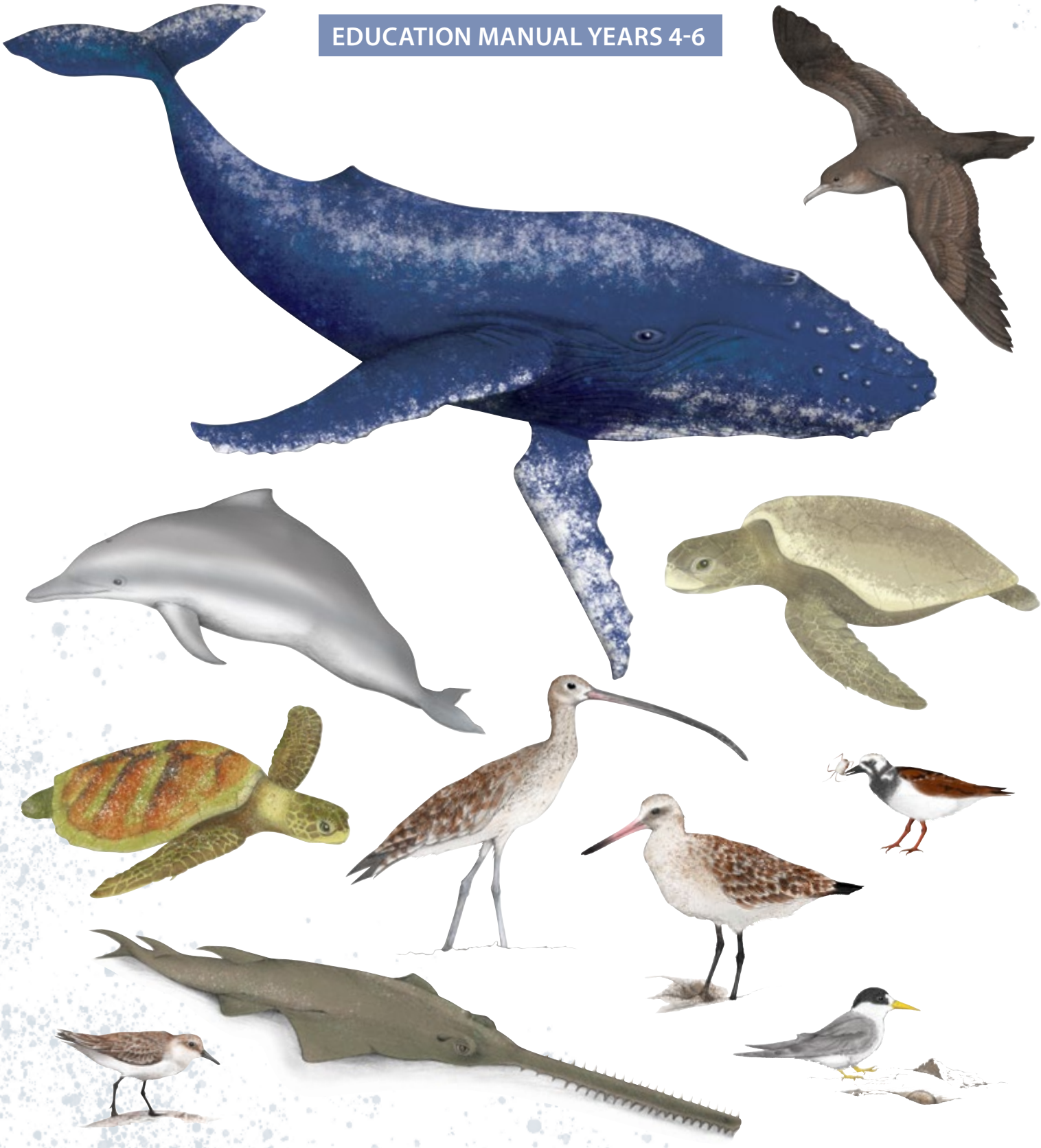
GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

PARKS AND WILDLIFE SERVICE

Threatened and protected species of Western Australia's marine and coastal habitats

EDUCATION MANUAL YEARS 4-6



Acknowledgements

This resource was produced by Department of Biodiversity, Conservation and Attractions.

Many people have contributed to this resource and their assistance is gratefully acknowledged.

Stage 4 Activity 4.3 Create your own flock is adapted from a **Pukorokoro Miranda Shorebird Centre** education resource miranda-shorebird.org.nz/flock-how

Publisher: Department of Biodiversity,
Conservation and Attractions
17 Dick Perry Avenue, KENSINGTON WA 6151
Locked Bag 104 Bentley Delivery Centre

June 2018

This document is available in alternative formats on request.

Project writer: Felicity Kelly

Contributors: Judymae Napier, Hannah Hampson and Carissa Ives

Editors: Liz Grant, Joselyn Juraszek, Sally Johnston

Design and illustrations: Mandy Nielsen, Bluefish Design

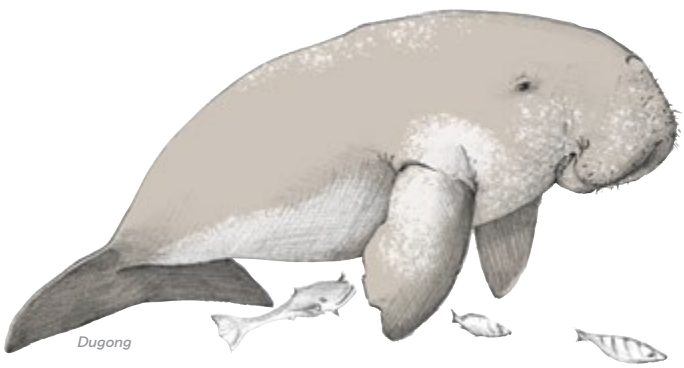
Images:

Activity sheet 1.1
Dugong – Blue Media Exmouth
Curlew sandpiper, eastern curlew – Nigel Jacket, Broome Bird Observatory
Green sawfish – David Morgan
Humpback whale – Aimee Jan
Red knot – Clive Nealon

Activity sheet 2.1
Green turtle – Johnny Gaskell
Mating turtles – Aimee Jan
Humpback whale with calf, humpback whale migrating – Lyn Irvine
Humpback whale subadult – Janine Marx

Activity sheet 3.1
Coral reef – Johnny Gaskell

Activity sheet 4.1
Humpback whale, mating turtles – Aimee Jan
Dugong – Blue Media Exmouth
Green sawfish – Richard Pillans



Dugong

Contents

Associated resources

Resource 1 Species profile

Poster 1 Marine turtles of Western Australia
Poster 2 Marine mammals of Western Australia
Poster 3 Sharks and rays under threat
Poster 4 Migratory shorebirds

Resource 2 Habitats

Poster 5 Importance of habitat

Resource 3 Pressures

Poster 6 Pressures facing threatened species

Introduction

Australia's terrestrial and marine habitats support a diverse range of species, many that are unique and are found nowhere else in the world. Today many of these species are at extreme risk of extinction with close to 1800 species of plants and animals listed as a threatened species under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999*.

The temperate, sub-tropical and tropical coastal and marine habitats of Western Australia support a diverse range of wildlife and, for some species, these habitats are the stronghold for some of the remaining populations of their kind.

- The sandy beaches of the mainland and most islands from Shark Bay north to the Kimberley are nesting habitat for five of the world's seven marine turtle species.
- Coastal waters provide feeding, breeding and resting grounds for dugongs, dolphins and whales.
- Migratory and resident shorebirds and seabirds utilise habitats including islands, sandy shores, intertidal flats and mangroves to breed, feed and rest.

The *Threatened and protected species of Western Australia's marine and coastal habitats* education manual aims to introduce threatened species and the importance of marine and coastal habitats to classrooms across Western Australia.

The development of this resource contributes towards the objectives of the Wheatstone Offset Project 66e *Threatened Species Information and Protection Program* that aims to raise awareness of threatened and migratory species and their habitat and encourage positive actions to safeguard habitat.

Bar-tailed godwit

Loggerhead turtle

How to use this education manual

This education manual is designed to be flexible and is in five stages that can be used sequentially or as isolated activities. Each stage has activity sheets that students can complete independently or in groups.

Each stage provides background information and teacher direction. The teacher directions include a series of questions that provide opportunity to engage the students in class discussion and brainstorming sessions.

Along with the background information for teachers and students is a package of additional resources that relate to every stage providing further information for a more in-depth approach.

Top left: Green turtle hatchlings. Photo – Grant Griffin/DBCA **Top right:** Caspian terns. Photo – Grant Griffin/DBCA
Above: Ningaloo coast. Photo – DBCA

Stage 1: Going, going, gone... species on the brink

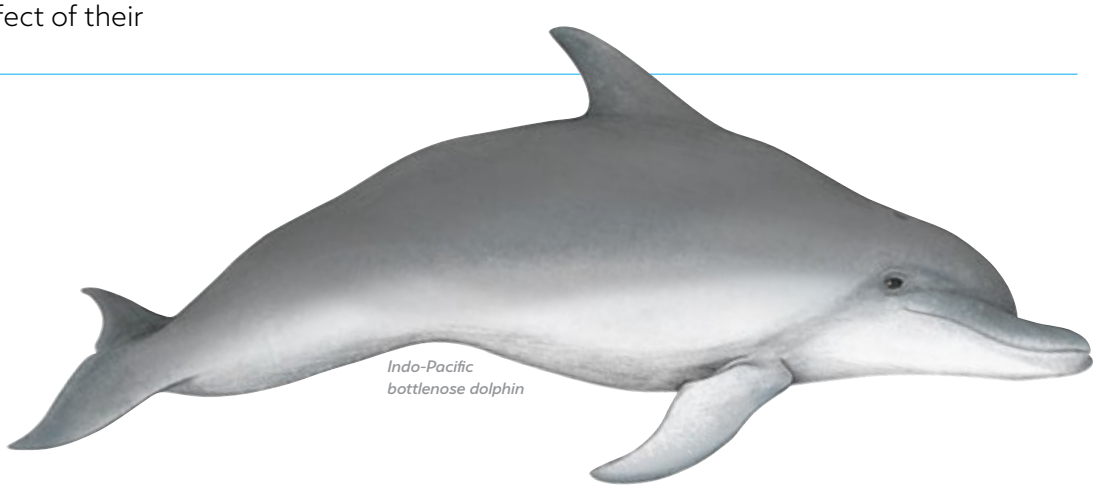
Concept:

- Students will be able to explain the concept of a threatened species, protected species and extinction.
- Identify threatened species of Western Australia's coastal habitats.
- Understand how human activity can impact the survival of a species.

Student inquiry:

- What is a threatened species?
- What are the differences between threatened, endangered, and extinct species?
- What threatened species occur in Western Australia's marine and coastal environments?
- How do human actions impact on the survival of species?
- What actions can you do to protect threatened species?

