
Appendix D

Marine invasive species risk assessment

Accent Environmental Gelliondale Wind Farm Marine Invasive Species Risk Assessment



Report to Accent Environmental
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European green shore crab, NIMPIS - <https://www.marinepests.gov.au/pests/identify/european-green-shore-crab>

Northern Pacific sea star, NIMPIS - <https://www.marinepests.gov.au/pests/identify/northern-pacific-seastar>

Undaria pinnatifida (Wakame), NIMPIS - <https://nimpis.marinepests.gov.au/species/species/50>

Onshore windfarm, Victoria, Fathom Pacific Pty Ltd

Gelliondale Wind Farm Marine Invasive Species Risk Assessment

Report to Accent Environmental

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Fathom Pacific acknowledges the designer of the Torres Strait Islander flag, the late Mr Bernard Namok.



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Executive Summary

Synergy Wind has proposed the development of a terrestrial wind farm (1.623 km²) consisting of 13 turbines and associated infrastructure in Gelliondale, Gippsland. One risk identified by the project is the potential for marine invasive species introduction associated with commercial shipping required to deliver materials for the development. It has been proposed that vessels will use Port Anthony-Barry Beach Marine Terminal (PA-BBMT) in Corner Inlet for this project. Corner Inlet is home to a Ramsar wetland of international significance and the surrounding area harbours a range of high value habitats and is a spatially unique ecosystem in eastern Victoria.

The development of a commercial port at Barry Beach and the existence of recreational vessels and commercial fishing vessels at Port Welshpool and Port Albert represent pre-existing vectors of potential marine invasive species introduction. Four marine invasive species have been recorded within the Corner Inlet Ramsar site, two of which on the Australian Priority Marine Pest List. The impact of marine invasive species, if they become established and spread, can be significant and cause alteration to ecological function. While the magnitude and consequences of marine invasive species incursions and establishment may be high, the likelihood of introduction of species from the Gelliondale Project specifically is low. This is due primarily to:

1. The mitigation and management processes involved for commercial shipping practices at the national and state levels.
2. The shipping activity specially associated with the project representing <5% of the PA-BBMT port's annual commercial shipping traffic.

The risk of marine invasive species introduction has been assessed in accordance with a risk evaluation methodology that considers the likelihood and consequence of environmental risk resulting from the invasion of these species. The assessment focused on the risk of introduction, long-term establishment and spread of marine invasive species into PA-BBMT site, Corner Inlet Ramsar site and Corner Inlet and Wilsons Promontory broader area. Overall, the risk of the Gelliondale Project resulting in a marine species incursion is ranked as Low. The risk of the Gelliondale Project resulting in a marine species incursion that results in establishment and spread is ranked as Medium. While the likelihood of the latter is ranked as rare, the magnitude of this is elevated, thus elevating the total ranking.

Commonwealth and Victorian regulators and the port owners/operators have lines of responsibility for managing biosecurity for commercial shipping. While the Gelliondale Project is not deemed to have specific jurisdiction and responsibilities for monitoring, ways in which the project can engage with these existing arrangements are identified.

1. Introduction

1.1. Proposed Project: Gelliondale Wind Farm

Synergy Wind has proposed the development of a terrestrial wind farm (16.23 km²) consisting of 13 turbines and associated infrastructure in Gelliondale, Gippsland. As part of the development process, risks to the receiving environment must be considered. One such risk is the potential for marine invasive species introduction associated with the supply of turbine components and construction materials via commercial vessels. For this project, commercial vessels will use Port Anthony-Barry Beach Marine Terminal (PA-BBMT), an existing port facility in Corner Inlet. Corner Inlet is home to a Ramsar wetland of international significance, supporting a diversity of habitats and communities. The risk of introducing marine invasive species to the Corner Inlet Ramsar Site via commercial vessel movements must be considered for project approvals.

A logistics investigation for the project identified three shipping options for the transport of construction materials to PA-BBMT (Blue Water Shipping, 2025):

1. Delivery from an international port to the Port of Geelong, followed by tug-and-barge to PA-BBMT.
2. Delivery from an international port to other regionally advantageous Victorian or Tasmania port, followed by transfer to PA-BBMT.
3. Direct delivery from an international port to PA-BBMT.

Option 1 is assessed herein as this option represents the most likely logistical solution and represents what is deemed to be the highest risk profile with respect to marine pests given that it involves the Port of Geelong, an area of several historic marine pest incursions and an area of current infestation. Therefore, the marine pest assessment for this option is considered the most conservative approach and other shipping options that emerge will represent a risk profile that is no worse than that provided here.

1.2. Receiving Environment

Major features of the receiving coastal and marine environment proximal to the proposed Gelliondale Wind Farm are shown in . The environment consists of coastal wetland, mangroves, saltmarsh, intertidal sand and mud flats, and shallow seagrass beds. For this risk assessment, three different priority areas will be referred to:

1. **Priority Area:** immediate vicinity of PA-BBMT.
2. **Buffer Area:** Corner Inlet Ramsar Site.
3. **Context Area:** coastal marine waters from Shallow Inlet in the west to Reeves Beach in the east, including Wilsons Promontory.

