Overview of the unique biodiversity of Bathurst Channel

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This video provides an overview of the unique biodiversity values of Bathurst Channel in the Port Davey Marine Park, embedded within the Tasmanian Wilderness World Heritage area. The marine waters of the Channel are overlain by strongly tannin-stained freshwater, which blocks sunlight from reaching the marine waters below. In these darkened waters, a wide range of sponges, corals and bryozoans thrive, many of which are more typically found in the deep sea.

Associated with this introductory video, is a series of eight location-specific videos that form a "virtual tour" along Bathurst Channel. Each video showcases the special features of a different location along the 14 km long Channel, illustrating the marked changes in marine life as you move eastwards from Breaksea Island at the ocean entrance, through to Platypus Point where Bathurst Channel opens into Bathurst Harbour - a small, shallow, inland sea.

Breaksea Island

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Breaksea Island, as the name suggests, is an island that sits at the entrance to Bathurst Channel in Port Davey. It very effectively blocks the large oceanic swells that impact that area of the wild west coast, protecting the channel located a kilometre inshore of it. Here on the island's more sheltered side, it is still somewhat wave exposed, so tough bull kelp plants grow in the shallow waters. Below that, down to around 3 to 4 metres depth, a range of brown algal species proliferate including the common kelp *Ecklonia radiata*. As we move a little bit deeper in that area, the light decreases quickly due to the tannin-stained water from the rivers draining into, and from, the adjacent Bathurst Channel. This reduced light environment is still suitable for some red algal species, including in the deeper parts to 5 metres where a special seaweed called *Thamnoclonium dichotomum* dominates. This species has a symbiotic relationship with a sponge, which helps it survive here at times of low light by providing extra nutrition. Of course, as this is an almost fully marine area with lots of wave action, it's also home to plenty of rock lobsters and abalone that feed in these productive ocean waters.

Turnbull Island

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Turnbull Island sits at the entrance of Bathurst Channel, inshore of Breaksea Island, where the sheltered waters of the Channel meet the more oceanic waters of Port Davey. While it's relatively protected from wave exposure by Breaksea Island, there is still some wave action here that allows kelp species like Bull kelp (*Durvillea potatorum*) and common kelp (*Ecklonia radiata*) to persist in shallow waters down to around 3 metres depth. However, below there it quickly transitions to a deeper filter-feeding invertebrate layer as the dark, tan-stained surface waters limit light availability for seaweed species that would normally grow much deeper and out-compete invertebrates for space. This oceanic end of the Channel is an area where there is an abundance of planktonic food, fed by the nearby productive oceanic waters of Port Davey and beyond. It is an ideal location for filter-feeding invertebrate species, many of which are usually only found in much deeper ocean waters.

Moving deeper down the reef below 3 metres, extensive patches of colonial hydroids and Bramble corals begin to occur. Several different species of Bramble corals are commonly found including the orange and white species shown here, which form characteristic bramble-like thickets over the seabed. Many other filter-feeding invertebrates are found here in clumps or patches, including brightly coloured yellow zoanthids. Other commonly encountered species include a range of colonial soft corals and bright orange solitary corals. The bright orange solitary corals are very abundant on deeper parts of the reef.

The rocky reef hosts a range of hard and encrusting lace bryozoans, and the sea fans and sea whips shown in this video. Overall, the invertebrate diversity covering the seabed at Turnbull Island is incredibly high. While Turnbull Island is the biodiversity hotspot of the Bathurst Channel system, all the locations shown in these highlight videos have their own unique biological values as each site showcased in this virtual tour series has its own particular environmental settings, with associated

biological communities. This combination of dark water in close proximity to the shore in a sheltered setting is globally very rare, with the only analogous environments being found in the New Zealand and Patagoinian fjords, albeit with their own distinct set of species.

