Australia’s southern waters are unique. Ninety per cent of our marine plants and animals are found nowhere else on earth. The system of Marine National Parks and Sanctuaries has been established to represent the diversity of Victoria’s marine environment, its habitats and associated flora and fauna.

Victoria’s marine environment has been classified into five bioregions according to a nationally agreed scheme based on physical and biological attributes.

Port Phillip Heads Marine National Park occurs in the southern part of Port Phillip Bay, which also includes three marine sanctuaries. The bay is part of the Victorian Embayments bioregion.

**Description**

The park has six sections covering 3,475 hectares: Point Lonsdale 377 hectares; Point Nepean 377 hectares; Popes Eye (The Annulus) 3.1 hectares; Portsea Hole 9.8 hectares; Mud Islands 625 hectares; and Swan Bay 2,083 hectares.

It stretches along approximately 34 kilometres of coastline from the high water mark, with some sections, Popes Eye, Portsea Hole and Mud Islands, not joined to the coast.

Point Lonsdale on the Bellarine Peninsula and Point Nepean on the Mornington Peninsula surround the headlands on both sides of the bay entrance (the Heads).

Popes Eye, a natural sand shoal with a partially completed bluestone fortification and Mud Islands, formerly known as Swan Isles, Signet Island and Flat Islands, are offshore on the Great Sands in Port Phillip Bay.

Portsea Hole, a steep remnant section of the ancient Yarra River, is offshore from Portsea Pier.

The Swan Bay section of the park on the Bellarine Peninsula includes most of this shallow bay.

The park has a long history of marine protection with most of it having been a Marine Reserve since 1979. Fishing has been banned in Popes Eye since 1976.

Sections of the park abut conservation managed terrestrial areas including Point Nepean National Park, Point Lonsdale Foreshore Reserve and Edwards Point Wildlife Faunal Reserve in Swan Bay, as well as Department of Defence management of Swan Island. Swan Bay and Mud Islands are internationally significant shorebird habitats and form part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula RAMSAR site.

The wrecks of the *Holyhead* and *George Roper* within the park are part of Heritage Victoria’s Underwater Shipwreck Discovery Trail.

Sections of the park that adjoin the coast are accessible by foot except for exclusion zones on Point Nepean. Some sections of the park are only accessible by boat with certain restrictions.

Parks Victoria acknowledges the Aboriginal Traditional Owners of Victoria – including its parks and reserves. Indigenous tradition indicates that the park is part of Country of Wathaurung (in the west) and Country of Boonwurrung (in the east, including Mud Islands).
Physical Parameters and Processes

The geology of Port Phillip Heads Marine National Park is calcarenite (limestone) with some sections covered with sand, though Popes Eye has an artificial structure of basalt blocks. The park has a wide variety of exposure. Outside the Heads the southern coasts of Point Lonsdale and Point Nepean are exposed to south-westerly weather and swells of Bass Strait. They receive ocean waves averaging about 1.7 metres, which break on the outer reef flats and arrive on the beach with reduced energy and wave height.

Between the Heads is a narrow, deep (100 metres) stretch of water that is very turbulent due to swell, waves, tides and weather. Tidal currents through the Heads dominate water circulation in southern Port Phillip Bay and can be as fast as 2.5m/s.

The park beaches on the inside coast of the Heads receive low wave energy and are dynamic with natural accretion and attrition of sand, covering and uncovering the reefs and other habitats.

Further inside the bay, Popes Eye and Portsea Hole have moderate exposure to waves and currents.

The islands of Mud Islands create a sheltered lagoon, however strong tidal currents and storm events continually alter the shape of Mud Islands and the Great Sands. Swan Bay is a large shallow sheltered lagoon, with a constricted connection to Port Phillip Bay by natural and artificial channels either side of Swan Island.

The park has an unequal semidiurnal tidal pattern, with flooding and ebbing having both a higher and lower event per day.

Tides vary in the different sections of the park, from 1.2 metres spring and 0.6 metres neap tides in Point Lonsdale and Point Nepean, to 0.7 metres spring and 0.1 metres neap tides in Portsea Hole and Mud Islands.