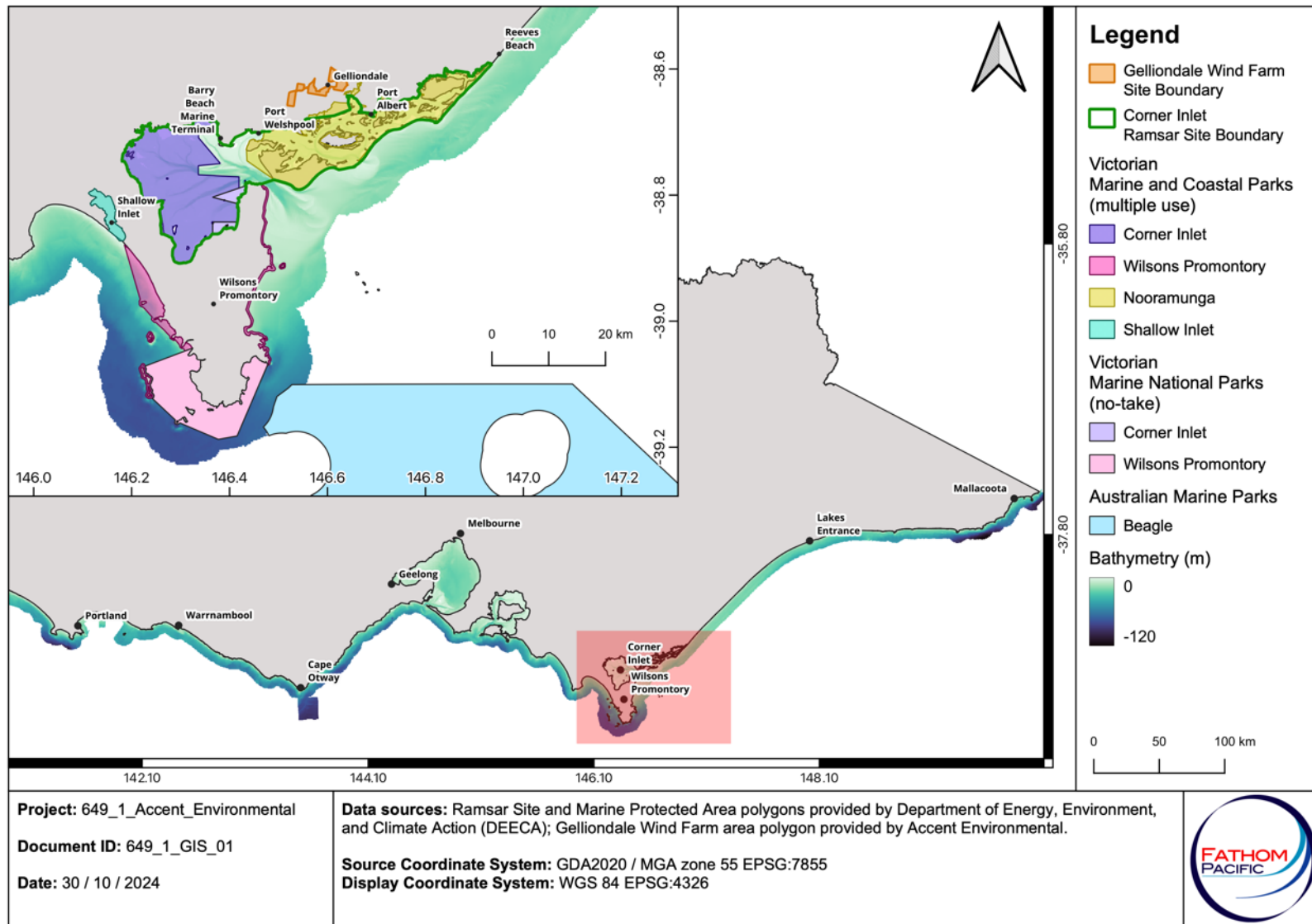


Figure 1-1 Map of Victoria showing key locations referred to in this report. Inset map shows Context Area for the project (Shallow Inlet to Reeves Beach).

1.2.1. Priority Area: Port Anthony-Barry Beach Marine Terminal

Turbine components and ancillary materials for the Gelliondale Wind Farm will be supplied via Port Anthony, which is approximately 26 km from Gelliondale via the South Gippsland Highway. PA-BBMT is a primary supply depot servicing oil and gas operations in the Gippsland Basin. Upgrade works are currently being proposed in Port Anthony to accommodate the emerging offshore wind industry and regional trade, making it a suitable port for delivery of turbine components (QUBE 2024).

The environment immediately surrounding PA-BBMT consists of shallow sand and mixed sediments, subtidal channels and seagrass beds (*Zostera*, *Posidonia* classes).

1.2.2. Buffer Area: Corner Inlet Ramsar Site

Port Anthony lies within Corner Inlet; a large, tide-dominated embayment, which supports a diversity of coastal and marine habitats. Corner Inlet was designated as a Ramsar wetland in 1982 covering over 67,000 ha and is characterised by a range of significant ecological features (Holmes 2020). Shallow marine waters support endemic seagrass beds, including the southerly most distribution of *Posidonia australis*; a broad-leaved seagrass species that plays an important role in sediment stabilisation. These shallow seagrass beds provide critical juvenile nursery habitats as well as spawning and feeding areas for a range of both commercially and recreationally valuable fish species, such as King George whiting (*Sillaginodes punctatus*), Australian salmon (*Arripis* spp.), sand flathead (*Platycephalus bassensis*), and gummy shark (*Mustelus antarcticus*) (Holmes 2020). Mangrove shrubland, coastal saltmarsh and intertidal mud and sand flats support more than 35 waterbirds listed under international migratory agreements, including 26 species of palaeartic migratory shorebirds (Holmes 2020). Deeper subtidal channels support tidal exchange of water over mud and sand flats, playing a key role in nutrient cycling. The Corner Inlet Ramsar Site Ecological Character Description provides further detail regarding these ecological features (Department of Sustainability, Environment, Water, Population and Communities 2011a).

To assess the risk of marine invasive species introduction to the Corner Inlet Ramsar Site, an understanding of the composition of habitats and ecological features is required for specific linkage to spatial management. The Department of Energy, Environment and Climate Action (DEECA) has developed a hierarchy of biogeography regions to assist in monitoring and management of the Victorian marine environment, including Corner Inlet. The lowest level of classification in this hierarchy represents 'Habitat Domains', for example seagrass beds, saltmarsh, mangrove. These Habitat Domains aggregate to form 'Segments' which represent a combination of both ecological characteristics and management boundaries. Segments and Habitat Domains are shown in Figure 1-2, and the area of each Habitat Domain is shown in Table 1-1, in order from largest to smallest Habitat Domain.

