



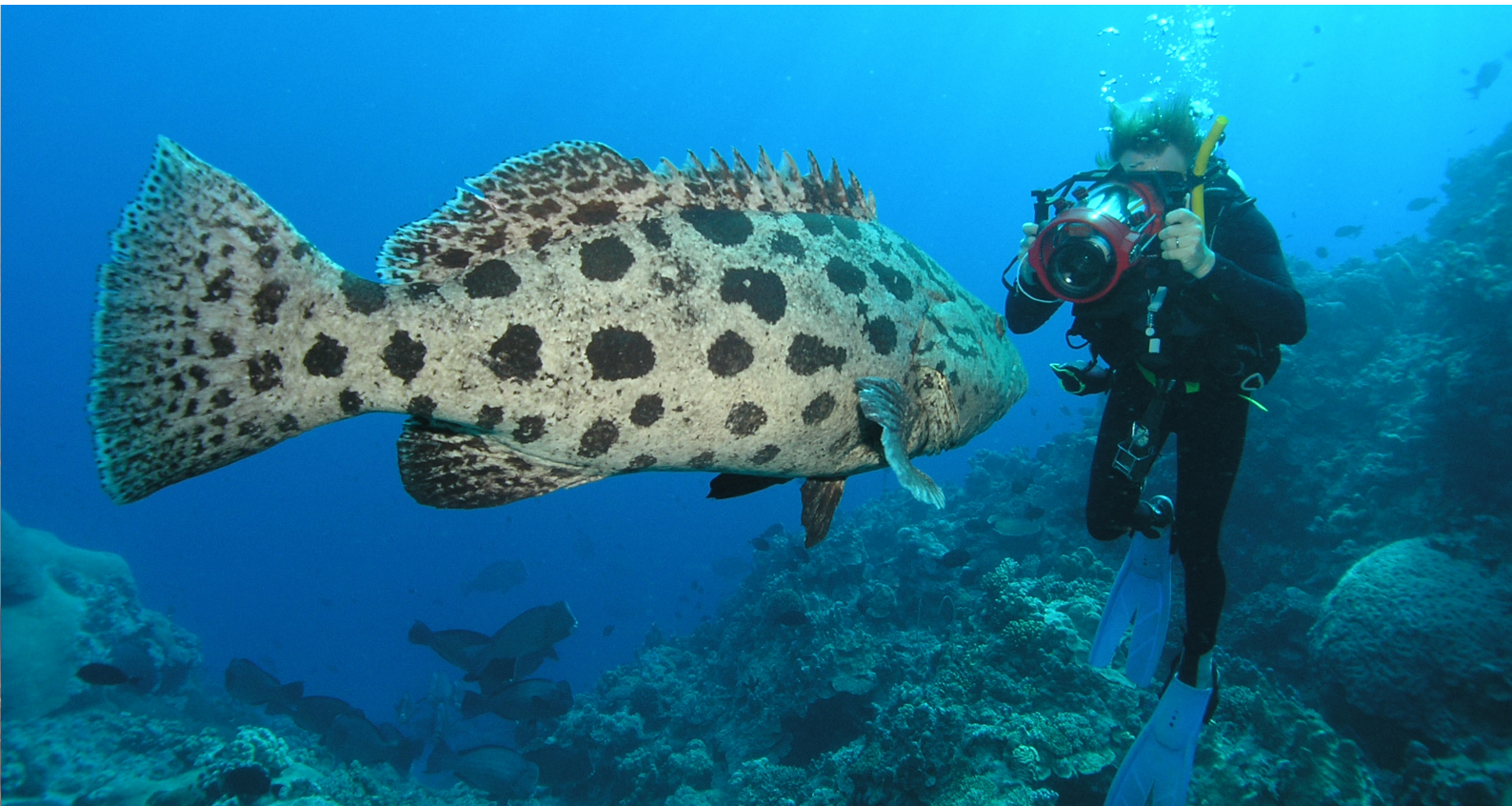
Department of **Parks and Wildlife**

Department of **Fisheries**

Kimberley Education Manuals

Series 2

Kimberley Marine Environment Years 1-3



Includes:

- curriculum-linked lesson plans
- project ideas and
- background information for Kimberley teachers.



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Lesson 1, 'Up high, down low', is from Marine WATERs Home Sweet Home lesson plan, Department of Fisheries, 2015. The original resource is available online: marinewaters.fish.wa.gov.au/resources/up-high-down-low/.

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Department of Parks and Wildlife
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Project leader:

Sally Johnston, Department of Parks and Wildlife

Project writers:

Sally Johnston, Department of Parks and Wildlife
Dylan Pross, Department of Fisheries
Sara McAllister, Department of Parks and Wildlife

Images:

Albatross with plastic in its stomach (p8), Keep Australia Beautiful Council WA
Potato cod (front cover), image by Eric Matson



Kimberley Science and Conservation Strategy

Six new marine parks are being established under the *Kimberley Science and Conservation Strategy*, the State Government’s \$103.6 million project to conserve the region’s natural and cultural values. This action more than triples the total area of the State’s marine parks and reserves from approximately 1.5 million hectares in 2008 to more than 5 million hectares once all new parks are complete. Jointly managed with traditional owners, Lalang-garram / Camden Sound and Eighty Mile Beach marine parks have already been created. Planning for four more marine parks under the strategy is underway to protect the natural and cultural values of the region, with proposed parks at Yawuru Nagulagun / Roebuck Bay in Broome, Lalang-garram / Horizontal Falls, North Lalang-garram, and the North Kimberley. The strategy further funds a number of marine research projects, providing new insights into the flora and fauna of this very remote coastal region, which will shape the management of these new marine parks.

To read more about other projects conserving the unique Kimberley environment, conducted under the strategy, visit www.dpaw.wa.gov.au/management/kimberley-strategy.



Top Turtle Reef **Above left** Turtle on Turtle Reef. Photos - Kimberley Media **Above right** Water sampling

Key messages

This resource series aims to introduce the topic of our local marine environment to Kimberley classrooms. Like most Western Australians, Kimberley people are passionate about the outdoors. With amazing beaches, hidden bays, coastal cliffs and coral reefs, it's not hard to see why. For those who don't live on the coast, many of these lessons can be adapted to suit freshwater places. Instead of using the beach as an example, you could talk about a local river, estuary or waterhole. The Kimberley marine environment is remarkably untouched, although as more and more people start to visit the spectacularly remote Kimberley coastline care must be taken to ensure threats such as pollution, overfishing and increased development are managed appropriately. These lessons focus on the variety of marine habitats found in the Kimberley, focusing on individual species and threats. An emphasis is placed on individual and community actions that contribute to ensuring our amazing Kimberley marine environment is preserved into the future.

The key questions we are examining through these activities at all year levels are:

- **What are marine habitats?**
- **How have animals adapted to different Kimberley marine habitats?**
- **How do marine parks protect our marine plants and animals?**
- **How can we fish for the future?**
- **What can we do to protect our Kimberley marine plants and animals, and their habitats?**

Introducing marine themes to your classroom

The following passage can be used to introduce the topic of the Kimberley marine environment to your class. You may also like to organise an excursion with the Fisheries or Parks and Wildlife education teams, or work towards participating in a community clean up or setting up a marine display at a community event once you have completed all the lessons (see p15-16).

Have you ever swum at the beach, stopped to watch the whales, or caught a big fish? Built a sandcastle, played beach cricket or volleyball, camped by the beach or a waterhole, or gone out on a boat? If you have, you are probably already familiar with the Kimberley marine environment.

When we talk about marine, we are talking about our beaches and oceans. If you don't live near the sea, don't worry, as we'll be talking about rivers and waterholes, too. Every wet season, rivers take thousands of litres of water out into our ocean around the Kimberley, so the lives of our freshwater and saltwater animals are connected. Some animals, such as barramundi and crocodiles, like to spend time in both places.

Not all parts of our marine environment are the same. We have sandy beaches where turtles nest, dense mangrove forests where mud crabs hide, seagrass beds that are home to dugongs, vast mudflats where shorebirds rest, estuaries where the river meets the sea, open ocean where whales play, and even coral reefs full of brightly coloured fish. Many of these habitats are protected as marine parks. Marine parks are like national parks for the ocean and coastline. They preserve these remarkable landscapes and ensure that all of our marine wildlife has a home for the future.

Our Kimberley marine environment really is an amazing place. We hope you enjoy learning about all the special plants and animals that call it home. Compared to the rest of the world, the Kimberley has some of the most well looked after ocean in the world. It's right up there with Antarctica in terms of how little impact people have had on it, and that's the way we'd like to keep it.

As more and more people start visiting and living in the Kimberley, looking after our marine environment becomes more complicated. We want to make sure there are enough fish for everyone, and their habitats are looked after as best we can. Following fishing rules and keeping our beaches and oceans clean is the best way to look after our marine wildlife. If we all work together to care for our marine environment, it's easy to make sure our animals' homes are looked after, and we will always have fish for the future.



Montgomery Reef in the Lalang-garram / Camden Sound Marine Park.

Series 2, Kimberley Marine Environment Years 1-3

This is the first of two teacher guides in the second series of Parks and Wildlife’s Kimberley educational manuals. Further series cover Kimberley biodiversity, cane toads, fire and introduced species. Each series comprises two teacher guides, offering sets of six curriculum-linked lesson plans for Years 1-3 and 4-6 in addition to background information and useful resources for educators. Printable worksheets and presentations to use in the classroom are available on the accompanying USB.

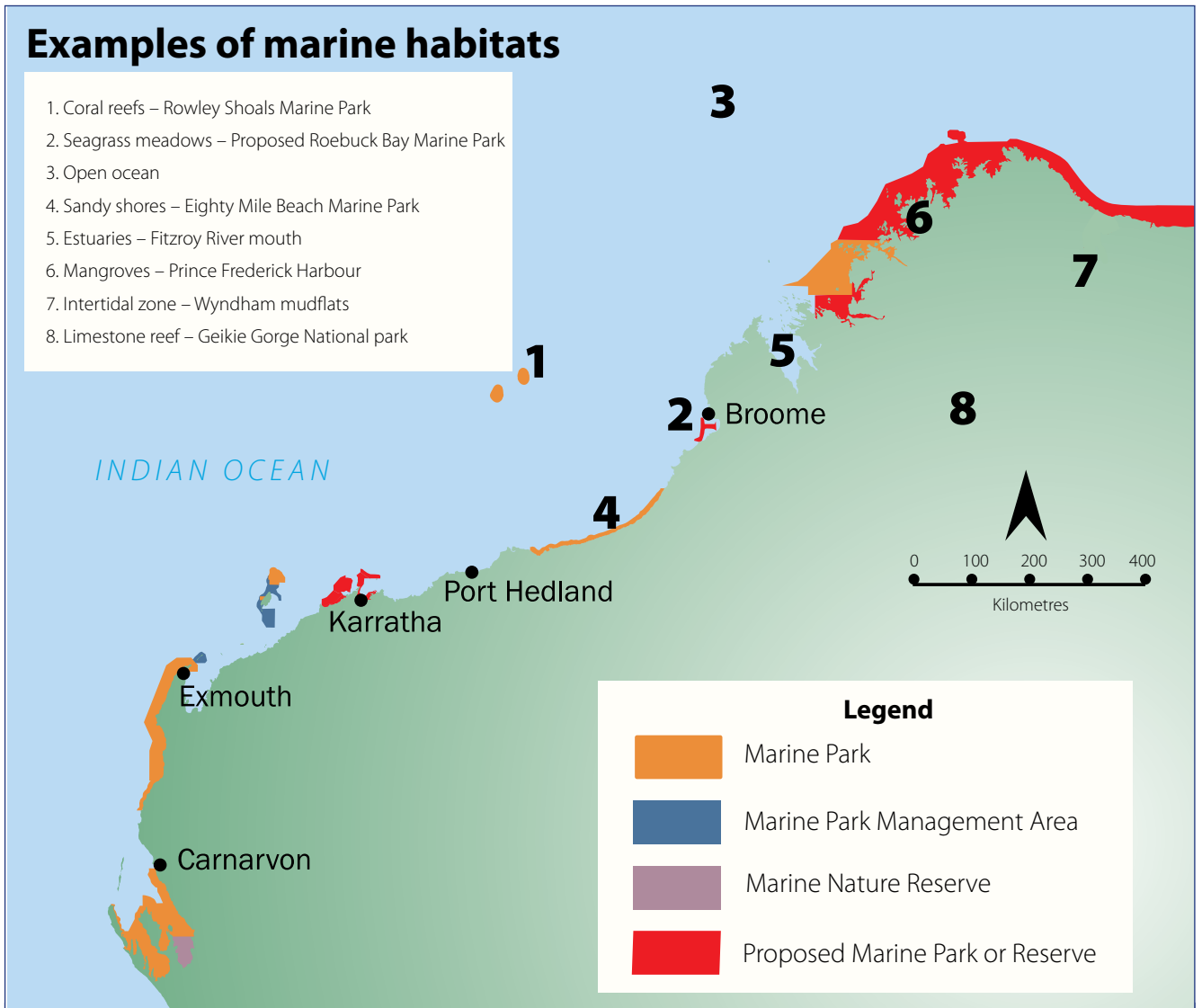
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Background information for teachers

The basics: marine habitats

Encompassing almost a third of the Western Australian coastline, the Kimberley features gulfs, headlands, cliff-lined shores, archipelagos, coral reefs, mangrove forests, tidal flats and the longest uninterrupted beach in Western Australia. Huge tides and a monsoonal climate make for ever-changing water conditions, for example reefs 10m deep underwater at high tide may be exposed for hours at low tide, and marine flora and fauna have had to adapt to the influx of freshwater and sediment from swollen wet season rivers.



