs, which is migratory, breeding in the spring and summer along the entire east coast from Tasmania to northern Queensland. The other population of the subspecies breeds in Asia and migrates to Australia in summer, masking the size of the threatened, eastern Australian population. Little terns have been recorded nesting at 70 sites along the NSW coast, but this has declined to only 31 since 1987 and 11 in 1998/99. Since 1995, the largest, most successful colonies have been at Sawtell, Harrington, Botany Bay, Lake Wollumboola and more recently Farquhar Inlet (formerly known as Old Bar) (NPWS, 2000a). In NSW, the species is strictly coastal. Most of the nesting sites are sand-spits, sand islands or beaches within or adjacent to the estuaries of rivers, creeks and coastal lakes. Nesting also occurs at some sites on ocean beaches well away from estuaries, but often with a large coastal lake nearby. Little terns in NSW feed predominantly, perhaps exclusively, on fish less than 10 cm long and are often generally referred to as whitebait. They include perchlets (*Ambassis* spp.), surfsardines (*Iso rhothophilus*) and sprats (Clupeidae), but may also include juvenile mullet, gudgeons, tailor and whiting. Most feeding occurs inside or at the mouths of estuaries and up to 500 m offshore. There are numerous threats to the species, and human disturbance has been identified as a major, and often the most important factor leading to poor breeding success and abandonment of nest sites. Human disturbance can range from the extreme of 4WD and trail-bike use through to walking or simply sitting or fishing on the beach, all of which may keep the terns off nests. Others include adverse weather conditions, nesting at locations prone to flooding, predation by foxes, dogs, cats, rats and a variety of birds, coastal development, availability of food, damage to estuarine habitats and pollution (NPWS 2000a). It is also listed as endangered under the EPBC Act 1999.

### ***Plants***

#### **Zannichellia palustris**

*Zannichellia palustris* is a submerged, weakly rhizomatous aquatic annual or perennial plant. It has a cosmopolitan distribution, but in Australia is known only from the Murray River estuary in South Australia and the lower Hunter region in NSW. It is considered to be indigenous to NSW and is recognised as rare nationally. It occurs in fresh to brackish, still to slowly moving waters, and recent collections of *Zannichellia palustris* in NSW are from Ironbark Creek and tributaries at Shortland and Wallsend, in Black Creek at Cessnock and in ponds on Kooragang Island. It has also been recorded from near Belmont. NSW populations of *Zannichellia palustris* behave as annuals and dieback completely each summer. The individual patches range from about 5 m<sup>2</sup> to 100 m<sup>2</sup>, but vary from year to year. None of the known sites of *Zannichellia palustris* in NSW are formally protected, and none are managed in any way for the conservation of the species. Further, all the known sites are in areas where considerable changes have, and are continuing, to take place in their catchments. These changes in catchment land use may result in changes in hydrological conditions and water quality, which may affect the ability of the species to persist in areas where it is known to occur.

## **b) Endangered populations**

### **Little penguins (*Eudyptula minor*) at Manly, Sydney Harbour**

Little penguins, only found in Australia and New Zealand, once ranged from Swan River in Western Australia through Tasmania and up to Moreton Bay in Queensland, and may still occasionally venture that far. They are relatively common in the waters of southern Australia, breeding mainly on offshore islands. They generally breed from south of Port Stephens in NSW, including the Sydney region, along the coast through Victoria, South Australia, Tasmania and as far as Fremantle in

Western Australia. In 1986, it was estimated that the total breeding population in eighteen known colonies in NSW consisted of 17,000 pairs, most at the large colonies on Montague, Tollgate and Brush Islands. It is now believed to be closer to 49,000 birds at 22 known sites, however, the population in North Harbour/Manly is the only population known to breed on mainland NSW, and consists of only approximately 50 breeding pairs.

Little penguin nesting habitat normally consists of burrows built in sand dunes, rockpiles, sea caves, and occasionally under buildings. At Manly, a range of nest types are utilised, including under rocks on the foreshore, rock falls under seaside houses, garages, under stairs, in wood piles and under overhanging vegetation. Male penguins return to their colonies between June and August to reconstruct or dig new burrows and to attract females. About 3 months later, fledglings leave the nest and only return annually to moult until they are about 3 - 4 years old, when they return to breed.