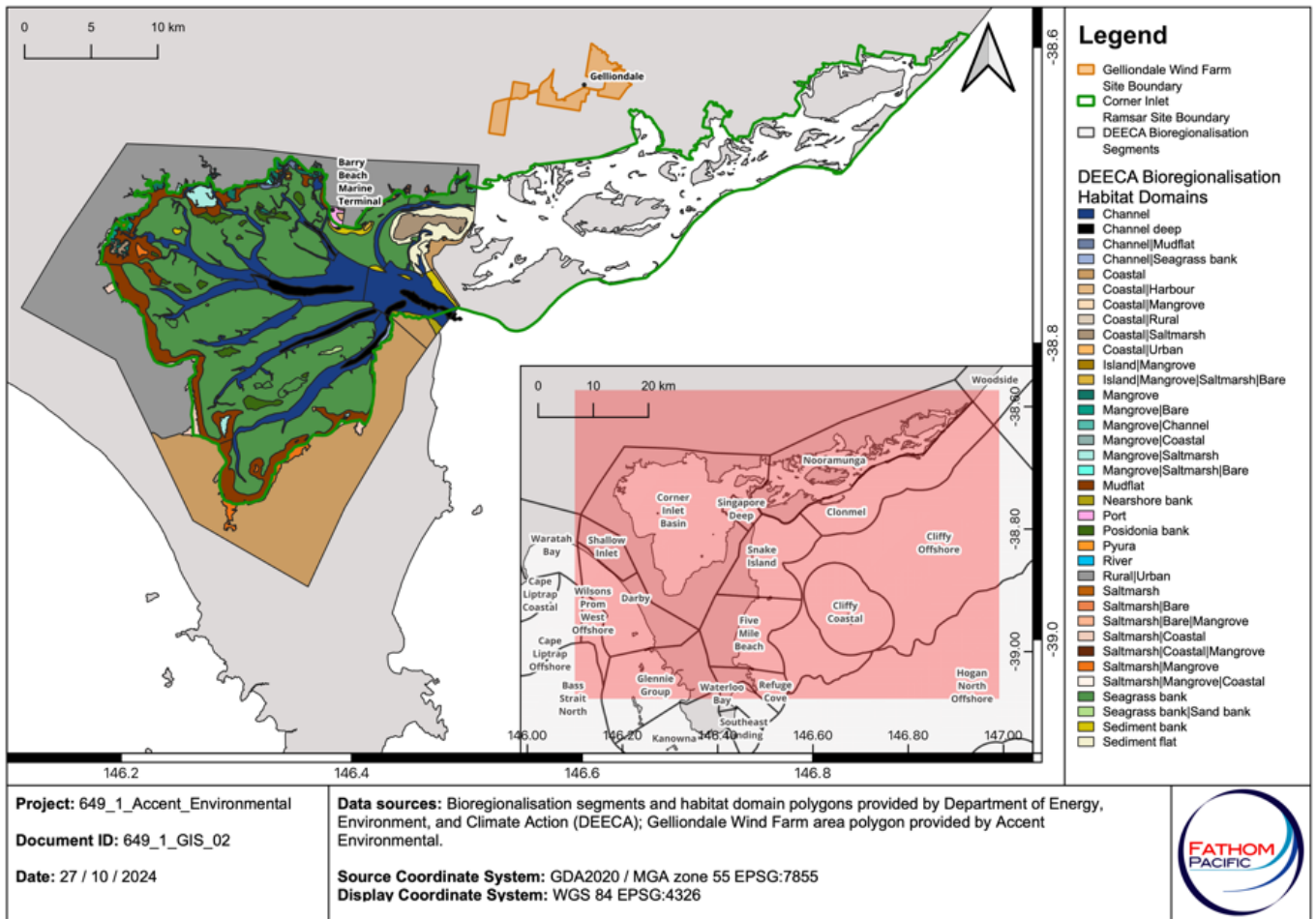


Figure 1-2 Map of DEECA bioregionalisation showing: Habitat Domains for the Corner Inlet and Singapore Deep (outer deep central channel) segments. Inset: Segments within the Context Area.

Table 1-1 Total area (hectares) of each Habitat Domain within the Corner Inlet segment identified by DEECA.

	Habitat Domain	Area (ha)
1	Seagrass bank	21,366
2	Rural Urban	15,703
3	Coastal	12,052
4	Channel	7,931
5	Mudflat	4,089
6	Channel deep	1,181
7	Sediment flat	1,044
8	Mangrove	720
9	Posidonia bank	696
10	Coastal Saltmarsh	679
11	Saltmarsh Coastal	450
12	Mangrove Saltmarsh	374
13	Saltmarsh Mangrove	364
14	Sediment bank	350
15	Mangrove Bare	167
16	Saltmarsh	150
17	Nearshore bank	145
18	Port	129
19	Channel Mudflat	95
20	Saltmarsh Mangrove Coastal	57
21	Saltmarsh Bare	49
22	Channel Seagrass bank	47
23	Seagrass bank Sand bank	46
24	Mangrove Channel	33
25	Island Mangrove Saltmarsh Bare	31
26	Mangrove Saltmarsh Bare	31
27	Coastal Harbour	28
28	Mangrove Coastal	14
29	River	8
30	Coastal Urban	6
31	Saltmarsh Coastal Mangrove	6
32	Island Mangrove	5
33	Coastal Mangrove	3
34	Pyura	2
35	Saltmarsh Bare Mangrove	2
36	Coastal Rural	1

Moving from management zones to habitats, mapping was conducted recently by Brooks and Hale (2020) for the West Gippsland Catchment Management Authority (Figure 1-3). The objective of this work was to improve the habitat map of the Corner Inlet Ramsar Site which is used to determine the change in wetland extent through time. There are fewer habitat types identified in this work compared to the DEECA Habitat Domains, however they link directly to the habitat types detailed in the Ramsar Site Ecological Character Description (Department of Sustainability, Environment, Water, Population and Communities 2011a). These habitats have defined Limits of Acceptable Change (LAC) against which the ecological character is evaluated (Department of Sustainability, Environment, Water, Population and Communities 2011b). The area of each habitat type is shown in Table 1-2 in order from largest to smallest habitat type.