Coral reefs

Corals reefs are living structures made up of colonies of tiny tubular animals called polyps. Only the surface of a coral reef is living coral; underneath are the skeletal remains of reef-building or hard corals. Corals are animals, not plants, and they belong to the class of organisms called Anthozoans. Coral polyps secrete a limestone skeletal case in which they live. This external skeleton supports and protects the soft body of the animal. Corals without this hard structure are called 'soft corals'. Coral colonies have distinctive structures and forms. Their common names, for example staghorn, branching and plate, often describe their shape. The atolls of the Rowley Shoals, sitting on the edge of the Australian continental shelf northwest of Broome, are pristine examples of WA's coral reefs.



Seagrass meadows

Around 60 species of seagrass exist worldwide. Australia is home to more than 30 species and Western Australia has the largest and most diverse seagrass meadows in the world. Western Australia’s dry climate and clear, nutrient-poor waters allow seagrasses to thrive.

Seagrasses are true flowering plants that can live underwater. Not to be confused with seaweeds (algae), seagrasses have leaves, roots, flowers, seeds and underground horizontal stems called rhizomes. They can range from the size of a fingernail to plants with leaves up to 7m long. Many individual plants live together to form extensive seagrass beds or ‘meadows’.



Animals such as dugongs and sea turtles feed directly on the plants themselves. Many other creatures, such as bacteria, worms and crabs, feed on the decomposing leaf litter (called detritus) that releases nutrients when it decomposes. Seagrass meadows provide shelter for marine animals. They offer protection from predators and provide breeding habitats and nursery areas for many fish and crustaceans, including whiting, tailor, flathead, prawns and crabs, and homes and food for dugongs and green turtles. The seagrass meadows of Roebuck Bay can be examined close up at low tide, and are regularly monitored by volunteers involved in Seagrass-Watch, the world’s largest seagrass assessment and monitoring program.

Limestone reefs

Limestone reefs are formed slowly from the remains of marine organisms such as coral and shells. Limestone easily erodes to create formations such as rockpools, caves and ledges. Macroalgae (seaweed) and seagrasses grow on and around the reef surfaces exposed to sunlight, while a colourful array of invertebrates such as sponges and sea squirts inhabit the shady parts. Many of the Kimberley’s iconic geological features, such as the stunning walls of Geikie Gorge, Tunnel Creek and Windjana Gorge in the central Kimberley, were once limestone reefs. Over time, as sea levels changed and watercourses developed, these historic reefs have been carved out to form the landscape we know today. If you look carefully when visiting these places, you can find fossilised remains from a time when these places were at the bottom of the ocean.



Intertidal zone

The intertidal zone lies between the high tide and low tide marks; intertidal zones may be rocky, limestone or granite reefs, sandy or mudflats. It is an area that is constantly changing as the water moves in and out with the tides. This area is colonised by a diverse mix of tough plants and animals that can survive the changes in exposure to water, sunlight and wind that characterise this habitat. With famously high tides, the Kimberley is an excellent place to study the intertidal zone and the creatures that inhabit it, but make sure you’re on the lookout for crocodiles if you’re near the water’s edge.



Mangroves

In 2010, there were 15.6 million hectares of mangroves worldwide. The total mangrove area in Australia is over 1 million hectares. Mangroves grow along sheltered shores and are more plentiful in the warm tropical regions in the north of Australia. In Western Australia, mangroves are most common in the Kimberley and Pilbara regions. In many parts of the world, large tracts of mangroves have been cleared for development, decimating this key marine habitat.

Mangroves are land plants that can live in salt water. They have adapted to live in the intertidal environment, where the mud is regularly flooded, low in oxygen and high in salt. They have developed various mechanisms to cope with the problem of excess salt, including filtering it out through their roots, excreting it through special salt glands in the leaves, and depositing the salt in older leaves and bark which then drop from the tree.



Mangroves protect the coastline by creating a buffer from storms and reducing erosion. They slow down currents and encourage an accumulation of mud and sediment that harbours an abundance of invertebrate life.

Mangroves are also an important nursery area for many marine animals, such as barramundi. Many species of fish spend at least part of their life in mangrove communities. It's not hard to find mangroves in the Kimberley; just about any coastal creek and much of our coastline hosts a healthy mangrove population. They can even be found on Town Beach in Broome.

Open ocean

Over 70 per cent of the Earth's surface is ocean but little is known about life in the open ocean. It is the largest aquatic habitat, allowing marine organisms to move from one habitat or area to another. Microscopic plants and animals called plankton, which drift with ocean currents, inhabit the surface layers of open waters. The open ocean of the Kimberley is still largely unexplored, although the results of a series of surveys in recent years have started to build our understanding of this rarely studied environment.



Sandy shores

Although it may appear to be a barren landscape, the seabed is teeming with tiny animals that burrow into the soft sand. These organisms filter food particles from the water column or obtain them from sediments. Some larger animals (such as crabs) survive here by burrowing into the sediment to hide during the day and emerging at night to feed. Eighty Mile Beach, south of Broome, is the longest uninterrupted sandy beach in Western Australia, at 220km long.



Estuaries

Estuaries are the meeting place of saltwater and freshwater. The sheltered waters, abundance of food, and lack of large predatory fish provide a vital habitat for many fish species, for some or all of their life cycle. Some fish such as barramundi are migratory species that pass through an estuary on their way to the sea. Others enter for a short period to feed when conditions are favourable. Some species live permanently in the estuary system and are able to tolerate the changing salinities.



Estuaries that are permanently open or seasonally opened for long periods by heavy wet season rains tend to have a higher diversity of fish. This is because a large variety of marine fish can swim easily into the estuary.

Environmental changes can place significant pressure on estuarine fish. Across Western Australia, estuaries are at risk of loss of vegetation, increased salinity arising from catchment clearing, acid sulphate soils, and increased pesticide, herbicide and fertiliser runoff. These all badly affect estuary health and fish abundance.

The lower reaches of most major Kimberley river systems, such as the Ord, Pentecost and Fitzroy are estuarine in nature, with seasonal variations in the output of freshwater and even daily changes in salinity and water level due to the tidal influx and efflux of seawater.

A history of the Kimberley marine environment

Three hundred and fifty million years ago, during the Devonian period, much of what is now the Kimberley mainland was underwater. A tropical sea filled the Canning and Bonaparte basins, and a barrier reef stretched more than 1000km around the coastline, the remains of which are visible as the Ningbing Range north of Kununurra, the cave systems of Mimbi Caves and Tunnel Creek, Geikie and Windjana gorges, right through to the rugged limestone hills running parallel to the King Leopold Ranges in the west Kimberley. Fossil sponges, fish, corals, snails, bivalves and stromatolites have been found in the ancient limestone reef system, including Western Australia's fossil emblem, the Gogo fish (*Mcnamaraspis kaprios*).

The Kimberley coastline as we know it today, with its rugged bluffs, sculpted gorges and numerous archipelagos, was formed approximately 17,000 years ago at the end of the last ice age as the ocean flooded into the system of hills and river valleys as part of a global rise in sea levels. This kind of drowned river valley is called a ria coast. The Kimberley ria coastline is globally unique in the extensiveness and variety of landforms exhibited in a tropical environment with such extreme tidal patterns.

Aboriginal people have a connection with Kimberley waters that dates back at least 40,000 years. There are hundreds of archaeologically significant marine sites (such as shell middens and fish traps) scattered all along the coastline, and the ocean remains prominent in oral traditions and spiritual activities. Today, traditional owners and Indigenous ranger groups work in partnership with Parks and Wildlife and Fisheries to manage the Kimberley marine environment and conserve these culturally significant places and species for future generations.

Northern Australia was visited regularly by fishermen and traders from neighbouring countries long before Europeans visited the continent. Of the more recent visitors, the Makassans, from the island of Sulawesi in what is now Indonesia, visited seasonally from the mid seventeenth century up until the early twentieth century. Arriving before the onset of the wet season, with equipment to set up semi-permanent camps including smokehouses, the Makassans stayed throughout the wet season collecting and smoking trepang, a kind of sea cucumber, which was a highly prized trade item throughout Asia. Evidence of buildings, metal cauldrons and other archaeological items has been discovered right across the top end, including at sites near Kalumburu and Yampi Sound.

Following the discovery of the world's largest pearl oyster shell in Roebuck Bay in 1861, pearlers from around the globe arrived in the Kimberley *en masse* seeking their fortunes. Today's pearlers continue to operate along the Northwest coastline between Broome and Darwin, and pearling remains a major contributor to the Kimberley economy, behind mining, tourism, retail and agriculture. The onset of the pearling wave roughly coincided with the Halls Creek gold rush, increased 'opening up' of the Kimberley's interior for pastoralism, and the arrival of missionaries to the region, all of which contributed to the displacement of the Kimberley's Aboriginal population from their traditional lands and lifestyles.

Conservation values

The Kimberley marine environment is listed among only 3.7 per cent of the world's oceans which have had a very low impact from human activities, alongside the Arctic and Antarctic polar regions. As both commercial and recreational human usage increases across the region, the need for carefully considered management strategies becomes more important.

Lalang-garram / Camden Sound Marine Park, south of the Bonaparte Archipelago, protects the largest humpback whale nursery in the southern hemisphere, with more than 1000 humpbacks using the sound each year to



The Gogo fish, fossil emblem of Western Australia.

breed, calve and nurse their young. The Kimberley also has important populations of manta rays, dugongs and all six species of threatened marine turtle found in Australia. Roebuck Bay lays claim to having the largest known population of snubfin dolphins, only recently known to scientists and found only in Australia.

The Kimberley's fringing coral reefs may be more extensive and diverse than those of Ningaloo Marine Park, but scientists are only just discovering them. Montgomery Reef, in Lalang-garram / Camden Sound Marine Park, is a particularly outstanding, biologically diverse coral reef covering around 30,000ha.

The Kimberley contains two of only a dozen areas in the world with huge intertidal flats rich in shorebirds. The Proposed Yawru Nagulagun / Roebuck Bay and recently established Eighty Mile Beach marine parks are summer refuges to hundreds of thousands of internationally protected migratory waders that fly from as far afield as Siberia.

Some of the largest mangrove patches in Australia, considered among the most pristine mangrove forests in the world, fringe the Kimberley coast, with a total area of 140,000ha. Stands comprise up to 18 tree species and their fauna is rich and distinctive.