Little penguins appear to be opportunistic feeders, foraging in relatively shallow waters. Their diet consists mainly of small schooling fish, like anchovies (*Engraulis australis*), pilchards (*Sardinops neopilchardus*), squid (Order Teuthida) and to a lesser extent, krill (Euphausiids). The population of penguins on Lion Island, in the Hawkesbury River, is also known to feed on blue sprats (*Spratelloides robustus*), small-mouthed hardyheads (*Atherinosoma microstoma*) and Ogilby's hardyheads (*Atherinomorus ogilbyi*).

The major threat to the Manly population is the loss of suitable habitat. Past development has greatly reduced available habitat in the area. Disturbance of little penguins and their habitat is also a major threat to the population. Predators such as dogs, cats, and foxes are known to take penguins from shallow burrows and as they move between the water and their nesting habitat. Commercial fishing has also been listed in the threat abatement plan as a threatening process, although there is currently no data to support the claim and fishing is not listed in the Act as a Key Threatening Process. Fishing, primarily hauling in this area, provides competition for food resources, disturbance due to noise outside burrows and may obstruct penguins from returning to their nests (NPWS, 2000b).

## **c) Vulnerable species**

### ***Plants***

#### ***Wilsonia backhousei***

*Wilsonia backhousei* is a perennial, matforming, prostrate subshrub of the family Convolvulaceae. It often occurs as pure, or nearly pure, stands. At most sites, stands are limited in extent (in the order of a few 10m<sup>2</sup>). The most extensive stands occur around Jervis Bay. It is found in intertidal saltmarshes and, more rarely, on seacliffs. In NSW, *Wilsonia backhousei* is scattered along the coast, reaching its northern limit at Wamberal Lagoon. There has been a considerable decline in the abundance of the species this century, largely because of loss of habitat. It is also readily damaged by trampling and vehicle use, and recovery from damage is slow (NPWS Scientific Committee Final Determination newsletter).

### ***Reptiles***

#### **Green turtle (*Chelonia mydas*)**

Green turtles occur worldwide and are found in tropical and subtropical waters. They inhabit seagrass beds and coral reefs with a good cover of seaweed. Adult turtles are herbivores, feeding on seaweeds and seagrasses, whereas immature turtles feed on jellyfish, small molluscs, crustaceans and

sponges. Green turtles grow to an average of about one metre and are sexually mature generally between 91.5 – 122.5cm CCL. They may migrate up to 3000 km from feeding grounds in Indonesia, Papua New Guinea, New Caledonia, Fiji, Queensland, Northern Territory and Western Australia to breed and nest in southern and northern Great Barrier Reef, northwest Northern Territory, Gulf of Carpentaria, Western Australia, Coral Sea and Ashmore Reef. Nesting generally occurs from late November to January and earlier in the Northern Territory from July to December. They recruit from the pelagic phase as immature turtles (CCL = 40-50cm) to inhabit subtidal and intertidal coral and rocky reefs and seagrass meadows of the continental shelf. While they are most abundant within 1000 km of their nesting beaches, they live year round in coastal waters from central Western Australia, through Northern Territory and Queensland to central New South Wales, continuing to feed in waters as cool as 15°C. Green turtles are also listed as vulnerable under the EPBC Act 1999.

#### Leatherback turtle (*Dermochelys coriacea*)

Leatherback turtles are the largest of the marine turtles, with shells averaging 1.6 metres in length and with a total weight of up to 500 kg. They are so named because of their leathery shell, which is black with lighter spots and has five ridges. They inhabit tropical and warmer temperate waters, feeding on jellyfish and other soft bodied invertebrates. Unlike other marine turtles, leatherbacks spend almost their entire life feeding within the water column and are generally regarded as an oceanic species. Leatherback turtles do not nest in Australia in any numbers. Only a small population of leatherback turtles has been found breeding and nesting in eastern Australia, mainly from December to January. In Queensland, 1 - 3 females per year nest on Wreck Rock and adjacent beaches, and sporadic nesting occurs at other widely scattered sites in Queensland, New South Wales and the Northern Territory. In Western Australia, there are 2 - 6 sightings off the mid-west coast per year. The major breeding and nesting sites in the Asia/Pacific occur in Indonesia, Malaysia, Papua New Guinea and the Solomon Islands. They are listed as vulnerable under the EPBC Act 1999.