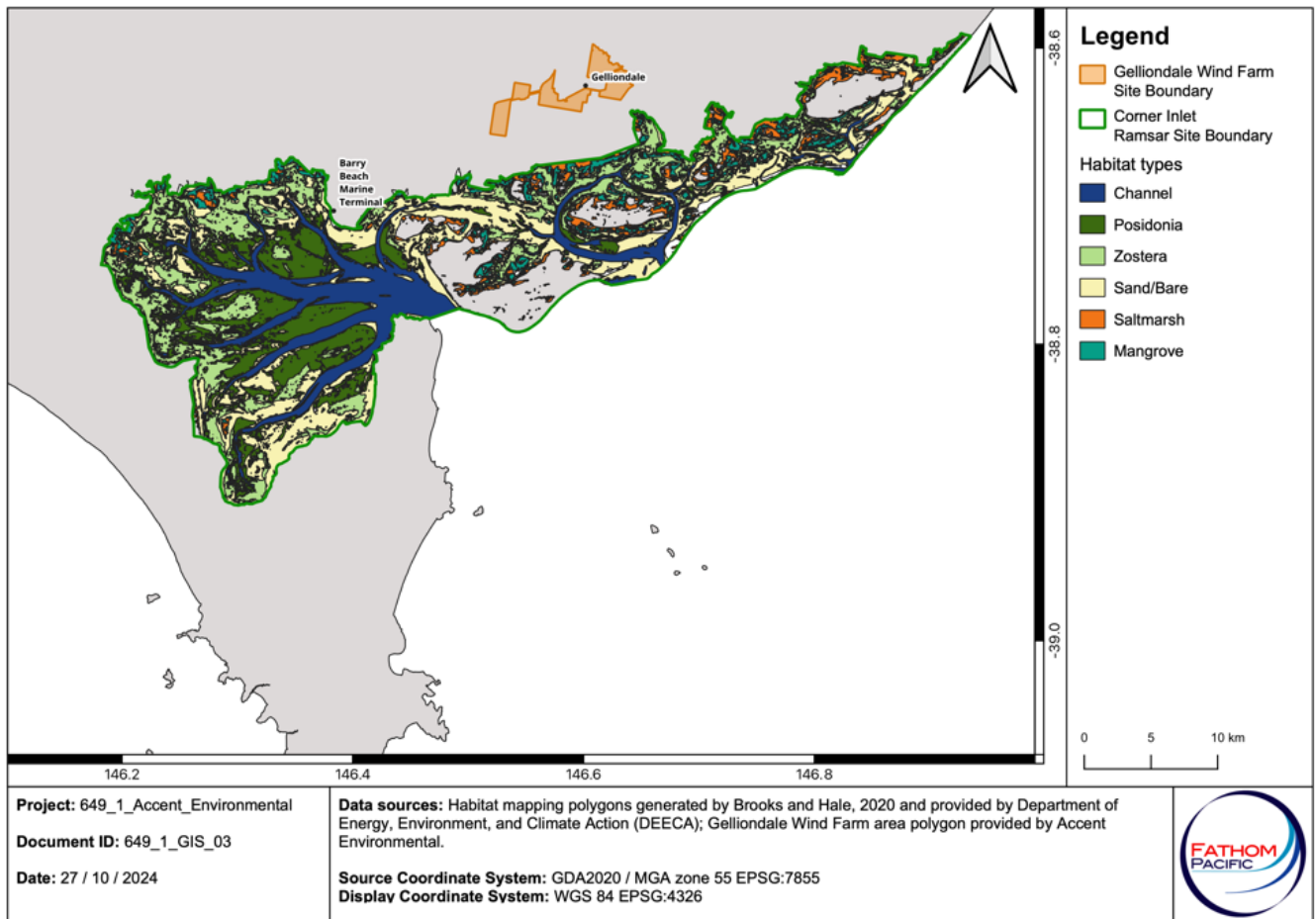


Figure 1-3 Map of Corner Inlet habitat types identified by Brooks and Hale, 2020.

Table 1-2 Total area (hectares) of each habitat type within the Corner Inlet Ramsar site mapped by Brooks and Hale, 2020.

	Habitat Domain	Area (ha)
1	Sand/Bare	15,937
2	Zostera	13,321
3	Posidonia	11,146
4	Channel	9,872
5	Saltmarsh	3,811
6	Mangrove	3,332

1.2.3. Context Area: Shallow Inlet to Reeves Beach

The Context Area for this project is defined as the coastal marine waters from Shallow Inlet in the west to Reeves Beach in the east, inclusive of Wilsons Promontory and Corner Inlet. This area provides a broader spatial context to consider the risk of marine invasive species introduction. This region includes six Victorian marine protected areas governed by Parks Victoria: four Marine and Coastal Parks which are multiple use zones (Shallow Inlet, Wilsons Promontory, Corner Inlet, Nooramunga), and two Marine National Parks which are no-take zones (Wilsons Promontory, Corner Inlet); as well as the northwestern portion of Beagle Marine Park, a multiple use zone, governed by the Commonwealth. The Context Area encompasses a wide range of marine ecosystems including coastal saltmarsh, mangrove shrubland, shallow seagrass beds, intertidal mudflats, exposed high energy beaches, subtidal sponge gardens, kelp forests and rocky reefs.

1.3. Objectives

This report aims to assess the risk of introducing marine invasive species to the Corner Inlet Ramsar Site via commercial vessel movements in the vicinity of Port Anthony associated with the supply of turbine components for the Gelliondale Wind Farm. This risk assessment identifies the direct impacts associated with introduction of marine invasive species and the indirect impacts associated with spread of existing or new marine invasive species.

This involves identification of known marine invasive species in the region and assessing the likelihood of introduction and consequences of introductions to the marine environment. Marine invasive species will be ranked according to key criteria, and a detailed risk assessment conducted for the top ten species to assess the potential risk their introduction poses to the ecological characteristics of Corner Inlet, taking into account available mitigation measures.

2. Marine Invasive Species Risks

2.1. Species and Management Arrangements

Marine invasive species are non-native marine organisms that have the potential to threaten native ecosystems and the services they provide (e.g., nutrient cycling, human nutrition, tourism, etc.). Invasive plants and animals have been identified as a significant risk to biodiversity and the economy in Australia (Bradshaw et al. 2021) and in general the risks of introduction of marine invasive species is expected to increase with increases in vessel movements.

To assess the distribution of marine invasive species in the Context Area, records of marine pests were extracted from the National Introduced Marine Pest Information System (NIMPIS) and the Atlas of Living Australia (ALA). NIMPIS (Department of Agriculture, Water and the Environment 2021) provides publicly available information about marine invasive species that are either already established in Australia, or that pose an introduction risk to Australia. Information includes species biology, ecology and distribution as well as known vectors, control measures and impacts on marine ecosystems. ALA is a repository for confirmed biodiversity records nationally, which includes marine pests (Belbin et al. 2021).

The Australian Priority Marine Pest List (APMPL) recognises ten invasive marine species. Of these priority species, three are established (self-sustaining) in Australian waters and seven species pose an introduction risk (Marine Pest Sectoral Committee Secretariat 2019). They are identified by the Australian Government as species that are nationally significant, can be identified easily, and can be eradicated. This list will be used in ranking marine invasive species in terms of their introduction risk to Corner Inlet.

