

Explore Sea Country

Background information
for teachers about
Australian Marine Parks



Acknowledgement

We would like to acknowledge the palawa people, the original and ongoing custodians of the Land, Sea, Sky and Waterways of *lutruwita*.

We pay our respect to Elders past and present and look forward to learning from the Elders of the future.

We would also like to thank and acknowledge the palawa community members, who have contributed information, feedback and images to this Explore Sea Country resource.

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Front cover photo: Southern Right Whale © Lewis Burnett



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1. Introduction

1.1 BACKGROUND

Tasmanian Aboriginal people have significant cultural responsibilities to care for Sea Country. They have been sustainably using and managing their Sea Country for thousands of years. In some cases, areas that are now under the sea were part of the landscape used by Aboriginal people during the late Pleistocene, before sea levels stabilised at current levels about 7,000 years ago.

Increasing awareness and understanding of Aboriginal traditional knowledge and cultural values of Sea Country throughout the earlier years of childhood will help to increase our future generations participation in the management of Sea Country. This will help to protect Sea Country from threats and pressures, to minimise damage, and to rehabilitate and improve the resilience of Sea Country.

1.2 EXPLORE SEA COUNTRY

The Department of Education in Tasmania in collaboration with Parks Australia have developed marine focussed education programs that embed Tasmanian Aboriginal culture and connections to Sea Country fitting within the Australian curriculum.

The education programs focus on exploring Sea Country with topics such as the importance of Sea Country, shell necklace making, kelp water carriers and muttonbirding. This will be implemented in the classroom and through field-based excursions.

About the Department of Education

The Department of Education provides support and education through Tasmanian child and family centres, schools, libraries and business units, with the values of aspiration, courage, growth and respect underpinning all aspects of our work.

Aboriginal Education Services (AES), a business unit within the Department of Education, provides culturally responsive services, curriculum resources and professional learning so that:

1. First Nations students are able to see themselves, their identities and their cultures reflected in their learning.
2. All Tasmanian learners develop a respect for, and understanding of, Aboriginal and Torres Strait Islander Histories and Cultures through the Early Years Framework and the Australian Curriculum.

About Parks Australia

Parks Australia looks after Australia's natural treasures – including Kakadu, Uluru and our beautiful oceans.

Parks Australia is part of the federal agriculture, water and environment portfolio and supports the Director of National Parks who has responsibility under federal environment law for six Commonwealth national parks, the Australian National Botanic Gardens and 59 Australian Marine Parks.

Australia's marine parks make up one of the largest and most sophisticated networks in the world, covering representative examples of all of Australia's marine bioregions. These protect the diversity of life in our oceans, from astonishing coral reefs in our tropical seas to deep ocean canyons and undersea mountains in temperate marine regions.



Short-tailed Shearwater, © EJ Woehler.

2. About Australian Marine Parks

Australia is surrounded by magnificent oceans and a marine environment that's the envy of the world.

Marine parks provide places for people to watch wildlife, dive, and go boating, snorkelling and fishing. Importantly, they support jobs in industries like fishing and tourism, and provide us with food and energy. Marine parks also help conserve marine habitats and the marine species that live within and rely on these habitats.

That's why the Australian Government has established 60 marine parks around the country located within Commonwealth waters – those over 5.5 kilometres from the coast.

The vision of the Australian Government for Australian Marine Parks is: Marine parks that are healthy, resilient and well-managed to enhance Australia's wellbeing.

This means ensuring that:

- the natural, cultural, socio-economic and heritage values of marine parks are understood, appreciated and conserved
- marine parks support jobs and businesses, providing multiple benefits to regional communities and the economy
- people have opportunities to enjoy marine parks
- visitors and tourists can enjoy world-class nature-based experiences in marine parks
- Aboriginal and Torres Strait Islander people and marine park users are partners in managing marine parks.

Australian Marine Parks protect Australia's offshore marine environment. Marine parks are important to ensure the ongoing health of our marine biodiversity, as well as enabling sustainable use.

Indigenous people have strong links with their Sea Country, which includes many regions, habitats and species within Australian Marine Parks.

Parks Australia manages 58 Australian Marine Parks located across five marine park networks (the North, North-west, South-west, South-east and Temperate East networks) and the Coral Sea Marine Park. The Great Barrier Reef Marine Park is managed by the Great Barrier Reef Marine Park Authority and the Heard Island and McDonald Islands Marine Park is managed by the Australian Antarctic Division.

Management plans set out our approach to managing our marine parks and can be accessed at <https://parksaustralia.gov.au/marine/management/plans>.

3. Australian Marine Parks Science Atlas

If you'd like more detail on our marine parks including recent research highlights from Australian Marine Parks, accessing relevant literature or quickly viewing available species, maps and habitat data, the Science Atlas is for you!

Our marine parks are exciting, dynamic places that protect spectacular marine life and important habitats. Situated offshore, often beyond sight of land, these parks are relatively undisturbed and unexplored, making them a fantastic place for cutting edge science and new discoveries.

Using maps, videos, images and data, the Science Atlas brings emerging science stories and our marine parks to life.

Dive into the Science Atlas <https://parksaustralia.gov.au/marine/science/science-atlas/>.

4. South-east Marine Parks Network

The South-east Marine Parks Network, located offshore from Tasmania, Victoria and South Australia, was the first temperate deep sea network of marine parks in the world and includes:

- extraordinary underwater canyons and mountains;
- a remarkable diversity and abundance of marine creatures (most of which are found nowhere else in the world);
- weird and wonderful deep sea creatures, with bizarre and fascinating adaptations to their completely dark homes - and that's just what we know.

The oceans of south-eastern Australia support a rich diversity of marine mammals and birds, more than four thousand species of fish, and tens of thousands of species of invertebrates, plants and microorganisms - many of which are globally significant and found nowhere else in the world.

The 14 marine parks of the South-east Marine Parks Network were established in 2007 to ensure that representative examples of the variety of marine habitats and the marine life they support are protected (refer to Figure 1). Specific values and details of each park are outlined in the section below.

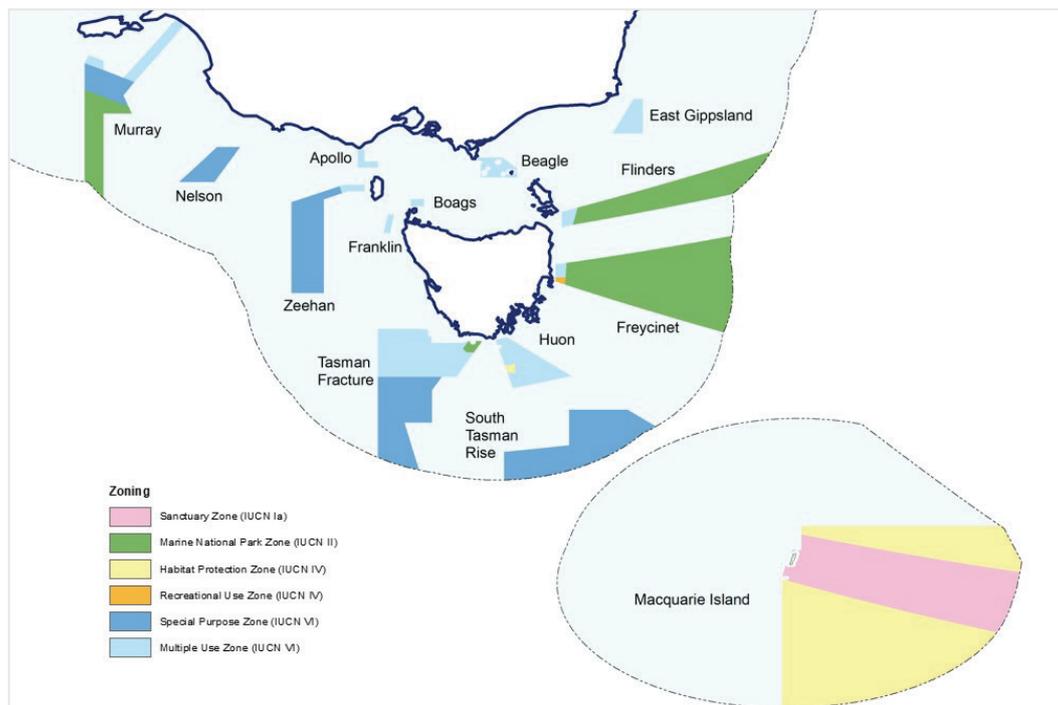


Figure 1. The South-east Marine Parks Network.

Together they form one of the largest networks of temperate marine parks - a total of 388 464 km² (an area almost one and a half times the size of New Zealand).

From the warm temperate waters around South Australia, Victoria and New South Wales, the marine parks extend through to the cool temperate waters around Tasmania, and the sub-Antarctic Southern Ocean waters around Macquarie Island.

4.1 BEAGLE MARINE PARK

Beagle Marine Park lies in Bass Strait between Victoria's Wilsons Promontory and Tasmania's Flinders Island and covers an area of 2,928 square kilometres across the continental shelf. It surrounds Tasmania's Hogan and Curtis island groups, and the Tasmanian Kent Group Marine Reserve and Kent Group National Park.

The marine park covers an area of the sea floor that was once dry land and that formed part of a land bridge connecting Tasmania to Victoria during the last ice age, when sea levels were much lower. As the ice age ended, glaciers melted and sea levels rose, isolating Tasmania about 11,000 years ago. The higher parts of that land bridge are now Bass Strait islands, including Deal, Erith, Hogan, Flinders and Babel islands.