AUSTRALIAN CURRICULUM – SCIENCE		
Year 4	**Year 5**	**Year 6**
Living things depend on each other and the environment to survive **(ACSSU073)** Science knowledge helps people to understand the effect of their actions **(ACSHE062)**	Living things have structural features and adaptations that help them to survive in their environment **(ACSSU043)**	The growth and survival of living things are affected by physical conditions of their environment **(ACSSU094)**



Indo-Pacific bottlenose dolphin

Green sawfish

Background information for teachers

The extinction situation in Australia

Australia's terrestrial and marine habitats support a diverse range of species, many that are unique and are found nowhere else in the world. Since European settlement more than 200 years ago, more than 130 of Australia's known species have disappeared from the wild. Today close to 1800 species of plants and animals are on the national threatened species list.

Over millennia many species have disappeared from the wild, dinosaurs and the megalodon shark are well-known examples of this. However, unlike the environmental factors that led to the end of their existence on earth, species today are facing extinction at exceedingly fast rates as a result of human activities. Increasing growth of the human population, habitat loss and destruction, invasive species, disease, pollution and unsustainable hunting are having significant impacts.

What does this mean for marine life in Western Australia?

Western Australia offers some of the richest and most diverse marine habitats in the world. Five of the world's seven marine turtle species nest on sandy beaches of the mainland and islands, dugongs, dolphins and whales feed, rest and breed in coastal waters, shorebirds and seabirds breed, rest and feed along the shores. Sadly, many of these species are at risk of extinction. Habitat preferences makes them susceptible to threatening processes caused by anthropogenic activities. Life history characteristics, such as being long lived, slow to mature and having low reproductive rates can add to a species vulnerability, as it takes longer for these species to replace their numbers once in decline.

Top left: Green turtle nesting. Photo – Paul Bester **Top right:** Osprey. Photo – Felicity Kelly/DBCA
Above: Roseate terns roosting. Photo – Grant Griffin/DBCA

Defining a threatened species

Under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) species, subspecies and a variety of native wildlife are listed as threatened or specially protected if they are at risk of extinction, are rare, or otherwise in need of special protection. They then assigned a conservation status:

Extinct – there is no reasonable doubt that there are no living members of the species.

Extinct in the wild – the species is known only to survive in captivity with no living members existing in the wild.

Critically endangered – the species is at extremely high risk of extinction in the wild.

Endangered – the species is at a very high risk of extinction in the wild.

Vulnerable – the species is at high risk of extinction in the wild.

Conservation dependent – the species is dependent on a conservation action to keep it from going extinct.

Under the EPBC Act a species that is not listed as threatened may also be granted protection as:

- a migratory species due to being listed under international conventions and agreements that Australia is party to,
- a marine species that has been specially listed by the Minister of Environment, or
- a cetacean, all species of whales and dolphins are protected in Australian waters.

In Western Australia the *Wildlife Conservation Act 1950* also provides for protection of species deemed at risk from extinction across their range. This allows for protection of species that may not yet be listed as threatened nationally but that in Western Australia may be facing significant threats such as population decline, are rare, or deemed to need special protection.

Above left: Shorebirds foraging on Simpson Island Nature Reserve. Photo – Carolyn Williams/DBCA
Above right: Green sawfish. Photo – David Morgan

CASE STUDY

Humpback whales make a comeback

Today there are many groups including state and federal governments, conservation organisations and individuals both in Australia and internationally working together to help remove species from the threatened species list.

The protection of the humpback whale is an example demonstrating how the protection of a species can have positive results, including population recovery.

In Australia hunting of humpback whales for their blubber and oil began in the 18th Century. By the 20th Century, it was evident that numbers of whales, including the humpback whale had declined significantly with less than 1000 individual humpback whales remaining. In 1963 whaling was banned in Western Australia and by 1978 all whaling stations had closed. In 1982 a total international ban on whaling humpback whales was put into place. This protection spread with the International Whaling Commission moratorium on commercial whaling in 1986.

Today, humpback whales are still listed as vulnerable, however, their population size is on the increase with some scientist recommending they be removed from the threatened species list.

Humpback whale

Teacher directions:

1. Explain to the students that they are going to investigate threatened species that are found in Western Australia's coastal environments. As a class introduce the first inquiry question by asking students if they know the meaning of the following words.

   extinct **endangered** **threatened** **vulnerable** **protected**

   Ask the students if they know any species that have become extinct? Can they name any species that are threatened today?

2. To introduce students to different species that are threatened or specially protected, give the students Activity sheet 1.1 to complete. The activity can be completed as individuals or in groups. The resources listed below may help students answer the questions.

3. As a class, brainstorm reasons why these animals are threatened or specially protected? What has happened to them? Are they affected by human activity? Hunting, recreation, coastal development, pollution, predators etc. Create a list of the student's answers. Discuss the ideas as a class.

4. Divide the students into small groups and let them know that they are going to investigate a threatened or protected species found in Western Australia's coastal environment. Assign each group one of the animals from Activity sheet 1.1. Using Activity sheet 1.2 each group is to investigate what is putting pressure on the survival of their species and what can be done to help it?

   Have each group present their species to the class, listing the pressures and the solutions. As a class discuss: Does more than one species face the same pressure? Why do you think this might be? Can a solution help more than one species? Why is it important to help protect these species? What will happen if we don't?

Resources:

- Resource 1: Species profile Posters 1, 2, 3, 4
- Resource 3: Pressures Poster 6

Additional resources:

- **Marine wildlife of WA's north-west identification guide**
  dpaw.wa.gov.au/images/documents/conservation-management/marine/20170303_marine_life_northwest_finalweb.pdf
- **Shorebirds and seabirds of the Pilbara coast and islands**
  dpaw.wa.gov.au/images/documents/conservation-management/wetlands/20170167_pilbara_shorebirds_and_seabirds_of_the_pilbara_coast_and_islands_web.pdf

Green turtle

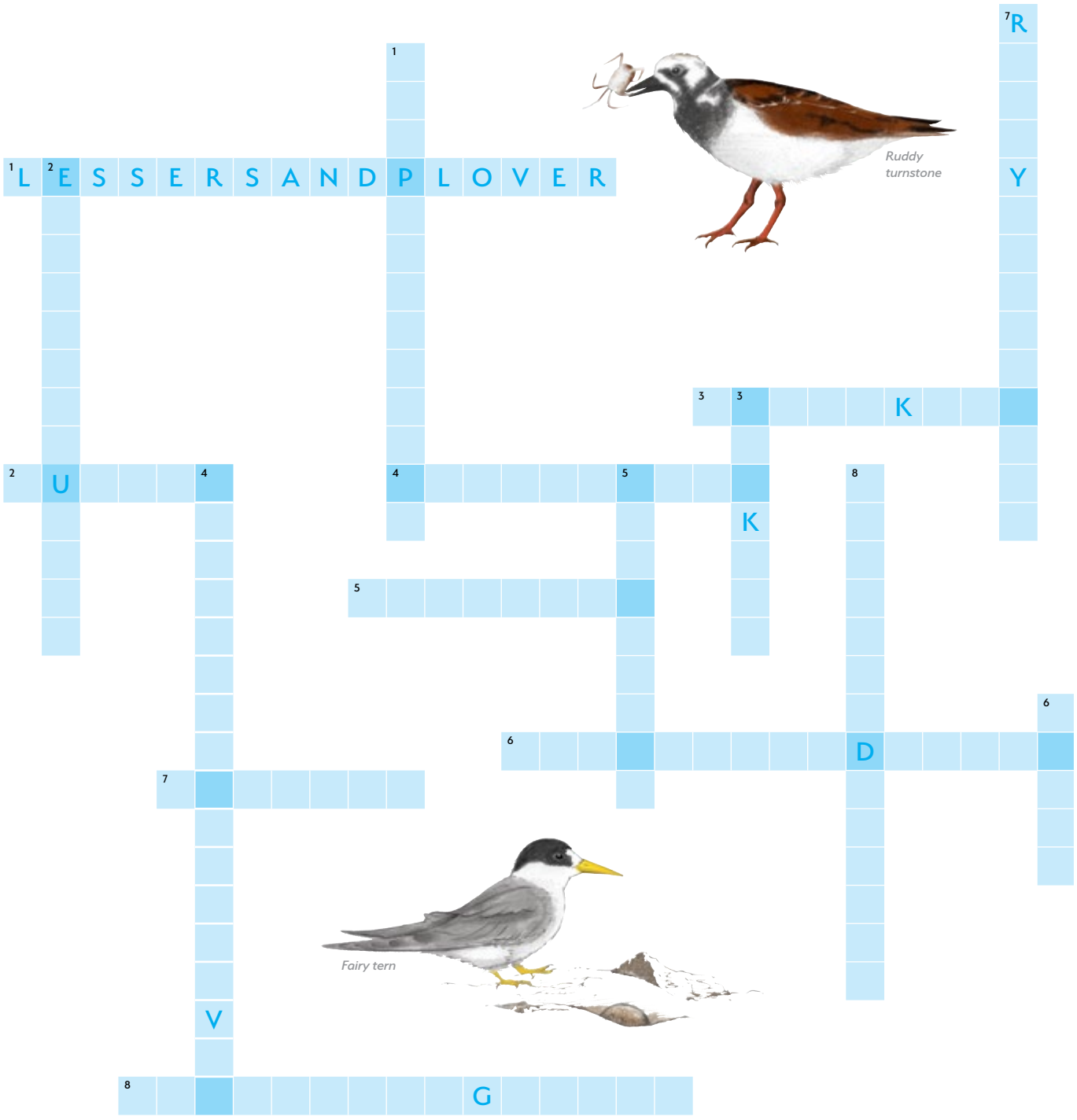
Activity sheet 1.1

Threatened and protected species crossword challenge

1. Using your investigation skills, can you identify each species in the pictures in the crossword clues to complete the crossword?

2. What is their conservation status or reason for being a protected species?

Note – All species can be found in Western Australia's coastal and marine environments. (You might need to use the resources or the internet to help you.)



Crossword clues

Across:

1. 	2. 	3. 	4. 
a *Lesser sand plover*	a	a	a
b *Endangered*	b	b	b
5. 	**6.** 	**7.** 	**8.** 
a	a	a	a
b	b	b	b

Down:

1. 	2. 	3. 	4. 
a	a	a	a
b	b	b	b
5. 	**6.** 	**7.** 	**8.** 
a	a	a	a
b	b	b	b

Did you know?

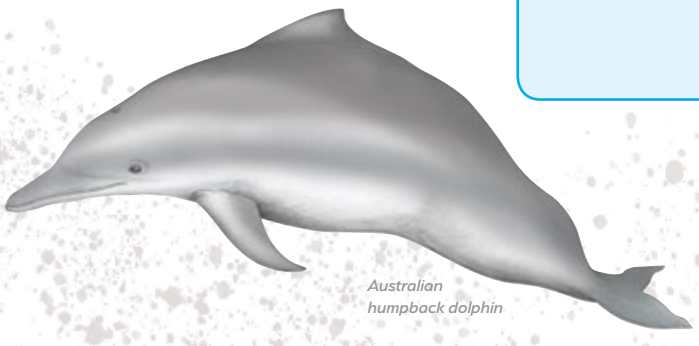
All of these species are found in Western Australia's coastal and marine environment.