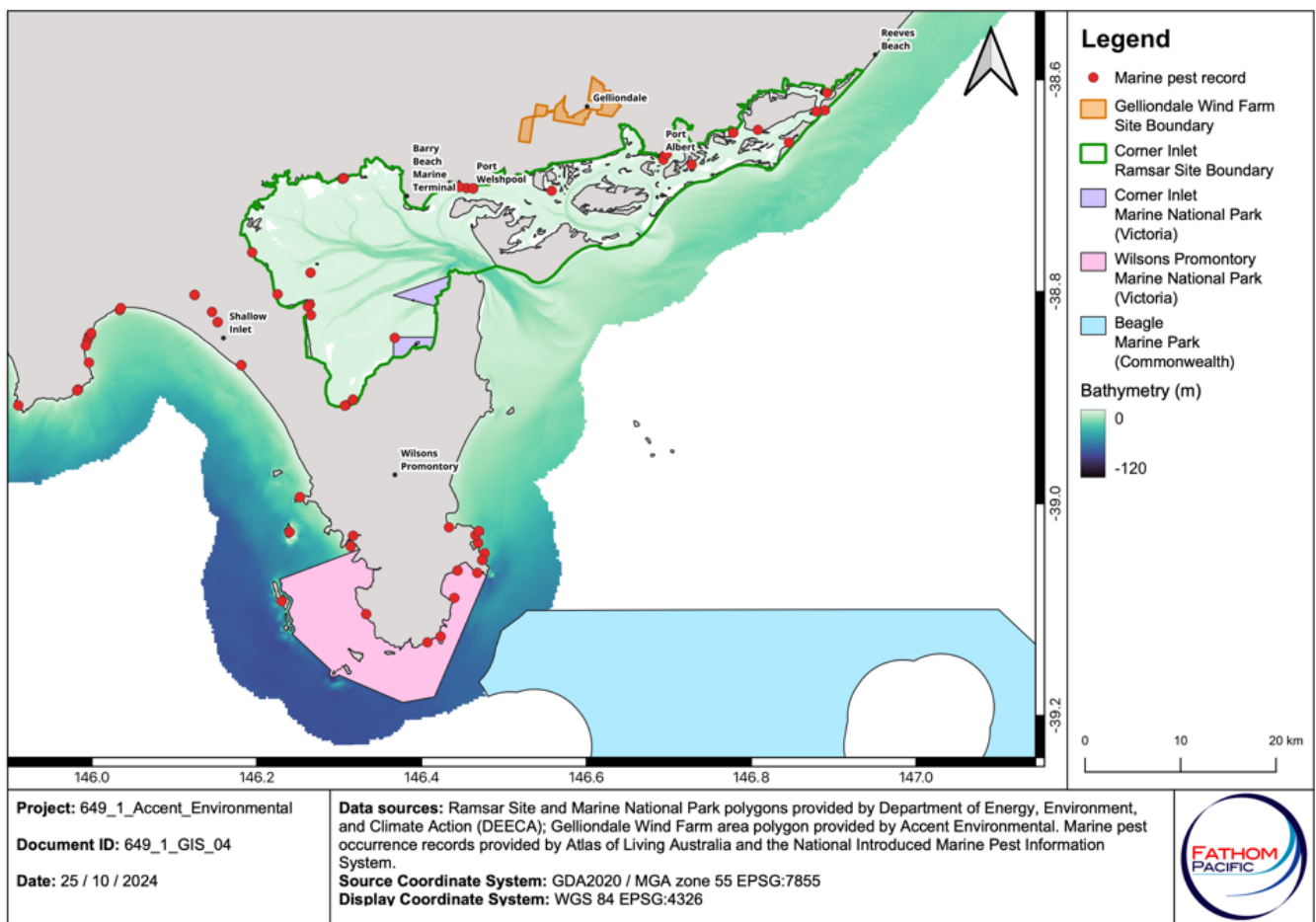
Monitoring for marine invasive species in Victoria is led by Agriculture Victoria, a service within The Department of Energy, Environment and Climate Action (DEECA), and involves a range of marine natural resource management authorities including DEECA regional offices and Parks Victoria. Agriculture Victoria has a range of programs to educate and inform port authorities and natural resource operators to widen the surveillance of marine invasive species. Responses to detections in the Gippsland region in the past have included activation of community and volunteer divers to eradicate, heightened monitoring and ongoing research into detection technologies including larvae (Hirst et al. 2013) and environmental DNA techniques (Ellis et al. 2022).

Management of marine pests falls under the Victorian Biosecurity Strategy and in the marine space, relies heavily on Federal mandatory ballast water (Department of Agriculture, Water and the Environment 2020a) and biofouling management (Department of Agriculture, Fisheries and Forestry 2023) requirements which themselves mirror international obligations. Furthermore, the Victorian Biosecurity Strategy engages with public education around the handling of recreational vessels and aquarium species.

2.2. Invasive Species Incursions and Establishment

Historically, there have been numerous introductions of marine invasive species into Victorian waters dating back to the early 1900s. A full list of marine invasive species in Victoria is provided in Appendix 1. Their introduction, spread and establishment has had various impacts on native marine ecosystems, as well as economic impacts on aquaculture.

The majority of marine invasive species incursions have occurred in Port Phillip Bay, where most commercial shipping in Victoria is concentrated. There have been relatively few marine invasive species incursions recorded in Gippsland waters, although incursions have been spatially widespread in the region (Figure 2-1). Marine invasive species in the project Context Area have been recorded within a range of habitats including seagrass beds, mangroves, saltmarsh, intertidal flats, and subtidal rocky reefs.



Note: Records shown are for the top ten species identified as most likely to be introduced to Corner Inlet: *Carcinus maenas*, *Undaria pinnatifida*, *Codium fragile* subsp. *fragile*, *Grateloupia turuturu*, *Arcuatula senhousia*, *Varicorbula gibba*, *Theora lubrica*, *Asterias amurensis*, *Magallana gigas*, *Ciona intestinalis*.

Figure 2-1 Map of marine invasive species records spanning 1974 to 2024. Each red circle represents one marine invasive species observation record.

In the Gippsland region, among the most significant incursions and marine pest establishments are:

- Tidal River, Wilsons Promontory: *Asterias amurensis* incursion (2012). Successfully eradicated.
- Anderson Inlet, South Gippsland: *Asterias amurensis* incursion (2004). Successfully eradicated.
- San Remo, South Gippsland: *Asterias amurensis* incursion (2011). Successfully eradicated.
- Port Welshpool, Corner Inlet: Establishment of *Undaria pinnatifida*. Establishment of *Carcinus maenus*. Establishment of *Codium fragile* ssp. *fragile*.
- Lakes Entrance: Establishment of *Styela plicata*.

Surveys at PA-BBMT in 2021 did not identify the presence of any marine invasive species (Silvey et al. 2022). The authors noted that the sheet pile walls used at the facility and the sand substrate (evidently mobilised by the action of ship's propulsion) may be limiting settlement and survival of marine invasive species. New developments at PA-BBMT¹ may provide additional potential habitat for marine pests in the future.

It should be noted that the successful eradication of the sea star *A. amurensis* listed above exclusively involved SCUBA diving, an activity that carries risks and costs and an activity that is restricted in commercial ports or where underwater visibility is low. Therefore, the reliance of eradication by hand should not be solely relied upon for marine pest management in PA-BBMT.

Undaria pinnatifida poses particular risks. In Port Phillip Bay, this species interacts synergistically with over-abundant sea urchins to create and maintain *Undaria*-urchin (*Heliocidaris erythrogramma*) barrens which limit recolonisation by native kelp. Given the abundance and growing risks of urchin barrens (*Centrostephanus rodgersii*) in the eastern Victorian open coast environment, and the proximity of Corner Inlet to highly valued habitats at Wilsons Promontory including Marine Protected Areas, and the unknown synergistic and antagonistic interactions that could occur, *Undaria pinnatifida* is considered a high-risk species in Corner Inlet. In Port Phillip Bay and other Victorian harbours, *Undaria pinnatifida* can become marooned and spatially restricted to harbours. Escape from harbours and range expansion through the environment can be triggered by climatic events, release of predation pressure, spread by human activity, or advantageous colonisation of disturbed habitat (e.g., urchin barrens). Recreational vessel activity in addition to commercial operations is a potential vector for the species to spread within the Corner Inlet Ramsar Site and potentially spread outside Corner Inlet. For commercial shipping, while ballast water management is effective, biofouling by *Undaria pinnatifida* is a risk for vessels servicing the port, including those which use weather refuges and pilotage standing areas near Wilsons Promontory.