The waters of Beagle Marine Park are quite shallow, ranging from 15 metres to 100 metres – unsurprising given its past as a land bridge. Its waters are influenced by the tidal currents of Bass Strait and by three major ocean flows: The East Australian Current bringing warmer water from New South Wales, the South Australian Current bringing warmer water from the west, and cooler temperate Tasmanian waters coming from the south.

Rocky reefs and soft sediments

Beagle Marine Park protects a shallow continental shelf ecosystem with habitats representative of central Bass Strait. The park features an extensive area of soft sediment with some outcropping of rocky ridges, which are likely to be a sand dune field prior to inundation of the land bridge. These rocky reefs support diverse, colourful sponge garden communities, which provide food for other species by concentrating the nutrients sweeping past in the currents.

Fish life is also diverse, with dozens of species recorded. In 2017, a research team studying rocky reefs in Beagle Marine Park filmed hundreds of Port Jackson sharks resting on the seafloor among the sponges – the largest gathering of these sharks they had ever seen. Giant cuttlefish, which reach up to 80cm in length and are one of the largest cuttlefish species in the world, are also seen in the park.

Migration

Like the other marine parks in Bass Strait, Beagle is a valuable foraging area for the many bird species that breed on the small islands nearby. The islands of Bass Strait hold the largest colonies (up to 6 million birds) of Australia's most abundant seabird, the migratory

Short-tailed Shearwater (or 'mutton birds'), are an Australian breeding stronghold for species such as the fairy prion, shy albatross, silver gull, short-tailed shearwater, black-faced cormorant, Australasian gannet, common diving-petrel and little penguin. It is a feeding area for the Australian fur seal which, while common in the waters of South-eastern Australia, only breeds on small isolated rocks in Bass Strait.

Beagle Marine Park is an important migratory pathway for whales. Southern right whales migrate through Bass Strait during October and November. While here they feed and nurse their young. The Park also provides important foraging grounds for pygmy blue whales and Humpback Whales.

Rising sea levels

Aboriginal people lived and hunted in this area for tens of thousands of years before rising sea levels cut them off from the Australian mainland at the end of the last Ice Age. The waters of the marine park continue to be culturally significant for Bass Strait Aboriginal communities, and many still rely on the natural resources provided by the sea in this area.

Shipwreck Strait

The waters of the Marine Park also have a long European history, with Mathew Flinders sailing through the park in 1798. Beagle Marine Park is named after Charles Darwin's survey ship *HMS Beagle*, which surveyed the then uncharted Bass Strait waters in 1838 and 1839.

Bass Strait is known as Shipwreck Strait, with its coasts and waters among the most dangerous in the world. Its seafloor is scattered with shipwrecks, with some locations mapped, and others yet to be discovered. We know of three historically significant shipwrecks resting on the seafloor in the Beagle Marine Park: the iron steamer *SS Queensland* (1876), sunk after colliding with another steamer; the *Eliza Davies* trading ketch (1924), foundered in a gale; and the *SS Cambridge*, sunk by a German mine (1940).

Zoning

Beagle Marine Park was proclaimed in 2007. It is designated as a Multiple Use zone, that provides for a range of ecologically sustainable recreational, commercial and research opportunities, and for the continuation of traditional activities.



Australian Fur Seal, © EJ Woehler.

4.2 BOAGS MARINE PARK

The small Boags Marine Park lies in Bass Strait off the north-western tip of Tasmania and about 8 kilometres to the north of Three Hummock Island (part of the Hunter Island Group). It covers an area of 537 square kilometres of shallow continental shelf, with depths ranging from about 15 to 70 metres.

These shallow depths and the strong tidal currents that sweep Bass Strait have combined to form extensive dunes on the seafloor that spread from east to west.

Mobile dune fields

The most prominent and striking feature in the Boags Marine Park is the presence of mobile dune fields rippling across the seabed. The large tidal rise and fall of 2.5 to 3 metres creates currents that form pronounced dunes, continuously eroding their steep faces and depositing material in the more sheltered area behind the dune.

In 2018, a survey team mapped the seafloor topography of the park and measured seabed depths. They found some of these dunes to be higher than 12 metres, with wavelengths of about 400 m to 600 metres.

There has been no scientific sampling of seabed biota, or of fish populations to date, but high-resolution bathymetry mapping has revealed the primary habitat features of the park. Crustaceans, polychaete worms and molluscs live in and on the sediments, but the mobile nature of the dunes means they are unlikely to support complex invertebrate cover such as the sponge gardens seen in the Beagle Marine Park to the north-east of Boags Marine Park. The Park is likely to host benthic fishes such as flathead, skates, rays and latches.

Migration and foraging

Boags Marine Park lies adjacent to the Hunter group of islands (Three Hummock Island, Hunter Island, Steep Island, Bird Island, Stack Island, Albatross Island and Penguin Islet) which host important seabird breeding colonies. The island group has been designated by BirdLife International as an Important Bird Area.

Like the other marine parks in Bass Strait, Boags is a valuable foraging area for these species, including the common diving-petrel, white-faced storm-petrel, shy albatross, Australasian gannet, short-tailed shearwater (or 'muttonbirds'), fairy prion, black-faced cormorant, and little penguin.

Bass Strait is an important migratory corridor for whales, and humpback whales have been tracked moving south through these waters in October to their feeding grounds in the Southern Ocean.

Zoning

Boags Marine Park was proclaimed in 2007. It is designated as a Multiple Use zone, and provides for a range of ecologically sustainable recreational, commercial and research opportunities.



Little penguin, © Cristian Valls. 

4.3 FLINDERS MARINE PARK

The 27,043 square kilometre Flinders Marine Park extends east from the coastal waters around Flinders Island into the deep ocean some 600 kilometres offshore. Though it covers a broad depth range – from 15 metres down to abyssal depths of more than 6,000 metres – most lie in deep water, at an average depth of 4,221 metres.

The park straddles four bioregions: the Tasmania Province, the Tasmanian Shelf Province, the Southeast Transition and the Southeast Shelf Transition. It is characterised by strong tidal currents, especially in shallow areas between Flinders Island and the Tasmanian mainland. The park experiences increased phytoplankton production in spring and autumn, which lead to seasonal pulses of organic matter reaching the seafloor. It is also influenced by southwards flow of the East Australian Current that brings warmer waters on to the shelf in summer. The marine life of the region is rich and diverse, containing species common in cold temperate waters as well as low abundances of species common to warmer temperate waters.

Sediment plains and rocky reefs

The key seafloor habitats on the Flinders Marine Park continental shelf consist of sediment plains with patches of reefs, and steep rocky outcrops where canyon heads incise the shelf break. Surveys of these habitats reveal diverse communities of species – from small seabed animals such as lace corals and sponges, to a variety of fishes and other species of commercial and recreational interest. A recent sampling of reef habitats yielded 52 species of fish, with the bluefin leatherjacket, jackass morwong, striped trumpeter and cosmopolitan leatherjacket most abundant. Southern rock lobster, arrow squid, octopus and calamari were also identified. Species richness was greater on habitats containing some reef and declined with increasing depth.

The park includes the habitat of several continental shelf and slope shark species, including the school shark, gummy shark, draughtboard shark and Port Jackson shark. Between 400 and 600 metre depths can also be found the rare and endangered deep-water shark, Harrison's dogfish, and the closely related southern dogfish.

Deep-sea ecosystems

Mapping and sampling of deeper water habitats below 2,000 metres has uncovered a range of habitats and biological communities. The fauna at 2,400 metres is diverse and dominated by brittle stars, sea cucumbers, seastars and sea spiders, while deep in the abyss at 4,100 metres thrives a rich and diverse ecosystem, with numerous Brittle stars, sea pens, sea squirts, sea mice, bristle worms and burrowing molluscs.

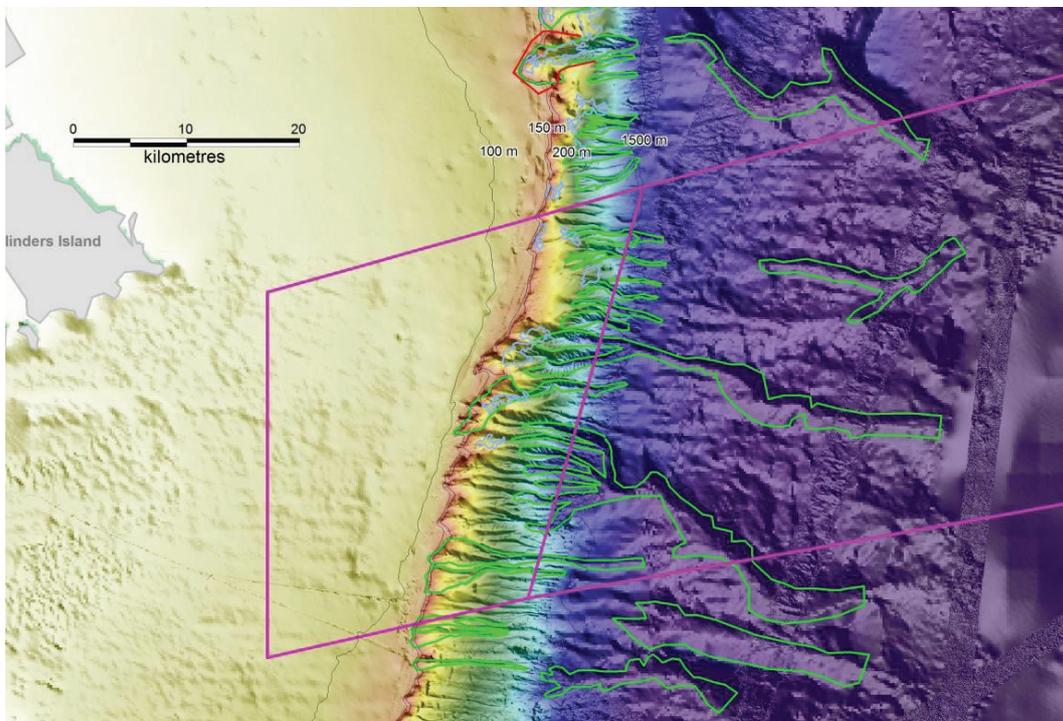
A prominent feature on the abyssal plain is a large seamount, as yet unexplored and believed to be too deep to have been fished. Seamounts are important habitats for open-ocean ecosystems and centres of rich deep ocean biodiversity, and this one is likely to host distinct deep-sea communities.