There are more than 2500 islands off the Kimberley coast, spectacularly beautiful places with plunging sea cliffs, tropical vegetation and secluded beaches. Most importantly, these islands are reservoirs of wildlife and ecological communities, many of which have disappeared or are under threat on similar areas of the mainland. This is because the islands have mostly been spared from recent disturbances such as feral cats, cattle and inappropriate fire regimes. The number of islands and their isolation has resulted in tremendous natural diversity. Just as in the Galapagos Islands, the Kimberley islands are a drawcard for the study of evolution. Unlike other parts of Western Australia, at present few islands in the Kimberley are reserved for conservation due to their remoteness.

Conservation challenges and sustainability

A combination of the historic inaccessibility of the Kimberley marine environment and the high costs associated with conducting research in the region, along with relatively low commercial and recreational use of the area, has meant that until recently the ecological value of the region had not been fully quantified. Comprehensive marine and biological surveys of Kimberley islands, conducted in 2006-13, have provided new insights that will shape future management strategies to preserve this unique environment while balancing the interests of commercial and recreational users.

Increased use and accessibility must be carefully balanced to prevent possible pollution, overfishing and the destruction of cultural and historic sites. The importance of living in a sustainable manner and adhering to rules that help us to manage marine populations of fauna is a vital part of modern society.

Marine debris

One of the greatest threats to the world's oceans is marine debris, that is, rubbish found in the ocean. The bulk of marine debris is non-biodegradable plastic, which spreads by travelling on ocean currents. The majority of this rubbish originates from land-based sources, such as beach users, stormwater drains, sewage outlets and windblown litter from adjacent urban areas and landfill sites. A small proportion of marine debris originates from recreational and commercial fishing vessels, tourist vessels and marine related industries, such as mining and shipping. Marine debris is hazardous to ships, swimmers, divers, beach users and marine life, and can remain in the marine environment for many years. In its original form, marine debris affects marine life directly through entanglement, ingestion and smothering the sea floor. As it breaks up into smaller pieces, plastic is mistaken for food by different organisms to the extent that it can affect entire ocean food chains.



Albatross with plastic in its stomach.

Erosion and climate

Inshore reefs are adversely affected by the influx of soil each wet season, an issue exacerbated by inappropriate fire regimes and the management of livestock, which contribute towards erosion in catchment areas and subsequently increase the amount of sediment in the river systems. Future changes in storm patterns attributed to climate change may further compound the issue. While Kimberley coral species are highly adapted to cope with regular exposure to sunlight and high air temperature at low tide, they are still susceptible to coral bleaching caused by a rise in sea temperature.

Industry

Historically, industries such as pearling, aquaculture, marine tourism and mining have only been conducted on a small scale, and as such site selection and planning for these activities has been done on a case by case basis. As industries grow and diversify, broader scale management strategies and zoning based on both projected growth and the results of marine research are required to balance industry, recreational, cultural and conservation values.

Increased marine industry may lead to new conservation challenges in the region, such as the increased likelihood of the introduction of marine pests and the need to monitor developing aquaculture.

Customary activities

Customary fishing and hunting by traditional owners is legislated independently from recreational fishing, but like recreational fishing, it is a requirement that all customary activities are undertaken sustainably. Traditional communities recognise the importance of maintaining local species and practices into the future as per their custom. Overfishing and the inhumane treatment of any species, including turtles and dugongs, are both prohibited under customary activity legislation. Projects such as the 2005-08 Northern Australian Indigenous Land and Sea Management Alliance's Dugong and Marine Turtle Project have seen traditional owners and Indigenous ranger groups from across the top end working together to survey and monitor these key species with the aim of developing their own species management plans. These plans, unique to each community, outline their own limits to hunting and/or sanctuary zones for use by their own community members.

What can we do to minimise impacts?

The Department of Parks and Wildlife and Department of Fisheries work together with traditional owners, industry, community groups and recreational users to look after the Kimberley marine environment. Key tools in managing the marine environment include fishing regulations and marine conservation areas, including marine parks. Community groups and individuals play a role as well, as on the ground users are often the first to notice something changing in their area and can suggest protection measures that would best suit their community.

Fishing rules

Western Australia's fisheries management strategy has one primary goal: fish for the future. This means ensuring our fisheries are ecologically sustainable. This is done through managing and licensing commercial and recreational fishing activities and protecting the aquatic environment and ecosystems on which fish depend.

Recreational fisheries are threatened by population growth, coastal development and improved fishing technology. A high participation rate, due to the low cost of equipment and the ability of fishers to access previously remote areas, is placing pressure on many fish stocks. Industrial activities and other human-induced environmental changes have caused damage to many fish habitats around the globe.

In Western Australia, recreational fishing is managed by the Department of Fisheries, and management is based on the biology and ecology of fish stocks and knowledge of patterns of past fishing effort. Typical recreational fishing management strategies include bag limits, size limits for certain species, and licences for fishing from boats, using nets, or catching certain shellfish such as abalone or western rock lobster (often incorrectly referred to as 'crayfish'). A number of species found in Kimberley waters, such as sawfish and humphead Maori wrasse, are totally protected under the Western Australian *Fish Resources Management Act 1994*, meaning they cannot be taken by recreational or commercial fishers. These initiatives are most effective when combined with community education programs and campaigns.

Marine parks

Marine parks are created to protect the natural features and intrinsic value of a particular area, while allowing a level of recreational and commercial use that does not compromise its conservation. In 2015, the Kimberley had three gazetted marine parks; Rowley Shoals, 300km northwest of Broome, Eighty Mile Beach, 100km south of Broome, and Lalang-garram / Camden Sound, 150km north of Derby. Additional parks are proposed under the *Kimberley Science and Conservation Strategy* for Yawuru Nagulagun / Roebuck Bay, Lalang-garram / Horizontal Falls, North Lalang-garram, and the North Kimberley coast from Camden Sound to the Northern Territory border.

Marine parks have four management zone options – sanctuary, general use, recreation and special purpose. These options can be described as follows:

- **Sanctuary zones** are 'look but don't take' zones, where surface water sports, snorkelling and scuba diving are permitted.
- **General use zones** are areas where activities such as sustainable commercial fishing, aquaculture, pearling, and petroleum exploration and production are permissible, provided they do not compromise conservation values.
- **Recreation zones** are areas where the priority use is recreation. These zones allow most types of recreational fishing, water sports and non-extractive tourism such as whale-watching, however commercial fishing is prohibited.
- **Special purpose zones** are areas that are created to give scientists baseline data about this and surrounding areas. Only certain activities are permitted in these areas, the details of which are unique to each park. Examples of special purpose zone restrictions may include a speed limit on boats to protect marine mammals, or an area allowing shore-based fishing alongside a sanctuary zone.



Proposed Lalang-garram / Horizontal Falls Marine Park.

Community actions

Community groups play a vital role in protecting the marine environment. By educating the broader community about issues affecting their local area, communities are able to enact positive change through long-term campaigns. Many community groups conduct or take part in citizen science projects, allowing researchers to gather valuable scientific data that they would not otherwise have access to due to geographic, financial or time constraints. All groups listed below welcome individual and school group volunteers.

The following groups contribute to conserving Western Australia’s marine environment:

- **Tangaroa Blue** www.tangaroablue.org

Tangaroa Blue is a not-for-profit organisation working to improve the health of our marine environment. They coordinate marine debris research, working with communities and individual volunteers to collect litter found on their beaches, and record and report their findings back to the central organisation. This information is used to identify the main sources of marine litter, subsequently stakeholders can be engaged to identify strategies to stop this rubbish entering our rivers and oceans in the first place.

- **Recfishwest** recfishwest.org.au

Recfishwest is a community organisation representing Western Australia’s recreational fishers. Their vision is to ensure sustainable recreational fishing resources, which means many of their projects focus on ensuring fish stocks are maintained through a variety of conservation projects. Community grants are offered to groups wanting to protect their local recreational fishing opportunities through litter reduction, maintaining healthy rivers and oceans, and reducing chemical run-off.

- **Keep Australia Beautiful** www.kabc.wa.gov.au

Keep Australia Beautiful works to prevent and reduce litter through community education and engagement, legislation and enforcement. Keep Australia Beautiful’s *Clean Marine* campaign targets recreational fishers and boaters to reduce the amount of marine litter. Resources available include signage, posters, brochures, stickers and portable ashtrays. Additional campaigns promote action through community clean ups and the *Adopt-a-spot* program, with gloves, bags and other resources available free of charge through an order form on their website.



The Derby Bush Rangers received a Recfishwest grant to install fishing line recovery bins at the Derby Jetty and to create signs encouraging fishers to put their rubbish in the bin at popular local fishing spots such as Willare Bridge, May River and the Cuttings.

The following groups contribute to conserving the Kimberley marine environment:

- **Roebuck Bay Working Group** www.roebuckbay.org.au

The Roebuck Bay Working Group is a partnership between land and sea managers, traditional owners and community members seeking to protect, restore and maintain the natural and cultural value of Roebuck Bay. Projects include community awareness campaigns, citizen science monitoring projects and contributions towards management plans concerning Roebuck Bay. Volunteers are invited to participate in turtle monitoring, mud sampling, bird catching and tagging, seagrass monitoring and community clean ups.

- **Environs Kimberley** www.environskimberley.org.au

Environs Kimberley is a community-based environmental organisation seeking to protect the natural environment of the Kimberley. Environs Kimberley partner with a broad range of stakeholders to deliver research, practical conservation and restoration projects, and community education. Environs Kimberley partner with the Department of Parks and Wildlife and Nyamba Buru Yawuru to monitor the health of Roebuck Bay's seagrass. Seagrass is used internationally as an indicator of marine health, it provides food for wildlife such as dugongs and turtles, and habitat for smaller fish and crustaceans. A healthy seagrass bed stabilises the sea floor and absorbs nutrients from run-off, keeping the water clean. Volunteers are enlisted to collect seagrass information from three sites around Broome, which are each surveyed every four months.

- **Yawuru Rangers – Cable Beach Turtle Monitoring, Roebuck Bay Mud Sampling**
yawuru.rangers@dpaw.wa.gov.au

The Department of Parks and Wildlife's Yawuru joint management team coordinate an annual turtle monitoring program on Cable Beach from November to February. Volunteers nominate to walk a section of the beach early in the morning looking for signs of turtle activity such as tracks, nests and turtles themselves. Information gathered by the volunteers is used to develop management strategies for conserving the turtle population.

The Yawuru Rangers partner with the Broome Bird Observatory and community volunteers to conduct monthly benthos (mud) sampling on the mud flats of Roebuck Bay. Cores of mud are collected from the mudflats at low tide and examined for invertebrates such as small crustaceans, snails and bivalves. These invertebrates form the bulk of the diet for migratory shorebirds that visit Roebuck Bay each year. Learning about changes in abundance of these invertebrates can help researchers identify links between external factors and the overall health of the bay.



Bush Rangers instructors take part in a mud sampling workshop.

- **Broome Bird Observatory** broomebirdobservatory.com

Broome Bird Observatory is a research and education facility situated on Roebuck Bay, dedicated to the conservation of migratory shorebirds. Established by Birdlife Australia, Australia's peak scientific and recreational bird organisation, researchers and volunteers monitor the tens of thousands of birds that visit Roebuck Bay each year. Activities include bird catching and banding, observational surveys and mud sampling, in addition to tours and information sessions.

Individuals

There are simple actions that individuals can take to contribute towards conserving our marine environment. By leading a sustainable lifestyle and minimising waste production and energy usage, people can make a significant contribution to protecting our marine flora and fauna.

