



Outdoor Activity – Hinsby Beach Discovery Trail (all ages)

<u>Overview:</u> Tasmania has a spectacular coastline and a diverse marine environment. This makes it a hotspot for diverse marine life forms and important conservation values. Rocky reefs occur along much of the Tasmanian coastline, and are one of the most diverse and productive habitats in Tasmanian waters. The area around Hinsby Beach provides a great opportunity to explore the rocky shoreline of the Derwent, and at low tide you can see some good examples of rocky reefs, with a large subtidal reef located just offshore. Our rocky shores provide a highly accessible environment for seeing marine animals and plants first hand, and hence provide an invaluable learning environment without needing to get too wet. The objective of this interpretive walk is to focus on coastal and intertidal ecosystems and to highlight that rocky reefs change continually with the seasons and the tides, so that every seashore trip leads to an interesting discovery.

The Hinsby Beach Discovery Trail can be enjoyed by individuals, or led by a teacher/guide. It is an interpretive walk consisting of 9 discovery points starting and finishing at the car park. The info pack can be read by individuals walking the trail to learn about the rocky reef and intertidal habitat and the animals and plants that live there. Alternatively, it can be used as a resource for teachers/guides to lead the Discovery Trail.

This info pack contains specially developed information relevant to each of the 9 Discovery Points that can be read out to students/participants to inform them about the interesting environment they are visiting. Several activities can also be undertaken as part of the walk to further engage students/participants. Currently there is no signage at the site, so it is essential you print out and take this info pack with you, including 9 discovery points and a map, so you can get the most out of the interpretive walk. Prior to the excursion teachers/guides should review the information provided for each of the 9 discovery points and select what is most relevant for their school age group. Follow the walking trail to discover the secrets of inter-tidal reef habitat and animals. This discovery experience is most beneficial when each student/participant has an activity sheet to fill in as they walk, and can use magnifying glasses and binoculars. Inclusion of the 'Rock Pool Hunt' and 'Taroona Seashell Fauna' activities will engage students/participants further.

Hinsby Beach Discovery Trail - Info Pack

Site orientation:

Arrive to Taroona Park via Taroona Cresent and park in the car park just behind the beach near the playground equipment (see map)

Location and access:

Starts and finishes at the car park and playground area at Taroona Park, at the end of Taroona Cresent, Taroona. The walk takes you from the car park south east along the beach and foreshore to a boulder area of rocky reef. The last Discovery Point is on the second beach, then the walk returns along same path. Currently there are slopes that can get slippery in wet conditions so care must be taken, and children should be supervised at all times.

Distance:

800m long track, 1.6km return.

Walk time:

30 mins nonstop, 50 mins with Discovery points, 70 mins with activities.

Safety:

Using the maps and other materials provided brief the class/group on where you are going, how long it will take, what time you will return and what they will need to bring. Complete a safety briefing for your group highlighting the risks and controls for the activity. There are hazards such as steep inclines, slippery surfaces, prickly bushes. It is essential that all participants wear enclosed footwear, and a first aid kit is carried by teachers/guides with first aid training.

Tide times:

It is recommended the arrival to the site is scheduled to coincide with low tide. Consult a tide table <u>http://www.bom.gov.au/oceanography/tides/</u> to determine the appropriate time and date to visit the Lauderdale saltmarsh to view the tidal flats

Materials Required:

- Enclosed shoes and clothing (hat, sunglasses, sunscreen)
- First aid kit
- Map
- Hinsby Beach Discovery Trail Educational Material and Map
- Field sheets and pencil, for students to record observations and facts
- Magnifying glasses (at least one per group of 3)
- Binoculars (if available)
- Cameras (if available)



DISCOVERY POINT 1 - The Derwent, a unique marine environment



The Derwent estuary foreshore consists of sandy beaches, tidal mudflats, and rocky shores. Underwater habitats are either soft-sandy sediment, seagrass meadows, or rocky reefs. Within the Derwent estuary rocky reefs fringe the coastline. This means that they are easily accessible because intertidal reefs are visible at low tide and submerged rocky reefs are located just offshore.