Tidal currents diminish before they reach Swan Bay, with a tidal amplitude <1 metre and flushing time of approximately 1.5 days. The flushing time of Port Phillip Bay varies from 0 days at the Heads to about 260 days in the main body of the bay.

Surface water temperature varies in the park from a summer mean of 17.5°C in Point Lonsdale and Point Nepean to 20.5°C in Swan Bay, and a winter mean of 13.5°C in Point Lonsdale and Point Nepean to 11.2°C in Mud Islands and Swan Bay.

Saltmarsh:
Vegetation on the low-lying Mud Islands consists of saltmarsh and dune shrubland communities dominated by...
Wet Saltmarsh Scrubland and Wet Saltmarsh Herbland with some Coastal Tussock Saltmarsh. Within these communities a number of species are considered rare or threatened in Victoria.

Saltmarsh in Swan Bay is predominately outside the park boundaries but contains communities of Wet Saltmarsh Scrubland; Wet Saltmarsh Herbland; Coastal Tussock Saltmarsh; Coastal Hyperaline Shrubland; Coastal Saltmarsh; and Estuarine Wetlands.

Species include beaded glasswort Sarcocornia quinqueflora, creeping brookweed Samolus repens, Hemichroa pentandra and grey glasswort Halosarcia halocnemoides.

Seagrass and Unvegetated Soft Sediments:
The intertidal and subtidal seagrass beds on the soft sediment in Mud Islands and Swan Bay, and on sand covered subtidal reef in Point Nepean, support abundant invertebrates and juvenile fish.

Intertidal Seagrass and Unvegetated Soft Sediments:
Intertidal seagrass, usually Zostera muelleri, is an important habitat in the park, particularly in Swan Bay and Mud Islands. The extensive intertidal seagrass beds in Swan Bay also include Halophila australis, Ruppia tuberosa, Lepilaena marina, and L. cylindrocarpa. Wrack on the shore in Swan Bay can be considerable and cover the inshore seagrass beds.

Infauna associated with intertidal seagrass beds in Swan Bay is dominated by large numbers of relatively few species. Corophiid amphipods and the amphipod Allorchestes compressa are the dominant crustacea, and the polychaete fauna is dominated by capitellids, the nereid Ceratonereis pseudoerythraeensis and the orbiniid Scoloplos cylindris.

In unvegetated intertidal soft sediments invertebrate communities are dominated by oligochaete worms, polychaete worms Capitella sp., bivalve Mysella donaciformis, gastropod Salinator fragils and crane flies Tipulidae.

Subtidal Seagrass and Unvegetated Soft Sediments:
Subtidal seagrass is also an important habitat the park, particularly in Mud Islands and Swan Bay. Mud Islands has large persistent beds of Heterozostera nigricaulis in the lagoon and outside in waters up to 8 metres deep.

The extensive subtidal seagrass beds in Swan Bay include Zostera muelleri, Heterozostera nigricaulis, Halophila australis, Ruppia maritima, R. polycarpa. H. australis is also found in deeper water around the Swan Bay jetty area just outside the park.

The southern deeper end of Swan Bay and near the centre tend to be more dominated by algae such as Caulerpa spp. and filamentous algae than seagrass.

The H. nigricaulis habitat in Mud Islands supports at least twenty-seven species of finfish and one species of squid.

The seagrass assemblages in Swan Bay tend to be dominated by large numbers of the spotted pipefish Stigmatopora argus with other species of pipefish such as Vanacampus phillipi. Other dominant species include the hardyhead Leptatherina presbyteroides, the bridled leatherjacket A. spilomelanurus, the spot-shoulder weed fish Heteroclinus perspicillatus and the cobbler Gymnapiests marmoratus.

In the shallow beds, smallmouth hardyheads Atherinosoma microstoma and hardyhead recruits Atherinidae spp. are the most abundant fish species along with the wide-body pipedhip Stimatorpora nigra, bridled leatherjacket Acanthaluteres spilomelanurus, little rock whiting Neodax balteatus, blue sprat Sparatelloides robustus and spotted pipefish S. argus.