The following actions can directly improve the survival rates of marine wildlife:

- Fish sustainably, only take what you will eat and pay attention to catch and size limits.
- Follow any signs showing where you can and can't fish, boat, camp and drive.
- Take all rubbish with you or put it in a bin, even if it wasn't your rubbish. Keep spare rubbish bags in the car for impromptu clean ups.
- Keep your distance and respect all wildlife. When watching nesting turtles observe from behind, use a red torch, and don't block their path to or from the water.
- Don't drive on beaches between November and February; this is turtle nesting time. If you drive on beaches at other times of year stay out of the dunes and watch out for wildlife.
- Think about chemicals you may be sending into rainwater drains (e.g. detergent from car washing or fertilisers from the garden). These end up in our oceans and rivers. Use slow-release fertiliser dug into the soil and covered with mulch, and wash cars, boats and bikes on the grass.

Additional resources for the classroom

Picture books

- ***Dhyum the Dugong***, Mariana Fuentes 2012. Available online: <http://www.coralcoe.org.au/wp-content/uploads/2016/05/dhyum-the-dugong.pdf>
- ***Myrtle's battle against climate change***, Mariana Fuentes 2010 (caution: scary themes). Available online: http://www.coralcoe.org.au/wp-content/uploads/2016/05/fuentes_educational-book_myrtle.pdf
- ***Dolphin Baby!*** Nicola Davies, 2012, Candlewick.
- ***Seadragon Sea***, Margaret Spurling, 2005, Working Title Press.
- ***Underwater Workout***, Clare Hibbert, 2008, Evans Brothers Limited.
- ***On the Beach*** (Usborne Lift-the-flap), Alastair Smith & Laura Howell 2004, Usborne Publishing.
- ***Claws, eyes, flippers***, Dub Leffler, 2012, Magabala Books.

Fiction for older readers

- ***Blueback: a fable for all ages***, Tim Winton, 2008 Pan Macmillan.

Non-fiction books

- ***Living Nature: Fish***, Oxford Scientific Films, 2003, Chrysalis Children's Books.
- ***Australian Sea Life***, Steve Parish, 1998, Steve Parish Publishing.
- ***Discover and learn about Australian Coasts and Oceans***, Pat Slater & Steve Parish, 2002, Steve Parish Publishing.
- ***Ocean watch: The young person's guide to protecting the planet***, Martyn Bramwell, Planet Ark, 2001, Dorling Kindersly.
- ***Australia's Changing Environments: Marine Environments***, Anna Sheppard, 2006, Heinemann Library.

Resources for teachers

- **Marine WATERS** – see 'Websites' on next page.
- **Exploring Western Australia's Marine Parks: Teachers' Guide**, Department of Parks and Wildlife 2013. Available online: <https://www.dpaw.wa.gov.au/images/documents/education/20130084-ExploreWAMarineParkUpPrimWB.pdf>
- **Marine Parks: Kids activity book**, Department of Parks and Wildlife 2014. Hardcopies of activity book and accompanying bookmarks and posters available from Parks and Wildlife's education team (see contacts p15). Available online: www.dpaw.wa.gov.au/images/documents/education/20140609_Marine_Parks_Kids_Activity_book_WEB.pdf
- **Seagrass-Watch Activity Book**, Junior and Senior editions and educators handbook, Seagrass-Watch. Available online: www.seagrasswatch.org/education.html
- **Dugong and Marine Turtle Teaching Resource and Information Pack**, Northern Australian Indigenous Land and Sea Management Alliance, 2006. Available online: www.nailsma.org.au/sites/default/files/publications/Dugong-and-Marine-Turtle-Teaching-Resource-and-Information-Package.pdf

Posters and brochures

- **Marine wildlife of WA's north-west: Identification guide**. Department of Parks and Wildlife. Available online: www.dpaw.wa.gov.au/management/marine/marine-wildlife
- **Marine turtles of the Kimberley coast**. Department of Parks and Wildlife. Hardcopies available in Resource Pack. Additional copies available from Parks and Wildlife education staff (see contacts p15).
- **Recreational fishing guide 2016: simpler rules for better fishing**. Department of Fisheries. Available online: www.fish.wa.gov.au/Documents/recreational_fishing/rec_fishing_guide/rules_guide_statewide.pdf
- **Recreational fishing in Western Australia: Fish identification guide**. Department of Fisheries. Available online: www.fish.wa.gov.au/Documents/occasional_publications/fop103.pdf
- **The Kimberley Coast, The Last Sanctuary: Nine iconic places**. Available online: awsassets.wwf.org.au/downloads/mo028_the_kimberley_coast_nine_iconic_places_16aug12_1.pdf
- **Dugong and Marine Turtle Handbook**. Northern Australian Indigenous Land and Sea Management Alliance, 2006. Available online: <http://www.nailsma.org.au/hub/resources/publication/dugong-and-marine-turtle-knowledge-handbook-2006>
- **Code of Conduct for Recreational Fishing in the Kimberley**. Department of Fisheries, 2013. Available online: www.fish.wa.gov.au/Documents/recreational_fishing/additional_fishing_information/kimberley_recreational_fishing_code_of_conduct.pdf



Dugong.

Websites

- **Marine Parks WA**, Department of Parks and Wildlife's marine parks website for kids. Learn about marine parks and the animals that live in them with information and interactive games. Teacher resources are also available under 'Downloads'.
<https://www.dpaw.wa.gov.au/management/marine/marine-parks-wa>
- **Marine WATERS**, teacher education resources from the Department of Fisheries. Create a free account and login to access curriculum linked lesson plans, worksheets, presentations and classroom resources.
marinewaters.fish.wa.gov.au
- **Seagrass-Watch**, resources relating to seagrass monitoring projects, data collection and background information.
www.seagrasswatch.org/home.html
- **Tangaroa Blue**, information for organising marine clean ups and collecting marine debris data.
www.tangaroablue.org
- **Roebuck Bay Working Group**, interactive presentations about Roebuck Bay's shorebirds and seagrass ecosystems.
www.roebuckbay.org.au/learning-activities

Videos

Three minutes of footage showcasing the Kimberley marine environment above and below the water.
museum.wa.gov.au/kimberley/videos/day-18-kimberley-montage-kimberley-2012

An explanation of how marine researchers work in the Kimberley.
museum.wa.gov.au/kimberley/videos/story-1-kimberley-2013

The turtle nesting experience at Eighty Mile Beach, Department of Parks and Wildlife, 2014.
www.youtube.com/watch?v=vXmCrloj3dg

Incursions, excursions and clean ups

Parks and Wildlife and Fisheries incursions and excursions

Parks and Wildlife and Fisheries education officers have a frequently updated program of incursions and excursions available to suit all year groups. Many of these activities can also be adapted for school holiday programs, youth groups and clubs. For the latest program, contact:

Fisheries Northern Education (08) 9193 8600

Parks and Wildlife Education (08) 9168 4200

Marine studies excursions

Marine monitoring activities suitable for undertaking on excursions are listed in [Exploring Western Australia's Marine Parks: Teachers' Guide](#).

Contact us on the numbers above if you need assistance with planning your excursion.

Clean ups

Conducting a clean up around your school or a local waterway or beach is a great way to start or finish your studies of the marine environment. Clean ups are one of the simplest practical measures students can take that directly assist with protecting marine wildlife. Data collected from clean ups is analysed by organisations such as Tangaroa Blue to identify the main sources of marine debris. Once they know where the litter is coming from, it is possible to work with stakeholders to reduce the amount of marine debris originating from these sources in the future.

The following organisations may assist with planning your clean up:

[Tangaroa Blue](#) – ‘How to’ manual, checklists and data sheets.

[Keep Australia Beautiful](#) – Register your clean up to receive gloves, bags and tongs. If you plan to make your clean up a regular event you may like to [‘Adopt-a-spot’](#).

Volunteering

The following organisations may be able to accommodate school groups with sufficient notice. As many of these activities take place in the early morning you may wish to combine them with an overnight camp at [Broome Camp School](#), [Broome Bird Observatory](#) or [Eighty Mile Beach](#).

- **Seagrass monitoring, Broome.**

See website for training sessions, monitoring dates and contact details:

www.environskimberley.org.au/kimberley-conservation-campaigns-projects/conservation-campaigns.

- **Mud sampling, Broome Bird Observatory.**

Contact yawuru.rangers@dpaw.wa.gov.au to register your interest. Sampling dates are listed here:

www.roebuckbay.org.au/volunteer-activities/benthos-monitoring.

- **Birdwatching, catching and banding, Broome Bird Observatory.**

Contact broome@birdlife.org.au. Dates are listed here: www.roebuckbay.org.au/volunteer-activities/shorebird-monitoring.

- **Turtle monitoring, Cable Beach and Eighty Mile Beach.**

For Cable Beach, email yawuru.rangers@dpaw.wa.gov.au to register your interest. For Eighty Mile Beach, contact Parks and Wildlife on (08) 9195 5500.



King Cascades.

Curriculum link overview Years 1-3

Year	Lesson 1 Up high, down low	Lesson 2 Marine moves	Lesson 3 What can you do in a marine park?
	Science	Science	Science
Year 1	<p>Living things live in different places where their needs are met (ACSSU211)</p> <p><i>Exploring different habitats in the local environment such as the beach, bush and backyard.</i></p> <p><i>Recognising that different living things live in different places such as land and water.</i></p> <p><i>Exploring what happens when habitats change and some living things can no longer have their needs met.</i></p> <p>Represent and communicate observations and ideas in a variety of ways such as oral and written language, drawing and role play (AC SIS029)</p> <p><i>Engaging in whole class or guided small group discussions to share observations and ideas.</i></p>	<p>Living things have a variety of external features (ACSSU017)</p> <p><i>Recognising common features of animals such as head, legs and wings.</i></p> <p><i>Describing the use of animal body parts for particular purposes such as moving and feeding.</i></p> <p>Represent and communicate observations and ideas in a variety of ways such as oral and written language, drawing and role play (AC SIS029)</p> <p><i>Engaging in whole class or guided small group discussions to share observations and ideas.</i></p>	<p>Living things live in different places where their needs are met (ACSSU211)</p> <p><i>Exploring different habitats in the local environment such as the beach, bush and backyard.</i></p> <p><i>Recognising that different living things live in different places such as land and water.</i></p> <p>Participate in different types of guided investigations to explore and answer questions, such as manipulating materials, testing ideas, and accessing information source (AC SIS025)</p> <p><i>Researching ideas collaboratively using big books, web pages and ICT within the classroom.</i></p>
Year 2	<p>People use science in their daily lives, including when caring for their environment and living things (ACSHE035)</p> <p><i>Recognising that many living things rely on resources that may be threatened, and that science understanding can contribute to the preservation of such resources.</i></p> <p>Science involves asking questions about, and describing changes in, objects and events (ACSHE034)</p> <p><i>Describing everyday events and experiences and changes in our environment using knowledge of science.</i></p> <p>Represent and communicate observations and ideas in a variety of ways such as oral and written language, drawing and role play (AC SIS042)</p> <p><i>Presenting ideas to others, both one-to-one and in small groups.</i></p>	<p>A push or pull affects how an object moves or changes shape (ACSSU033)</p> <p><i>Exploring ways that objects move on land, through water and in air.</i></p> <p>Participate in different types of guided investigations to explore and answer questions, such as manipulating materials, testing ideas, and accessing information sources (AC SIS038)</p> <p><i>Researching with the use of simple information sources.</i></p> <p><i>Sorting objects and events based on easily identified characteristics.</i></p>	<p>People use science in their daily lives, including when caring for their environment and living things (ACSHE035)</p> <p><i>Identify the ways humans manage and protect resources, such as reducing waste and caring for water supplies.</i></p> <p><i>Recognising that many living things rely on resources that may be threatened, and that science understanding can contribute to the preservation of such resources.</i></p> <p>Participate in different types of guided investigations to explore and answer questions, such as manipulating materials, testing ideas, and accessing information sources (AC SIS038)</p> <p><i>Researching with the use of simple information sources.</i></p>