Have you ever seen any of these species before? If yes, which ones and where did you see them?

Activity sheet 1.2

Pick a threatened species found in one of Western Australia's coastal or marine habitats of your choice. Make a concept map of the different pressures that the species face. Then come up with solutions for each pressure.

SPECIES	PRESSURE	SOLUTION
		1. 2.
		1. 2.
		1. 2.



Australian humpback dolphin

Stage 2: A life in the sea, how different can animals be?

Concept:

- Explore the cyclic nature of life and compare the different requirements of marine turtles (reptiles) and humpback whales (mammals).
- Investigate the physical and behavioural adaptations needed by species to survive in the marine environment.
- Understand that the physical condition of the environment plays a vital role in a species' ability to survive.

Student inquiry:

- What is a life cycle? How do life cycles differ between species?
- Do all animals have the same features?
- What physical structures are required to live in the marine environment?
- What is a habitat? What does it provide for a species?
- Why do species depend on more than one habitat?
- What pressures can influence the survival of an animal or the habitat?
- How can you help protect threatened species in Western Australia?

AUSTRALIAN CURRICULUM – SCIENCE		
Year 4	**Year 5**	**Year 6**
Living things have life cycles **(ACSSU072)** Living things depend on each other and the environment to survive. **(ACSSU073)**	Living things have structured features and adaptations that help them survive in their environment. **(ACSSU043)**	The growth and survival of living things are affected by physical conditions of their environment. **(ACSSU094)**

Background information for teachers

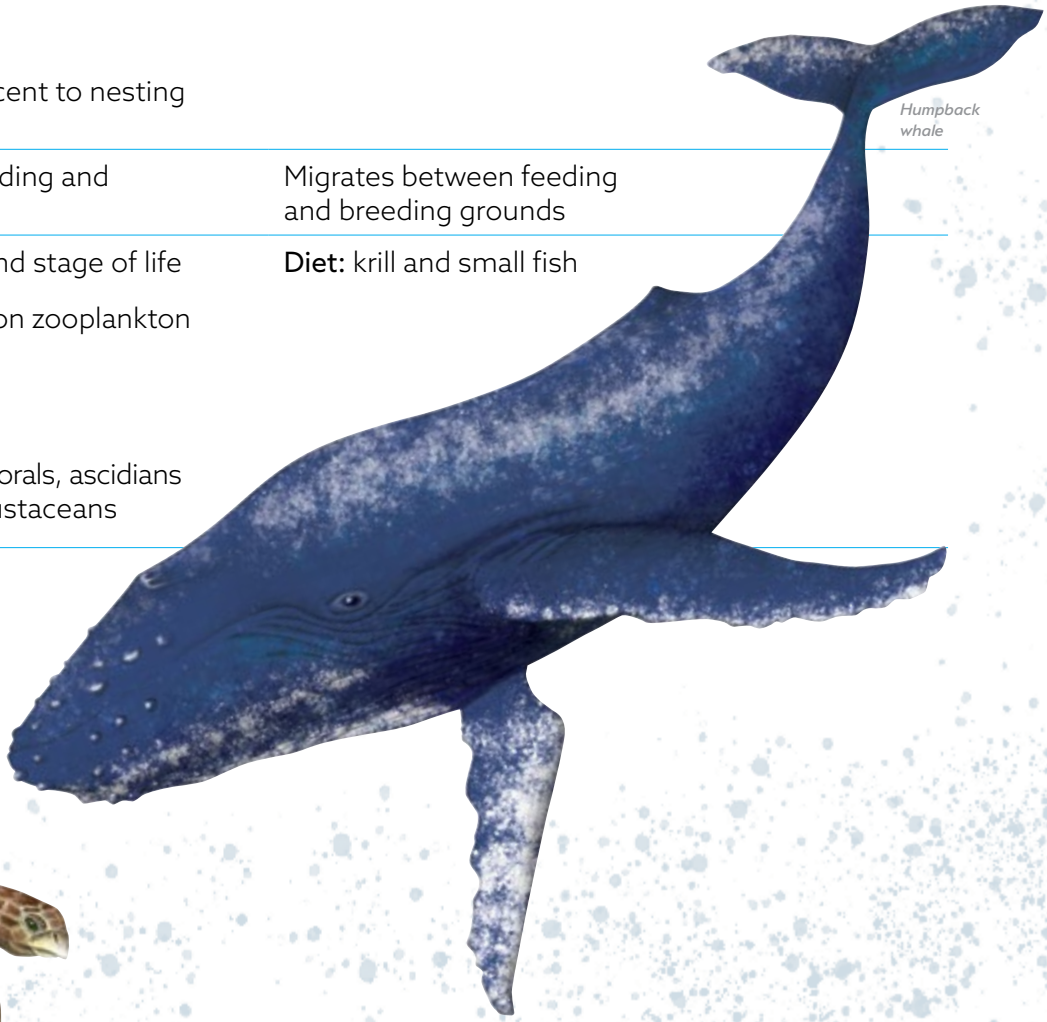
Understanding species requirements

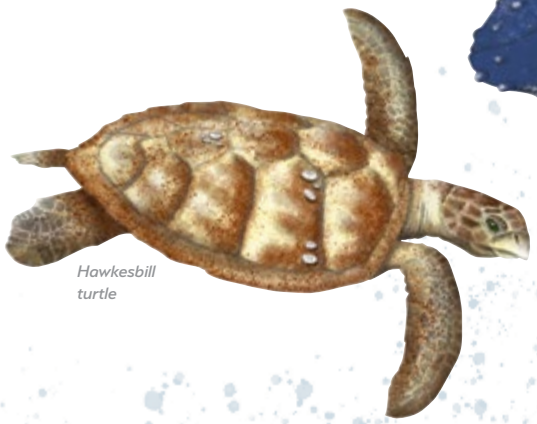
All living things have a life cycle, a series of changes that occur during an organism's life (birth, growth, reproduction and death). Different classes of animals have different life cycles, the stages will vary from one species to another due to life history characteristics (reproductive methods, reproduction rates, number of offspring produced and parental care). As a species progresses through the different life stages they grow and develop in a habitat that meets their requirements to survive. Their needs include a food supply, protection and water. Throughout the stages of life, they may require more than one habitat type. Species develop physical and behavioural adaptations to improve their ability to survive in the conditions of the habitat in which they live in.

Marine turtles (reptiles) and humpback whales (mammals) are good examples of how life cycles, adaptations and habitat requirements can vary between species in the marine environment.

Quick facts

MARINE TURTLES	HUMPBACK WHALES
Reptile	Mammal
Ectothermic – cold blooded	Endothermic – warm blooded
Lay eggs	Give birth to live young
Number of offspring: 50-150 (depending on species)	**Number of offspring:** 1
Parental care: No	**Parental care:** Yes, young suckles from mother for about 11 months
Years to reach sexual maturity: 30-50	**Years to reach sexual maturity:** 4-8
Life span: about 80 years	**Life span:** up to at least 50 years
Has lungs: breathes air	**Has lungs:** breathes air
Habitat: Nesting – tropical and sub-tropical island and mainland beaches Hatchlings/juveniles – open ocean Foraging – coastal waters Breeding – coastal waters adjacent to nesting habitat	**Habitat:** Breeding – warm tropical waters (winter) Feeding – in rich nutrient waters of the Antarctic/Southern Ocean (summer)
Migrate between feeding, breeding and nesting grounds	Migrates between feeding and breeding grounds
Diet: varies between species and stage of life Hatchlings of all species: feed on zooplankton Adults: Greens – Seagrass Flatbacks – cucumber, jellies Hawksbills – sea sponges, soft corals, ascidians Loggerhead – molluscs and crustaceans	**Diet:** krill and small fish


Humpback whale


Hawkesbill turtle

Species vulnerabilities to pressures

Life history characteristics, adaptations and habitat preferences of marine turtles and humpback whales can make them vulnerable to pressures, including human disturbance, vessel movements, coastal developments and climate change. Understanding how species such as marine turtles and humpback whales interact with their habitats during their life stages and identifying pressures that can impact on their survival is essential for working out what management actions will adequately protect the species and habitat critical for their survival.

Teacher directions:

1. As a class, list the different classes of animals (mammals, reptiles, birds, fish, amphibians). Ask the students to identify the differences between them and what they have in common. (Mammals give birth to live young, reptiles are cold blooded, mammals have hair or fur at some stage during their life cycle.)
2. Ask the class to explain what a life cycle is. Brainstorm the different stages of a life cycle. Identify and compare the different stages of mammals and reptiles. Give the students Activity sheet 2.1 and ask them to complete it individually, in groups or as a class.
3. Ask the class to look at the life cycles in Activity sheet 2.1 and brainstorm the different habitats that each species will use during the different life stages. Use different tools such as books, the internet and posters to investigate why species may use different habitats during their life.
4. Give students Activity sheet 2.2 to complete.
5. Discuss with the class the meaning of adaptation. Brainstorm the different adaptions of different marine animals and how those enable them to survive in their environment. Using marine turtles and whales as an example give the students Activity sheet 2.3 and ask them to create a Venn diagram showing the physical and behavioural adaptations. Once completed discuss the answers.
6. As a class, make a list of threats that can impact on the survival of turtles and whales. What threats are naturally occurring or human induced? Do whales and turtles share the same pressures?