In the deeper seagrass beds the most abundant fish is the wide-body pipedhip S. nigra. Also abundant are leatherjackets, including the bridled A. spilomelanurus, toothbrush A. vittiger and pygmy Brachialuteres jacksonianus and the little rock whiting Neodax balteatus. The Australian giant cuttlefish Sepia apama has been found in the deeper beds of H. nigricaulis. Red mullet Upeneichthys vlamini, little gurnard perch Maxillicosta scabriceps and yank flathead Platyccephalus speculator are also found in the deeper beds.

A number of commercially important species, rough leatherjacket Scobinichthys granulatus, six-spined leatherjacket Meuschenia freycineti, and King George whiting Sillaginodes punctatus, settle directly into subtidal H. nigricaulis beds. Skates, rays and stingarees are particularly common.
on the unvegetated sand beds. Species include the eagle ray *Myliobatis australis*, smooth stingray *Dasyatis breviceps*, banjo ray *Trygonorrhina fasciata*, southern fiddler ray *T. guaneria*, sparsely spotted stingaree *Urolophus paucimaculatus* and spotted stingaree *U. gigas*.

**Reefs:**
The intertidal calcarenite reef in the park supports a high invertebrate diversity. In Popes Eye the intertidal and subtidal reef is an artificial basalt structure and supports abundant large fish. In Point Lonsdale and Point Nepean the shallow subtidal calcarenite reefs have high algal diversity and abundance. The reef can be solid or patchy, high or low profile, with rubble, gutters, ledges and overhangs and can be inundated by sand. It can be dominated by large canopy forming brown algae, or as in parts of Point Nepean, extensive beds of seagrass *Amphibolis antarctica*.

The kelp *Ecklonia radiata* grows on shallow to moderate depth reefs in Point Lonsdale, Point Nepean and Portsea Hole. Deep subtidal reef in Point Lonsdale, Point Nepean and Portsea Hole is dominated by sessile invertebrates, predominately diverse sponges.

***Intertidal Reefs:***

One species of seagrass *Amphibolis antarctica*, and twenty nine species of macroalgae, including fourteen species of brown algae, are commonly found on the intertidal reefs.

The macroalgal community is dominated by the brown algae Neptune’s necklace *Hormosira banksii*. Other algae growing on the intertidal reef includes *Notheia anomala*, *Echinothamnion* sp., *Corallina officinalis*, algal turf, filamentous greens and *Sargassum* sp. The ephemeral green algae *Ulva* spp. occur as small patchily distributed tufts.

Habitat forming sessile invertebrates include the tube worm *Galeolaria caespitosa*, and two species of mussels, the beaked mussel *Austromytilus rostratus* and the tiny horse mussel *Limnoperna pulex*, occur in low abundances on the intertidal reef. Other sessile invertebrates include four species of barnacles *Chamaesipho tasmanica*, *Chthamalus antennatus*, *Tesseropora rosea* and *Tetraclitella purpurascens*, the ascidian *Pyura stolonifera*, and three anemones *Aulactinia veratra*, *Actinia terebrosa* and *Oulactis muscosa*.

Thirty species of mobile invertebrates, including twenty nine species of molluscs, have been found on the intertidal reefs.

The slit limpet *Clypidina rugosa* is the most common species along with the variegated limpet *Cellana tramoserica* and striped conniwink *Bembicium nanum*. Other common molluscs include the false limpet *Siphonaria* spp., ribbed top shell *Austrocochlea constricta*, tall ribbed limpet *Patelloida alticostata* and warrener *Turbo undulatus*.

Less common species include the carnivorous gastropods the wine-mouthed lepsiella *Lepsiella vinosa* and lined cominella *Cominella lineolata*. The small black periwinkle *Nodilittorina acutispira* can be very abundant on the intertidal reef, but its abundance varies considerably.

Fish have been described as abundant in the rockpools outside the Heads in Point Nepean and include blennies, gobies, juvenile wrasse, leatherjackets and old wives.