Shipping activity in most Australian ports, even those with relatively low usage, generally translates to the detection of marine pests to some degree (Pollard and Rankin 2003). However, the Port of Geelong is considered an area of particularly high risk in the Victorian context. The Port of Geelong in Corio Bay, a sub-area of Port Phillip Bay,

¹ <https://qube.com.au/projects/bbmt-project/>

is recorded to have higher marine invasive species occurrence than other Victorian ports (Currie et al. 1998) and is generally considered to be the likely point of entry for historic marine pest outbreaks that have spread throughout the bay. *Undaria pinnatifida*, *Sabella spallanzanii*, *Asterias amurensis*, *Myxicola infundibulum* and *Corbula gibbosa* are species that were first identified in Corio Bay or the Geelong Arm area (Parry et al. 1996, Currie et al. 1998, Hewitt et al. 2004). The spectrum and intensity of shipping operations, relatively high diversity of habitat types, relatively low tidal flushing rates and relatively low influence of freshwater in Corio Bay may contribute to its high marine pest occurrence profile.

Local vessels working within Victorian ports are not subject to the same biosecurity measures that international shipments are exposed to. Furthermore, movements of vessels and barges between Victorian ports may involve vessels that do not use ballast. As such, ballast water management regimes are not applicable for this kind of activity, but biofouling of hulls is a more relevant consideration. This assessment considers the base case being the use of vessels current stationed in Port of Geelong to deliver materials to PA-BBMT. Mitigations that are recommended are based on precautions that account for the risk associated with those vessels being stationed in area of high potential exposure to biofouling marine pests.

2.3. Risks to Ramsar Wetland Values

Marine invasive species can cause a range of negative impacts to biodiversity, ecosystem services, and socioeconomic values associated with marine environments. In general, invasive species are one of the greatest causes of biodiversity loss, second only to habitat destruction (Breithaupt 2003). Once established, marine invasive species often reproduce rapidly and compete with native species for essential resources such as space and food, leading to significant changes in the structure and function of marine ecosystems (Streftaris and Zenetos 2006). For example, (Stuart-Smith et al. 2015) found via field surveys throughout southeastern Australia, that in regions where invasive species were highly abundant, native fish and invertebrate communities exhibited low species richness. Similarly, in the US, abundance of the invasive invertebrate *Ciona intestinalis*, was found to be negatively correlated with species richness, thus reducing local species diversity (Blum et al. 2007). In Tasmania, the native bivalve *Theora fragilis* has declined over the past century in parallel with substantial increases in abundance of the invasive *Theora lubrica*, introduced from southeast Asia (Edgar et al. 2005). As well as changes to ecosystem structure, marine invasive species can also act as vectors for parasites and disease, putting native species at risk (Costello et al. 2021; Goedknecht et al. 2019).

On top of the impacts to ecosystem features, economic consequences can ensue from marine invasive species. Impacts to aquaculture industries (e.g., shellfish, finfish) include fouling of infrastructure, biological competition, predation, and increased disease risk. For example, *Asterias amurensis* is a voracious predator of native shellfish, posing a significant risk to bivalve aquaculture (Aguenel 2008). Furthermore, Felling et al. (2014) found that native sea bream (*Diplodus sargus*) in the Mediterranean that grazed on invasive macroalgae (*Caulerpa racemosa*) had altered fatty acid composition, resulting in decreased fish health as well as diminished nutritional value. In Australia,

impacts of marine invasive species have potentially significant economic ramifications due to the high value of industries and environmental assets associated with the marine environment. For example, the nominal value of Australian fisheries and aquaculture production is more than \$3 billion (Tuynman et al. 2024).

Specific to Corner Inlet, marine invasive species have been identified as a threat to the ecological character of the Ramsar site (Department of Sustainability, Environment, Water, Population and Communities 2011a). Ecological character is defined as *‘the combination of the ecosystem components, processes and benefits/services that characterise the wetland at a given point in time’*. These ecosystem components include seagrass beds, saltmarsh, mangroves, intertidal flats, shallow marine waters, waterbird abundance and diversity, threatened species, and fisheries resource value (Department of Sustainability, Environment, Water, Population and Communities 2011a). Each component supports a range of ecosystem services including provisioning (e.g., seagrass beds and mangroves serve as nursery habitats for commercially valuable fish species, which provides food for humans), regulating (e.g., mangroves provide erosion protection, seagrass beds provide coastal sediment stabilisation), cultural (e.g., high biodiversity and endemism of species support tourism), and supporting (e.g., intertidal flats and shallow marine waters play important roles in nutrient cycling). Marine invasive species have the potential to negatively impact ecosystem components and services that comprise the ecological character of the Corner Inlet Ramsar site via competition with native species, predation, habitat modification, changes to nutrient cycling, and increased disease risk. The consequences of these impacts could span multiple spatiotemporal scales due to the reliance on Corner Inlet by many migratory waterbird species (Holmes 2020). Understanding the risk that marine invasive species pose to the Corner Inlet Ramsar site is, therefore, critical to inform appropriate monitoring and management.

3. Risk Assessment

The risk of marine invasive species introduction consequent from the Gelliondale Wind Farm project has been assessed in accordance with the risk evaluation methodology outlined in the Department of Climate Change, Energy, the Environment and Water's (DCCEEW) Environmental Management Plan Guidelines (DCCEEW, 2024). This approach considers the likelihood and consequence of environmental risk to determine the overall risk rating.

3.1. Vectors

Marine invasive species can be introduced and spread via a range of vectors, such as ballast water in commercial ships, biofouling on vessel hulls, and aquaculture operations. For the Gelliondale Wind Farm project, introduction of marine invasive species via hull fouling is the primary vector of concern.

Vessels will transport wind farm components from the Port of Geelong into PA-BBMT via the “tug and barge” method, involving a total of 13 voyages into Corner Inlet. Barges are vessels designed to carry freight over short distances, they remain stationary in port for varying length of time between trips, increasing the risk of acquiring biofouling. The exchange of cargo from vessels operating out of large ports presents the risk of marine pests being transferred to barges. When in inshore waters, barges can be in close proximity to the seabed during loading and unloading cargo, presenting an opportunity for fouling organisms to settle on the vessel. Barges are usually towed or pushed by tugs, multi-purpose vessels with powerful engines used for moving large non-self-propelled objects or manoeuvring large vessels in port. Similar to barges, tugs spend the majority of time within ports, offering opportunities for entrainment of invasive marine pest through biofouling or infection from other vessels. Both barges and tugs were assessed for the potential to act as vectors for the spread of marine pests around Australia and were ranked as ‘High Risk’ compared to other vessel types. The risk assessment was based on the number of voyages usually undertaken, the amount of time spent in and around ports and the level of interaction with the seabed (Kinloch et al. 2003).