Migration and foraging area

Along its length, the marine park protects diverse seafloor habitats and important foraging areas for seabirds such as the wandering, black-browed, yellow-nosed and shy albatrosses, northern giant petrel, Gould's petrel and cape petrel. Humpback whales pass through the park on their southward migration to Antarctic feeding grounds for summer.

Zoning

Flinders Marine Park was proclaimed in 2007 and is managed as two zones. A Marine National Park Zone covering the lower continental margin and abyssal plain provides a high level of ecosystem protection and prohibits mining and fishing. In the western area of the park a small Multiple Use Zone covering the shelf and upper slope provides for a wide range of sustainable activities and is popular for fishing.



Canyons and seafloor of Flinders Marine Park, CSIRO.



Coral in Flinders Marine Park, CSIRO.

4.4 FRANKLIN MARINE PARK

The small Franklin Marine Park encompasses an area of 671 square kilometres off the north-west corner of Tasmania. It covers shallow continental shelf waters in a depth range of 15 to 120 metres and includes areas representative of two major bioregions: Western Bass Strait Shelf and the Tasmanian Shelf Province. Its cool temperate waters are exposed to large swells driven by the powerful frontal systems of the Roaring Forties.

Rippled sediments

The northern end of the marine park is dominated by a gently sloping seafloor covered by ripples of fine and coarse sediments. At the southern end, a 117-metre deep valley is etched into the otherwise shallow continental shelf.

There has only been limited sampling and imaging of marine life in the park. Along the western boundary, the seafloor is 75 to 95 metres deep and dominated by rippled sediments. There is no evidence of reefs, and these sandy habitats seem to be only sparsely populated with sea pens, starfish, urchins and crabs.

There does appear to be some isolated reef-like patches in the southeastern region of the park, as well reef-like structures extending southeast from Black Pyramid Rock, 6 km north. However, these structures have not been verified as fine scale mapping data only covers the sediment-dominated habitats of the western boundary.

Migration and foraging

Black Pyramid Rock, six kilometres north of the marine park, is a Tasmanian nature reserve which is one of only eight breeding sites for the Australasian gannet species in Australia and, with a population of approximately 12,500 birds, the largest breeding colony.

A little further north-east lies Albatross Island, which is home to 5,000 breeding pairs of Australia's only endemic albatross, the shy albatross, and one of only three islands in the world on which the species lives. Though they can fly as far away as South Africa and are even sometimes spotted on the Pacific Coast of the United States, some 40% of the world's population of the species returns here to reproduce.

The Marine Park provides an important feeding ground for these species, as well as for a variety of other seabirds such as the little penguin short-tailed shearwater (or 'muttonbirds'), fairy prion, common diving petrel, black-faced cormorant and silver gull. White shark also forage in the reserve.

Zoning

Franklin Marine Park was proclaimed in 2007. It is designated as a Multiple Use zone, and provides for a range of ecologically sustainable recreational, commercial and research opportunities.



Shy Albatross, © Simon Grove (TMAG). 

4.5 FREYCINET MARINE PARK

At 57,942 square kilometres, Freycinet Marine Park is the largest marine park of the South-east Network (apart from Macquarie Island Marine Park) – with an area almost the size of Tasmania. It extends in a wedge-shape from 3 nautical miles (5.5 kilometres) offshore from Freycinet Peninsula out to the edge of Australia's Exclusive Economic Zone, 200 nautical miles (370 kilometres) from the coast. The north-western end of Freycinet Marine Park is adjacent to the town of Bicheno and the Governor Marine Reserve, a Tasmanian state marine park renowned for its spectacular underwater scenery and abundant marine life.

Freycinet Marine Park was proclaimed in 2007, and includes examples of ecosystems, habitats and communities associated with the Tasmania Province, the Tasmanian Shelf Province and the Southeast Transition and with an extraordinary underwater landscape of deep ocean plateaus, canyons and enormous volcanic seamounts.

Though it covers a broad depth range – from 15 metres down to abyssal depths of more than 6,000 metres – most of the park lies in deep water, at an average depth of 4,206 metres.

Tree-forming black corals

About 11 kilometres off the coast, at a depth of about 68 metres, lies an unusual 200 metre-long granite reef, known to local fishers as Joe's Reef. It has recently been explored and documented by deep-diving citizen scientists in conjunction with researchers from the University of Tasmania. What they discovered was remarkable – large numbers of tree-forming black corals, some growing to over 2 metres tall. It marked the first time in Australia that divers had seen tree-forming black coral in coastal shelf waters. While black coral is named for the colour of the species' skeletons, they can have very brightly coloured living tissue. The black coral was not the only discovery – it grew amongst dense and biodiverse gardens of spectacular sponges, soft corals and bryozoans, with huge schools of butterfly perch, leatherjackets and many other fish and invertebrate species congregating.

Coastal dune systems

Drowned coastal dune systems are extensive throughout the park, while small canyon incisions provide a series of isolated reef systems at the shelf-break. These isolated reefs provide important habitat for prized commercial fish species, such as striped trumpeter and jackass morwong.

Deep-sea ecosystems

Though much of the park is unmapped and unexplored, scientists recently surveyed and sampled deep sea and abyssal ecosystems here for the first time. In a small area in the north of the park they mapped the biodiversity of the continental slope, terraces, and plateaux of the deep-sea zone and the abyss. At 1600 to 1900 metres deep they found a rocky environment with expanses of soft sediment, where sea cucumbers fed amongst

the sea pens, and rocks were encrusted with numerous filter feeders such as feather stars, brittle stars, sea stars, sea urchins and glass sponges. Basketwork eels and eel-shaped fish were common. Deeper still at almost 3,000 metres, the seafloor was dominated by sponge colonies sheltering various brittle stars, crustaceans and worms, and supporting sea cucumbers, sea pens and molluscs – a reflection of an organic-rich environment.

Seamounts

The continental shelf drops 6000 metres to the abyssal plain. Here three enormous underwater volcanic seamounts rise up from the seafloor making them higher than any mountains on land in Australia. Though as yet unexplored, we know seamounts to be oases for sea life - important reservoirs of marine biodiversity in the open ocean. The swirl of ocean currents around seamounts often form eddies that cause the upwelling of nutrient rich waters. This creates an ideal habitat for suspension feeders such as cold-water corals, gorgonians, sea anemones, hydroids, sponges and sea pens to settle and attach, which in turn provides niches and nursery grounds for a variety of crustaceans and fish. Each of the seamounts is likely to host distinct and richly diverse communities.