#### Loggerhead turtle (*Caretta caretta*)

Loggerhead turtles are found worldwide, inhabiting tropical and warmer temperate waters such as coral reefs, bays and estuaries. While they are most abundant within 1000 km of their nesting beaches, they live year round in coastal waters from southern Western Australia, through the Northern Territory and Queensland to southern New South Wales. The southern Great Barrier Reef and adjacent mainland near Bundaberg is the breeding centre of the eastern Australian population. Breeding is centred on Dirk Hartog Island (Shark Bay), Muiron Islands, Ningaloo and the North West Cape area for the western population. Loggerhead turtles eat shellfish, crabs, sea urchins and jellyfish. They reach sexual maturity at about 30 years or more and grow to an average of one metre in size. Loggerhead turtles migrate from feeding grounds in the Northern Territory, New South Wales and Queensland to the above nesting sites on the eastern and western Australian coastlines. Mating occurs from late October to early December, followed by nesting from late October to early March. They recruit from the pelagic phase as immature turtles (CCL = 70-80cm, >10 years) to inhabit subtidal and intertidal coral and rocky reefs and seagrass meadows as well as deeper soft-bottomed habitats of the continental shelf. They are listed as endangered under the EPBC Act 1999.

### ***Birds***

#### Australasian bittern (*Botaurus poiciloptilus*)

The Australasian bittern occurs from southern Queensland to Tasmania and southeastern South Australia, including most of Victoria and New South Wales. It also occurs in the southwestern corner of Western Australia. In NSW, the species has been recorded along the coast as well as in wetlands of

the Murrumbidgee and Lachlan Rivers and is frequently recorded in the Murray-Darling Basin. It inhabits terrestrial and estuarine wetlands, generally where there is permanent water with dense vegetation including sedges, rushes and reeds. Essentially a freshwater species, it also occurs in dense saltmarsh vegetation in estuaries and flooded grasslands. At dusk, the species forages in shallow water up to 30 cm deep, primarily feeding on frogs, fish, invertebrates (including crayfish), leaves and fruit. The major threats to the species include grazing and trampling of riparian vegetation and siltation of waterbodies by livestock, predation by foxes, regulation of waterways, clearing and draining of habitat, salinisation and pollution of wetlands and degradation of drought refuges.

Black bittern (*Ixobrychus flavicollis*)

The black bittern occurs from southern New South Wales, north to Cape York and along the entire northern coast to the Kimberley region. They also occur in the southwestern corner of Western Australia. In NSW, the species has been recorded scattered along the coast, rarely south of Sydney or inland. They inhabit freshwater and estuarine wetlands, generally where there is permanent water with dense vegetation. They occur in flooded grassland, forest, woodland, rainforest and mangroves. At dusk and at night, the species forages for reptiles, fish and invertebrates, including dragonflies, shrimp and crayfish. The major threats to the species include grazing and trampling of riparian vegetation by livestock, predation by feral cats, clearing and draining of habitat, and salinisation and pollution of wetlands.

Black-tailed godwit (*Limosa limosa*)

Godwits are migratory wading birds that breed in Mongolia and Siberia, and visit Australia during the summer, arriving in August and leaving in March. They are most common between Weipa and Darwin, but is also found in small numbers along much of the Queensland coast south of Cairns, south of Derby in Western Australia, the southeast of South Australia, and mainly around Port Phillip Bay in Victoria. In NSW, they have been regularly recorded only on Kooragang Island (Hunter River), with scattered sightings from both coastal and inland areas. Inland records, particularly within the Murray-Darling Basin, indicate that a regular inland passage is used. Godwits are primarily found along the coast on sand spits, lagoons and mudflats, and inland on mudflats of lakes and swamps. They have also been recorded in meadows and sewage treatment works. Their diet includes a variety of invertebrates such as insects and larvae, earthworms, crustaceans, molluscs, spiders, spawn and tadpoles of frogs and fish eggs. Threats to the species include hydrological changes to inland lakes and tourism or agricultural developments reducing coastal and inland habitat areas.