Tasmania's coast is divided up into a number of 'bioregions', each with distinctive physical and biological attributes. The Derwent estuary is within the Bruny Bioregion of south eastern Tasmania, which is characterised by high marine diversity, and a high degree of marine species endemism. Endemic species are those found here and nowhere else.

Rare species

A number of species endemic to the Derwent estuary are also very rare. Examples include the Critically Endangered spotted handfish, and Derwent River seastar.

Some important species have shown dramatic reductions in their abundance within the Derwent estuary, which is very worrying. For example, giant kelp populations historically occurred up the estuary as far as Rosny Point. Southern Right Whales were historically a very common sight, as the Derwent was a major breeding ground, but they were the focus of a major whaling industry for many decades. After many years of no whales they are slowly returning to the Derwent.

Community types

Reef organisms can be loosely grouped into community types based on where they live and how they live within the reef.

Main community types include:

intertidal reef organisms – visible in rock pools, and on boulders and slabs at low tide; sessile reefs organisms – attached to submerged rocks and reef;

benthic reef organisms - that move about on the sediment or rock surface; and,

pelagic reef organisms - that move about in the water column (e.g., reef fish and birds)

DISCOVERY POINT 2 - Inter-tidal rocky reefs



Zonation of plants and animals

If you look closely at the rocky shoreline you can see some clear patterns emerging in the distribution of plants and animals, called zonation. Characteristic bands occur as a result of the different physical conditions between the 'splash zone', 'tidal zone' and 'low shore fringe'. The splash zone is above the high tide mark, where sea spray from waves wets the rocks and vegetation. The tidal zone is the area covered and uncovered by the tide twice a day, being further separated into the high tide, mid tide and low tide zones. The low shore fringe is where the waves break when the tide is at its lowest. In which zone an animal lives depends upon their ability to tolerate desiccation, immersion, and wave action.

Algae and lichen plant communities often occur in prominent bands or zones of the foreshore. For example, rust coloured lichens are often found along the high tide mark, bright green sea lettuce occurs along the mid tide mark and macroalgae or seaweed such as Neptune's Necklace often occurs in rock pools at the low tide mark.

A harsh environment

Intertidal reefs support a diverse mix of specialist plants and animals which have adapted to the harsh conditions of the intertidal zone. Animals and plants living here must endure wave action when submerged, exposure to air during low tides, and extremes of salinity and temperature. As if this wern't enough, they can also be eaten by land animals such as birds at low tide, and by marine animals like fish at high tide.

Mobile inter-tidal animals such as crabs, sea stars, turbo shells, and limpets, can move into rock pools or crevices during low tide to avoid drying out. However, many inter-tidal animals are 'sessile', meaning they fix themselves permanently to the rocky shoreline. This is a handy strategy to overcome wave action, but means these animals have had to develop ways of retaining water to keep their gills wet in order to breath during low tide.

- Many shellfish and marine snails have an operculum, which is a special type of door that is used to close over the opening at the base of their shell. This protects them from drying out when the tide is low.
- Limpits and chitons cling tightly to rocks and secrete a mucous substance around their shell to form a seal against moisture loss.

DISCOVERY POINT 3 - Rock pools contain a highly diverse animal community



Eight-armed seastar

Turban Shell

Look closely in rockpools and in crevices and boulders around you to see the high diversity in animals that live in the intertidal zone. The most abundant rockpool animals are invertebrates such as molluscs, crustaceans, echinoderms, anemones, sponges and tubeworms.

Fragile environments – be careful not to tread on or damage any marine animals. Return all animals where you found them, and if you turn over a rock be sure to place it back again so animals on the underside don't dry out!