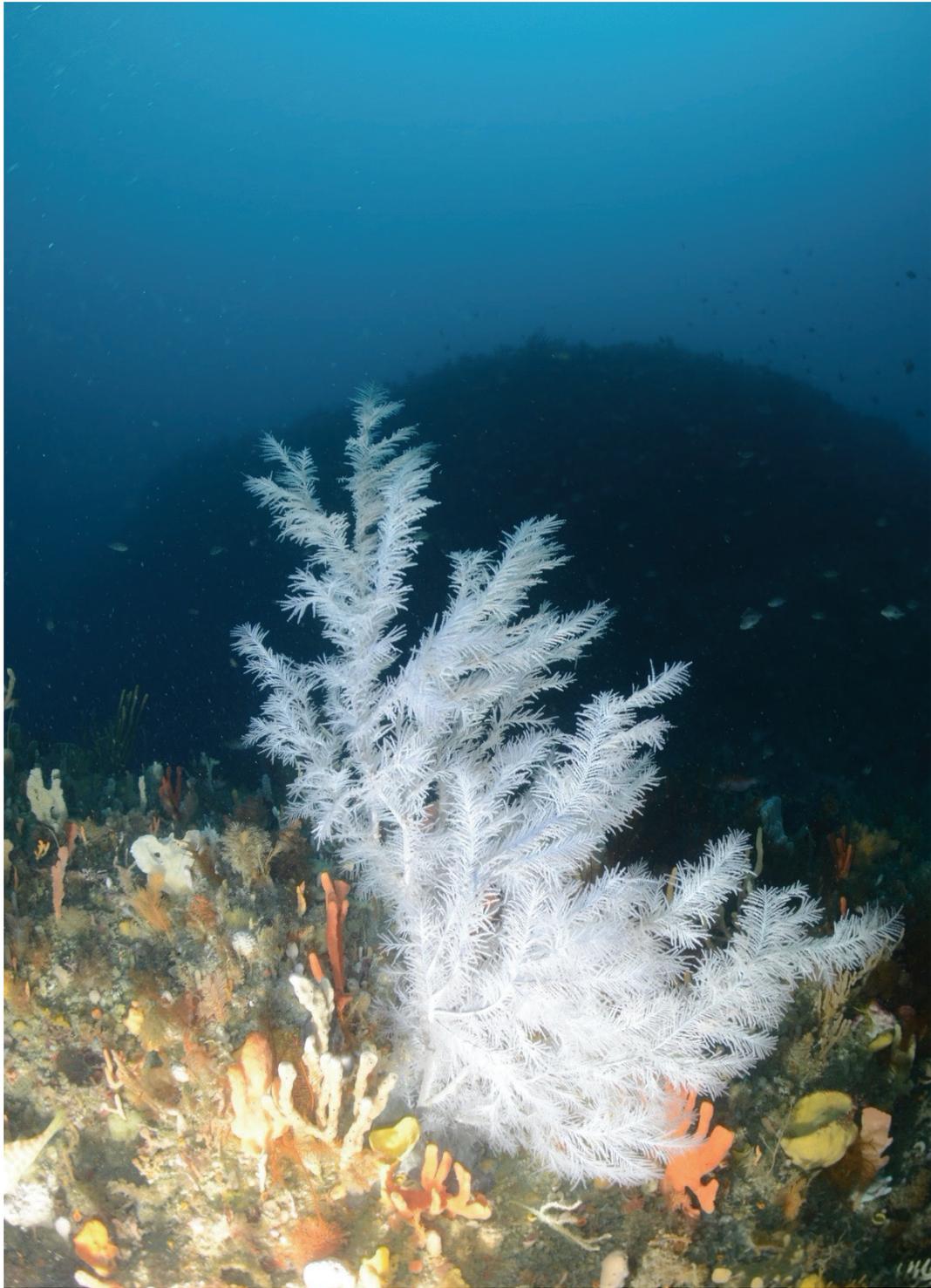
Whales

Humpback, southern right and long-finned pilot whales travel through the marine park on their migratory journeys and are likely to congregate around the seamounts.

The park provides important foraging for many seabird species including those birds found in the shallower areas of the park – white-fronted and crested terns; shy, black browed and white-capped albatross; Australasian gannet; black-faced cormorant; common diving-petrel; fairy prion; silver gull; short-tailed shearwater (or 'muttonbirds'), white-faced storm-petrel and little penguin.

Zoning

Freycinet Marine Park is managed as three zones. Two small zones occur on the outer continental shelf and upper continental slope – a Multiple Use Zone to the north that provides for a wide range of sustainable activities, and a Recreation Zone to the south that is managed primarily for conservation, with recreational fishing and tourism allowed. Most of the park – extending across the lower continental margin and abyssal plain – is designated a Marine National Park Zone, which provides a high level of ecosystem protection, and prohibits mining and fishing.



Black tree coral on Joe's Reef in Freycinet Marine Park, © James Parkinson. 

4.6 HUON MARINE PARK

Huon Marine Park, lying to the south of Dover and Bruny Island in south-east Tasmania, covers an area of 9,991 square kilometres across the continental shelf, slope and abyssal plain. Located three nautical miles from the coast, it covers a broad depth range – from the inner continental shelf at about 15 metres down to abyssal depths of more than 5,000 metres. Most of the park lies in deep water – at an average depth of 2,300 metres.

Huon Marine Park was established in 2007, and includes examples of ecosystems, habitats and communities associated with the Tasmanian Shelf Province and the Tasmania Province, and with sea-floor features such as seamounts, pinnacles, saddles, shelf and terraces.

Seamounts

The key ecological feature of this Marine Park is a cluster of more than 120 undersea mountains (seamounts) – the largest cluster in Australian waters, and one of global importance. These cone-shaped seamounts are remnants of extinct volcanoes, with peaks sitting between 1000 to more than 2000 metres below the sea surface, and some rising up 1400 metres from the seafloor. The topography of the seamounts interacts with the water column, giving rise to localised currents and swirling eddies that collect plankton and nutrients to provide a rich food source for mobile ocean species such as sharks, cetaceans and billfish.

At depths shallower than 1400 metres, colonial corals dominate. These communities are hotspots of biological diversity, with living mazes of black, gold and bamboo corals, sponges, anemones and other marine animals attached in dense colonies to their rocky slopes. Many species are found nowhere else, and many are long-lived and slow-growing – the flora and fauna are hundreds and possibly thousands of years old, making them some of the longest-lived species on Earth. At depths below 1400 metres, sea urchins dominate the benthic communities.

Though some seamounts are less than 25 kilometres apart, connectivity between each is quite limited and hence each seamount has given rise to unique communities. Some have been subject to commercial fishing, but the deeper seamounts are in pristine condition. Their conservation significance, and the impact of commercial bottom trawl fishing, led to the area's protection in 1999 as the Tasman Seamounts Marine Reserve – making it the world's first deep-sea protected area. In 2006, it was included on the Commonwealth Heritage List and in 2007, it became part of the Huon Marine Park.

A Habitat Protection Zone has been established to protect the unique and vulnerable communities of the reserve's seamounts. The park also protects the spawning grounds for basketwork eels (the only known such spawning area in the world) and for commercial fish species, including orange roughy.

Migration and foraging area

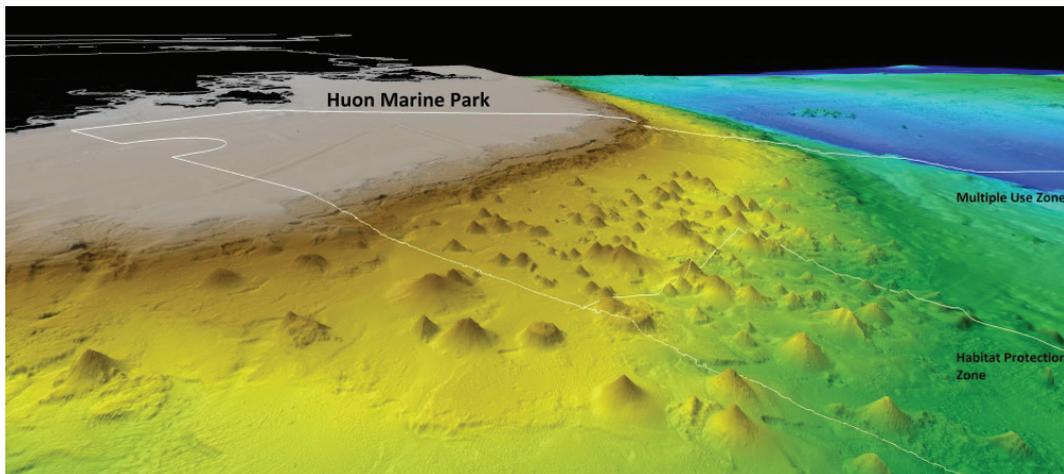
The Huon Marine Park includes an area of continental shelf and slope known to be important foraging habitat for over 40 species of seabirds, many of them rare and threatened and all protected, such as the fairy prion, the short-tailed shearwater (or 'muttonbirds') and at least 10 different species of albatross. The Shy Albatross – the only endemic Australian albatross – and Australasian Gannet have critical breeding habitat on the nearby island of Pedra Branca on the boundary of the park.

The park is also a foraging area for the white shark, fur seal and killer whale, an important migration area for the humpback and long-finned pilot whales and a spawning or nursery area for commercial fish, including ocean perch and blue warehou.

Mapping within the Huon Marine Park has also revealed an extensive region of complex reef in the north-east corner of the park, extending to around 100 metres before grading to sandy substrate. This reef underpins a significant lobster fishery in the region.

Zoning

Huon Marine Park was proclaimed in 2007. It includes two zones, a Habitat Protection Zone which is managed primarily for conservation, and a Multiple Use Zone that allows for a wide range of sustainable recreational and commercial activities that do not significantly impact on habitats.



Huon Marine Park showing the Tasmanian Seamounts, CSIRO.



Shy Albatross, © Eric Woehler.

4.7 MACQUARIE ISLAND MARINE PARK

At 162,000 square kilometres, Macquarie Island Marine Park is the largest marine park of the South-east Network – with an area more than twice the size of Tasmania. It lies in the Southern Ocean about 1500 km south-east of Tasmania and covers one third of Australia's territorial waters around the island. The reserve is adjacent to the Macquarie Island Nature Reserve, which is managed by the Tasmanian Government.

In 1997, Macquarie Island and waters within a 12 nautical mile radius were inscribed on the World Heritage List for their unique geological characteristics. Macquarie Island is the exposed crest of the Macquarie Ridge – a 1500 km long submarine ridge – and is the only known location where rocks from the Earth's mantle are actively exposed above sea level.

Macquarie Island Marine Park was proclaimed in 1999 and includes a portion of the World Heritage Area – the waters from 3 to 12 nautical miles from the shore. It covers a broad depth range – from 15 metres down to abyssal depths of more than 6,000 metres. Most of the park lies in deep water – at an average depth of 4,185 metres, and includes examples of ecosystems, habitats and communities associated with the Macquarie Province, and with sea-floor features such as the Macquarie Ridge, canyons, slopes, troughs and the abyssal plain. To the east of the Macquarie Ridge, the abyssal plain contains a southeast trending chain of large seamounts and numerous smaller volcanic cones.