Broad-billed sandpiper (*Limicola falcinellus* subsp. *sibirica*)

This subspecies of sandpiper are migratory wading birds that breed in north and northeastern Soviet Union, and visit India, southeast Asia and Australia during the summer. In Australia, they are most common along the northern coasts, particularly the northwest, with occasional birds seen on the southern coasts and very few inland. In NSW, the main site for the species is the Hunter River, with records along the coast south to Shoalhaven River. They are known to favour estuarine sand- and mudflats, particularly areas of soft mud on the seaward side of mangroves, saltmarshes and reefs as feeding and roosting habitat. They have also been recorded in shallow freshwater lagoons and sewerage treatment works. Their diet includes insects, worms, crustaceans, molluscs and seeds. Threats to the species include hydrological changes to inland lakes (for individuals that remain in Australia over winter) and development of coastal estuaries, mudflats and saltmarshes.

Comb-crested jacana (*Irediparra gallinacea*)

In Australia, comb-crested jacanas occur in the north and northeast of the country, originally from the Kimberley region east to about the Hunter region in NSW. They are thought to have expanded this range, however, and are now recorded as far south as Bermagui (Marchant and Higgins, 1993). They are found primarily in freshwater wetlands, lagoons, billabongs, swamps, lakes and rivers where there is an abundance of floating aquatic vegetation, particularly waterlilies, nardoo or milfoil. They feed on seeds and aquatic insects from amongst aquatic vegetation and debris. They nest on loosely constructed platforms of aquatic vegetation up to 10 m wide and in NSW, breeding takes place between September and April.

#### Freckled duck (*Stictonetta naevosa*)

Essentially a freshwater species, freckled ducks also occur in coastal districts of southeastern and southwestern Australia, particularly during drought years. Eastern breeding grounds include the Murray-Darling Basin, Lake Eyre and southwestern Queensland. In coastal areas, they prefer swamps heavily vegetated with ti-trees. They feed on algae, seeds and the vegetative parts of various aquatic grasses and sedges, small crustaceans, zooplankton, worms, insects and small fish. Threats to the species include loss of habitat and breeding sites, river regulation and illegal hunting.

#### Great knot (*Calidris tenuirostris*)

Knots are migratory wading birds that breed in Siberia and migrate to Australia in large numbers from late August, leaving in March and April. Some individuals may stay over winter. They occur throughout Australia, including the coastal islands of Tasmania, but is most common and abundant in the north, and uncommon to rare further south. In NSW, they have been recorded in scattered sites along the coast to about Narooma, and are primarily found within sheltered, coastal habitats containing large intertidal sand- and mudflats, including in inlets, bays, harbours, estuaries and lagoons. They have also been recorded on exposed reefs or rock platforms. Their diet includes bivalve molluscs, gastropods, polychaete worms and crustaceans. Threats to the species include hydrological changes to inland lakes (for those that remain over winter) and tourism or agricultural developments reducing coastal and inland habitat areas.

#### Greater sand plover (*Charadrius leschenaultii*)

Sand plovers are migratory wading birds that breed in central Asia and migrate to Australia in summer. The species is commonly recorded on the west coast, but is apparently rare on the east coast. In NSW, they have been recorded in coastal areas from the northern rivers region south to Shoalhaven Heads, with the majority of birds recorded in the Clarence and Richmond Rivers. They forage on intertidal sand- and mudflats in estuaries, and roost during high tide on sandy beaches or rocky shores. They have also been recorded on inshore reefs, rock platforms, and small rocky islands and sand cays on coral reefs. Their diet includes insects, molluscs and crustaceans. Threats to the species include hydrological changes to the Clarence and Richmond Rivers and tourism or agricultural developments reducing coastal and inland habitat areas.