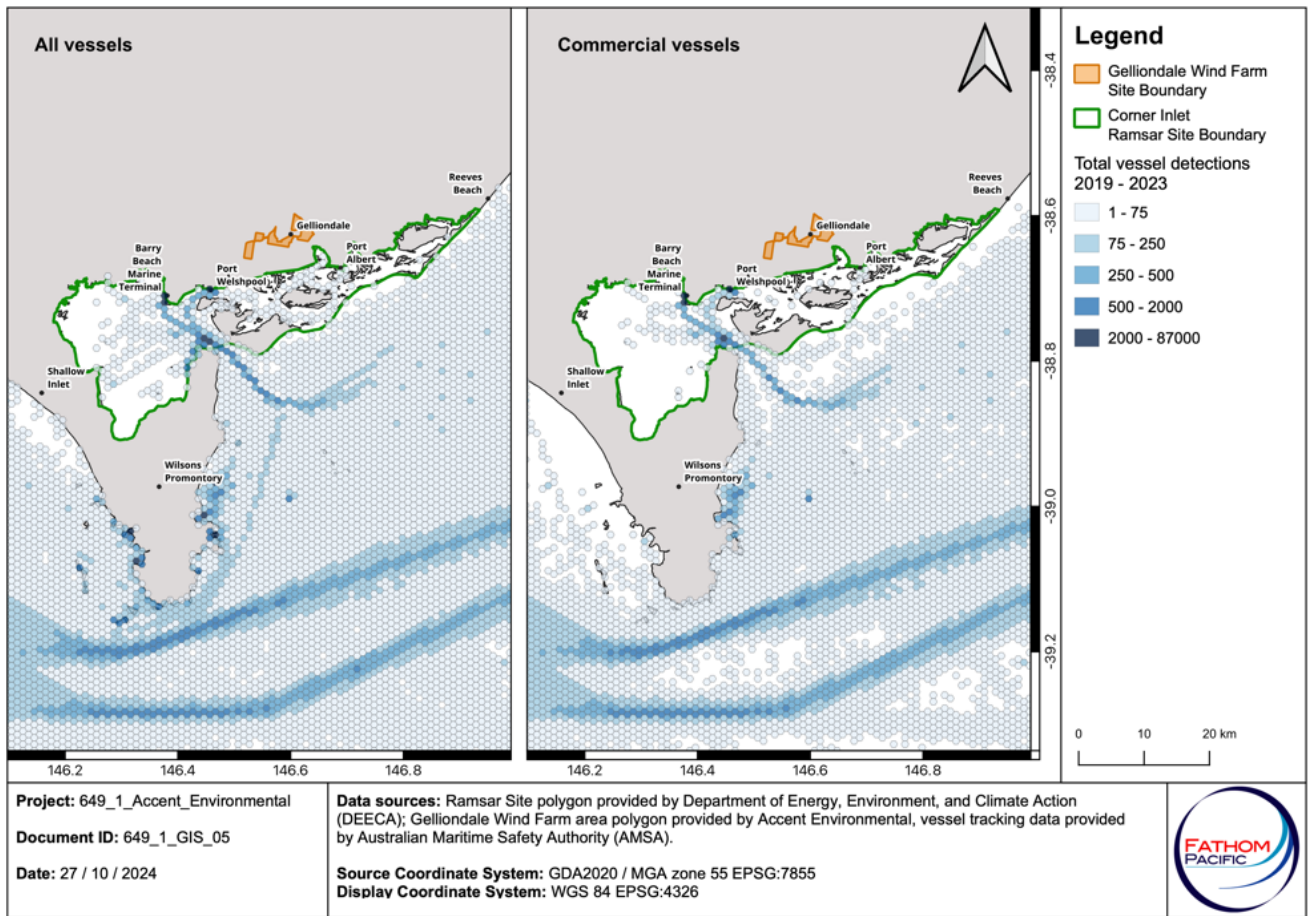
To assess the risk of marine invasive species introduction, an estimate of shipping traffic associated with the Gelliondale Wind Farm is required. To determine the project-related increase in vessel traffic relative to existing levels, vessel traffic data were analysed within the Context Area. Publicly available vessel traffic data were obtained from the Australian Maritime Safety Authority's Digital Data repository (Australian Maritime Safety Authority 2024). These data contain hourly vessel detections via shipborne Automatic Identification System (AIS) data sources. Vessel traffic data were compiled for a five-year period between 2019 and 2023, inclusive. Vessel detections with missing data (e.g. zero vessel length, no vessel type assignment, no timestamp) were excluded from the analysis. Vessels were categorised as either ‘Commercial’ (e.g. cargo, tanker, tug) or ‘Other’ (e.g. sailing, military, fishing) to distinguish between large, commercial ships of the type likely to supply the Gelliondale Wind Farm and other vessel types that are unlikely to be associated with the project.

Total vessel detections and commercial vessel detections in the Context Area for the period 2019 to 2023 are shown in Figure 3-1. To represent a typical year of vessel traffic, total vessel detections for 2023 are shown in Figure 3-2.

Summary statistics were calculated for commercial vessels entering and exiting PA-BBMT. From 2019 to 2023, 22 unique commercial vessels made a total of 1,410 visits to PA-BBMT, which represents on average 282 commercial vessel visits to PA-BBMT per year. On average, each commercial vessel visiting PA-BBMT spent 12 days in port per year spread across approximately 13 separate port visits, indicating an average residence time per visit to PA-BBMT of 22 hours. These data indicate that vessel movements to and from PA-BBMT consist of a relatively low number of unique commercial vessels that are each conducting multiple trips. Commercial vessels visiting PA-BBMT between 2019 and 2023 were on average 81 m long, with the largest five vessels ranging from 87 m to 111 m. More recently, in 2024, PA-BBMT received a 126 m long general cargo ship (Daily Cargo News 2024), demonstrating its increasing capacity to accommodate larger vessels of the type required to transport turbine components and ancillary materials. Assuming the Gelliondale Wind Farm requires 13 vessel trips to supply turbine components, this represents a 4.6 % increase on the annual number of commercial vessel visits to PA-BBMT.

While this assessment focussed on commercial vessels, recreational and other non-commercial vessels are an important consideration for the risk posed to the Corner Inlet Ramsar site. Recreational vessels are unique in their ability to spread marine invasive species once they are introduced to an area that is remote from commercial shipping operations (Hilliam et al. 2024) as recreational activity typically moves from urbanised areas to remote areas. The protected waters of Corner Inlet, its recreational and aesthetic values and its ‘gateway’ positioning between the safe harbours of Lakes Entrance and Western Port, position it in an area where recreational use is relatively widespread. In particular, it is important to note that in Figure 3-1, recreational vessel activity extends into the eastern sector of the Ramsar site where commercial shipping does not exist. Hayes et al. (1997) noted the significance of recreational vessels in ranking national marine pest risk, stating that data on these vessels would likely alter the risk ratings.