The Macquarie Ridge acts as a major barrier to the Antarctic Circumpolar Current (ACC), the largest oceanic current in the world. The ACC circles the Antarctic continent in an eastward direction, connecting the waters of the Atlantic, Pacific, and Indian Oceans, and strongly influences the climate and the underwater biodiversity of the Macquarie Island Marine Park.

Associated with the ACC, and lying just south of the island, is the Antarctic Convergence, where cold Antarctic waters meet the warmer waters of the sub-Antarctic, creating a zone of upwelling nutrients. This upwelling nurtures high levels of phytoplankton and so in turn copepods and krill, and the resultant food-chains supporting fish, whales, seals, penguins, albatrosses, and a wealth of other species.

Highly productive ecosystems

There are relatively few surveys on the nature and diversity of bottom-dwelling communities in the Macquarie Island Marine Park. However the information do we have – on the position of the park at the crossroads of major surface water currents and subsurface water masses, and on the foraging areas of the species found here – indicates that these are highly productive waters and that pelagic prey is readily available for foraging seabirds and seals.

Macquarie Island Marine Park contains a variety of large-scale benthic habitats – from rocky volcanic slopes to sediments in deep valley floors – each exposed to different depths, currents, nutrient levels, and temperatures. A 1999 benthic survey hinted at the diverse range of organisms that might be hidden below the surface. They found species-rich communities of large sponges and octocorals on substrata below 1000 metres; and shallow sediments providing habitats for molluscs, brachiopods and seapens, while deeper

muddy sediments supported small, deep-living sea cucumbers and small sponges.

Krill, mid-depth fishes and squid are very important in the marine park food chains. Significant stocks of the Patagonian toothfish are also found in the Park at depths of 600 to 3200 metres, but the commercial toothfish fishery operates outside the Marine Park to the west of the island.

Migratory seabirds and mammals

Macquarie Island supports some of the world's largest sub-Antarctic seabird breeding grounds with an estimated 3.5 million birds – one of the greatest concentrations of seabirds in the world. These are predominantly penguin species. King penguins have recovered dramatically from their harvesting for the blubber oil industry in the 19th century, and the population is now estimated at about 500,000. The island's endemic royal penguin colonies are estimated at containing some 750,000 breeding pairs. Southern rockhopper penguins breed in medium to large colonies with a total population of 100,000 – 500,000 breeding pairs, while the gentoo penguin population numbers about 3800 breeding pairs.

Large oceanic birds of conservation significance that breed on the island include the northern and southern giant petrel and four species of albatross – the black-browed, the light-mantled, the grey-headed and the wandering albatross. They, like the penguins and several smaller seabirds that breed on or visit Macquarie Island, rely on the surrounding waters of the marine park for feed such as squid, shallow and deep-water fishes, and crustaceans.

Macquarie Island is breeding ground for approximately 100,000 seals. Antarctic and sub-Antarctic fur seals breed on the island, while non-breeding male New Zealand fur seals also frequent the island. The most common seal on Macquarie Island is the southern elephant seal, with a population size of about 85,000 during the breeding season. Leopard seals and Hooker's sea lions also regularly come ashore while Weddell and crab-eater seals occasionally visit. The marine park is a known foraging ground for all these seal populations.

Killer whales are the most commonly sighted whales in the waters around Macquarie Island, particularly during the breeding season of the island's seals and penguins. Southern right, sperm, humpback, Antarctic minke, southern bottlenose and other beaked whales are also known to occur in the marine park.

A wildlife sanctuary proclaimed

After its discovery in 1810 by an Australian sealing captain, the island's abundant wildlife was exploited for commercial gain – initially heavily, then intermittently – until 1919. The island's estimated 200,000 fur seals became locally extinct within 10 years, elephant seal numbers reduced by 70%, and finally king and royal penguins were harvested for their oil. Australian Antarctic scientist and explorer Douglas Mawson was so appalled at the devastation when he visited during his 1911-14 expedition, that he lobbied the government for the island's preservation. It was finally proclaimed a wildlife sanctuary in 1933.

The dangers of shipping

The dangers of shipping in the treacherous waters off Macquarie Island are well documented. During the sealing era, from 1810 to 1919, 144 vessel visits are recorded, twelve of which ended when the vessel was wrecked.

In 1914, the Australian Government's fisheries research vessel *Endeavour* disappeared without trace after leaving Macquarie Island for Hobart in heavy weather.

Most of these vessels were washed up on the coast. But the most recent shipwreck, that of Danish ice breaker *Nella Dan* in 1987, lies within the Marine Park. On a re-supply visit to Macquarie Island for the Australian Antarctic Division, *Nella Dan* ran aground in bad weather. After the crew and passengers were safely taken off the ship, and equipment and oil salvaged, the ship was towed out to deep water and scuttled.

Zoning

Macquarie Island Marine Park is managed as two zones – a central Sanctuary Zone situated between two Habitat Protection Zones. The Sanctuary Zone (the only Sanctuary Zone in the South-east Network) provides the highest level of protection possible for vulnerable or protected species and important habitats in a marine environment. This is a 'look but don't take' area where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values.

The Habitat Protection Zones are managed primarily for conservation but do allow for a range of sustainable recreational and commercial activities that do not significantly impact on habitats, such as fishing, diving, and nature watching and filming.



King Penguin, © EJ Woehler.

4.8 SOUTH TASMAN RISE MARINE PARK

South Tasman Rise Marine Park lies in deep waters far off the coast of south-east Tasmania, with its southern edge following the boundary of the Australian exclusive economic zone, 200 nautical miles from land. The depth of the park ranges from 800 to 6,000 metres, with an average depth of 3,183 metres.

It is a large marine park of 27,704 square kilometres, spanning mid-continental slope and deeper water, and encompassing seamounts and a section of the South Tasman Rise, a large submerged plateau of continental rock that abuts southern Tasmania.

South Tasman Rise

The South Tasman Rise rests less than 1,000 metres below sea level and is separated from Tasmania by a saddle more than 3,000 metres deep. This plateau stands as the last remnant of the link between Australia and Antarctica – a sunken land bridge that used to connect Tasmania to Antarctica. As eastern Gondwana broke up, the seafloor spread and the Australian plate moved north. Tasmania was still connected to Antarctica by the stretched crust of the South Tasman Rise until about 45 million years ago when Australia and Antarctica finally tore apart. Over the next 10 million years or so the South Tasman Rise itself subsided. The seafloor in the South Tasman Marine Park was deformed by this massive rifting.

In 1997, significant aggregations of orange roughy were discovered on the South Tasman Rise and a fishery rapidly developed there, including in the section now designated a Marine Park. Orange roughy stocks are vulnerable to exploitation as the species is long-lived and easily caught when aggregating to spawn or feed. After the first couple of years of the fishery, the availability of fish had decreased dramatically and showed no signs of recovery. Since 2007, the region has been closed to commercial fishing to give the orange roughy population a chance to rebuild.

While we have limited knowledge of the habitats and species found here government fisheries observers made detailed records of species caught on 545 trawls in the South Tasman Rise orange roughy fishery between 1997 and 2000. They recorded a significant bycatch of hard and soft coral species (with reef-forming stony coral dominating) and of a number of deep water oreo fish species. A wide range of other fish species were found in smaller amounts as well as numerous invertebrates including crustaceans, molluscs, echinoderms and sponges.

Seamounts

The park also contains several large seamounts, some of which have flat summits, indicating that they were exposed above the surface at some time. These seamounts are likely to host unique communities of cold water corals, sponges and relatively high densities of fish, like the better studied seamounts to the north.

Feeding stop

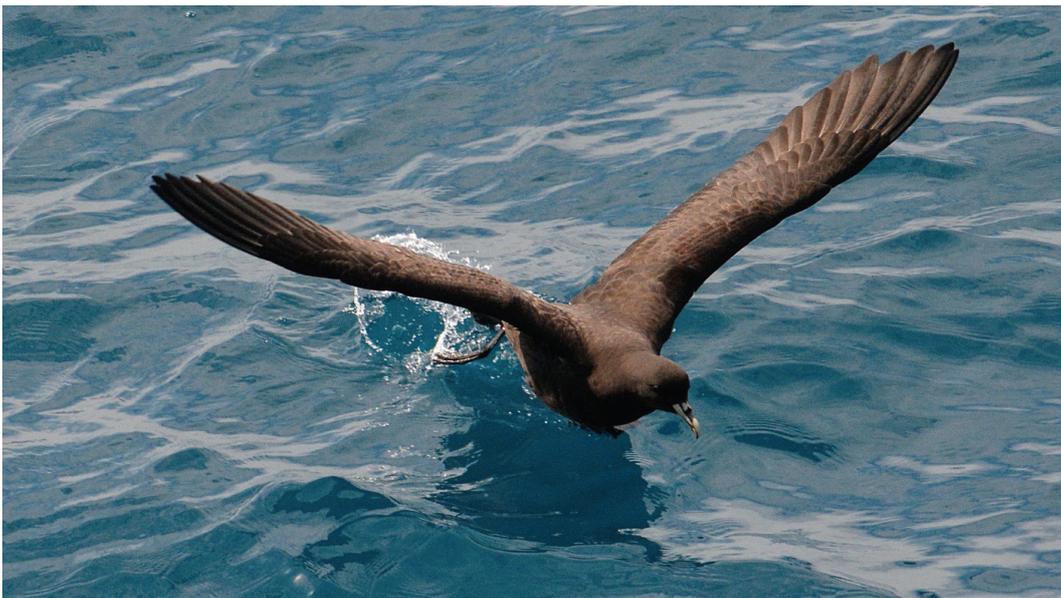
Seamounts and other prominent seafloor features can give rise to swirling eddies and upwellings that collect plankton and nutrients. Research at other such sites south of Tasmania has found that this rich food source attracts an abundance of seabirds and mobile ocean species such as sharks, whales and billfish.