Molluscs: are an extremely diverse group of invertebrates with over 85,000 known species. They include most of the intertidal and reef animals with shells (except barnacles), as well as octopus, squid, and calamari. Main features of a mollusc are:

- a hard shell, with a soft, unsegmented body beneath;
- a muscular foot or tentacles; and,
- a radula or toothed tongue to scrape microalgae off rock surfaces or to cut up prey items like barnacles and oysters.

Some commonly seen intertidal molluscs include:

- Chitons and limpets. They attach themselves firmly to rocks using their muscular foot. Their teeth attached to the radula are so hard that they are able to grind through rock. Chiton are easily identified as they have eight plates that form a protective armour for its soft body.
- Turbos (periwinkles), whelks, and black lipped abalone are molluscs known as gastropods or snails; and,
- Maori octopus can be found in large rock pools, but most often retreat to submerged reef at low tide.

Crustaceans: Most crustaceans are mobile, like the Shore Crab and Southern rock lobster. But did you know that barnacles are also crustaceans.

Barnacles:

- Because barnacles are fixed to rocky shores they are often mistaken for a mollusc such as a limpet or chiton. But they are in fact related to crayfish, crabs and krill.
- There are many different types of barnacles in Tasmania.
- They have calcareous exoskeletons forming hard plates to protect them, and when exposed to air they slide two plates across their aperture to avoid drying out.
- Most barnacles live continually in their shell, and feed by reaching into the water column with hairy legs to filter plankton and detritus from the water.

Crustacean Anatomy:

Crustaceans like crabs and crayfish have many pairs of appendages. Some are developed into paddles or legs for swimming or walking. Mouthparts also consist of several small pairs of appendages, each used for different things. Some transport food, while others separate food from inedible sediment.

DISCOVERY POINT 3 - Rock pools contain a highly diverse animal community

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Anemones:

- are related to corals and jellyfish in an animal group called Cnidarians;
- are carnivorous animals, many of which have stinging tentacles used to catch and paralyse prey; and
- commonly attach to rock, or kelp, but some species are free-swimming.

Waratah anemone are a common sight in rockpools and in crevices along the intertidal zone of the lower Derwent estuary.

Echinoderms:

- are spiny skinned animals such as sea urchins, starfish, brittle stars, and sea cucumbers.
- have tube feet that enable them to move around using hydraulic pressure.
- can often regrow a part of their body if it breaks off.

Common echinoderms on submerged reef at Hinsby Beach are the biscuit star, orange feather star, and purple urchin. A common echinoderm visible in rockpools at Hinsby Beach is the eight-armed seastar which occurs in many different colours. Despite the name, the number of arms can actually range from seven to nine. Another common seastar has been introduced from NZ - known simply as the 'regular seastar' – and it is a tiny blue-grey animal.

Q: Can you see any Eight armed seastars? How many arms do they have and what colours can you see in their body?

Look a little closer!

- Encrusting sponges attach to rocks near the low-tide mark and look like tiny barnacles, so they are often overlooked. Sponges are actually animals although they don't have organs like other animals. They draw water into a cavity in the sponge where food particles are trapped and digested.
- Tube worms are also commonly overlooked or miss identified. They are found in crevices and rockpools and are identifiable by their calcium carbonate encrustings. When submerged by a high tide the worms emerge from their hard tube and use tiny tentacles to filter food particles from the water.



Here we see encrusting tube worms alongside purple barnacles (Tetraclitella purpurascens), flea mussels (Limnoperna pulex), and tiny periwinkles (Nodilittorina unifasciata).

DISCOVERY POINT 4 - Submerged reef communities



Just off the shoreline is a large area of underwater reef that supports a wide range of species. Rocky reef structure can vary from flat reef, to a complex system of boulders and crevices. The more structure to a reef the greater the diversity and abundance of animals and plants that can live there. Tropical reefs are usually dominated by coral, but in the cooler temperate waters of Tasmania most reefs are dominated by macroalgae and sponges.