***Shallow Subtidal Reef:***

Macroalgae (seaweeds) provide important habitat structure for other organisms on shallow subtidal reefs. This habitat structure varies considerably depending on the type of macroalgae species present. Shallow subtidal reef macroalgal communities can be grouped as: outside the Heads; inside Point Lonsdale in Lonsdale Bay; inside the...
Outside the Heads the reefs have a Phyllospora comosa or Ecklonia radiata dominated canopy, with an understorey of smaller species such as Phacelocarpus peperocarpus. A small patch of the seagrass Amphibolis antarctica grows offshore from the Surf Life Saving Club at Point Lonsdale.

Inside the Heads in Point Nepean, the algal canopy is Ecklonia radiata with Cladophora prolifera, Cystophora moniliformis, Seirococcus axillaris and Phyllospora comosa. Amphibolis antarctica forms substantial beds in the middle of Lonsdale Bay. These reefs have a relatively low cover of red algal understorey species, which includes Ballia callitricha, Areschougia congesta, Phacelocarpus peperocarpus and Plocamium spp.

Inside the Heads in Point Nepean the reef is dominated by large monospecific stands of the seagrass Amphibolis antarctica and patches of mixed brown algal species. Beds of A. antarctica are not just restricted to low reef flats but grow well up the sides of reef slopes. The brown algae generally includes Ecklonia radiata, Phyllospora comosa, Cystophora moniliformis and C. retorta.

The relatively sheltered subtidal reef at Popes Eye is dominated by the kelp Ecklonia radiata, with green algae Caulerpa spp., and a moderate abundance of red algal species. Open patches of turfing red algae on the reef are maintained by the scalyfin Parma victoriae and used as important feeding areas for other fish. Phyllospora comosa, which dominates the more exposed Point Lonsdale and Point Nepean reefs is not recorded at Popes Eye. Likewise, the brown algae Cystophora moniliformis is not recorded at Popes Eye. Small patches of Ecklonia radiata dieback has been observed in recent years on reefs in the park.

Over 150 species of opisthobranch molluscs (colourful sea slugs) have been observed on the shallow subtidal reef within Point Lonsdale. Point Nepean also has some rare species of molluscs. The biscuit star Tasia australis is the most abundant seastar on all the reefs in Port Phillip Heads, although its numbers can be very variable.

As observed with macroalgae communities, there are four general groups of invertebrate communities, corresponding to the four site groupings: outside the Heads; inside the Heads at Point Lonsdale in Lonsdale Bay; inside the Heads in Nepean Bay; and well inside the Heads at Popes Eye. The invertebrate community can be very variable through time especially inside the Heads in Point Lonsdale and Point Nepean.

Blacklip abalone Haliotis rubra are more abundant outside the heads than inside. Inside the Heads in Point Lonsdale greenlip abalone H. laevigata are not as common as blacklip abalone H. rubra, and the warrener Turbo undulatus and the seastar Nectria ocellata are common.

Reefs both outside and inside the Heads at Point Lonsdale have low abundances of purple sea urchin Heliocidaris erythrogramma and feather star Comanthus trichoptera. Inside the Heads in Point Nepean there are moderate abundances of both blacklip abalone Haliotis rubra and greenlip abalone H. laevigata. The molluscs, warrener Turbo undulatus and cartrut shell Dicathais orbita, and feather star Cenolia trichoptera are abundant along with moderate abundances of the purple sea urchin Heliocidaris erythrogramma. The biscuit star Tasia australis is not common.

The spaces in the basalt blocks of the reef at Popes Eye have high abundances of the featherstar Cenolia trichoptera, low abundances of blacklip abalone Haliotis rubra, and moderate to high abundances of the purple sea urchin Heliocidaris erythrogramma. No greenlip abalone Haliotis laevigata or the warrener Turbo undulatus have been recorded in Popes Eye.

Over seventy one species of fish are found on the shallow subtidal reefs of Port Phillip Heads Marine National Park. There is a less distinct grouping of fish communities than for the macroalgae and invertebrate communities.

Outside the Heads in Point Lonsdale, reef has abundant scalyfin Parma victoriae and senator wrasse Pictilabrus latiflavus as well as herring cale Odax cyanomelas, blue-throated wrasse Notolabrus tetricus and horseshoe leatherjacket Meusdenia hippocrepis.