Resources:

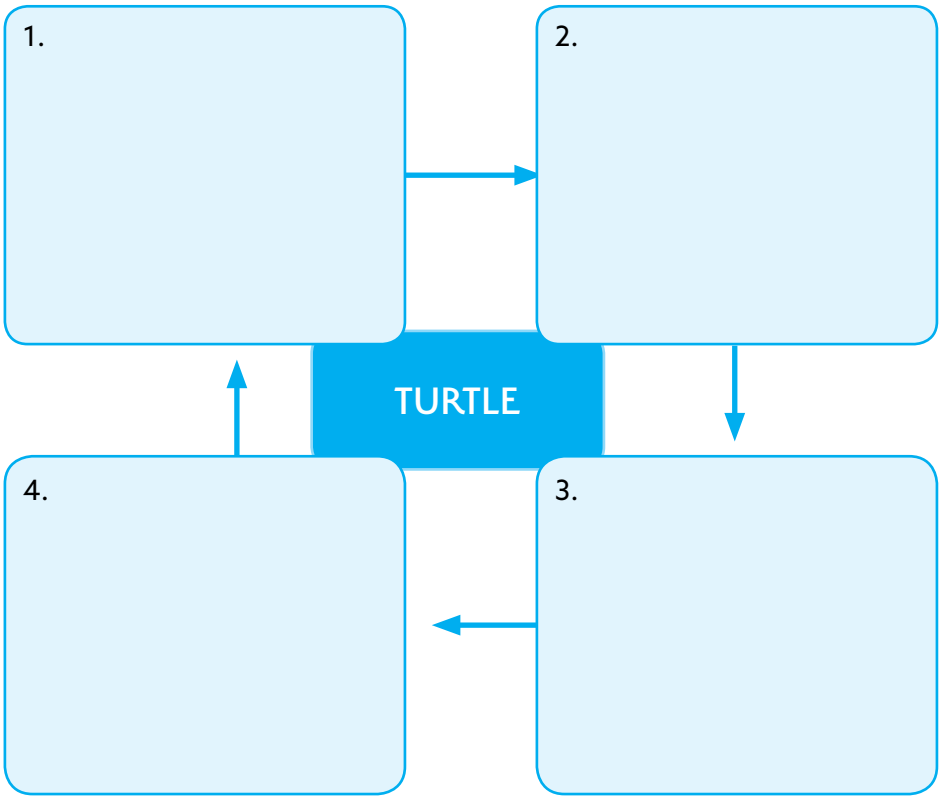
- Resource 1: Species profile Posters 1, 2
- Resource 2: Habitats Poster 5
- Resource 3: Pressures Posters 6

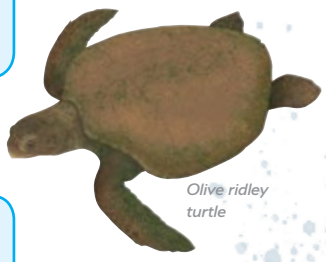
Additional resources:

- Marine wildlife of WA's north-west identification guide
  dpaw.wa.gov.au/images/documents/conservation-management/marine/20170303_marine_life_northwest_finalweb.pdf
- Marine turtles in Western Australia
  dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/turtles
- Humpback whales
  dpaw.wa.gov.au/management/marine/marine-parks-wa/fun-facts/422-humpback-whale

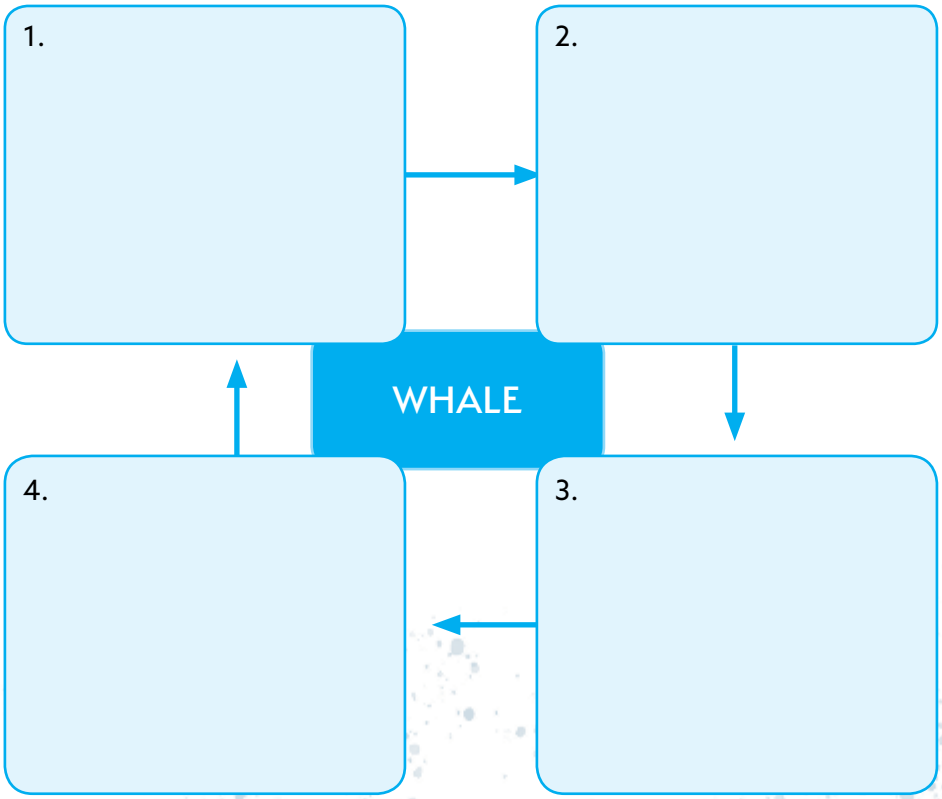
Activity sheet 2.1

Using the pictures below create the life cycles of a turtle and a whale.





Olive ridley turtle



Activity sheet 2.1

Using the pictures below create the life cycles of a turtle and a whale.

Eggs are laid

Rely on mum for food and protection

Drift along with currents

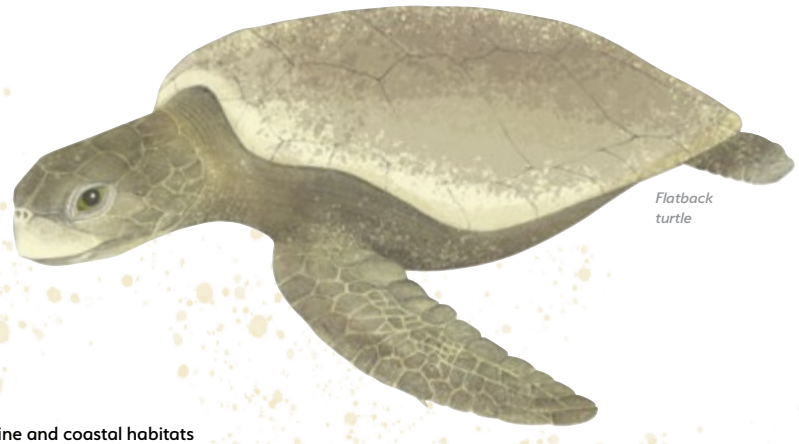
Migrate north to breed

Spend time in the coastal areas feeding

Weigh around 1 tonne

Start mating at 30- 50 years

Not fully mature



Flatback turtle

Activity sheet 2.2

Looking at the life cycle of both turtles and whales from Activity sheet 2.1 can you identify the different habitats that each species will need during their life cycle?

TURTLE		HUMPBACK WHALE	
Life stage	**Habitat**	**Life stage**	**Habitat**
1.		1.	
2.		2.	
3.		3.	
4.		4.	

1. Why do they use different habitats at different stages in their life?

2. What special physical or behavioural adaptation do they have to survive in that habitat?

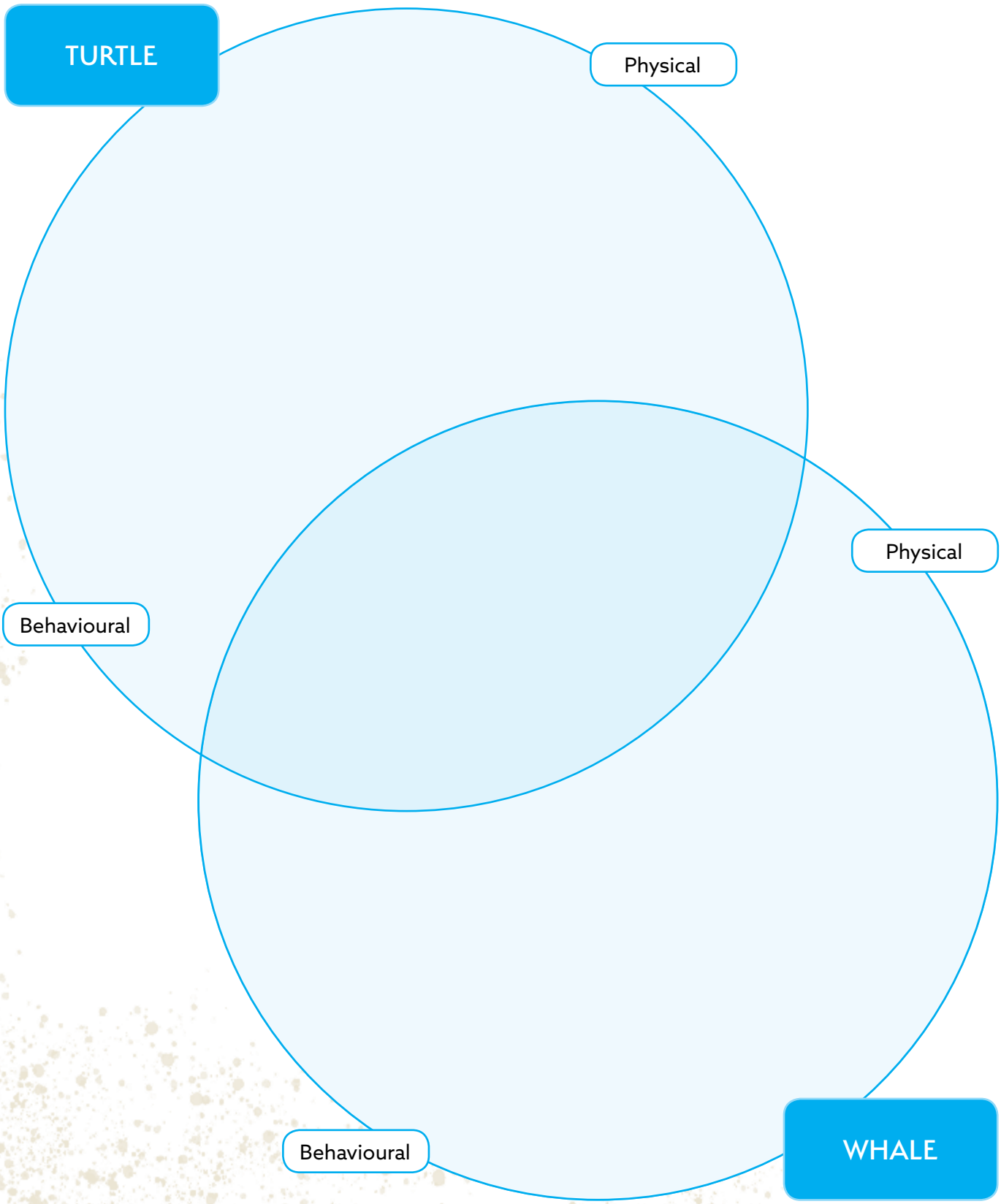
3. Could a whale and turtle live in the same habitats?

4. List a natural and an anthropogenic (human) pressure that each species may face during each stage of its life cycle.

5. Pick one anthropogenic (human) pressure and describe one action you can take to help reduce a pressure or remove it.

Activity sheet 2.3

Create a Venn diagram by listing as many physical and behavioural adaptions you can think of that help turtles and whales survive in their environment. Can you think of any they share?