Curriculum link overview Years 1-3

Year	Lesson 1 Up high, down low	Lesson 2 Marine moves	Lesson 3 What can you do in a marine park?
	Science	Science	Geography
Year 3	<p>Living things can be grouped on the basis of observable features and can be distinguished from non-living things (ACSSU044)</p> <p><i>Recognising characteristics of living things such as growing, moving, sensitivity and reproducing.</i></p> <p><i>Recognising the range of different living things.</i></p> <p><i>Sorting living and non-living things based on characteristics.</i></p> <p>Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports (AC SIS060)</p> <p><i>Exploring different ways to show processes and relationships through diagrams, models and role play.</i></p> <p><i>Using simple explanations and arguments, reports or graphical representations to communicate ideas to other students.</i></p>		<p>The representation of Australia as states and territories, and Australia's major natural and human features (ACHGK014)</p> <p><i>Using geographical tools, for example a globe, wall map or digital application such as Google Earth, to locate and name the state, territories, major cities and regional centres in their own state.</i></p> <p><i>Identifying and describing the major natural features of Australia, for example rivers, deserts, rainforests, the Great Dividing Range and the Great Barrier Reef.</i></p> <p>The similarities and differences in individuals' and groups' feelings and perceptions about places, and how they influence views about protection of these places (ACHGK018).</p> <p><i>Discussing why it is important to protect places that have special significance for people, for example a wetland, a sacred site, a national park or a world heritage site.</i></p>



Year	Lesson 4 Let's get fishy	Lesson 5 Dugongs of the seagrass meadow	Lesson 6 Keeping it clean
	Science	Science	Science
Year 1	<p>Living things have a variety of external features (ACSSU017)</p> <p><i>Recognising common features of animals such as head, legs and wings.</i></p> <p><i>Describing the use of animal body parts for particular purposes such as moving and feeding.</i></p> <p>Living things live in different places where their needs are met (ACSSU211)</p> <p><i>Exploring different habitats in the local environment such as the beach, bush and backyard.</i></p> <p><i>Recognising that different living things live in different places such as land and water.</i></p> <p><i>Exploring what happens when habitats change and some living things can no longer have their needs met.</i></p>	<p>Living things live in different places where their needs are met (ACSSU211)</p> <p><i>Exploring different habitats in the local environment such as the beach, bush and backyard.</i></p> <p><i>Recognising that different living things live in different places such as land and water.</i></p> <p><i>Exploring what happens when habitats change and some living things can no longer have their needs met.</i></p> <p>People use science in their daily lives, including when caring for their environment and living things (ACSHE022)</p> <p><i>Identifying ways that science knowledge is used in the care of the local environment such as animal habitats, and suggesting changes to parks and gardens to better meet the needs of native animals.</i></p>	<p>Living things live in different places where their needs are met (ACSSU211)</p> <p><i>Exploring different habitats in the local environment such as the beach, bush and backyard.</i></p> <p><i>Exploring what happens when habitats change and some living things can no longer have their needs met.</i></p> <p>People use science in their daily lives, including when caring for their environment and living things (ACSHE022)</p> <p><i>Identifying ways that science knowledge is used in the care of the local environment such as animal habitats, and suggesting changes to parks and gardens to better meet the needs of native animals.</i></p>
Year 2	<p>Living things grow, change and have offspring similar to themselves (ACSSU030)</p> <p><i>Recognising that living things have predictable characteristics at different stages of development.</i></p> <p><i>Observing that all animals have offspring, usually with two parents.</i></p> <p>People use science in their daily lives, including when caring for their environment and living things (ACSHE035)</p> <p><i>Identify the ways humans manage and protect resources, such as reducing waste and caring for water supplies.</i></p> <p><i>Recognising that many living things rely on resources that may be threatened, and that science understanding can contribute to the preservation of such resources.</i></p>	<p>Living things grow, change and have offspring similar to themselves (ACSSU030)</p> <p><i>Recognising that living things have predictable characteristics at different stages of development.</i></p> <p><i>Observing that all animals have offspring, usually with two parents.</i></p> <p>People use science in their daily lives, including when caring for their environment and living things (ACSHE035)</p> <p><i>Identify the ways humans manage and protect resources, such as reducing waste and caring for water supplies.</i></p> <p><i>Recognising that many living things rely on resources that may be threatened, and that science understanding can contribute to the preservation of such resources.</i></p>	<p>Different materials can be combined, including by mixing, for a particular purpose (ACSSU031)</p> <p><i>Exploring the local environment to observe a variety of materials, and describing ways in which materials are used.</i></p> <p><i>Identifying materials such as paper that can be changed and remade or recycled into new products.</i></p> <p>People use science in their daily lives, including when caring for their environment and living things (ACSHE035)</p> <p><i>Identify the ways humans manage and protect resources, such as reducing waste and caring for water supplies.</i></p> <p><i>Recognising that many living things rely on resources that may be threatened, and that science understanding can contribute to the preservation of such resources.</i></p>

Curriculum link overview Years 1-3

Year	Lesson 4 Let's get fishy	Lesson 5 Dugongs of the seagrass meadow	Lesson 6 Keeping it clean
	Science	Science	Science
Year 3	<p>Living things can be grouped on the basis of observable features and can be distinguished from non-living things (ACSSU044)</p> <p><i>Recognising characteristics of living things such as growing, moving, sensitivity and reproducing.</i></p> <p>Science involves making predictions and describing patterns and relationships (ACSHE050)</p> <p><i>Making predictions about change and events in our environment.</i></p> <p><i>Considering how posing questions helps us plan for the future.</i></p>	<p>Living things can be grouped on the basis of observable features and can be distinguished from non-living things (ACSSU044)</p> <p><i>Recognising characteristics of living things such as growing, moving, sensitivity and reproducing.</i></p> <p><i>Recognising the range of living things.</i></p> <p>Science involves making predictions and describing patterns and relationships (ACSHE050)</p> <p><i>Making predictions about change and events in our environment.</i></p> <p><i>Considering how posing questions helps us plan for the future.</i></p> <p>Science knowledge helps people to understand the effect of their actions (ACSHE051)</p> <p><i>Investigating how science helps people such as nurses, doctors, dentists, mechanics and gardeners.</i></p> <p><i>Deciding what characteristics make a material a pollutant.</i></p> <p><i>Researching Aboriginal and Torres Strait Islander people's knowledge of the local natural environment, such as characteristics of plants and animals.</i></p>	<p>Science involves making predictions and describing patterns and relationships (ACSHE050)</p> <p><i>Making predictions about change and events in our environment.</i></p> <p><i>Considering how posing questions helps us plan for the future.</i></p> <p>Science knowledge helps people to understand the effect of their actions (ACSHE051)</p> <p><i>Investigating how science helps people such as nurses, doctors, dentists, mechanics and gardeners.</i></p> <p><i>Deciding what characteristics make a material a pollutant.</i></p> <p>Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate (AC SIS055)</p> <p><i>Recording measurements using familiar formal units and appropriate observations.</i></p> <p><i>Using a variety of tools to make observations such as digital cameras, thermometers, rulers and scales.</i></p> <p><i>Discussing safety rules for equipment and procedures.</i></p>



Lesson one: Up high, down low



Department of Parks and Wildlife
Department of Fisheries

Students learn about the needs of marine animals, and the different kinds of marine habitats that meet these needs, through an interactive game and a reflection on their own past experiences.

Australian Curriculum - Science

Year 1	Year 2	Year 3
<p>Living things live in different places where their needs are met (ACSSU211)</p> <p><i>Exploring different habitats in the local environment such as the beach, bush and backyard.</i></p> <p><i>Recognising that different living things live in different places such as land and water.</i></p> <p><i>Exploring what happens when habitats change and some living things can no longer have their needs met.</i></p> <p>Represent and communicate observations and ideas in a variety of ways such as oral and written language, drawing and role play (AC SIS029)</p> <p><i>Engaging in whole class or guided small group discussions to share observations and ideas.</i></p>	<p>People use science in their daily lives, including when caring for their environment and living things (ACSHE035)</p> <p><i>Recognising that many living things rely on resources that may be threatened, and that science understanding can contribute to the preservation of such resources.</i></p> <p>Science involves asking questions about, and describing changes in, objects and events (ACSHE034)</p> <p><i>Describing everyday events and experiences and changes in our environment using knowledge of science.</i></p> <p>Represent and communicate observations and ideas in a variety of ways such as oral and written language, drawing and role play (AC SIS042)</p> <p><i>Presenting ideas to others, both one-to-one and in small groups.</i></p>	<p>Living things can be grouped on the basis of observable features and can be distinguished from non-living things (ACSSU044)</p> <p><i>Recognising the range of different living things.</i></p> <p><i>Sorting living and non-living things based on characteristics.</i></p> <p>Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports (AC SIS060)</p> <p><i>Exploring different ways to show processes and relationships through diagrams, models and role play.</i></p> <p><i>Using simple explanations and arguments, reports or graphical representations to communicate ideas to other students.</i></p>

Teacher notes:

Habitat: the area or environment in which an organism normally lives or occurs. Refer to background information p3-5 for types of marine habitats.

Specialist: a species that has adapted to be able to survive in a specific type of habitat.

Resources: *Up high, down low* flashcards or PowerPoint from Resource Pack. Music (e.g. CD and CD player)

For each student: *A marine habitat I have been to* worksheet

Introduction: Up high, down low

This activity will introduce different marine habitats. This activity can be run using PowerPoint or flash cards.

Lead a discussion with students about habitats. Explain that a habitat is a place where animals make their homes and find their food. Outline some land examples (desert, rainforest, bushland) and talk about what animals live in each of these habitats and where they make their homes and find food.

Show *Up high, down low* flashcards or presentation to the students to help stimulate discussion. What habitats are these? What animals might live in each of the habitats? Where might they live or hide (e.g. in seagrass or coral, under rocks, in mangroves)? What food can they find in each habitat (e.g. seaweed, fish, crabs)? Has anyone been to any of these habitats? What animals did they see there? For older students, ask them to identify living and non-living features of each habitat and explain how they made those decisions (e.g. living things grow and change, living things have babies).

Have students share and discuss their responses with the class.

Activity: Musical habitats

Students will demonstrate limited habitat resources through playing a 'musical chairs' game. You may like to read *Underwater workout* (see Picture Books p13) for ideas on how to move like marine animals.

Explain to students that they are all one type of marine animal (e.g. a crab or a fish).

Discuss the things that animal needs to survive in its habitat in terms of food and shelter.

Set out one chair per student at the beginning of the game. Each chair represents the available habitat space, such as a reef ledge, required for each individual to survive.

Students walk (or hop or crawl or slide) around the circle of chairs mimicking the movement of the chosen animal when the music is played.

When the music stops, each student must sit down on an available chair.

Begin removing chairs each round to reflect less available habitat for the chosen animal. Explain that this habitat may have been lost due to human actions or natural climatic events. Students that cannot find a free chair are either eaten by a predator (they have no place to hide) or run out of food. You may like to repeat the game as different animals, or change animals every few rounds.

Reflection: My marine habitat

This activity will consolidate what a marine habitat is.

Hand out *A marine habitat I have been to* worksheet.

Referring back to *Up high, down low*, ask students to identify a marine habitat they have visited (e.g. beach, mangroves, coral reef, open ocean). If students have not visited a marine habitat, they may select a freshwater habitat (e.g. river, waterhole, lake).

Instruct students to think about some of the animals that may live in that habitat and to draw them. Add in living and non-living features that belong to that type of habitat (e.g. rocks, sand, coral, seaweed, seagrass, mangroves). Ask students to make sure they draw food and homes for their animals in their picture.

Once completed, have some students present their drawings and explain their pictures to the class. What was special about that area? How was it different to other areas? What kinds of food and homes could animals find in the area? What parts of the picture are living? Why? What parts are non-living?



A marine habitat I have been to

Name: _____

A marine habitat I have been to is



Lesson two: Marine moves



GOVERNMENT OF
WESTERN AUSTRALIA

Department of Parks and Wildlife
Department of Fisheries

Students appreciate the diversity of marine animals, identifying physical features and different kinds of movements these animals can perform with their unique body parts, before creating their own imaginary sea creatures.