The South Tasman Rise Marine Park is thought to be an important foraging habitat for many seabirds, including the wandering and black-browed albatrosses, the short-tailed shearwater (or 'muttonbirds') and the white-headed and white-chinned petrels.

The size and location of the park indicate that it is likely to be an important site for marine mammals. Indeed, satellite tracking studies of humpback whales show that the migration path of many south-bound humpback whales takes them over the South Tasman Rise Marine Park en route to Antarctica.

Zoning

South Tasman Rise Marine Park is designated as a Special Purpose zone, which limits access to mining but allows for a wide range of activities provided they will not have an unacceptable impact on the values of the area.



White-chinned Petrel, © EJ Woehler.

4.9 TASMAN FRACTURE MARINE PARK

The Tasman Fracture Marine Park extends south-west of Tasmania from the continental shelf to Australia's exclusive economic zone boundary, 200 nautical miles from the Tasmanian coast. It was established in 2007 and complements the Port Davey Marine Reserve proclaimed by the Tasmanian Government in 2005.

This large marine park encompasses an area of 42,501 square kilometres. It covers a broad depth range – from 15 metres down to abyssal depths of more than 6,000 metres. It incorporates examples of ecosystems, habitats and communities associated with the Tasmanian Shelf Province, the Tasmania Province and the West Tasmania Transition, and with a great range of sea-floor features including abyssal plains, steep escarpments, saddles, basins, seamounts and trenches. It is scored by steep canyons and includes part of a plateau that is over 400 kilometres long and rises three kilometres above the seafloor. Biodiversity in the marine park is influenced by the Zeehan Current that sweeps south from the Indian Ocean along the west coast of Tasmania. The park's geological features influence and intensify the current, creating turbulent mixing and upwelling of nutrient rich waters.

Tasman Fracture Zone

A key ecological feature of the marine park is the Tasman Fracture Zone – a four-kilometre-deep crack in the earth's crust. Scientific surveys have revealed marine life on rocky seabed to depths of over 4000 metres at some locations. A distinctive community dominated by gorgonian corals, gooseneck barnacles and millions of round, purple-spotted sea anemones is centred at a depth of about 2500 metres. Also found are hundreds of species new to science, including a carnivorous sea squirt, sea spiders and giant sponges, which represent the deepest known Australian fauna. Some deep-sea corals in this region are extremely long-lived – with some specimens aged at over 1000 years.

Seamounts

The marine park also includes a number of undersea peaks rising to less than 1500 metres below the sea surface. These provide structure and habitat for deep-water reef-building hard corals which form a dense matrix that in turn provides a platform for a rich diversity of marine invertebrates. Three hundred different species of animals, such as sponges, soft corals and anemones, can live in a single seamount community.

Reef systems

Previously fished reef systems extending to depths of 140 metres are now protected in the 'no-take' Marine National Park Zone. Soft coral and bryozoan communities dominate here, with a high number of brittle stars. They provide habitat for Southern Rock Lobster and for 50 or more species of fish, including ocean reef perch, butterfly perch, jack mackerel, striped trumpeter and red cod. Many commercially targeted species of fish and lobsters have been found to be more abundant inside than outside the Marine National Park Zone.

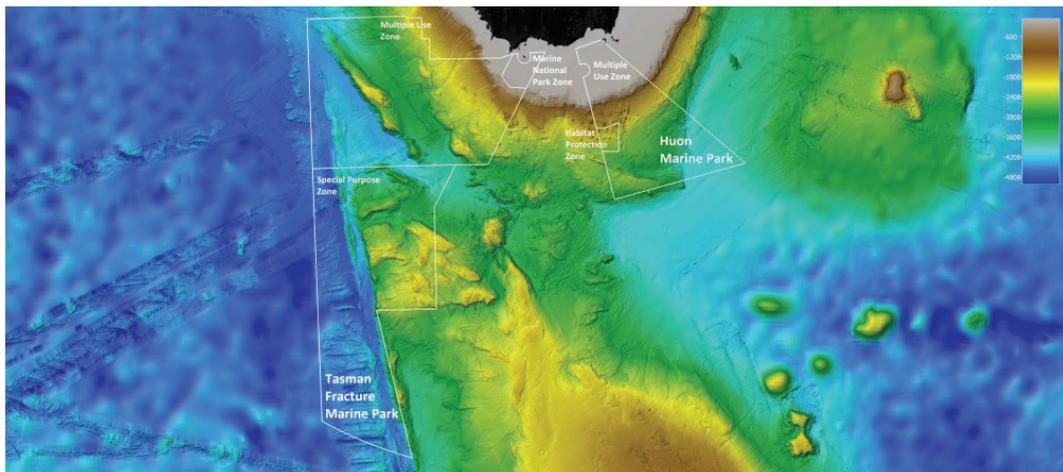
Migration and foraging area

Partly surrounded by the Tasman Fracture Marine Park is the rocky island of Mewstone, a Tasmanian nature reserve that hosts the largest breeding colony of the shy albatross – Australia's only endemic albatross and a threatened species. The Marine Park also protects important foraging habitat for many other species of seabirds, including wandering and black-browed albatrosses, white-chinned petrels, common diving petrels, short-tailed shearwaters (or 'muttonbirds') and fairy prions.

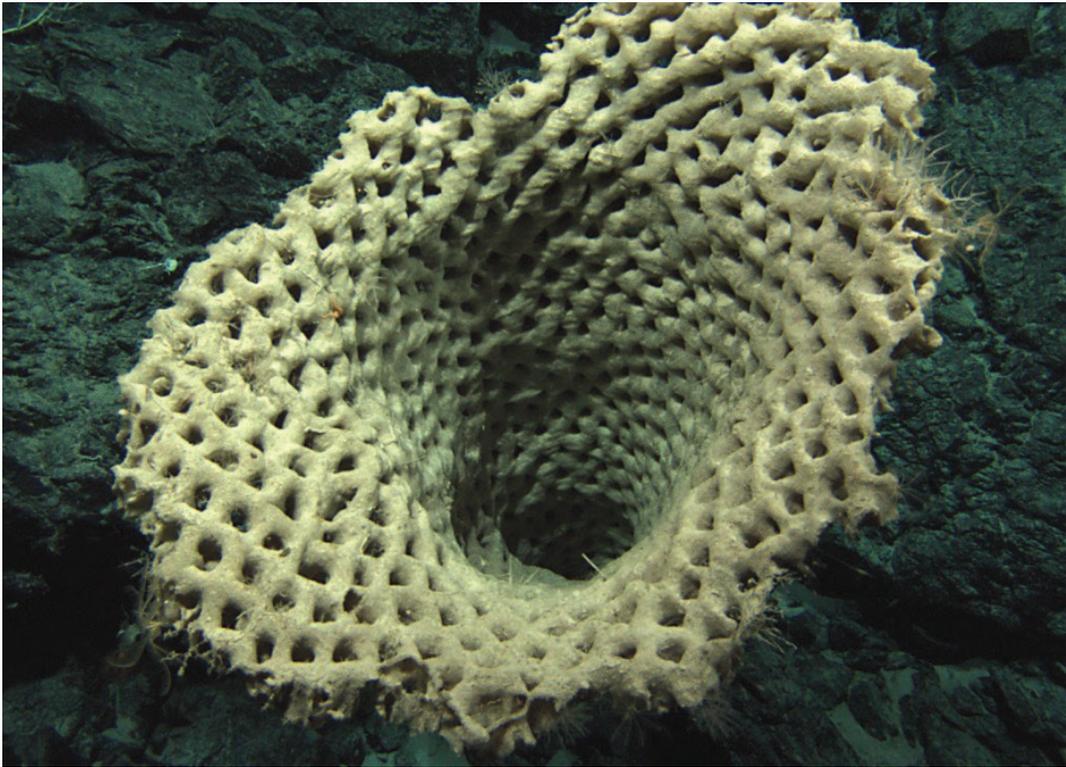
The marine park is also an important foraging area for fur seals, white sharks and school sharks, and a migration area for the humpback and long-finned pilot whales. As the park extends into the Southern Ocean it's also home to some sub-Antarctic fishes and invertebrates.

Zoning

A zoning plan is in place that protects this biologically important area. In addition to the smaller National Park zone, it contains a large Special Purpose and a Multiple Use zone that allow for a wide range of sustainable recreational and commercial activities that do not significantly impact on habitats.



Tasman Fracture Marine Park and Huon Marine Park seafloor map, CSIRO.



Glass Sponge in Tasman Fracture Marine Park, CSIRO.

4.10 ZEEHAN MARINE PARK

Zeehan Marine Park lies to the west and south-west of King Island, off north-west Tasmania. This large park covers an area of 19,897 square kilometres, and a huge depth range – from shallow 70-metre continental shelf waters down to six kilometres on the abyssal plain.

The park incorporates examples of ecosystems, habitats and communities associated with the Tasmania Province, the West Tasmania Transition and the Western Bass Strait Shelf Transition, and with a huge range of associated sea-floor features, including abyssal plains, valleys, hills, slopes and undersea canyons cutting deep into the continental shelf.