The hydroid Solanderia fusca and large sponges on deep subtidal reef at Point Lonsdale. Photo by Don Love.
Inside the Heads in Point Lonsdale and Point Nepean there is a lower abundance of scalyfin Parma victoriae and senator wrasse Pictilabrus latilavus than reef outside the Heads. Point Lonsdale also has a higher abundance of zebra fish Girella zebra and magpie perch Cheilodactylus nigripes than Point Nepean.

The Popes Eye fish community is distinct from elsewhere in the park, with larger, more abundant fish and more species. Southern hula fish Trachinops caudimaculatus, scalyfin Parma victoriae and blue-throated wrasse Notolabrus tetricus are very abundant.

The interstitial spaces in the basalt blocks of the reef at Popes Eye provide important habitat for southern hula fish Trachinops caudimaculatus, which is not common elsewhere in the park. Sea sweep Scorps aequipinnis and rosy wrasse Pseudolabrus psittacus observed at Popes Eye are also rarely observed elsewhere in the park.

Scalyfin Parma victoriae maintains open turfing red algal patches that are used as important feeding areas for magpie perch Cheilodactylus nigripes, banded morwong Cheilodactylus spectabilis and marblefish Aplodactylus arctidens at Popes Eye. Purple wrasse Notolabrus fucicola, barber perch Caesioperca razor horseshoe leatherjacket Meuschenia hippocrepis and herring cale Odax cyanomelas are also abundant in this section of the park.

Deep Reef:
The deeper subtidal reefs, on the tops of the rocky banks of Lonsdale Wall and Nepean Banks have beds of kelp Ecklonia radiata.

On Lonsdale Wall these extend to the edge of the canyon and as small isolated stands on horizontal shelves to depths of approximately 27 metres. These deep Ecklonia beds have a lower abundance of understorey algae and lower abundance and diversity of mobile invertebrates, particularly seastars, and different fish community than shallow Ecklonia beds.

Vertical sections of the Portsea Hole reef have thalllose red algae and kelp Ecklonia radiata and support a high abundance and diversity of sessile invertebrates, including sixteen different types of sponge such as arborescent, flabellate, encrusting and massive ruffled sponges. Other sessile invertebrate fauna includes bryozoans such as Orthoscicella ventricosa, and ascidians Herdmania momus and Ritterella pedunculata.

Portsea Hole has a high abundance and diversity of fish species including barber perch Caesioperca razor, southern hula fish Trachinops caudimaculatus, silver sweep Scorps lineolata and Australian mado Atypichthys strigatus. Other commonly seen fish species include the blue devil fish Paraplesiops meleagris, butterfly perch Caesioperca lepidoptera, jackass morwong Nemadactylus macropterus, gurnards Triglidae and goat fish Mullidae.

The sessile invertebrate communities of the deep reefs in the Heads are quite distinct from comparable deep reefs in Point Addis and Wilsons Promontory. Lonsdale Wall’s deep subtidal vertical reef has a high abundance and diversity of sessile invertebrates, especially arborescent, encrusting and flabellate sponges, and gorgonian corals. Distinctive species include hydroids Solanderia fusca, Halopteris glutinosa, Nemertesia proccibens and Gymnangium superbum, jewel anemone Corynactis australis and the bryozoan Orthoscicella ventricosa.

Over two hundred and seventy one species of sponges have been recorded at the Heads, which is a substantial proportion of the known species from Victoria and Australia. At least 115 of the sponge species are endemic to the Heads. Port Phillip Bay also has high bryozoan diversity and is particularly rich in hydroid fauna. The Heads are the type locality for three ascidian species, one of which is endemic.

Deep subtidal reef in Lonsdale Wall has a diverse fish community dominated by barber perch Caesioperca razor, southern hula fish Trachinops caudimaculatus and rosy wrasse Pseudolabrus psittacus.