Macroalgae:

- are also known as 'seaweed';
- use sunlight as a food source like land plants;
- absorb nutrients directly from the seawater as they don't have roots;
- can have large ribbon shaped fronds, and a central stipe, resembling the leaves and branches of trees on land
- broadly divided into green, brown and red algae as a result of colour pigments in the plant cells. Red
 algae are better at absorbing light so can live at greater depth, while brown and green algae occur in
 shallow waters.
- come in a wide diversity of shapes and sizes some resemble balls, mushrooms, fans, or combs, while some are bead like, or thin and filamentous.

Sponges:

- are actually animals, although they don't have organs like other animals.
- catch food particles from the water column by drawing water in through small pores in their body then filtering it through a fine network of passageways that act like a net.

Shallow sheltered reefs here at Hinsby Beach supports a mix of macroalgae. The largest macroalgae is kelp, with individual plants growing to over 30m height. There are three types of kelp in the Derwent estuary, common kelp (*Ecklonia radiata*), bull kelp (*Durvillaea potatorum*), and giant kelp (*Macrocystis pyrifera*). Where kelp dominate reefs they are known as 'kelp forests'. Tasmania has the largest forests of Giant Kelp in Australia. However, over the past 30 years there has been a dramatic decline in kelp forests of up to 95%, particularly along the eastern and south eastern coast of Tasmania. This is thought to be due to marine pollution, coastal runoff, the introduction of Japanese Kelp, and increases in water temperature.

Q: Did you know: An initiative called 'KelpWatch' has been established by the State Government to try and keep track of changes in kelp forests.

DISCOVERY POINT 4 - Submerged reef communities

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Strange fish

Compared to the flat sandy bottom in the middle of the Derwent estuary, the rocks, corals, sponges and macroalgae of reefs provide a complex structure for reef animals to live. A wide range of fish species of all different shapes and sizes live on rocky reefs.

Blue-throated wrasse are common on Tasmanian reefs, and are one of the easiest fish to spot as they swim about in the water column. Blue throat wrasse are a peculiar animal as they change sex from female to male. and in doing so, their colouration and general appearance becomes distinctly different. Juveniles have a nondescript appearance, females have thick black and white stripe across their body, and when they turn into males they develop a distinctive blue throat and yellow fins.

Long-snouted boarfish are commonly found on sheltered inshore reefs, and are easily recognisable by their elongated snout with a tiny mouth at the end. Like many fish, when they open their mouth their jaw extends out creating suction to draw small crustaceans and marine worms in.

Weedy seadragons are among the most peculiar looking, with leafy appendages providing the perfect camouflage among seaweeds.

Tasmanian blennies are harder to see, as they are small hide in cracks and crevices darting out to snap up small shrimps, crabs and worms. They are easily recognisable by the pair of branched horns on the top of the head and brown body with faint vertical bands.



Weedy Seadragon have an astonishing colour pattern and body shape designed to provide camouflage among macroalgae.

Suggested Activity - Rock Pool Detective

DISCOVERY POINT 5 - Hunting and gathering

[photo of midden]

[photo of flint stone]

The Derwent valley and estuary was inhabited by the Mouhenneener Aboriginal people for many thousands of years prior to European settlement. The foreshore was a popular gathering place for the Mouhenneener, as they would have gathered marine plants, dived for crayfish, abalone and other shellfish, and hunted seals, and muttonbirds to provide their families with food. Many native plants nearby were also used for food, medicines and other necessities.

Shell middens can still be seen in the banks adjacent to the foreshore, and they provide an indication of the types of intertidal animals that were popular foods. Turban shells (periwinkles or warreners) and abalone were one of the most popular shellfish and are still a popular food for some Tasmanian Aboriginals.

Tasmanian Aboriginals used stone and shell tools for cutting and for manufacturing wooden tools, especially spears. Flaked stone tools can still be found along the foreshore of the Derwent, providing a window into the past.