Playing a vital role in the ecosystems of the marine park is the Zeehan Current, an extension of the Leeuwin Current from Western Australia that runs southward along the Tasmanian west coast. This current brings warmer saltier water as far south as the bottom tip of Tasmania. In winter, when the current is strongest, it can flow around the base of Tasmania and up the east coast as far as the Freycinet Peninsula. The current provides a free ride for many marine species, assisting their migration and subsequent distribution, from the tropical north to the temperate southern waters.

Submarine canyons

A significant feature of Zeehan Marine Park is a series of four submarine canyons that incise the continental slope, extending from the shelf edge to the abyssal plains. When the Zeehan Current meets these canyons, waters swirl upwards, bringing nutrients to the surface to create ideal conditions for abundant and diverse marine life.

Zeehan Marine Park includes a great variety of seafloor features and depths, causing different biological communities to evolve independently in each very different habitat. There have only been limited scientific surveys and biological sampling in this extensive marine park, but we know that it hosts species that are found nowhere else in the world and that are new to science. For example, exposed rocky limestone reefs on the continental shelf support rich diverse animal communities of large sponges and other permanently attached invertebrates. On the continental slope there are extensive 'thickets' of lace corals and sponges. The rocky limestone banks also provide important habitats for a variety of crustaceans, such as the giant crab. Concentrations of larval blue warehou and ocean perch indicate the area is also a nursery ground for commercially significant fish species.

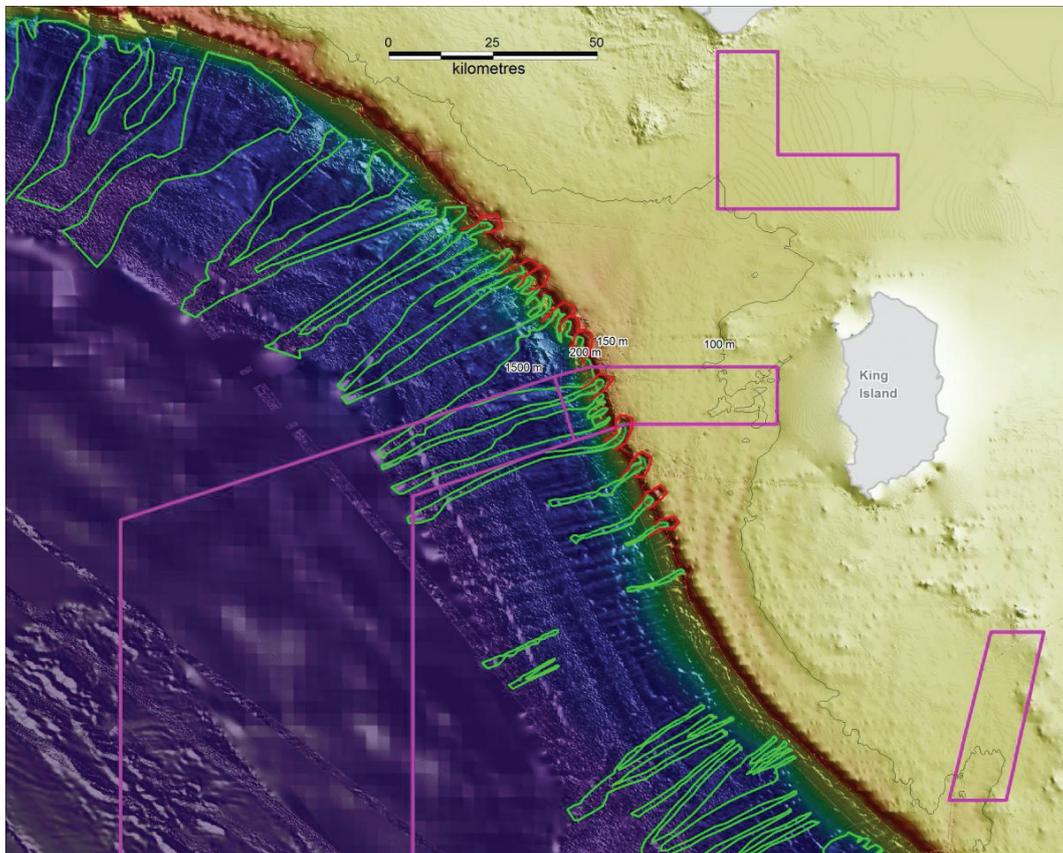
A large portion of this park extends out over abyssal plains, down to depths of six kilometres. Little is known yet about the extraordinary sea creatures living in the ocean's 'twilight zone'. Adapting to a world almost devoid of light and under extreme pressure, these organisms can develop huge eyes, fang-like teeth, bioluminescence and other specialised features. The fish that live here are thought to be the most abundant in the ocean and they play a vital role in keeping the ocean ecosystem healthy.

Migration

Several protected and migratory species use the marine park for breeding and/or feeding, including marine mammals, seabirds, tuna and sharks. It is known to be a foraging area for a variety of seabirds, including black-browed, wandering and shy albatrosses, and great-winged and cape petrels. It is also a feeding ground for the great white shark, and a variety of other sharks and commercial fish species.

Zoning

Zeehan Marine Park was proclaimed in 2007. It is divided into two management zones: a small Multiple Use zone, which provides for a range of ecologically sustainable recreational, commercial and research opportunities, and a Special Purpose Zone covering most of the park which provides for a similar use of natural resource but prohibits commercial fishing.



Zeehan Marine Park bathymetry, CSIRO.

4.11 APOLLO MARINE PARK

Apollo Marine Park lies within the cool waters of Bass Strait, 3 nautical miles south of Cape Otway and Apollo Bay in western Victoria, and northwest of King Island. It covers an area of 1184 square kilometres across the continental shelf and complements the Victorian Government's marine protected area network.

The waters of Apollo Marine Park are quite shallow, starting in depths less than 50 metres near Cape Otway and deepening offshore to 120 metres. The park features reefs, and ancient shorelines and river courses from the last ice age, about 18,000 years ago. It includes the Otway Depression, a 100-metre-deep undersea valley that joins the Bass Basin to the open ocean.

Apollo Marine Park is exposed to huge south-westerly swells, and strong tidal flows as the southern tip of Cape Otway interacts with the complex underwater geological features. Another of the dominant influences on the park is the Leeuwin Current which transports warm, subtropical water southward along the West Australian coast and then eastward over the continental shelf to the southern tip of Tasmania. This current is stronger in winter than in summer. During summer and autumn, the cold Flinders Current flows westward along the continental slope of western Victoria and South Australia. Prevailing seasonal south-easterly winds drive upwelling, and the resulting increase in nutrient enrichment supports an abundance of marine organisms, including high value fish species.

Productive reefs and sediments

Most reef habitat in Apollo Marine Park is confined to the shallow northern section, but only limited biological sampling has been undertaken there. Biological sampling in state waters to the north have revealed a variety of marine habitats that are likely to extend their distribution into the park. These include reefs supporting diverse, colourful sponge gardens, rocks covered with filter-feeding sea plumes, sea tulips and hydroid fans, and colonies of erect octocorals growing on sediment. All in turn provide habitat for numerous fish and other invertebrates.

Directly north of Apollo Marine Park in the shallower Victorian State waters is a region of reef known as the "Paddock" by commercial rock lobster fishers in recognition of the abundance of southern rock lobsters foraging and sheltering there. These highly productive shallow reefs extend into the northwestern region of the park, and southern rock lobsters are thought to migrate to and from the shallower waters and the slightly deeper water of Apollo Marine Park throughout the year.

There have been no targeted surveys of reef-affiliated fish within or near the marine park. However, recent detailed multi-beam sonar surveys have identified new reefs that are likely to provide critical habitat for fish and other animals. They are also providing insight into the habitats that may be hotspots for marine biodiversity and so a priority for biological sampling in the future.

Feeding stop

A rich diversity of oceanic seabirds forage in these waters, including the Australasian gannet; little penguin; shy, black-browed, yellow-nosed and wandering albatrosses; southern and northern giant-petrels; white-chinned, great-winged and Cape petrels; Wilsons, white-faced and grey-backed storm-petrels; fairy prion; common diving-petrel; fluttering, flesh-footed, short-tailed, Huttons and sooty shearwaters; and crested tern.

Apollo Marine Park is an area of high at-sea use by lactating Australian fur seals, and the highly migratory conservation-listed school shark. Its waters host many different species of migrating whales, including the humpback, blue, fin, sei southern right and killer whales.

Sea Country

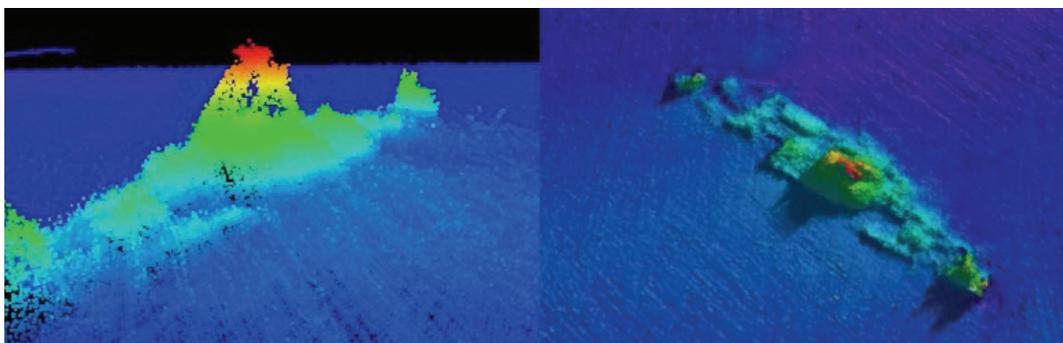
During the last ice age, which began about 30,000 years ago, sea levels were approximately 120 metres lower than present-day levels. Bass Strait was dry land, and the area covered by the marine park would have been extensively used by Aboriginal people. About 17,500 years ago, as the ice age ended and glaciers melted, sea levels started rising. This had such a profound impact on societies that local Aboriginal oral histories preserve details of coastal flooding and the migration of populations.