Waterfall Bay

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Waterfall Bay sits opposite Turnbull Island at the southern shore of the seaward entrance to Bathurst Channel. Here, it is relatively protected from oceanic swells, but still subject to the fresh tannin-filled surface waters of this estuarine system that restricts the sunlight reaching the seabed. Generally, the tannin influence and its effect on seabed light levels decreases somewhat here relative to other locations in Bathurst Channel because of tidal exchange with nearby clearer oceanic waters. The rocky reef here is typically steep, plummeting to around 5 metres depth where sediments then dominate. The common kelp *Ecklonia radiata* is abundant to 3 metres depth, interspersed with giant kelp (*Macrocystis pyrifera*) and a range of other brown algae. Below that it quickly changes to a filter-feeding invertebrate-dominated community but includes the red algae *Thamnoclonium dichotymum* which has a symbiotic relationship with a sponge. This symbiosis allows the algae to thrive in low light conditions where other algae can't survive. On the lower sections of reef to around 5 metres depth, the seabed marine life community is quite similar to that found at Turnbull Island. It includes a range of invertebrates such as bryozoans, hydroids, ascidians, soft corals and several hard coral species, including the beautiful bramble corals.

The reef drops steeply from the shore into soft sediments, and a large area of the bay includes a seabed covered by muddy sediment from 5 to 10 metres depth. The area still has plenty of planktonic food coming in from the ocean and is particularly preferred by sea pens. These can form a dense and extensive coverage at times, as seen in some of the historical footage shown in this video. They are a fascinating species, being colonial invertebrates related to the corals. Every pen is actually a colony consisting of many, many thousands of polyps, and can reach up to 40 centimetres in height. These pens are quite impressive to watch, as they can deflate when food is scarce and pull themselves down into the sediment to hide from predators, perhaps also protecting them against algae overgrowth in

summer. But when the incoming tide brings oceanic food, and currents are flowing strongly, the pens pop up in large numbers. Here we have some historic footage taken at the same Waterfall Bay site in the early 1990s, showing how dense some of these sea pen populations can be. It's quite an impressive sight! More recently, we haven't seen as many pens in this area, but we're not sure whether that's due to a change in environmental conditions or whether we've just visited at the wrong time of the tide. There is a lot more research to be undertaken to better understand this iconic species.

Forrester Point

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Forrester Point lies several kilometres further along the Channel from Turnbull Island, moving away from the ocean. The Bathurst Channel become quite narrow opposite Munday Island, so it's an area of high current flow with significant influence on seabed light levels due to the dark, tannin-stained fresh surface waters above. There tends to be less brown algae in these shallow waters than at Turnbull Island because of both the lack of wave motion and the overall lower light levels on the seabed due to the darker waters. The seafloor has a distinct *Hormosira banksii* (Neptune's Necklace) algal layer which quickly transitions to being invertebrate-dominated below 2 to 3 metres depth. At these depths we find quite a range of seabed-associated invertebrates including mobile ones such as the large sea slugs shown in this video. However, the most characteristic feature of this area is the forest of filter-feeding sea whips that are found on reef from around 3 to 7 metres depth. They dominate this middle part of the estuary where there's not much light, declining amounts of food as we move away from the ocean, and no competition for space from algae.

Historically, this area had quite an extensive coverage of sea whips, as shown in this video taken in 2012. This dense sea-whip forest was typically covered with all sorts of things, from shark eggs through to through to basket stars, which use the whips as attachment points to hold on in the strong currents. The historical footage shown in this video includes some even earlier footage from the 1990's which captured what the community used to look like, when the sea whip forest was particularly dense. In recent years there has been a substantial decline in both the density and health of these sea whips which we think may be in response to a number of quite significant drought years in Southwest Tasmania. The lower river flow under drought conditions means less tannins are found in surface waters and the surface layer of freshwater is much diminished. This therefore results in more sunlight reaching the seabed, allowing seaweeds to thrive, overgrowing and smothering the sea whips.

However, despite this loss, there's still plenty of life here, and we find an abundance of large sponges and yellows zoanthids, many filter-feeding basket stars, and the typical range of other invertebrates like lace bryozoans and anemones. This area of the Channel is an increasing hotspot for sponge cover as we move away from the ocean and the strong competition for space that occurs in places like Turnbull Island with its high diversity of species. While the sea whips tend to dominate in the depth range from 3 to 5 metres, below this there's a whole range of other invertebrates species including a number of lace bryozoans that are very common below the sea whip band.