#### Lesser sand plover (*Charadrius mongolus*)

Lesser sand plovers are migratory wading birds that breed in eastern Siberia, southern Mongolia, western China and the Himalayas and migrate to the coasts of eastern and southern Africa, the Middle East, India, Southeast Asia and Australia in summer. The species occurs around the entire coastline of Australia but is most abundant in the Gulf of Carpentaria and along the east coast of Queensland and northern NSW. They are rarely recorded south of Shoalhaven River. They favour beaches, sandflats, mudflats and mangroves within estuaries, and roost during high tide on sandy beaches or rocky shores. In NSW, important estuaries for them include Port Stephens, Harrington Inlet

and the Clarence and Richmond Rivers. Their diet includes crustaceans, molluscs, insects and polychaete worms. Threats to the species include hydrological changes to the Clarence and Richmond Rivers and tourism or agricultural developments reducing coastal and inland habitat areas.

Mangrove honeyeater (*Lichenostomus fasciocularis*)

Mangrove honeyeaters are found in mangroves and adjacent woodlands of coastal northeastern Australia, from Townsville in Queensland to Macksville in NSW (Pizzey and Doyle, 1984; Simpson and Day, 1996). Their nest consists of a deep cup of fine dry grass or dried seagrass in the fork of mangrove trees down to 60 cm above the high water mark. They usually feed on the blossoms of mangrove trees, but also descend to the mangrove floor at low tide to feed among the trunks and roots.

Osprey (*Pandion haliaetus*)

Ospreys have a disjunct distribution around the Australian coastline, occurring in the north from Broome in WA to the south coast of NSW, in the south from Kangaroo Island to the Great Australian Bight, and from Esperance to Cape Keraudren in the west (Marchant and Higgins, 1993). In NSW, the osprey occurs primarily along the coast, south to about Womboyn Lake and is found in greater numbers in the north of the State (Marchant and Higgins, 1993). They require extensive areas of clear, open water for fishing, often ranging up into freshwaters of larger rivers. They are found on offshore islands, littoral habitats, terrestrial wetlands and coastal lands of tropical and temperate Australia (Marchant and Higgins, 1993). They nest in prominent positions near the ocean or large waterbodies, on rocky headlands, stacks, cliffs, palm trees, in tall dead trees, and on artificial platforms (Marchant and Higgins, 1993). More recently, particularly on the north coast of NSW, ospreys have been nesting on electrical supply poles as they provide the type of vantage points of their former natural habitat. The NPWS and NorthPower have been working together to customise these poles to avoid electrocution and to provide stable nesting platforms. They feed mostly on fish, clutching them from the surface of the water or diving to less than 1 m, and are able to eat toxic (Diodontidae, Tetraodontidae) and spiny fishes (Balistidae and Acanthuridae). They also feed on terrestrial vertebrates, seabirds and crustaceans (Marchant and Higgins, 1993). Osprey are tolerant of human activity, often nesting within or adjacent to urban areas, but over clearing and degradation of water quality are likely to have an adverse impact on their nesting and feeding habitat (Marchant and Higgins, 1993).

Pied oystercatcher (*Haematopus longirostris*)

The pied oystercatcher is distributed along the entire Australian coastline and offshore islands, with most key sites located in the southeast. These include The Coorong in SA, Derwent River in Tasmania and Corner Inlet in Victoria (Marchant and Higgins, 1993). They roost and forage on sandy beaches, mudflats, sandbanks and rocky shores, and occasionally roost in mangroves. They also forage on oyster leases, but are more common at the low water mark on beaches where they probe soft substrata for molluscs, worms and crabs and sometimes take small fish from shallow water. They nest on sandy beaches, sandbars and along estuaries, immediately above the high water mark, as well as on sand dunes or saltmarshes and mudflats (Marchant and Higgins, 1993). Threats to the species include alteration of habitat, human disturbance, destruction of nests and predation by foxes.

Sanderling (*Calidris alba*)

Sanderlings are an uncommon to locally common migrant from Siberia and other breeding grounds within the Arctic. They generally spend the summer in coastal areas of northern and eastern Australia and some individuals remain over winter. Sanderling prefer open sandy beaches exposed to open sea-swell, exposed sand bars and spits, and are also found in coastal areas on low beaches of firm

sand, near reefs and inlets, along tidal mudflats and bare coastal lagoons. In NSW, important estuaries for them include Harrington Inlet and Old Bar at the mouth of Manning River. They forage at the edge of the water in the wave-washed zone and sometimes among rotting kelp, as well as at the edges of shallow pools on sandspits and mudflats. Their diet consists of insects and their larvae, crustaceans, jellyfish, fish, spiders, worms, plants and seeds, and larger molluscs and crustaceans are also taken as carrion. Threats to the species include hydrological changes to estuaries and similar waterbodies that may modify or remove habitat, and tourism or agricultural developments reducing coastal and inland habitat areas.