Stage 3: Home sweet home

Concept:

- Students to consider what a habitat is and the basic requirements that make a habitat.
- Connectedness of species and habitats, why is this important.
- How humans play a role in the health of a habitat.

Student inquiry:

- What are the main components of a habitat?
- What types of habitats can be found along the Western Australian coastline?
- What are some of the most important habitats for threatened and migratory species? Why are they important? How do species interact in these habitats?
- How can the physical condition of the habitat change?
- How do human activities impact coastal and marine habitats?
- How can you and other members of the community help protect important habitat?

AUSTRALIAN CURRICULUM – SCIENCE		
Year 4	**Year 5**	**Year 6**
Living things depend on each other and the environment to survive. **(ACSSU073)**	Living things have structured features and adaptations that help them survive in their environment. **(ACSSU043)**	The growth and survival of living things are affected by physical conditions of their environment. **(ACSSU094)**

Top: Tent Island Nature Reserve. Photo – DBCA **Above left:** Green turtle at Ningaloo Marine Park. Photo – Johnny Gaskell
Above right: Wedge-tailed shearwater burrow. Photo – Carolyn Williams/DBCA

Background information for teachers

A healthy habitat provides plants and animals with the basic resources to survive and reproduce: food, water, shelter and space. Healthy, undisturbed habitats give species the best chance of survival by offering protection against extreme weather events, predators, disease and other threats.

Western Australia's coastline spans more than 13,500km from the cold temperate waters of the Southern Ocean to the northern tropical waters of the Kimberley and provides a vast array of habitats supporting a great diversity of life, including many threatened and migratory species. Islands, coral reefs, mangroves, seagrass meadows, sandy beaches, rocky shores, bays, estuaries and lagoons are among some of the essential habitats needed for survival by marine turtles, shorebirds, seabirds, whales, dolphins, dugongs and sawfish.

Many of these species require more than one habitat to carry out the functions of life: eat, rest and reproduce. A habitat can support many different species at various stages of life. The interconnectedness of species and habitats forms the basis of a functioning ecosystem.

Coastal and offshore habitats of Western Australia provide some of the healthiest intact habitats in the world for many threatened and migratory species. Sawfish are considered globally to be one of the most threatened marine fish and north-west Western Australia is believed to be the last stronghold of the green sawfish. Historically, the green sawfish had a significant distribution throughout the Indian and Pacific region, their range has now been reduced dramatically. Even in Australia, populations are no longer found in Victoria, New South Wales and southern Queensland. Recent research has identified pupping grounds in the Pilbara and this discovery gives us an opportunity to learn about how sawfish interact with their habitat and take action to protect important habitat. The world's largest remaining population of hawksbill turtles is found in Western Australia's coastal waters and humpback whale numbers have increased substantially making the Western Australian population one of the healthiest in the world. The eastern side of Exmouth Gulf, Barrow Islands, the Montebello Islands, Eighty Mile Beach and Roebuck Bay are internationally recognised Important Bird Areas because they support globally significant numbers of migratory shorebirds.

Coastal and marine habitats are not only highly valued for threatened and migratory species but also for the wellbeing of people. Looking after and protecting these habitats is essential. Natural events such as fires, cyclones and increased ocean temperatures, along with human activities such as coastal development, recreational activities, commercial and recreational fishing can change the environmental conditions and severely affect habitat health.

Above left: Shorebirds foraging on Simpson Island Nature Reserve. Photo – DBCA **Above right:** Turtle tracks on Locker Island Nature Reserve. Photo – DBCA

Teacher directions:

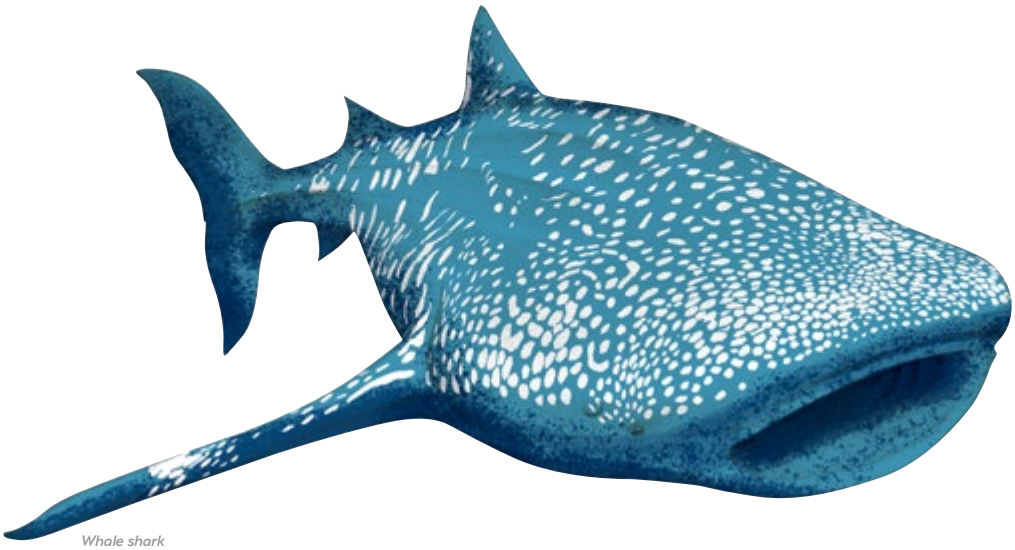
1. As a class, discuss what a habitat is and identify the main components. (Shelter, food, a place that allows reproduction etc.)
2. Brainstorm the different habitats that marine wildlife may need (beaches for nesting, seagrass beds for food supply, open ocean for hunting). Ask a series of questions to get the students thinking. Why are these habitats important? What would happen if they could no longer use that habitat?
3. Give students Activity sheet 3.1 to complete.
4. Have students discuss their answers with the class or a partner.
5. Ask the students to think about how more than one species live in the same habitat. Do they rely on the same food source? Is the habitat used at different stages of the species life cycle?
6. Discuss the concept that the physical condition of the environment can change due to natural and human causes. Ask students to list natural causes that may impact on a species (such as seasonal changes, extreme weather events, higher ocean temperatures) and human causes (such as coastal development, commercial and recreational fishing practices, recreational activities, pollution).
7. Give students Activity sheet 3.2. As individuals or groups, students investigate a threatened or migratory species found along the Western Australian coast and prepare a poster or presentation to educate others and raise awareness of threatened species and the pressures on them. Students will reflect on knowledge gained in Stages 1 and 2.

Resources:

- Resource 1: Species profile Posters 1, 2, 3, 4
- Resource 2: Habitats Poster 5
- Resource 3: Pressures Posters 6

Additional resources:

- **Marine wildlife of WA's north-west identification guide**
  dpaw.wa.gov.au/images/documents/conservation-management/marine/20170303_marine_life_northwest_finalweb.pdf
- **Shorebirds and seabirds of the Pilbara coast and islands**
  dpaw.wa.gov.au/images/documents/conservation-management/wetlands/20170167_pilbara_shorebirds_and_seabirds_of_the_pilbara_coast_and_islands_web.pdf



Whale shark

Activity sheet 3.1

1. Can you answer the following questions for the pictured habitats?
   a) Name a threatened or protected species that uses this habitat?
   b) What components of the habitat are important for that species?
   c) What can impact on these habitats?

			
Mangrove forest	Island	Open ocean	Intertidal flats
a	a	a	a
b	b	b	b
c	c	c	c
			
Sandy beaches	Estuary	Seagrass meadow	Coral reef
a	a	a	a
b	b	b	b
c	c	c	c


Dugong

Activity sheet 3.2

Investigate a threatened or protected species that can be found along the Western Australian coast and prepare a poster or presentation to educate others and raise awareness of threatened species and the pressures on them.

Use the questions below to help guide your research.

1. Species?

2. Conservation status?

3. What are this species' distinctive physical characteristics?

4. What are its habitat preferences? Does it have specific habitat requirements for different life cycle stages?

5. Does it prefer a certain climate?

6. What does it eat?

7. In Western Australia, where are you likely to see this species? Show this on a map.

8. Name at least one pressure that can affect this species in its habitat. Describe how it impacts the species.

Stage 4: Migratory species, a journey to survive

Concept:

- Students are introduced to the concept of migration.
- Many species need to migrate to reproduce, feed, rest, escape harsh climates.
- Migratory species face threats across their range.

Student inquiry:

- Why do species need to migrate?
- What species migrate to the Western Australian coastal and marine environments?
- What countries do migratory shorebirds visit during migration?
- What are some of the biggest threats that shorebirds face?
- How are shorebirds protected outside Australia?

AUSTRALIAN CURRICULUM – SCIENCE		
Year 4	**Year 5**	**Year 6**
Living things depend on each other and the environment to survive **(ACSSU073)**	Living things have structural features and adaptations that help them to survive in their environment **(ACSSU043)**	The growth and survival of living things are affected by physical conditions of their environment **(ACSSU094)**
AUSTRALIAN CURRICULUM – GEOGRAPHY		
The importance of environments to animals and people, and different views on how they can be protected **(ACHASSK088)**		The location of the major countries of the Asia region in relation to Australia and the geographical diversity within the region **(ACHASSK138)**

Background information for teachers

A survival tactic

Migration is an important survival strategy that many species undertake at different stages of life. It involves the movement of a large portion or the entire population of a species from one geographical area to another. The need for a species to migrate can be triggered by seasonal weather patterns, food supply and/or breeding habitat requirements. Some migrations may be small, others are journeys of epic distances crossing equatorial boundaries. Species that migrate at some stage during their life are classified as a migratory species. These species have evolved to take advantage of the availability of resources such as optimal habitat and food supply and to avoid seasonal climate changes they are not adapted for.

It sounds pretty good to always have the best habitat, food supply and climate however, it comes at a price. It takes a lot of energy to migrate and an ample food supply before leaving so individuals can store enough fat to fuel their journey. Predictable patterns and mass aggregations of species at sites makes them vulnerable to overharvesting by humans. Human disturbance, habitat loss as a result of coastal development, invasive species and pollution at important sites along the journey, or at the end destination, put migratory species at risk.

CASE STUDY

The travellers

Migratory shorebirds have some of the most impressive migrations of all animals. For some, the annual migration is close to 30,000km-return journey from the breeding grounds in the northern hemisphere to the feeding grounds in the southern hemisphere. Thirty-seven shorebird species regularly migrate to Australia.

They fly along the East Asian Australasian Flyway (EAAF). The EAAF is like a circuit of highways in the sky connecting breeding grounds and feeding grounds. Many birds need to stop along the way to rest and refuel, these areas are called staging sites. One of the most important staging sites for migratory shorebirds in the EAAF is the Yellow Sea, which is bordered by the coasts of China and the Korean Peninsula.

Teacher directions:

1. As a class, discuss the definition of migration, ask the students if they can list any species that migrate. Do any of them migrate to the Western Australian coast? Brainstorm different reasons why each species listed may migrate.