Australian Curriculum - Science		
Year 1	Year 2	Year 3
<p>Living things have a variety of external features (ACSSU017)</p> <p><i>Recognising common features of animals such as head, legs and wings.</i></p> <p><i>Describing the use of animal body parts for particular purposes such as moving and feeding.</i></p> <p>Represent and communicate observations and ideas in a variety of ways such as oral and written language, drawing and role play (ACSI029)</p> <p><i>Engaging in whole class or guided small group discussions to share observations and ideas.</i></p>	<p>A push or pull affects how an object moves or changes shape (ACSSU033)</p> <p><i>Exploring ways that objects move on land, through water and in air.</i></p> <p>Participate in different types of guided investigations to explore and answer questions, such as manipulating materials, testing ideas, and accessing information sources (ACSI038)</p> <p><i>Researching with the use of simple information sources.</i></p> <p><i>Sorting objects and events based on easily identified characteristics.</i></p>	<p>Living things can be grouped on the basis of observable features and can be distinguished from non-living things (ACSSU044)</p> <p><i>Recognising characteristics of living things such as growing, moving, sensitivity and reproducing.</i></p> <p><i>Recognising the range of different living things.</i></p> <p>Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports (ACSI060)</p> <p><i>Exploring different ways to show processes and relationships through diagrams, models and role play.</i></p> <p><i>Using simple explanations and arguments, reports or graphical representations to communicate ideas to other students.</i></p>

Teacher notes:

Adaptations: the way in which a plant or animal has evolved to make it particularly suitable to survive and thrive in its environment.

Structural (or **morphological**) adaptations relate to the physical features of the organism. These include things you can see, like its shape or body covering, as well as its internal organisation.

Animals that live in the water have developed features that assist them to move in this environment. Some examples from the Kimberley include:

1. Whales and dolphins have large tails which move up and down and fins to swim. Whales can travel long distances around the world.
2. Octopuses have eight legs to move on the seafloor and to propel through the water.
3. Starfish or seastars have tube feet under their arms to move along the seafloor.
4. Dugongs have a tail which moves up and down and small spade-like fins to swim.
5. Turtles have strong fins to help them swim, and feet to help them walk on land.
6. Fish have a streamlined body, fins and a tail that moves from side to side.

It's important to note that some animals spend time in the ocean and on land, for example crocodiles, turtles, and shorebirds. These animals have features that help them move in both environments.

Resources: *Northwest Marine ID Guide* – class set from Resource Pack, pictures of sea animals (e.g. in books or on smartboard), blank paper, drawing materials

Introduction: Land or sea?

Students will compare land and sea animals.

Teacher asks class to give examples of animals that live on the land in their local area.

Teacher divides the board in half and writes down examples on one side of the board.

Teacher and students to go through the list and explain how each animal moves and what part of the body helps them to move (e.g. a wallaby has a big tail and feet to hop, a snake has a strong body to slither, a bird has wings to fly and feet to walk).
Teacher now asks class to give examples of animals that live in the ocean in their local area (if you are not near the coast, talk about freshwater animals that live in rivers and waterholes).
Teacher writes down examples on the other side of the board.
Teacher and students to go through the list and explain how each animal moves and what part of the body helps them to move. What are the differences in how animals move on land and water? Why? Discuss how moving in water is different from moving through air (e.g. if you try running while in the water, what happens? Why can't you swim on land?).
Note that some animals spend time in the ocean and on land (e.g. crocodiles, turtles, birds) and they have features that help them move in both environments.
Activity: Design your own underwater creature
Students will design their own sea creature.
Brainstorm body parts that ocean animals use to move (e.g. fins, flippers, legs, claws, tentacles). List these on the board for ideas (you may like to draw each part next to its name). Use the Marine ID Guides and books found in the classroom (or the internet) for more ideas.
Ask students to vote on their favourite ocean animal body parts. Teacher then draws an imaginary animal incorporating the favourite features (e.g. a crab with tentacles, claws and a shark fin on its back). Your library may also have flipbooks that create creatures by matching up different animal parts.
Explain to students that they will draw their own imaginary sea creatures. They need to work out how their new animal will move around in its environment.
Students draw and name their own imaginary sea creature. For older students, ask them to label their animal's body parts using words listed on the board (from the brainstorming at the start of the activity).
Reflections: Sharing
Students share their drawing and explain where they live and how they move around to the rest of the class.



Booby chick.

Lesson three: What can you do in a marine park?



Department of Parks and Wildlife
Department of Fisheries

Students identify marine parks in their area, learn activities that they can undertake in these parks, and appreciate the benefits that marine parks provide for marine ecosystems.

Australian Curriculum - Science (Years 1-2), Geography (Year 3)

Year 1	Year 2	Year 3
<p>Living things live in different places where their needs are met (ACSSU211)</p> <p><i>Exploring different habitats in the local environment such as the beach, bush and backyard.</i></p> <p><i>Recognising that different living things live in different places such as land and water.</i></p> <p>Participate in different types of guided investigations to explore and answer questions, such as manipulating materials, testing ideas, and accessing information sources (ACSI025)</p> <p><i>Researching ideas collaboratively using big books, web pages and ICT within the classroom.</i></p>	<p>People use science in their daily lives, including when caring for their environment and living things (ACSHE035)</p> <p><i>Identify the ways humans manage and protect resources, such as reducing waste and caring for water supplies.</i></p> <p><i>Recognising that many living things rely on resources that may be threatened, and that science understanding can contribute to the preservation of such resources.</i></p> <p>Participate in different types of guided investigations to explore and answer questions, such as manipulating materials, testing ideas, and accessing information sources (ACSI038)</p> <p><i>Researching with the use of simple information sources.</i></p>	<p>The representation of Australia as states and territories, and Australia's major natural and human features (ACHGK014)</p> <p><i>Using geographical tools, for example a globe, wall map or digital application such as Google Earth, to locate and name the state, territories, major cities and regional centres in their own state.</i></p> <p><i>Identifying and describing the major natural features of Australia, for example rivers, deserts, rainforests, the Great Dividing Range and the Great Barrier Reef.</i></p> <p>The similarities and differences in individuals' and groups' feelings and perceptions about places, and how they influence views about protection of these places (ACHGK018)</p> <p><i>Discussing why it is important to protect places that have special significance for people, for example a wetland, a sacred site, a national park or a world heritage site.</i></p>

Teacher notes:

Marine parks

- Are divided into zones, with different activities allowed in each zone. Some activities are restricted in some areas of the parks, but may be allowed in other areas.
- Create recreational opportunities for people and a chance to enjoy these beautiful natural areas.
- Play an important role in scientific research and educating visitors about marine conservation, marine ecology and marine park management.
- Protect culturally significant sites and maritime heritage such as historic shipwrecks.
- Help protect areas known to be important for some large marine mammals whose numbers were depleted by hunting, such as the blue whale breeding area at Ngari Capes Marine Park and the humpback whale breeding area in Lalang-garram / Camden Sound Marine Park.
- Support a growing marine ecotourism market which includes whale watching, sea lion, dolphin and dugong viewing, scuba diving, snorkelling, kayaking and glass-bottomed boat tours.
- Help protect assets important to commercial and recreational fishers, such as schooling sites, nursery areas, spawning and breeding grounds.

Activities enjoyed in marine parks include

- | | |
|----------------|------------|
| • Fishing | • Camping |
| • Swimming | • Diving |
| • Birdwatching | • Kayaking |
| • Boating | • Surfing |
| • Photography | |

Some animals living in marine parks include:

• Whale	• Dugong
• Dolphin	• Prawn
• Turtle	• Sea cucumber
• Fish	• Shark
• Seabird	

Resources: Smartboard or computer with projector that can display websites, access to the Parks and Wildlife 'Park Finder' parks.dpaw.wa.gov.au/park-finder, access to the Parks and Wildlife marine parks website <https://www.dpaw.wa.gov.au/management/marine/marine-parks-wa>

YouTube videos:
[youtube.com/watch?v=uAQQAcbtI5w](https://www.youtube.com/watch?v=uAQQAcbtI5w) (National Geographic *Weird Fish Marine Reserve*)
www.youtube.com/watch?v=RPu_P18XTvs (Kimberley marine park animals)
www.youtube.com/watch?v=OzHeVrGvE8g (Marine protected area activities (USA))

Charade/Pictionary cards – cut into individual cards and placed in a bag or box

Introduction: Where are the marine parks?

Teacher to introduce national and marine parks. Ask questions of students to assess prior knowledge. Does anyone know what a national park is? Can anyone name a national park in your local area? Prompt students if necessary. Has anyone visited a national park? What did they do there? What did they see? Why do we have national parks?

As a class, look at the Parks and Wildlife '[Park Finder](#)'.

Ask a student if they can show where your town or community is on the map of Australia.

Zoom in on the map to find the closest national park to you. Ask students if they have visited this park. What did they do there? What kinds of plants and animals live in the park? Explain that national parks are created to protect the natural environment of special places. It is a way of looking after all the plants and animals that live there. Explain that like national parks look after animals and plants that live on land, marine parks look after plants and animals that live in the sea.

Navigate to the Marine Parks WA page of the Parks and Wildlife website and click on '[Marine parks and reserves](#)' in the menu on the right.

Ask a different student to point out where your town or community is on the map of Western Australia.

Which is the closest marine park to your town? Click on the marine park to learn more about it, or visit the [gallery](#) to see pictures of the park. Ask students to identify animals that live in the park and activities people can do in the park. Why do students think these places have been chosen to become marine parks?

You may also like to look at both marine and national parks in other parts of the Kimberley and compare them with parks in your area, or watch the National Geographic *Weird Fish Marine Reserve* YouTube video.

Activity: Marine park charades

Students will play charades and act out an activity or animal that you find in marine parks.

Review animals and activities that you can find and do in marine parks. You may like to watch the YouTube videos listed above for more ideas of marine park animals and activities. Make sure that all activities listed on the charade cards have been discussed (or make your own cards with animals and activities your students are familiar with).

Announce to the class that you are going to play charades (or Pictionary). Students will have to act out activities or animals that they might do or see in a marine park while their classmates try to guess what they have.

Divide students into two teams. Alternating between teams, students are called to the front one at a time to collect a charade card. The student is then given 20 seconds to act out (or draw) the animal or activity on their card.

The teacher picks other students to guess what animal or activity was on the card, alternating between teams. The team that guesses correctly gets a point.

Continue until all students have had a turn. The team with the most points wins.



Reflection: Sharing

Class combines their best charades into a skit (or as actions to a marine-themed song) to perform as an assembly item to teach other students about their local marine park.

Alternatively, print charade cards to A3 and have students illustrate each activity/animal on the back of the card to create a class set of flashcards. Laminate the cards for future use or compile into a class book.



Marine park charades/Pictionary cards, add your own ideas to the blank spaces

make a sandcastle	go fishing	go swimming
put on a hat and sunscreen	play beach cricket	go snorkelling
go scuba diving	go bird watching	look at shells
a fish	a shark	play beach volleyball
a crocodile	a turtle	an octopus
a dolphin	a whale	a dugong
an oyster	a starfish	a crab
a stingray	a sea eagle	a jellyfish

Lesson four: Let's get fishy



Department of Parks and Wildlife
Department of Fisheries

Students learn how recreational fishing rules are applied to protect fish populations, and practice the skills needed to handle, measure and release fish.