#### Sooty oystercatcher (*Haematopus fuliginosus*)

Sooty oystercatchers are endemic to Australia and are widespread along the east, west and south coasts, with scattered records from northern Australia. There are thought to be only small numbers of birds in NSW distributed evenly along the coast (Marchant and Higgins, 1993), although the coastline between Lake Conjola and Lake Tabourie is thought to support more than 1% of the Australian population (Carter, 1995). They are a strictly marine coastal species, preferring rocky intertidal shorelines with a minimal cover of foliose algae, coral reefs or sandy beaches near intertidal mudflats. They also occasionally forage on oyster leases, but are more common on intertidal rock platforms where they feed on molluscs, crustaceans, ascidians, echinoderms and small fish. When feeding on beaches, they take worms, larvae of seaweed flies and sandhoppers. They nest on offshore islands and rock stacks, often close to rocky coasts, and sometimes on remote headlands, promontories or steep beaches (Marchant and Higgins, 1993).

#### Terek sandpiper (*Xenus cinereus*)

The Terek sandpiper is a non-breeding migratory visitor to Australia's west, north and east coasts. In NSW, the species has been recorded from the Northern Rivers region south to Lake Wollumboola. The two main sites are the Hunter and Richmond Rivers, with the Hunter identified as nationally and internationally important for the species. They prefer muddy beaches near mangroves, coastal mudflats, lagoons, creeks and estuaries, but have been observed on rocky pools and coral reefs and occasionally up to 10 km inland around brackish pools. Their diet consists of polychaete worms, crustaceans, small shellfish, beetles, waterbugs, and the adults and larvae of various flies. Threats to the species include hydrological changes to estuaries that may modify or remove habitat, tourism or agricultural developments reducing coastal and inland habitat areas, urban and industrial development, and disturbance by recreational activities.

### ***Marine mammals***

#### Humpback whale (*Megaptera novaeangliae*)

Humpbacks have a worldwide distribution, but spend the summer months feeding in pelagic waters of Antarctica, generally between 60 – 70°S. In winter and spring, they migrate to warmer breeding grounds, 15 – 20°S, and are recorded in coastal waters off all States of except for the Northern Territory. There is distinct Northern and Southern Hemisphere populations based on temporal migration separation, and there are thought to be at least six Southern Hemisphere populations. Two of these populations are recorded off Australia's coastline, one off the west coast and the other off the east coast. There is thought to be a sex ratio bias towards males in east coast migration, and a possibility that not all females migrate north each year. Key localities within Australian waters include: Cape Naturaliste/Geographe Bay, north of Rottnest Island, Shark Bay, North West Cape, off Dampier Archipelago and coastal islands off Kimberley in Western Australia; southern coast, off Coffs Harbour and Cape Byron in New South Wales; Stradbroke Island, Hervey

Bay, and islands in Great Barrier Reef, especially Whitsunday Passage area off Queensland. The exact locations of breeding grounds are unknown, although breeding occurs in the central Great Barrier Reef area and there is probably a wide range of opportunity for breeding over several degrees of latitude on both the east and west coasts. Humpbacks feed mainly in Antarctic waters almost exclusively on krill (*Euphausia superba*). Elsewhere they feed on small shoaling fish and occasionally benthic organisms, and there is some evidence of feeding on fish and plankton swarms in warmer waters, e.g. off Eden and on larval *Munida gregaria* during their southern migration off New Zealand. Catches in the subtropics off northwest Western Australia and eastern Australia showed almost no evidence of local feeding. They feed by variety of methods, generally determined by their location. In the Southern Hemisphere, they feed by swallowing large volumes of prey and water or by disturbing the water, creating a washing machine effect. In the Northern Hemisphere, they feed by lunging and bubble feeding, which involves production of a bubble net formed by exhalation under water, concentrating prey. Humpbacks were heavily exploited by commercial operations until about 1970, and estimates suggest the population may have been reduced to 5% of its initial size by 1963. Despite international protection since then, recovery seems to have been delayed until mid-1970s, possibly mainly through continued illegal catches until about 1970. Current threats are thought to include direct disturbance on migration path and in breeding areas by:

- whale watching and research vessels/aircraft, pleasure craft, swimmers and divers
- coastal seismic operations
- defence operations
- collision with large vessels
- entanglement in fishing gear/shark nets
- pollution, including increasing amounts of plastic debris at sea, oil spills and dumping of industrial wastes into waterways and the sea, leading to accumulation of toxic substances in body tissues, although this is likely to be minimal given that it rarely feeds in low latitudes (Bannister *et al.*, 1996).

Humpback whales are also classified as vulnerable under the EPBC Act.

#### Indo-Pacific humpbacked dolphin (*Sousa chinensis*)

This dolphin occurs in southern China, through the Indo–Malay Archipelago to northern and northeastern Australia, where it is most regularly recorded in Western Australia (north of 24°S), Northern Territory and Queensland, with occasional strandings reported in New South Wales (mostly north of 29°S). They are primarily a coastal species, occurring in estuaries and rivers of tropical and subtropical climates. They occur close to the coast, in less than 20 m depth, although aerial surveys in the Great Barrier Reef region may have located them in waters between the outer reef and the mainland, further from shore than has been previously reported in the literature. Key localities for the species in Australia include Moreton Bay, Tin Can Inlet and Great Sandy Strait in Queensland. Their diet consists of a variety of species of fish, some cephalopods and crustaceans. They have been known to feed in association with prawn trawlers in Moreton Bay, and presumably elsewhere throughout their range in Australia. There is no reliable data on mortality rates or on abundance. In Moreton Bay, 36% of dolphins show evidence of shark attack, suggesting mortality from sharks may be significant. In South Africa, many animals also have very high levels of organochlorines, probably sufficiently high to kill a female's first calf, and it is possible that similar high pollutant loads occur in dolphins of Moreton Bay, but no data are available at present. Threats to the species are thought to include habitat

destruction and degradation, noise pollution, harassment or disturbance (particularly close to major cities as in Moreton Bay), incidental capture in shark nets and trawl-nets, illegal killing, and overfishing of prey species. They are also prone to live capture for display purposes, in Queensland (permits granted for up to 12 per year at present) and northern NSW. Other potential threats include pollution and mass mortalities induced by pathogens.

#### Southern right whale (*Eubalaena australis*)

Southern right whales are circumpolar and only found in the southern hemisphere between approximately 30° and 60°S. They move from pelagic waters of higher latitudes where feeding occurs in summer, to warmer, lower latitudes for breeding in winter, when they approach close to the coast. In Australia, they are distributed around the southern coastline from Perth, WA to Sydney, NSW, including Tasmania. Their range is possibly extending, with recent sightings from Shark Bay and North West Cape, WA and north of Sydney to Cape Byron, NSW. Adult females are sighted most frequently close to coast, coming inshore to give birth on a mainly three-year cycle. Little is known about the diet of southern rights, but observations, lack of suitable prey and whaling data imply that they do not feed near the coast in winter, with calving females effectively fasting for at least four months. Prey is thought to be mainly pelagic larval crustaceans, particularly *Munida gregaria* and copepods. They are taken primarily during summer in the open ocean, south of about 40°S. Threats to the species are thought to include historical gross exploitation at least into the late 1960s, and despite international protection, is likely to have prevented significant recovery until recently. More recent threats are thought to include direct disturbance, particularly in near-shore concentration/calving areas, from:

- whale watching and research vessels/aircraft, pleasure craft, swimmers and divers
- low-flying aircraft
- coastal industrial activity, e.g. seismic, drilling, sandmining and shipping operations
- defence operations
- collision with large vessels, particularly on shipping routes on eastern seaboard, in Bass Strait and across the Great Australian Bight
- entanglement in fishing gear.

Potential threats are thought to include increased whale watching pressure, industrial activity and pollution levels, and these may all be compounded by an increase in right whale numbers. The latter will also affect availability of suitable coastal calving habitat (Bannister *et al.*, 1996). Southern right whales are also classified as vulnerable under the EPBC Act.