   In the list students may have identified different animal groups: mammal, birds, reptile etc. Ask the students if they know how each species group knows where to migrate. How do they learn? (For example mammals receive parental care and are taught the migration route, turtles are genetically programmed to return to their natal beaches (the beaches they were born), birds follow a flock.)

   Ask the class, do they think migration is risky for the species? Get them thinking about the different stress migration can have (for example it requires a lot of energy, need ample food supply before leaving, how weather can have an impact). Discuss how humans can impact their survival during migration (for example targeted hunting using predictable migration routes and times, habitat loss at important stopover sites or final destination, development causing disruption in migration routes, harvesting of prey species and disturbance).

2. In groups or as individuals give students Activity sheet 4.1 to complete. This may require students to do an internet search or use provided resources. Use prior knowledge gained from Stages 1-3 to assist in completing the questions.

3. Provide students with the Migratory shorebird poster and/or page 1-5 of the Shorebirds and seabirds of the Pilbara coast and islands. Read 'The travellers' paragraph from the teacher notes to the students. Discuss with the students the reasons for migration (for example birds are not adapted for extreme cold weather). Ask the students to think about how the birds make the journey? What is needed to make the distance? What route do they take?

4. Give students Activity sheet 4.2 to complete.

5. Discuss with the class the different countries that shorebirds visit during their migration journey and if there is protection for them in these countries. Brainstorm/investigate a list of organisations or conservation projects that work towards their protection (for example Birdlife Australia, governments working together using international agreements – Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA) and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)).

6. As a class, work together and create your own flock to raise awareness of shorebirds in your local area. Investigate which is your nearest wetland habitat where shorebirds rest and refuel. If there are none close by focus on the importance of Western Australia's wetland and coastal habitat. This activity can be completed at any time or be planned to coincide with World Migratory Bird Days on the second Saturday in May and October or the arrival (September – November) or departure times (March – May) of migratory shorebirds.

Resources:

- Resource 1: Species profile – Poster 4
- **Shorebirds and seabirds of the Pilbara coast and islands**
  dpaw.wa.gov.au/images/documents/conservation-management/wetlands/20170167_pilbara_shorebirds_and_seabirds_of_the_pilbara_coast_and_islands_web.pdf

Top left: Roseate terns nesting on Stewart Island. Photo – Carolyn Williams/DBCA **Top right**: Caspian, crested and lesser crested terns. Photo – Grant Griffin/DBCA **Above:** Migratory shorebird roosting. Photo – Felicity Kelly/DBCA

Activity sheet 4.1 Create a threatened species calendar

Using the pictures below make a calendar of when and where you would find these species along the Western Australian coast.

1. Name the habitat and location where you can find them
2. What stage of their life cycle are they at? Or what is the reason for migrating to that location
3. What pressures can have an impact on them at this location?

January	February	March
April	May	June
July	August	September
October	November	December


Humpback whale


Dugong


Australian humpback dolphin


Green turtle hatchlings


Turtle's mating


Whale shark


Turtle laying eggs


Shorebirds feeding


White-bellied sea-eagle


Wedge-tailed shearwater in burrow


Fariy tern

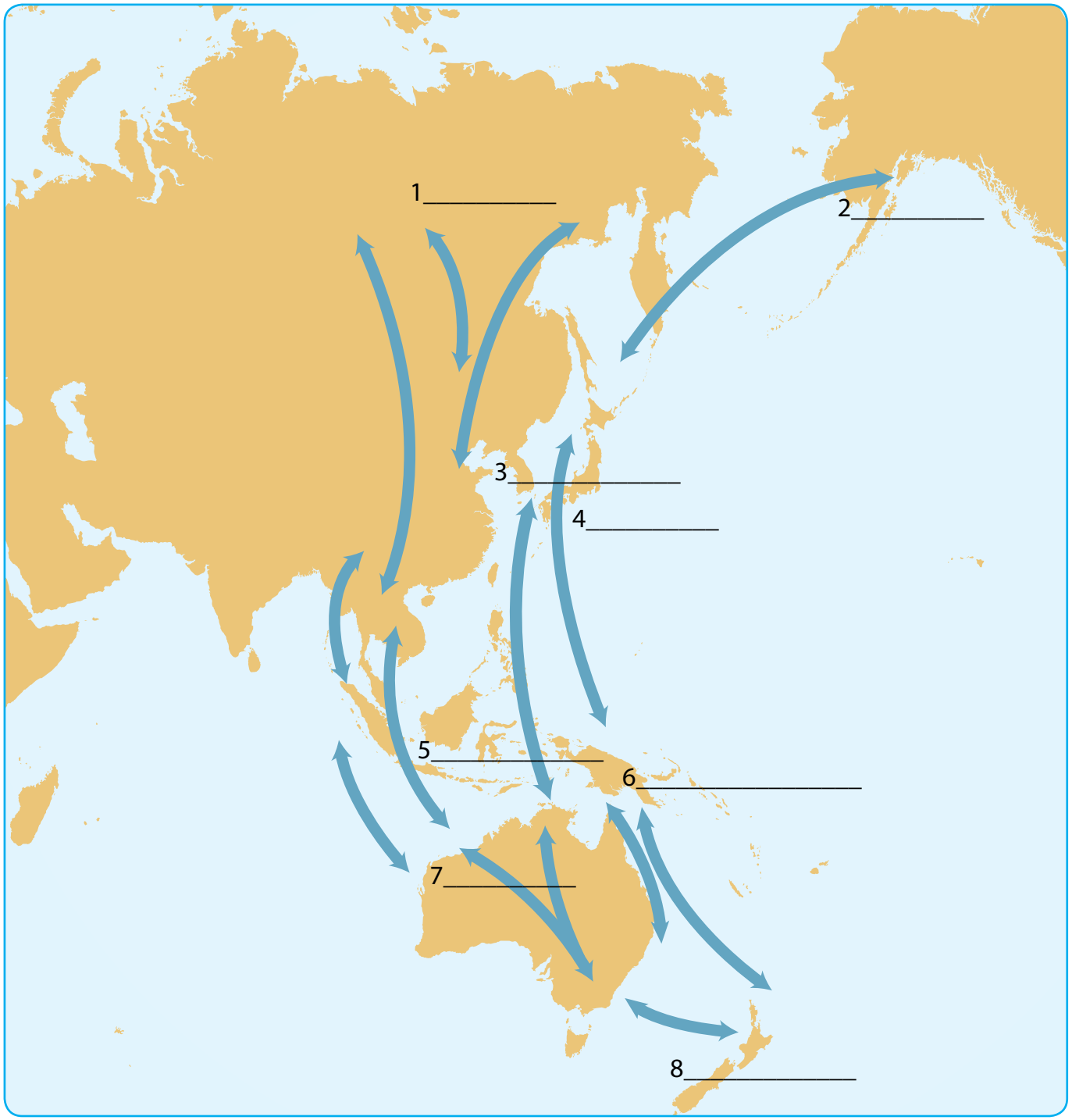

Green sawfish

Activity sheet 4.2

Investigate the migration route of shorebirds in the East Asian Australasian Flyway.

1. Look at the map below: can you label the countries where shorebirds stop along the way?
2. How far do they travel?
3. Why do they need to stop?

East Asian-Australasian Flyway



Activity sheet 4.3 Create your own flock

(adapted from Pukorokoro Miranda Shorebird Centre education resource)

Celebrate the arrival or departure of shorebirds by creating your own flock in the classroom.

Shorebirds, also known as waders, may utilise wetland habitats that are not on the coast, even if you live inland you may have some species living near you.

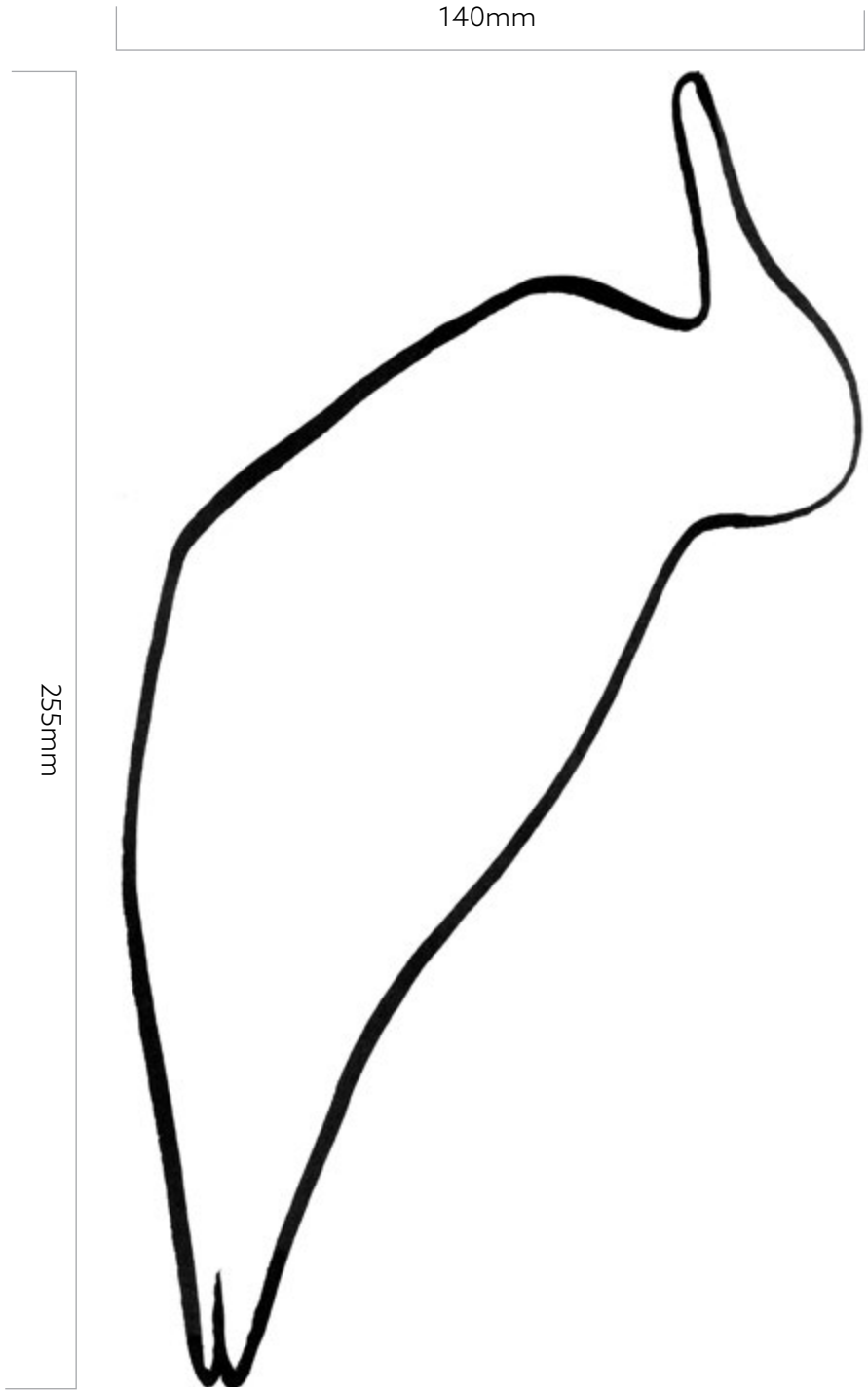
1. Each student picks one of the attached bird templates and then designs it to their liking.
2. Put your flock on display at school, in the community and send a picture into the local paper to help raise awareness of the migratory shorebirds.