Methods used to catch rocky reef species are thought to include a simple baited box trap, and tidal traps made of boulders.

Making necklaces from shells is a significant cultural tradition among the Palawa, or Tasmanian Aboriginals. Necklace-making by the Palawa dates back at least 2,600 years. Necklaces were made by women, and were used for adornment, as gifts and tokens of honour, and as trading objects. The rainbow kelp-shell is a 10 – 20mm sized gastropod (mollusc) belonging to the topshell family that was commonly used by Aboriginals to make shell-necklaces.

'Taroona' is the Aboriginal name for chiton – a shell animal found along the foreshore.

Archaeological evidence suggests that after eating fish for many thousands of years, the Tasmanian's dropped fish from their diet about 3500 years ago.

Suggested Activity - Taroona Seashell Fauna

DISCOVERY POINT 6 - Alum Cliffs, foreshore vegetation and coastal protection



Native she oaks and grasses provide shelter for land animals accessing the foreshore and for marine animals coming to land



From this point you can see tracts of native vegetation along the foreshore extending south to Alum Cliffs. The cliffs extend for many kilometers and are a fantastic geological feature providing a window into the past. The horizontal lines visible in the cliffs are different layers of sediment from the bottom of the sea laid down over millions of years. Small rocks at the cliff edge contain fossils of marine organisms that were trapped in the layers of sediment.

Historically native forests and grasslands would have grown right up to the rocky coastline and beaches of the Derwent estuary. Much of this forest was cleared to make way for agriculture, and now, as you can see, suburban development has encroached right down to the foreshore. The large blue gums and black gums near the carpark are an example of the bushland that once existed here.

Other foreshore vegetation such as hopbush, banksias, coast wattle, saltbush and native shrubs have also been heavily cleared. Here we can see an example of these small native tree and shrub species.

On rough days seaspray from waves blows over the foreshore turning the soil salty. This means that only hardy terrestrial plants can grow along the shore line. Some salt tolerant shrubs and tussocks are able to grow among the boulders just above the high tide mark.

Major roles of foreshore vegetation:

- vegetation plays important structural roles by stabalising the foreshore against erosion from storms evident from bank slumping in areas where vegetation has been cleared right up to the beach
- pacific gulls and pied oystercatchers often nest among the native grasses at the top edge of the rocky shoreline.
- little penguins still frequent this beach at night to rest. Penguins no longer breed at this site, but still breed in a cliffy area 1km south of here.

Community involvement in coastal habitat protection

The Taroona Environment Network are a local volunteer group who care for Taroona's coastal foreshore and the gullies leading to the coast. Weeding, planting native species, and fencing special areas are key tasks of the group. The Southern Coastcare Association of Tasmania (SCAT) also operates in the broader Derwent estuary as well as neighbouring coastline. As well as revegetation and habitat protection, SCAT also hold community oyster smashing days to clean up parts of the coastline by removing the introduced Pacific oyster.

Q: Why don't you become involved in a local Bushcare or Coastcare groups?

DISCOVERY POINT 7

Introduced marine pests and warming sea temperatures brings change



Regular Seastar

New Zealand half crab (Image: S Glasby)

Introduced marine pests

The Derwent estuary is a busy shipping port with the arrival of overseas ships which may bring stowaways. Marine species either attach to ship hulls, or travel in their ballast water. New arrivals who can tolerate the water temperature and find a suitable niche in the new area are able to survive, and often become unwelcome pests. Introduced species are a major concern as they often displace native species, and can disrupt local food webs.