Water Column:
The water column is home to a variety of planktonic and pelagic organisms. Those that make their permanent home in the water column include sea jellies, salps, many fish, and phytoplankton and zooplankton. A number of marine mammals, a marine reptile and seabirds are also found in or use the water column in the park.

Species and Communities of Conservation Significance
There are thirteen sites of biotic significance in the park, seven of which are minor roost sites for wader birds in Swan Bay.
The park provides important feeding and roosting habitat for fifty-eight threatened bird species such as the critically endangered grey-tailed tattler Heteroscelus brevipes. It protects feeding areas for forty-three internationally important migrant bird species.

There are two hooded plover Thinornis rubricollis nesting sites inside the Heads on the beaches at Nepean Bay and Observatory Point in Point Nepean. 

Popes Eye is a minor roost for cormorants and a breeding colony for Australian gannets Morus serrator.

Mud Islands is the second largest crested tern Sterna bergii nesting colony in Victoria and the largest wader roost site in Port Phillip Bay with up to 5000 birds in summer. The islands also have large breeding colonies of terns, cormorants and gulls.

The open waters off the Heads provide habitat for conservation listed southern bluefin tuna Thunnus maccoyii, grey nurse shark Carcharias taurus and white shark Carcharodon carcharias.

The conservation listed loggerhead turtle Caretta caretta is a vagrant that has been recorded in the bay.

The deep reef of Point Lonsdale is part of the Port Phillip Bay entrance deep canyon marine community which is conservation listed in Victoria.

One shrimp, a chiton, and a bivalve are endemic and one bivalve and a marine snail are presumed to be endemic to the park. One hundred and four species of marine flora and fauna are believed to be at their distributional limits within the park.

**Major Threats**

Measures to address or minimise threats identified for Port Phillip Heads Marine National Park form part of the park management plan. Parks Victoria also uses an adaptive management approach which includes periodic reviews of priority natural values and threats through processes such as the State of the Parks evaluation and setting of desired conservation outcomes. Through these processes Parks Victoria has identified emerging threats and developed appropriate management responses.

Serious threats include invasive marine pests; increased sedimentation impacting seagrass, benthic fauna, birds and the water column; coastal development; visitor impacts; poaching and major oil spills.

The introduced Northern Pacific Seastar Asterias amurensis and the algae Codium fragile subspecies fragile have been recorded in the Mud Islands and Swan Bay sections of the park.

The introduced green shore crab Carcinus maenas is confirmed from Mud Islands but is thought to be present in the intertidal zone throughout the park.

Weeds are also a threat in terrestrial parts of Mud Islands and can impact on the islands’ bird populations, ecology and landscape values.

Small patches of dieback of the common kelp Ecklonia radiata have been observed in recent years on reefs in the Point Lonsdale section of the park, however the cause of the dieback is unknown.

The introduced Japanese kelp Undaria pinnatifida has also recently been found in Queenscliff Harbour and there are serious concerns about its possible spread to Swan Bay and other sections of the park.

Climate change also poses a serious medium to long term threat to natural values. Parks Victoria will use an adaptive management approach to develop responses and actions that focus on priority climate change issues such as extreme weather events and existing risks that will likely be exacerbated by climate change.

**Research and Monitoring**

Parks Victoria has established extensive marine research and monitoring programs that address important management challenges for the marine national parks and sanctuaries. These focus on improving baseline knowledge, as well as applied management questions.

Since the establishment of the parks in 2002 our knowledge and understanding of natural values and threats for the system have improved significantly through the marine science program. Much of the research has been undertaken as part of the Research Partners Program involving collaboration with various research institutions.

There are eight ongoing research projects and one habitat mapping project that are relevant to Port Phillip Heads Marine National Park, while ten research projects and one habitat mapping project have already been completed. The park has ongoing intertidal and shallow subtidal reef monitoring programs. Community based monitoring programs have been undertaken by Reef Life Survey, Reef Watch and Sea Search, and a number of Friends groups are active in the park.

While recognising there are still knowledge gaps Parks Victoria will continue to focus on addressing the information needs that will assist management.

For more information, including marine habitat mapping products, please see the full versions of the Marine Natural Values reports on www.parks.vic.gov.au.