Example of a created flock of shorebirds

Above: Flock Oz – Broome. Photo – Kandy Curran, Roebuck Bay Working Group courtesy of Grace Maglio/Flock Oz Broome.

Templates: Great knot and Bar-tailed Godwit

To enlarge these bird templates to full size, set photocopier to enlarge from A4 to A3 or enlarge to 140%.

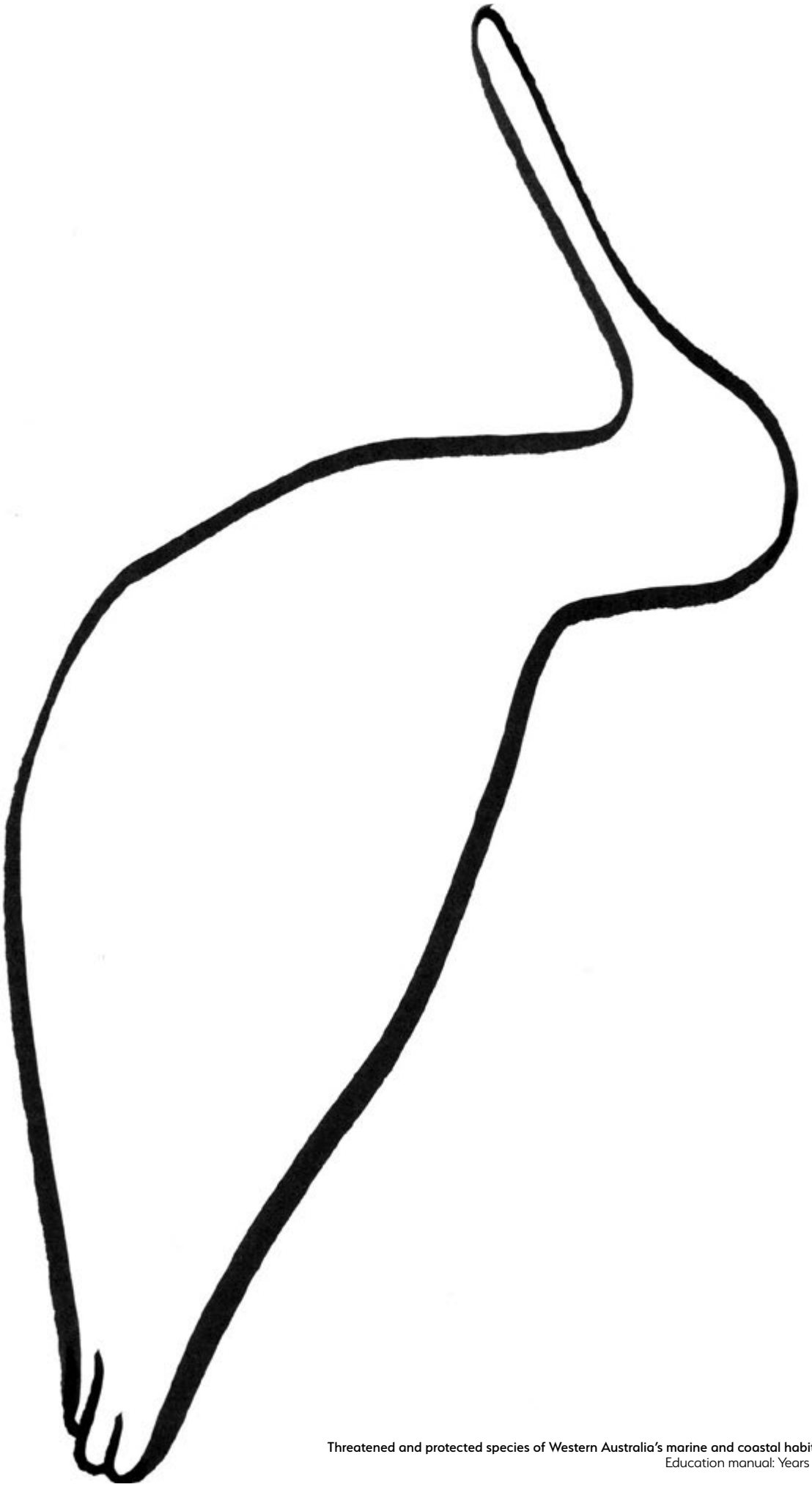


Great knot

Bar-tailed godwit

205mm

380mm



Stage 5: Protecting habitat

Concepts:

- Students will gain an understanding of habitat protection, and why it is needed.
- Investigate island habitats, why is protection of these places so important and how can this be achieved.

Student inquiry:

- What is habitat protection?
- What natural values need protecting?
- Who is responsible for protecting threatened species habitat in Western Australia?
- Why are islands so important?
- What protection measures can help protect important habitat?

AUSTRALIAN CURRICULUM – SCIENCE		
Year 4	**Year 5**	**Year 6**
Living things depend on each other and the environment to survive **(ACSSU073)**	Living things have structural features and adaptations that help them to survive in their environment **(ACSSU043)**	The growth and survival of living things are affected by physical conditions of their environment **(ACSSU094)**
AUSTRALIAN CURRICULUM – GEOGRAPHY		
Year 4	**Year 5**	**Year 6**
The importance of environments to animals and people, and different views on how they can be protected **(ACHASSK088)**	The way people alter the environmental characteristics of Australian places (e.g. vegetation clearance, fencing, urban development, drainage, irrigation, farming, forest plantations, mining) **(ACHASSK112)**	

Above left: Muiron Islands. Photo – DBCA **Above right:** Osprey nest. Photo – Carolyn Williams/DBCA

WA marine parks and reserves

Background information for teachers

What are protected areas?

Terrestrial and marine protected areas are vital as they provide protection of habitat essential for the survival of native flora and fauna, particularly threatened and migratory species.

In Western Australia, more than 31-million hectares of terrestrial and marine environments are protected through a system of national parks, marine parks, nature reserves and state forests. The Department of Biodiversity, Conservation and Attractions is responsible for managing these parks and reserves in accordance with the *Conservation and Land Management Act 1984*. These protected areas are managed to reduce threats such as feral animals, weeds, disturbance to species and habitat while maintaining access for scientific research and support social, recreational, cultural and spiritual values.

Why do islands need protection?

Western Australia has more than 3500 islands off its coast, more than any other state or territory in Australia. More than a third of Australia's critically endangered and endangered species rely on these islands for all or part of their life. They provide refuge for a number of small mammals that have been lost from the mainland. Islands also offer breeding, resting and foraging habitats for marine turtles, shorebirds, seabirds and seals. For these reasons many Western Australian islands are nature reserves, conservation parks or national parks.

Islands are highly valued as they provide habitat free from many of the pressures and types of disturbance found on the mainland including:

- Non-indigenous fauna species (foxes, cats, black rats, house mice, cane toads)
- Non-indigenous flora species (buffel grass and kapok bush)
- Minimal human disturbance from recreation, development, light pollution.

Above left: Sunday Island. Photo – DBCA **Above right:** Fairy tern. Photo - Grant Griffin/DBCA

Teacher direction:

1. Ask students to describe what they think a protected habitat is? Discuss what national parks, marine parks and nature reserves are. What are their benefits? (Conservation of flora and fauna, social, recreational, cultural, spiritual and health and wellbeing.) As a class investigate which is your closest national park, marine park or nature reserve. What threatened or migratory species are found there? What activities can you do there?
2. Read to the class the background information for teachers explaining protected areas and how they are managed.
3. As a class, discuss what an island or islet is? What are some of its key features? (For example isolated by water, small sandy beaches, rocky shores.)
4. Show the students the map of Western Australia's marine parks and reserves. Point out the area where the Pilbara islands are. Ask the students to describe to you what they may look like? What sort of climate do they have? What species might use these islands?
5. Ask students if they think islands are important habitats? Why/why not? What is different on uninhabited islands compared to the mainland? (Infrastructure, lights, cars, humans etc.) As a class brainstorm and list what can impact the islands ecosystem. Are they natural or human impacts? What would be the consequence of these impacts? Discuss what solutions could be used to minimise these impacts?
6. Provide the students with Activity sheet 5.1 and work in small groups to complete.
7. Have the student present their plans to the class. Discuss the different outcomes.
8. What values were protected?

Resources:

- Resource 1: Species profile – Posters 1, 2, 3, 4
- Resource 2: Habitats – Poster 5
- Resource 3: Pressures – Poster 6

Additional resources:

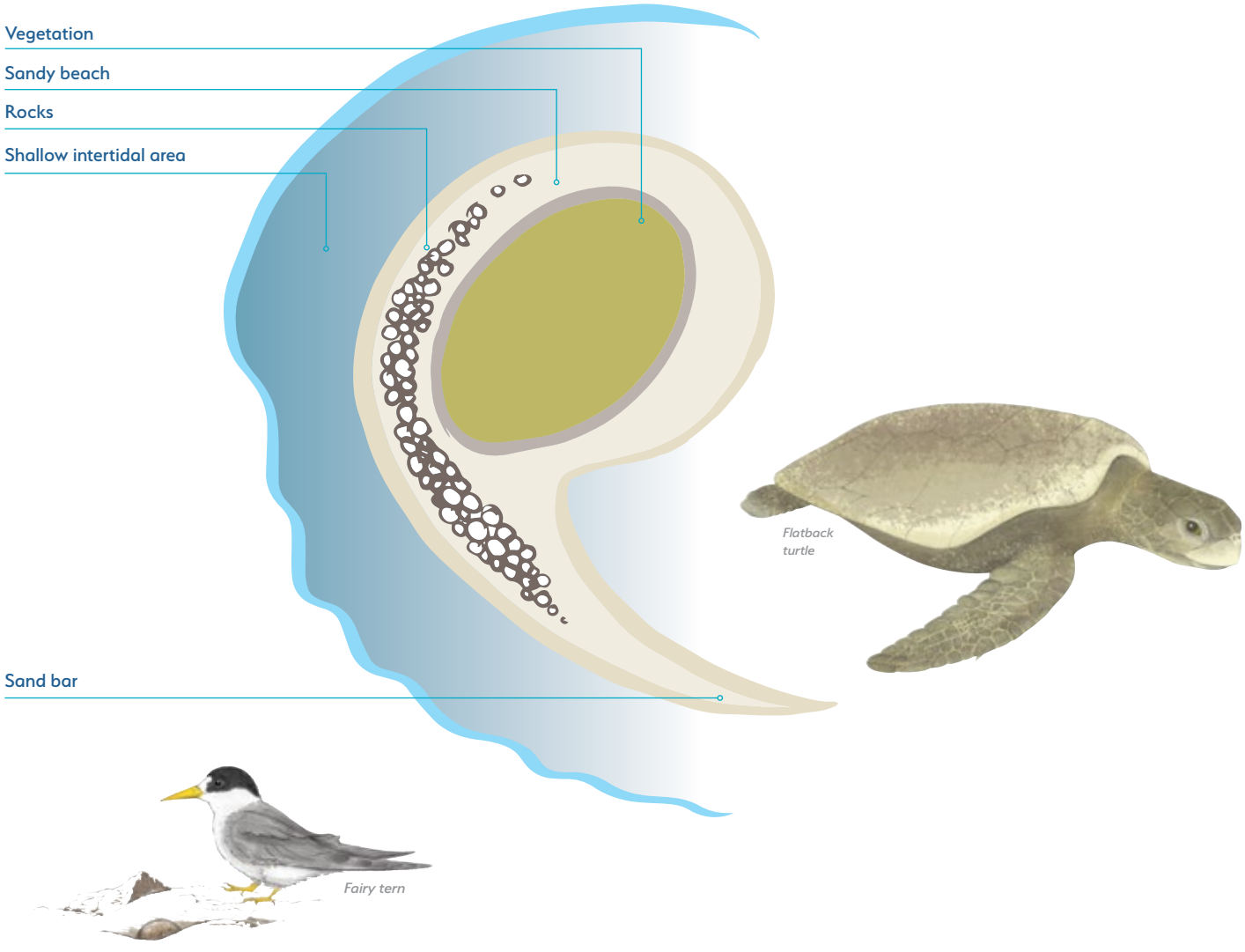
- **Pilbara inshore island nature reserves**
  parks.dpaw.wa.gov.au/park/pilbara-inshore-islands
- **Montebello Islands Marine Park**
  parks.dpaw.wa.gov.au/park/montebello-islands
- **Dirk Hartog Island National Park**
  parks.dpaw.wa.gov.au/park/dirk-hartog-island

Activity sheet 5.1: Protecting island habitat

It has been discovered that Seabird Island has important natural and social values. How can you protect this island to ensure it remains a healthy habitat for nesting turtles and nesting, foraging and roosting shorebirds and seabirds as well as a place where future generations can enjoy nature?

Look at the map of Seabird island, using what is known about the island (key below) can you come up with a plan that will help protect important habitat and also allow people to also enjoy it.

- Flatback and green turtles nest on the islands from October to April each year.
- Wedge-tailed shearwaters nest in burrows in the vegetated section of the islands. They arrive in July, lay eggs in November, rear their young and depart in April.
- Fairy terns have been seen nesting on the island.
- Migratory and resident shorebirds including the ruddy turnstone and the red-capped plover are known to use the island.
- People have been seen camping on the island in January, March, July and late December. Campers use bright lights at night and have camp fires.
- Rope, bait bags, water bottles and food packaging has been seen washing up on the island.



The following questions will help guide your plan.

1. What are the main values of the island?

2. Is there a time of year that the island is vulnerable? Why?

3. Would people visiting the island be disruptive to wildlife?

4. What recreational activities would have the most impact?

5. How could you manage this?

6. Does the entire island need protection?

7. Why?

8. Using the questions above design a habitat protection plan for the island.

Take Action

No matter where you live in Western Australia, even if far from the ocean you can play a part in protecting threatened species found in Western Australia's coastal and marine environments.

Take part in some of the following days and help raise awareness through your school or local community.

- National Threatened Species Day - 7 September
- World Migratory Bird Days – second Saturday in May and October
- World Turtle Day – 23 May
- World Sea Turtle Day – 16 June
- Schools Clean Up Day – 2 March
- Keep Australia Beautiful Week – August
- Aussie Backyard Bird Count - October

To find out more visit environment.gov.au/about-us/media-centre/events

Get involved in ongoing projects and programs

Get hands-on, find out what volunteering or citizen science projects are going on near you.

Ningaloo Turtle Program

Since 2002, the Ningaloo Turtle Program (NTP) in Exmouth has been monitoring beaches to better understand turtle nesting, threats to turtles and long-term trends in turtle populations along the Ningaloo coast. Information collected by NTP is invaluable in supporting DBCA in the effective management and conservation of these important turtle rookeries including feral animal control and managing areas sensitive to human disturbance. The flagship turtle program is a successful partnership between the Department of Biodiversity, Conservation and Attractions and the Cape Conservation Group. Each year NTP engages local, interstate and international volunteers to work together to help protect and conserve these iconic and wonderful marine animals and the complex marine ecosystems they call home.

To find out more visit ningalooturtles.org.au

West Pilbara Turtle Program

The West Pilbara Turtle Program (WPTP) brings together industry, government and the community to monitor marine turtle nesting and raise awareness of the importance of local beaches for turtle conservation. The program is a partnership between the Department of Biodiversity, Conservation and Attractions (DBCA) and Rio Tinto. Data collected by the program helps improve knowledge on local turtle nesting beaches near Wickham and assist the DBCA and Rio Tinto to reduce negative impacts on turtles in the area. The program can provide schools with incursions and excursions, and opportunities for students to participate in monitoring activities or turtle nesting tours.

To find out more visit dpaw.wa.gov.au/get-involved/volunteering-opportunities/196-west-pilbara-turtle-program

Keep Australia Beautiful

Keep Australia Beautiful engages with a wide range of stakeholders including schools, community groups, businesses and local government authorities to adopt positive attitudes and behaviours that will work towards making Western Australia litter free.

There are many ways your school can help, from the clean schools program to adopting a spot.

Find out more at kabc.wa.gov.au/get-involved

Dolphin Watch

Dolphin Watch is run in collaboration with the Department of Biodiversity, Conservation and Attractions, Curtin University and Murdoch University. Citizen scientists are trained in how to recognise individual dolphins, identify behaviours and record other information relating to the weather and tides.

A Dolphin Watch smartphone app exists to support recording and ensure quality of data entry. Researchers export data from the database and further quality assessment occurs prior to evaluation using the statistics package R and ArcGIS.

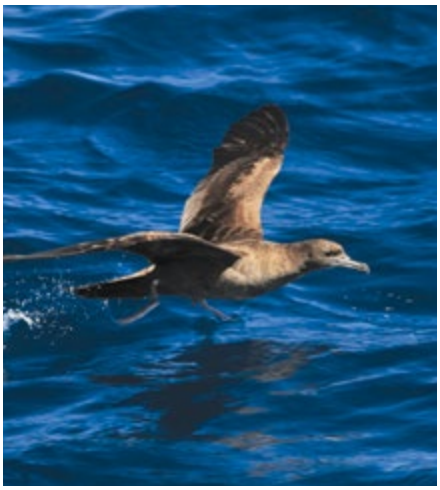
DBCA is currently working with various stakeholders to expand Dolphin Watch to other parts of the State. Version 3 of the Dolphin Watch app now enables users to record sightings of other species of dolphins found off Western Australia's coastline, including the snubfin dolphin, Australian humpback dolphin, spinner dolphin and false killer whale.

To find out more visit riverguardians.com/projects/dolphin-watch

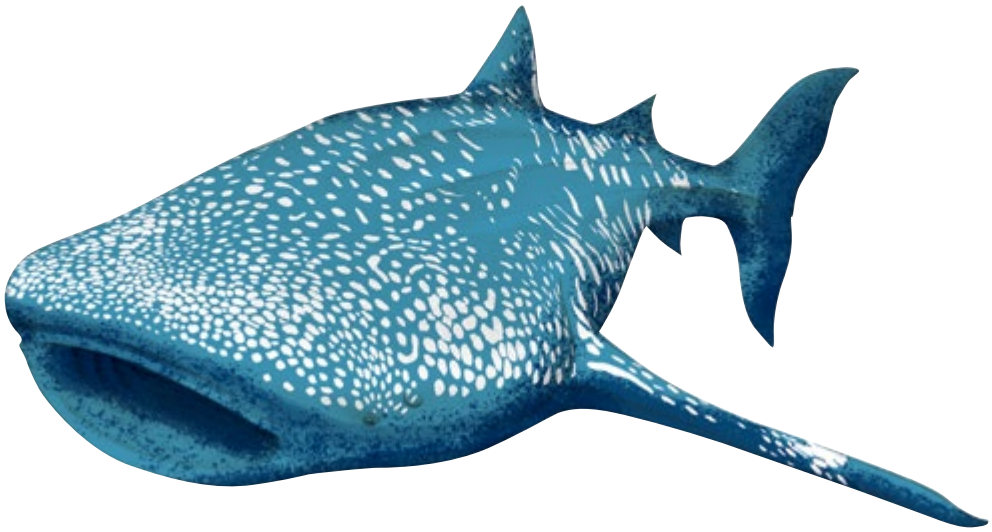
Birdlife Australia

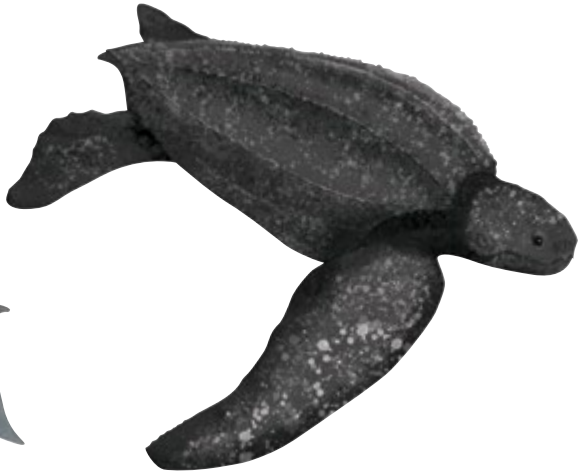
Birdlife Australia is a not-for-profit organisation that is devoted to the conservation of birdlife in Australia. With more than 30 projects active nationwide, birds of all habitats get Birdlife's attention. DBCA have been working with Birdlife's Shorebird 2020 Program to raise awareness of shorebirds in Western Australia and actively engage the community to participate in gathering information that will add to the conservation of shorebirds into the future.

To find out how your school can get involved visit birdlife.org.au/projects/shorebirds-2020



Top left: Indo-Pacific bottlenose dolphins. Photo – Holly Raudino/DBCA **Top right:** Wedge-tailed shearwater. Photo – Grant Griffin/DBCA
Above left: Great knot. Photo – Grant Griffin/DBCA **Above right:** Green turtle. Photo – Johnny Gaskell





GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

PARKS AND WILDLIFE SERVICE

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