Some examples of ship stowaways that are now significant pests in the Derwent include:

- Northern Pacific seastar (Asterias amurensis)
- New Zealand screwshell (Maoricolpus roseus);
- Regular seastar (Patriella regularis);
- New Zealand half crab (Petrolisthes elongatus)

Some marine species were introduced on purpose for aquaculture, but have escaped and are now significant pests in the Derwent. Some examples are:

- Pacific oyster (Crassostrea gigas);
- Japanese kelp (Undaria pinnatifida)

Rising sea temperatures

Another major concern for rocky reefs and many other marine habitats are changing environmental conditions with global climate change. Local concerns include increasing strength of the East Australian Current. Stronger currents transport animals and plants further south and also warm waters around Tasmania. This results in changes in species ranges, with tropical species moving further south. Also, local species with a limited tolerance to warmer temperatures are dying off.

For example, long-spined sea urchins *(Centrostephanus rodgersii)* are native to the Australian mainland, but have recently arrived to Tasmania. Long-spined sea urchins now exist down the entire eastern coast of Tasmania, including in the Derwent estuary. In large numbers, without predators, they completely transform rocky reefs. What were once lush and productive kelp beds are transformed into lifeless bare rock. Large rock lobsters are one of their few predators.

DISCOVERY POINT 8 -Human impacts on rocky reefs and the intertidal zone



Humans can impact intertidal zones and adjacent rocky reefs in many ways.

Some examples include:

- direct capture of animals through fishing and netting;
- damage to intertidal and rockpool animals by handling or trampling;
- boat damage and anchor damage to the reef organisms; and,
- influx of poor water quality through stormwater and wastewater

Stormwater and Wastewater

At Hinsby Beach you do not have to look far to see stormwater outlets, and wastewater pipes. Stormwater is rainfall and other water that collects on rooftops and on roads throughout suburban streets. It funnels along drainage lines ending up here and draining into the sea. As you follow the gravel path just behind the rocky foreshore you can see a line of raised circular concrete caps. These caps attach to a buried sewerage pipe, carrying waste water from nearby homes to the sewage treatment plant for treatment before it is released into the estuary. Waste water sometimes leaks from such pipes, and sewerage may overflow during high rainfall events.

Stormwater contains:

- a pulse of freshwater at stormwater outfalls, especially during high rains, which can damage or kill sensitive reef plants and animals.
- a wide range of water pollutants such as pesticides, oils, detergents and heavy metals which have negative effects on water quality;
- high nutrient loads, leading to algal blooms evident by the growth of green algae where stormwater runoff meets beaches and intertidal rocky reef – causing imbalances in marine food webs
- rubbish, and this litter ends up on our beaches and in the sea which impacts marine life

Q: What types of litter can you see around you? What sort of hazards will these objects cause to marine life?

Public signage

Stormwater and wastewater both reduce quality of the water in coastal waters which is why signage has been erected at swimming beaches to inform the public of the suitability for swimming.

Q: Find the nearest water quality signage and find out - What is the current advice for this beach?

DISCOVERY POINT 9 - Marine Reserves and threats to rocky reef



Tinderbox Marine Reserve, Derwent Estuary. Source: Parks and Wildlife Service

Tasmanian's love fishing and diving, and enjoy using their beaches and coastal areas. But these areas need our protection to maintain what we currently have, and avoid further losses of biodiversity. One way to protect productive reef habitat is to create publically recognised marine reserves, where fishing activities are restricted or prohibited. This means that habitat and organisms within reserves will be protected to provide a refuge.

One such marine reserve is south of Hinsby Beach at Tinderbox Point. Leatherjackets and wrasse are common on the reef at Tinderbox. If you look amongst the kelp you may be lucky enough to see a big-bellied seahorse or an octopus.

Some threats to sub-tidal rocky reefs include:

- over fishing
- the over collection of shells and organisms such as sea urchins and starfish
- trampling and habitat disturbance
- damage from boat anchors or fishing equipment
- local oil spills, or other water pollution events
- fishing lines and other marine debris that can entangle birds, and marine mammals, or accidentally ingested by animals.
- the introduction of invasive species
- rising sea temperature
- ocean acidification with rising sea temperature
- range shifts of marine organisms with change in climate and currents

Q: What are some ways you can act to help protect foreshore areas and rocky reefs?