Australian Curriculum - Science		
Year 1	Year 2	Year 3
<p>Living things have a variety of external features (ACSSU017)</p> <p><i>Recognising common features of animals such as head, legs and wings.</i></p> <p><i>Describing the use of animal body parts for particular purposes such as moving and feeding.</i></p> <p>Living things live in different places where their needs are met (ACSSU211)</p> <p><i>Exploring different habitats in the local environment such as the beach, bush and backyard.</i></p> <p><i>Recognising that different living things live in different places such as land and water.</i></p> <p><i>Exploring what happens when habitats change and some living things can no longer have their needs met.</i></p>	<p>Living things grow, change and have offspring similar to themselves (ACSSU030)</p> <p><i>Recognising that living things have predictable characteristics at different stages of development.</i></p> <p><i>Observing that all animals have offspring, usually with two parents.</i></p> <p>People use science in their daily lives, including when caring for their environment and living things (ACSHE035)</p> <p><i>Identify the ways humans manage and protect resources, such as reducing waste and caring for water supplies.</i></p> <p><i>Recognising that many living things rely on resources that may be threatened, and that science understanding can contribute to the preservation of such resources.</i></p>	<p>Living things can be grouped on the basis of observable features and can be distinguished from non-living things (ACSSU044)</p> <p><i>Recognising characteristics of living things such as growing, moving, sensitivity and reproducing.</i></p> <p>Science involves making predictions and describing patterns and relationships (ACSHE050)</p> <p><i>Making predictions about change and events in our environment.</i></p> <p><i>Considering how posing questions helps us plan for the future.</i></p>

Teacher notes:

Daily bag limits are designed to set a social standard for a 'fair day's catch' for an individual fisher, sharing the available catch among the thousands of fishers wanting to catch a fish. They may also reduce the rate at which a population of fish or an area is depleted by fishing, and ensure that a larger number of fish are available in the water for a longer period of time. When set very low, they may also reduce the total catch of a species.

Legal sizes – minimum sizes are usually based on the breeding biology of a species, and are set to protect fish until they reach maturity and have been able to spawn at least once. These limits can also be set to enhance recreational fishing quality by increasing the average size of fish available. **Maximum sizes** are useful in protecting large breeding fish, or in reducing the take of highly prized, and often rare, large specimens.

Any fish you release may join breeding stocks and live to be caught again at a bigger size. If you hook an unwanted or undersize fish, take the time to release it gently, using the following steps:

1. If possible, avoid lifting fish from the water to unhook them. If you need to lift a fish from the water, use a knotless landing net or place a wet hand or rag under the fish's stomach to support the vital organs.
2. Place fish on a wet surface, avoiding hot, dry areas.
3. Use wet hands or a wet rag to hold the fish so damage to its slime layer is minimised.
4. Remove the hook gently with pliers (if possible) or cut the line if the hook is in the fish's gut or gills.
5. Treat fish gently to reduce stress and injury. Scale damage or the removal of the protective mucous coating over their scales can lead to infections.
6. Return the fish to the water as soon as possible.

If you release a fish and it seems to lie on its side or gradually sinks, it may be tired and lacking oxygen. Hold the fish from above, behind the head, moving it through the water as if it were swimming, repeating as necessary. This action pushes water over the fish's gills so it can get enough oxygen to recover. The fish will soon give a few kicks, indicating it is ready for release.

Resources: Colouring pencils, paints or markers. Fish measuring stickers x 4 (from Resource Pack or contact Fisheries), rulers x 4, ring magnets x 4, sticky tape, string or wool. To make 'fishing rods', attach approximately 1m of string to the end of each ruler and tie a magnet onto the other end of the string; alternatively you could just tie magnets onto the ends of hand lines in place of hooks

For each student: *Let's get fishy* worksheet, scissors, paper clip

Introduction: How do we protect fish?

Lead a discussion with students about how we can protect and look after fish (see key words). Where do students go fishing? What kinds of fish do they usually catch? Do they keep all of the fish, or throw some back? How do they choose which to keep and which to throw back? If lots of new people came and started fishing at these places, what might happen to the fish?

Activity: Let's get fishy

Students will learn about some ways they can make sure there are fish for the future and learn best practice when handling fish.

Give each student a copy of the *Let's get fishy!* worksheet.

Get students to decorate fish and cut fish out.

Ask students to point out their fish's eyes, mouth, gills, fins and tail. What does the fish use each body part for?

Each student attaches a paper clip over their fish's mouth.

Once fish are complete, teacher places a sample fish (with paper clip) on the floor and demonstrates how to 'catch' the fish with the 'fishing rod'. Teacher shows how to handle, measure and release fish, and find out what the size and bag limits are (see teacher notes). Discuss how fish that are too small are thrown back so they can grow up to be adults and have more baby fish. If we catch all of the young fish, there won't be any adults in the future to keep on having more babies, so there won't be any fish left.

Students split into four groups, spread around the classroom (or outdoor area). In each group, students place their fish on the ground in a 'school'. Each group is given a 'fishing rod' and fish measuring sticker. Students take it in turns to catch, handle, measure and release their fish.

Reflection: Take home

Encourage students to take their decorated fish home to teach their friends and family how to handle, measure and release a fish.



Let's get fishy!



Lesson five: Dugongs of the seagrass meadow



Department of Parks and Wildlife
Department of Fisheries

Students examine the dugong and its habitat, the seagrass meadow, focusing on threats to dugong populations and actions people can take to minimise these threats.

Australian Curriculum - Science

Year 1	Year 2	Year 3
<p>Living things live in different places where their needs are met (ACSSU211)</p> <p><i>Exploring different habitats in the local environment such as the beach, bush and backyard.</i></p> <p><i>Recognising that different living things live in different places such as land and water.</i></p> <p><i>Exploring what happens when habitats change and some living things can no longer have their needs met.</i></p> <p>People use science in their daily lives, including when caring for their environment and living things (ACSHE022)</p> <p><i>Identifying ways that science knowledge is used in the care of the local environment such as animal habitats, and suggesting changes to parks and gardens to better meet the needs of native animals.</i></p>	<p>Living things grow, change and have offspring similar to themselves (ACSSU030)</p> <p><i>Recognising that living things have predictable characteristics at different stages of development.</i></p> <p><i>Observing that all animals have offspring, usually with two parents.</i></p> <p>People use science in their daily lives, including when caring for their environment and living things (ACSHE035)</p> <p><i>Identify the ways humans manage and protect resources, such as reducing waste and caring for water supplies.</i></p> <p><i>Recognising that many living things rely on resources that may be threatened, and that science understanding can contribute to the preservation of such resources.</i></p>	<p>Living things can be grouped on the basis of observable features and can be distinguished from non-living things (ACSSU044)</p> <p><i>Recognising characteristics of living things such as growing, moving, sensitivity and reproducing.</i></p> <p><i>Recognising the range of living things.</i></p> <p>Science involves making predictions and describing patterns and relationships (ACSHE050)</p> <p><i>Making predictions about change and events in our environment.</i></p> <p><i>Considering how posing questions helps us plan for the future.</i></p> <p>Science knowledge helps people to understand the effect of their actions (ACSHE051)</p> <p><i>Investigating how science helps people such as nurses, doctors, dentists, mechanics and gardeners.</i></p> <p><i>Deciding what characteristics make a material a pollutant.</i></p> <p><i>Researching Aboriginal and Torres Strait Islander people's knowledge of the local natural environment, such as characteristics of plants and animals.</i></p>

Teacher notes: Dugong (*Dugong dugon*)

What does it look like?

With its paddle-like flippers, fluked tail and portly body, measuring 3m long and weighing up to 450kg, the dugong resembles an overweight dolphin. However, it is actually more closely related to the elephant. Its elongated snout faces downwards and has an enormous, bristly, mobile upper lip, used to strip seagrass leaves or snuffle up plant stems from the sea floor. Adult males and some females have short tusks. Special valves keep the nostrils closed while underwater, where the dugong can remain submerged for up to six minutes. Its heavy skeleton helps it stay on the bottom while feeding. As seagrass is hard to digest, the dugong has an extraordinary large intestine. It's as thick as a fire hose and stretches some 30m long.



Where does it live?

The dugong is found in warm, shallow waters between 26° north and south of the Equator, from east Africa to Vanuatu. The dugong is the world's only marine mammal herbivore. It feeds almost exclusively on seagrass – up to 50kg (wet weight) per day! However, it does occasionally snack on molluscs and crustaceans. As it feeds, it stirs up plumes of sand, leaving meandering trails that can be seen from the air.

Dugongs can be found in seagrass meadows of the Kimberley, including in the Eighty Mile Beach, proposed Yawuru Nagulagun / Roebuck Bay, proposed Lalang-garram / Horizontal Falls, Lalang-garram / Camden Sound, proposed North Lalang-garram and proposed North Kimberley marine parks.

How does it breed?

Dugongs have a similar lifespan to humans, and can live for up to 70 years. The female has her first young, called a calf, between 12–17 years of age. Only one calf is born per pregnancy, which lasts up to 14 months, and pregnancy occurs every three to seven years. A newborn calf is pale brown, just over 1m long and weighs up to 35kg! It can swim as soon as it is born, although it needs a little help from its mother to go to the surface to breathe. The calf starts eating seagrass while still very young, but continues to drink its mother’s milk until it is 18 months old. It may stay with its mother for two years or more, swimming just above her back and communicating with bird-like chirps, squeaks and trills.

Any threats to its survival?

The dugong is considered globally vulnerable to extinction. Sharks and killer whales eat dugongs but the worst threats are pollution and coastal development, which destroy seagrass beds, as well as boat traffic, entanglement in fishing nets, and hunting. The dugong has good eyesight and excellent hearing, and can swim at 20kph over short distances. Its average speed is 10kph – even slower when it is feeding.

Resources: *Dhyum the Dugong* (access online or see Picture Books p13), craft supplies: paper, paints or coloured pencils, materials for collage, scissors, glue, butchers paper x 3 plus butchers paper/newspaper/cardboard/material for life-sized dugong, tape measure. A dugong template is available in the Resource Pack.

Introduction: *Dhyum the Dugong*

Teacher to read *Dhyum the Dugong* to the class (for younger students, look at pictures and summarise story).

Discuss dugongs and their habitat. What do dugongs eat? Where do they live? What other animals live in the same places as dugongs?

Dugongs have been around for a long time. As well as Aboriginal stories about dugongs, there are stories of sailors who saw dugongs and thought they were mermaids. Why might sailors have thought dugongs look like mermaids?

Discuss cultural connections to dugongs. What do dugongs mean to you? What word does your family use for dugong?

What were some of the threats the dugongs faced in the story? How can scientists and other people help the dugongs?

Activity: Dugong habitat collage

Students will create a life-sized collage of a dugong in its seagrass habitat.

Re-read *Dhyum the Dugong* to find out how big dugongs are.

As a class, measure out a length of butcher’s paper or newspaper big enough for a life-sized dugong (you may need to join lots of sheets together). Trace a dugong shape onto the paper, and when students are happy with the shape go over the outline in grey paint. Alternatively print off the template in the Resource Pack.

Allocate sections of the dugong to students to decorate. If you used multiple sheets of paper it might be easiest to separate these out for groups to work on, and join them together at the end. Alternatively, ask students to paint sheets of paper in dugong colours then place them together over your outline, cutting around the edges to fill the shape.

Reflection: Save our dugong

This activity will consolidate what students have learnt.

Name your dugong. Ask students to take it in turns to make up a fact about your dugong (where it might live, what it might eat, who its friends might be etc). Write these on a piece of butchers’ paper under your dugong’s name.

On a second piece of butchers’ paper, list or draw possible threats to your dugong (refer back to story).

On your last sheet of butchers’ paper, list or draw things people can do to help protect your dugong.

Display your life-sized dugong, dugong’s personal facts, threats to dugongs, and ways to help dugongs in a visible location in your school (e.g. in the library) or community (e.g. a shopping centre).

Lesson six: Keeping it clean



Department of Parks and Wildlife
Department of Fisheries

Students discuss the impact of litter on the environment around them, and transfer this knowledge to gain an understanding of the impact of litter on the marine environment while undertaking a practical beach (or schoolyard) clean up.