The Shipwreck Coast

The coastline stretching from Cape Otway to Port Fairy is so notoriously dangerous for shipping it is known as the Shipwreck Coast. Matthew Flinders declared, "I have seldom seen a more fearful section of coastline." There are 638 known shipwrecks along Victoria's coast, although only around 240 of them have been discovered. One at least lies in the waters of Apollo Marine Park – the historically significant wreck of MS City of Rayville. Destroyed by a German mine in 1940, it was the first US ship to be sunk during WWII. The site of the wreck is approximately 14 kilometres south of Cape Otway, at a depth of about 76 metres, and recent high density sonar data has given us a detailed picture of the orientation of the wreck and surrounding seabed.

Zoning

Apollo Marine Park was proclaimed in 2007. It is designated as a Multiple Use zone that provides for a range of ecologically sustainable recreational, commercial and research opportunities.



Depth profile of the City of Rayville shipwreck situated on the western edge of Apollo Marine Park, Deakin University.

4.12 EAST GIPPSLAND MARINE PARK

The 4,137 square kilometre East Gippsland Marine Park lies south-east of the New South Wales–Victoria border at Cape Howe. It contains deep-water habitats from 500 metres on the upper continental slope down to 5,000 metres on the abyssal plain.

Geological highlights of the park have recently been revealed for the first time by high-resolution 3D mapping, include an extensive network of submarine canyons up to 2000 metres deep, numerous ridges and gullies eroding into the continental margin, and a knoll which juts out from the base of the continental slope. These seafloor features play a vital role in deep ocean ecosystems – engineering habitats and transferring energy up the food chain. Particularly in areas where biological information is absent, the availability of such high resolution bathymetric data helps us better understand the deep-water habitats of marine life.

The East Australian Current, bringing subtropical water from the north, interacts with this varied seafloor terrain. Around Cape Howe the current forms large eddies with a central core of warm water and an outer ring of cooler, nutrient-rich water, creating conditions for highly productive phytoplankton growth, which supports a rich abundance of marine life.

During winter and spring, another current, the seasonal Bass Strait Cascade, flows through the park. This flow results from the formation of high salinity water in Bass Strait that sinks over the upper continental slope and forms a temperature front, which also influences biodiversity and productivity.

Diverse deep-water habitats

Both the warm and temperate waters of East Gippsland Marine Park support a rich abundance and diversity of marine life. Phytoplankton blooms are the basis of the food chain, and underpin this diversity of organisms, including commercially important fish species, top order predators, marine mammals and seabirds.

Swarms of oceanic salps, a type of gelatinous zooplankton, are also key components of marine food webs here and are a food source for many species including fish, and crustaceans. They occur in the upper 200 metres of the sea and play a major role in carbon sequestration. Mass depositions on the seafloor of their carcasses and faecal pellets also provide important food-fall for the benthic fish and crustaceans.

Previously, information on ecosystems in these deep areas of the East Gippsland Marine Park has been limited. However recent mapping and sampling of the park has uncovered a range of habitats and biological communities. A video transect of the muddy plain across the plateau at 2,500 metres revealed fish, cnidarians, and lots of plankton in the water. Further north in the park a 2,500 metre trawl found a diverse range of fauna including many sea spiders, sea-stars, sea cucumbers, bristle worms, molluscs, brittle stars, ship-worms, predatory lizardfish, a large red spiny king crab and a finned-octopus. A deep trawl at 3850 metres yielded numerous sea mice, sea squirts, sea pens, small clams, squat lobsters, brittle stars and sea snails.

Foraging and migration

East Gippsland Marine Park is a valuable foraging area for many oceanic seabirds, including wandering, black-browed, yellow-nosed and shy albatrosses, the great-winged petrel, wedge-tailed shearwater and cape petrel.

Humpback whales pass through the park during their migrations north and south along the eastern seaboard, and killer whales and Southern right whales have also been recorded in these waters.

Zoning

East Gippsland Marine Park was proclaimed in 2007. It is designated as a Multiple Use zone, and provides for a range of ecologically sustainable recreational, commercial and research opportunities.



Humpback whale, © warrencameron. 

4.13 MURRAY MARINE PARK

Murray Marine Park is located south of the mouth of the Murray River, off the South Australian coast, and stretches to the limit of Australia's Exclusive Economic Zone more than 400 kilometres out to sea. It covers 25,803 square kilometres and spans an extensive area across the Lacedpede Shelf, continental slope and deeper water ecosystems.

It incorporates a huge depth range – from shallow 15-metre continental shelf waters down to six kilometres on the abyssal plain.

This marine park connects the waters draining from the Murray River to the deep ocean abyss. Mapping and sediment sampling along the Lacedpede Shelf has revealed the ancient course of the Murray River to be a 200-km long system of infilled channels and lagoons.

The marine park contains the Murray Canyon system, one of the most spectacular geological formations on the Australian continental margin and a system so vast that America's Grand Canyon would fit inside it. Sixty-three canyons incise a long section of the continental shelf and extend across the slope to the abyssal plain. The system stretches more than 150 kilometres and descends to 4,600 metres below sea level, generating strong upwellings and supporting highly productive and biodiverse ecosystems.

Canyons

There has been little biological sampling in the Murray Marine Park, and little is known about the habitats there. However, the Murray canyons have been identified as having high habitat potential for both open ocean and seabed animals.

The Murray River carries sediments rich in nutrients from its passage through New South Wales, Victoria and South Australia. 'Rivers' of these sediments scour channels into the continental shelf and eventually deposit their nutrient-rich load on the seafloor. Seasonal changes in water currents bring a huge upwelling of this deep nutrient-rich water to the sea-surface, which triggers a phytoplankton bloom – one that is visible from space! This attracts swarms of krill, breeding seabirds, and seals, dolphins and whales to feast.

The steep-sided valleys of the submarine canyons trap nutrients and attract a diversity of marine life – communities of sponges and corals attach to their hard walls, and tiny creatures collect in their sediments. The complex undersea topography of these canyons points to them being hotspots for marine biodiversity, but multi-disciplinary surveys are needed to understand more about their ecosystems.

Migration and foraging area

Many seabirds can be seen foraging within Murray Marine Park, including wandering, black-browed, yellow-nosed and shy albatrosses, flesh-footed and short-tailed shearwaters (or 'muttonbirds'), great-winged petrel and white-faced storm petrel.

The park is a known cetacean habitat for blue, sperm, killer and southern right whales. Southern right whales use the inshore area of the park to nurse their young.

The Murray Marine Park is an important foraging area for Australian sea lions, who have nearby breeding colonies on Kangaroo Island.

Zoning

Murray Marine Park was proclaimed in 2007. It is divided into three management zones: a Multiple Use zone, which is managed for a range of ecologically sustainable recreational, commercial and research opportunities; a Special Purpose Zone, which provides for a similar use of natural resource, but prohibits commercial fishing; and a large National Park Zone, which provides a high level of ecosystem protection, and prohibits all mining and fishing.



Australian sea lion, © Franca Wermuth. 

4.14 NELSON MARINE PARK

Nelson Marine Park lies off the far southeast corner of South Australia, beyond the edge of the continental shelf. It covers 6,123 square kilometres and encloses important habitats representative of the West Tasmanian Transition.

This is a very deep marine park. Waters here plunge from 2,500 metres down to 6,000 metres on the abyssal plain. Mapping of the seafloor reveals geological features such as rocky knolls, canyons, plateaus and the abyssal plain.

Because Nelson Marine Park is so deep and far from shore, it is more difficult to access, and study than many other marine parks. Scientists believe the park is home to unique fauna, but little is known about what lives here, particularly in its cold abyssal depths. The abyss – the very bottom of the ocean some 4 kilometres below the waves – is the largest and deepest habitat on Earth. It covers half the world's oceans and one third of Australia's marine territory and is thought to be a major reservoir of biodiversity. The fauna of abyssal seafloor habitats everywhere is poorly sampled and poorly surveyed, largely due to the difficulty of reaching and working at such incredible depths.

What we do know is that life in the abyss must adapt to the extreme conditions of the deep sea – just-above-freezing temperatures, crushing pressure and darkness. Food is scarce here too, with marine life reliant on particles of organic matter sinking from the ocean's surface thousands of metres above. Abyssal sediments are likely to harbour a diversity of species, from tiny macrofaunal invertebrates to bizarre kinds of fish. Many creatures that dwell at these depths have developed extraordinary measures to survive – from having no eyes, to producing their own light through bioluminescence.

The complex undersea topography of the park points to a range of seafloor habits and marine biodiversity, but multi-disciplinary sampling and surveys are needed to shed light on this deep sea environment and the creatures that live there.

Zoning

Nelson Marine Park was proclaimed in 2007. It is designated as a Multiple Use zone, that provides for a range of ecologically sustainable recreational, commercial and research opportunities.



Great White Shark, © Jay. 