Little Woody Island

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Little Woody Island lies to the east of Forester Point. It's close to mid-way along Bathurst Channel where planktonic food input from the ocean starts to decline significantly, somewhat limiting the number of filter-feeding species that can survive here. Because of limited wave exposure and the dark tannin-stained fresh surface waters, the algal band here is very much limited to the upper two meters of the reef system. This rapidly changes with depth to an invertebrate band that is very much dominated by lace bryozoans. There are a few highly dominant species, but a number of others including soft corals and several other invertebrates co-exist here. However, it's quite a simple system compared to Turnbull Island to the west, so the lace bryozoans are very much a key and conspicuous part of it. This species is very fragile and Little Woody Island is an area where anchoring and scuba diving is discouraged to prevent damage to this community. Anchoring is prohibited in some of these sensitive areas of Bathurst Channel for this reason. Overall, Little Woody Island is an area of significant bryozoan coverage and diversity, and it is quite unique for that particular feature. Notably, much of the "muddy" sediment in Bathurst Channel is derived from bryozoan skeletons that have accumulated here over thousands of years, just like in parts of the deep ocean.

The Narrows

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The Narrows is an area where – as the name suggests – the Bathurst Channel really narrow downs. Joan Point to the south and Farrell Point to the north come together, forming a small gap with a deep channel between them subject to strong tidal currents. This is where the bushwalking track from Lake Pedder to Mellaleuca has some dinghies kept to allow hikers to cross the Channel. This area is approximately two-thirds of the way along Bathurst Channel from the ocean and is characterised by very rich dark tannin-stained surface waters from nearby rivers and strong currents. There is an algal band near the surface, with sheltered-water species such as *Hormosira banksii* (Neptune's necklace) dominating, but this extends to at most 2 metres depth. Below this band it very quickly transitions into an invertebrate filter-feeding community. The diversity of invertebrate species here is much lower than in the more seaward locations, as there's planktonic food this far up into the estuary and it's very dark below the tannin-stained surface waters that block sunlight. This combination of factors means rocky reefs here are very much characterised by a soft corals with a range of other small sponges and filter-feeding invertebrates amongst them, including the lace bryozoans which are a relatively common group in this area. These lace bryozoans are a key characteristic of this location, forming a distinct band below the soft corals at around 5 metres depth. The diversity of bryozoan species found here is quite high, as shown in this video. Other species occur in patchy hotspots, including bright yellows zoanthids, and a range of different solitary and colonial anemones. This community graduates into numerous solitary orange hard corals on the deeper reef sections to around 20 meters depth.

Eve Point

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Eve Point lies a kilometre to the east of "The Narrows", closer to where the channel enters Bathurst Harbour. As the surface tannin-stained fresh waters are darker and deeper here relative to locations closer to the ocean, we see an ongoing reduction in the depth range of the brown algal species. These contract to only a metre or so depth due to a lack of light availability and are instead replaced by an increasing dominance of soft corals. This dominance of soft corals appears to be related to decreasing planktonic food availability with distance from the sea. Food availability is insufficient to support many of the other filter-feeding species found further seaward, including the sea whips, sea fans, bramble corals and many sponge species. It appears that the soft corals and the bright orange solitary corals are better adapted to living in the low food environments of these dark waters. In this part of the Channel, it is usually totally dark just 2 to 3 metres below the surface, similar to a deeper sea environment where a number of these species are much more commonly found. Other species found here in lower numbers are mostly filter feeders, including a range of different anemones, lace bryozoans and sponges amongst the predominant soft coral cover.

Platypus Point

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Platypus Point lies at the eastern end of Bathurst Channel, at the inland end where the Channel meets Bathurst Harbour. Here, the surface waters are darkest of all due to the tannins in the freshwater surface layer above, and very little light penetrates below a depth of one or two metres. This greatly restricts the depth that algae can grow to, so the invertebrate band starts much shallower and continues downwards on the reef. At depths as shallow as 3 metres, we find the reef is almost exclusively dominated by soft corals. There's almost 100% cover of soft corals in in much of this area, extending down to at least 5 to 7 metres. These corals are a colonial organism that typically forms a large structure up to 30 centimetres high, with each structure covered in thousands of individual feeding polyps that can be seen actively feeding during incoming tides. Typically, there is also a scattering of lace bryozoans and other invertebrate species amongst the soft corals, but at much lower abundances. Moving deeper, orange solitary hard corals become more abundant, but otherwise this is a low diversity location relative to other parts of the system, predominantly because of the lack of planktonic food making it this far from the ocean. Despite this, it seems that some of these otherwise deeper sea species are well adapted to the scarcity of food and darkness that characterises this environment.