Australian Curriculum - Science

Year 1	Year 2	Year 3
<p>Living things live in different places where their needs are met (ACSSU211)</p> <p><i>Exploring different habitats in the local environment such as the beach, bush and backyard.</i></p> <p><i>Exploring what happens when habitats change and some living things can no longer have their needs met.</i></p> <p>People use science in their daily lives, including when caring for their environment and living things (ACSHE022)</p> <p><i>Identifying ways that science knowledge is used in the care of the local environment such as animal habitats, and suggesting changes to parks and gardens to better meet the needs of native animals.</i></p>	<p>Different materials can be combined, including by mixing, for a particular purpose (ACSSU031)</p> <p><i>Exploring the local environment to observe a variety of materials, and describing ways in which materials are used.</i></p> <p><i>Identifying materials such as paper that can be changed and remade or recycled into new products.</i></p> <p>People use science in their daily lives, including when caring for their environment and living things (ACSHE035)</p> <p><i>Identify the ways humans manage and protect resources, such as reducing waste and caring for water supplies.</i></p> <p><i>Recognising that many living things rely on resources that may be threatened, and that science understanding can contribute to the preservation of such resources.</i></p>	<p>Science involves making predictions and describing patterns and relationships (ACSHE050)</p> <p><i>Making predictions about change and events in our environment.</i></p> <p><i>Considering how posing questions helps us plan for the future.</i></p> <p>Science knowledge helps people to understand the effect of their actions (ACSHE051)</p> <p><i>Investigating how science helps people such as nurses, doctors, dentists, mechanics and gardeners.</i></p> <p><i>Deciding what characteristics make a material a pollutant.</i></p> <p>Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate (AC SIS055)</p> <p><i>Recording measurements using familiar formal units and appropriate observations.</i></p> <p><i>Using a variety of tools to make observations such as digital cameras, thermometers, rulers and scales.</i></p> <p><i>Discussing safety rules for equipment and procedures.</i></p>

Teacher notes: Western Australia’s beaches are among the most polluted in Australia: www.news.com.au/travel/australia/western-australias-beaches-most-polluted-in-australia/story-e6frfq89-1226006342654.

Litter in our oceans (referred to as ‘marine debris’) is an increasing issue that must be managed. Animals mistake litter for food, become entangled in larger items, and may lose their habitat or food sources as a result of pollution. Most of this litter is windblown from adjacent areas into the ocean, although some originates from boats already in the ocean. Picking up litter along our beaches and coastline, and making sure your own rubbish is disposed of correctly, is one of the most basic things we can do to protect the marine environment.

Reducing single-use plastic products in our lifestyles may also lead to a decrease in the amount of litter entering our oceans. Simple actions students can take include saying ‘no’ to plastic bags, using reusable water bottles, and aiming for a ‘zero waste’ school lunch. For more information on waste reduction for schools, contact:

Clean Schools www.kabc.wa.gov.au/get-involved/clean-schools

Litter reduction campaign run over the course of a school term, webinars, classroom resources.

Waste Wise Schools www.wasteauthority.wa.gov.au/programs/waste-wise-schools/

Grants for projects that minimise waste ending up in landfill, webinars, classroom resources.

YouTube video: [It’s Time to Stop Trashing Our Beaches](#)

<p>Resources: <i>Un-fantastic Plastic - Harmful Marine Debris</i> slideshow (from Resource Pack or Marine WATERs). Gloves and bags for clean up, available from Keep Australia Beautiful (see Clean ups p15-16)</p> <p>For each student: hat, sunscreen, gloves and closed shoes</p>
<p>Introduction: Un-fantastic Plastic</p>
<p>Students will demonstrate society's reliance on plastics and the impact this material has on the marine environment.</p>
<p>Brainstorm waste products, particularly plastic, created in everyday life. Use students' lunchbox items as an example, or, for a larger project, conduct a waste audit of your school's bins.</p>
<p>Record all items you come up with on the board.</p>
<p>Ask students to describe how they feel when they see rubbish or litter at school, in the community and in the natural environment. Where does the rubbish come from? What was it used for before it became rubbish? What is it made of? What do they think happens when rubbish makes it to our waterways? Explain that on a windy day, even litter from the middle of a big city could eventually end up in the ocean (see mockumentary The Amazing Journey of Plastic Bags).</p>
<p>Discuss the term biodegradable. How many of the items students listed on the board earlier in the lesson are biodegradable? Circle items students think are biodegradable (will break down over time) in one colour, and circle items that aren't biodegradable in another colour. What are the similarities and differences between these items? Do students know of any ways we can reduce the amount of rubbish we produce?</p>
<p>At this stage you may wish to introduce the concept of reduce, reuse, recycle. Explain that the '3Rs' are listed in order of what we want to do most. First, we try and reduce the amount of rubbish we create; this might be through bringing a reusable water bottle instead of buying bottled water. Next, we try and reuse. For items which will eventually be thrown away, we try and use them as much as possible before we get rid of them, instead of using them only once. This might mean that if we do have to buy bottled water one day when we forget to bring our own water bottle, we then keep that plastic bottle and refill it to reuse it next time we need a water bottle. Recycling is our last option. We have reduced and reused, but we still have rubbish. Your plastic bottle has been used so many times that it needs to be replaced, so you recycle it. Composting and worm farming are also types of recycling, as are mobile phone, battery and printer cartridge collections. Even if your town or community does not have a kerbside collection service, there are still ways you can recycle some of your waste.</p>
<p>Activity: Harmful marine debris</p>
<p>Inform students that a recent report by Clean Up Australia has named Western Australia's beaches as the most polluted in Australia (see news item in Teacher notes). Ask students how this makes them feel. Why do they think we have more litter than other states?</p>
<p>View the slideshow <i>Un-fantastic Plastic - Harmful Marine Debris</i>, to learn about marine debris and its direct effects on marine life.</p>
<p>Discuss the content of the pictures and direct impacts on marine life. For older students, you may like to share the YouTube video listed under Teacher notes. What ideas do students have for minimising marine litter?</p>
<p>Extension: Take action</p>
<p>Ask students whose responsibility it is to manage rubbish on beaches. It is everyone's responsibility to keep our beaches clean. We can do this by educating other people about marine litter, by picking up any rubbish we see, and by taking part in clean ups.</p>
<p>If you are unable to clean up a local beach or waterway as part of an excursion, consider cleaning up your school surrounds, or making posters to put up around your school telling people to put their rubbish in the bin. It is important to end discussion of the impacts of marine debris with positive practical actions students can take, so as not to leave the class feeling despondent or overwhelmed.</p>
<p>If you can, conduct your clean up at a local beach or waterway that students may visit with their families. Consider printing some copies of Tangaroa's Marine Debris Identification Manual and Data Collection sheets for accompanying adults (see Clean ups p15-16).</p>
<p>Once students are on site, give a safety briefing. This should include protective clothing and equipment (shoes, gloves, hats, sunscreen), the boundaries of your clean up, instructions for staying in groups, and what to do if they find hazardous items. The most common hazardous items will be sharp objects (e.g. broken glass), rusty metal and biological hazards (e.g. nappies, sanitary products, condoms). Hazardous items should only be handled by the adult accompanying each group. Give clear instructions on how long you are working for and where to meet at your designated finish time. State whether all full rubbish bags need to be returned to the start location, or if they can be left at alternate locations for vehicle collection afterwards.</p>
<p>Split students into smaller groups led by an adult. Groups spread out along the beach within an area prescribed in the briefing.</p>

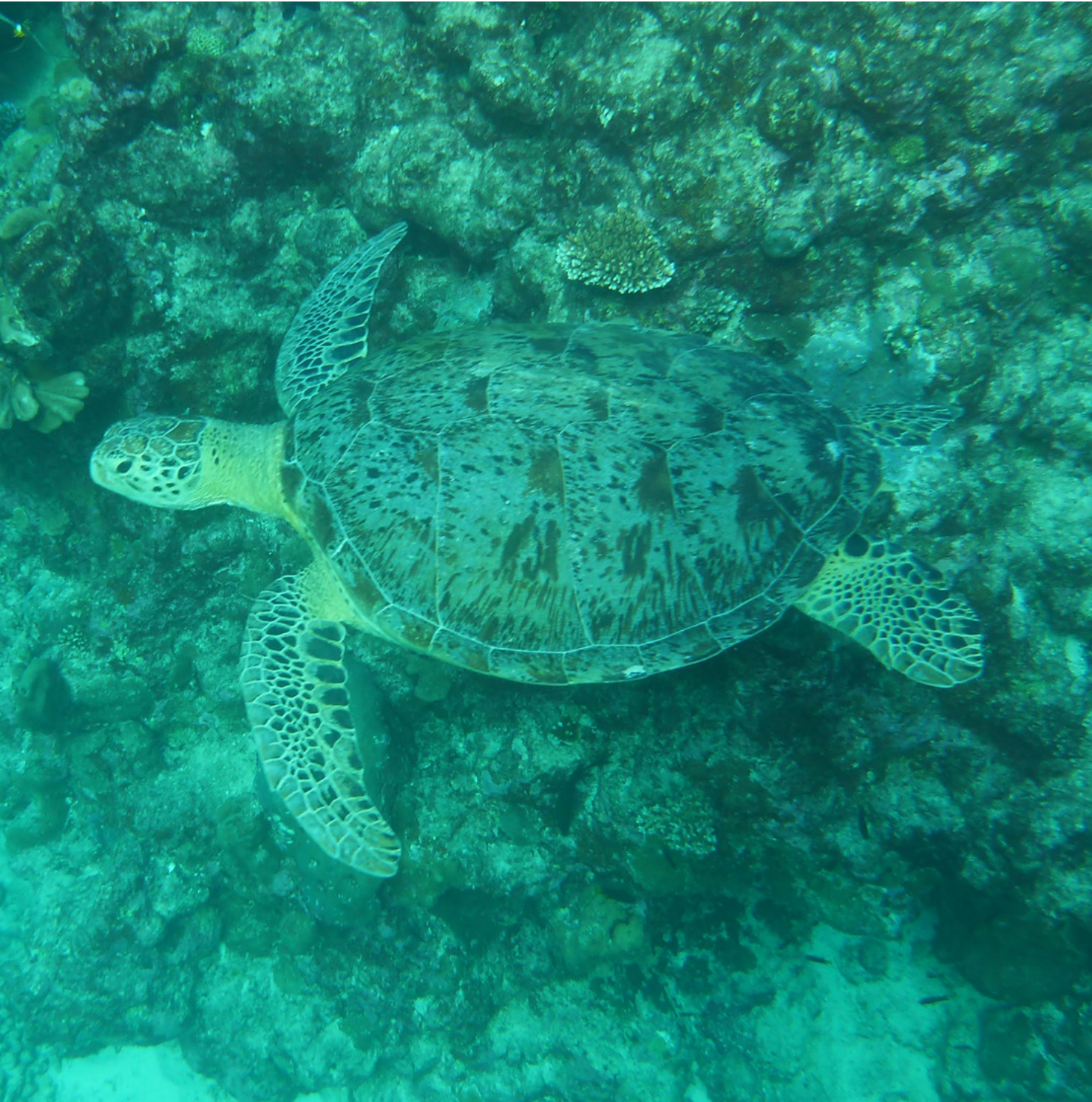
Collect a range of debris in your rubbish bags, buckets or containers. Use cameras to record the events of the excursion and photograph marine debris items collected. You may also like to give the adult with each group a data sheet or designate a student as 'scribe' with a notebook and pen to record what their group finds.

Look closely for smaller items such as plastic fragments and plastic resin pellets that may be present along tide marks. Place smaller items into zip lock bags as you go.

After the designated time, return to the meeting location. If possible, weigh bags of marine debris collected by each group to calculate a cumulative total. A weigh scale used to measure the weight of fish works well.

Sort your debris samples at the beach or back at school (depending on how much rubbish you collected you may choose to just sort a smaller percentage of it, for example one bag per group). Use a tarpaulin or grassed area and separate your rubbish into groups of similar things (such as fishing line, pellets, and plastic bottles). Record what you find on the Tangaroa Blue data sheet and explain that you are going to send this information to the scientists so they can learn where most of the rubbish on our beaches is coming from. Once they know where the rubbish comes from, it is easier to stop it getting there in the first place. Students may like to come up with their own suggestions for reducing marine litter from the results of your survey.









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Department of **Parks and Wildlife**
Department of **Fisheries**



For more information contact Parks and Wildlife's Kimberley education team on (08) 9168 4200 or email kununurra@dpaw.wa.gov.au

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