Whilst marine invasive species may be introduced via shipping and other vectors, not all will become established and persist through time due to inability of the species to breed, recruit juveniles to the population and survive long-term. The likelihood of persistence is therefore an important factor to consider when assessing the risk species pose to the marine environment. Records of marine invasive species in the Context Area date back to as early as 1900 (*Carcinus maenas*), with numerous incursions since. To quantify the persistence of marine invasive species in the Context Area, the number of years between the earliest record and the latest record of a species was considered.



Note: Zone of high commercial vessel detection in nearshore zone off eastern Wilsons Promontory is associated with weather refuge and waiting zone for pilotage into Corner Inlet.

Figure 3-1 Map of shipping traffic for the period 2019 to 2023 inclusive for all vessel types (left) and commercial vessels only (right).

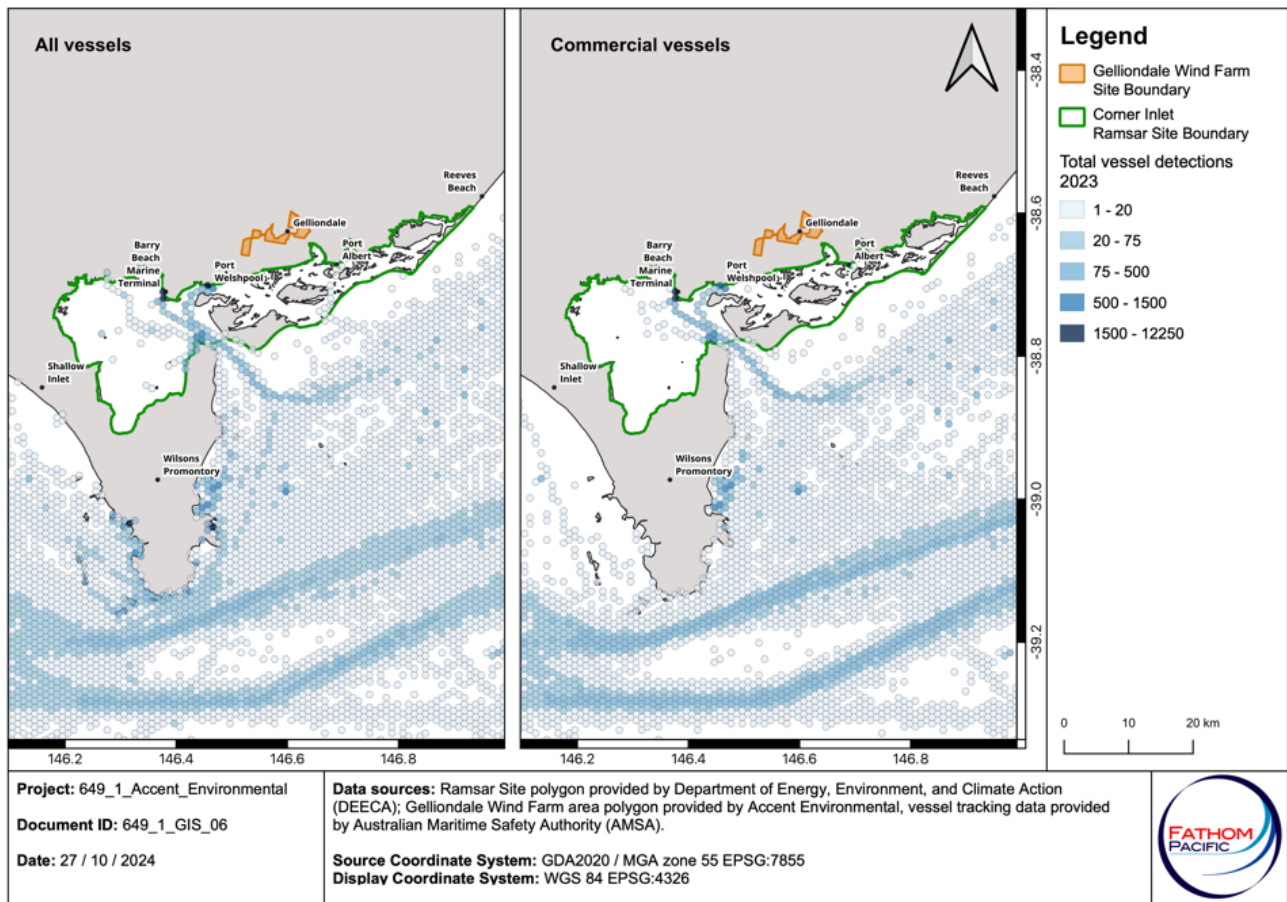


Figure 3-2 Map of shipping traffic for 2023 for all vessel types (left) and commercial vessels only (right).

3.2. Species Risk Ranking

Data extracted from the National Introduced Marine Pest Information System (NIMPIS) (Department of Agriculture, Water and the Environment 2021) were used to rank invasive marine species according to the risk associated with introduction to the Corner Inlet Ramsar site. To rank species risk level, the following criteria were considered:

- Presence in Corner Inlet: whether the species has been recorded as present in Corner Inlet (Buffer Area) at any time.
- Temporal commonness: whether the species has been previously detected in the Context Area, weighted according to the number of years between the earliest and latest detection.
- Broader spatial extent: whether the species has been previously detected in the wider Gippsland region, weighted according to proximity to Corner Inlet.
- Spreading potential: number of identified vectors weighted according to relevance to shipping.
- Priority: whether the species is listed on the APMPL.

The species scores and rankings are shown in Appendix 1. The top ten species were taken forward to a detailed risk assessment that examined the risk level posed by each species to the Corner Inlet ecosystem.

The top ten ranked species from this process are listed in Table 3-1. Of these top ten ranked species, three are on the APMPL and six are listed as ‘medium priority’ by Hayes et al. (1997) and two are listed as ‘low priority’ by Hayes et al. (1997). All of the top ten high ranked species were recorded in the Context Area, four of which were recorded within the Corner Inlet Ramsar site (*Carcinus maenas*, *Undaria pinnatifida*, *Codium fragile ssp. fragile* and *Grateloupia turuturu*).

Table 3-1 Species risk ranking, species in bold text are those listed on the Australian Priority Marine Pest List.

Rank	Species	Common Name	Year of latest record	Australian Priority Marine Pest List	#years recorded in Context Area
1	<i>Carcinus maenas</i>	European Shore Crab	2024	Yes	50
2	<i>Undaria pinnatifida</i>	Japanese Kelp/Wakame	2021	Yes	22
3	<i>Codium fragile ssp. fragile</i>	Dead Man's Fingers	2021	No	1
4	<i>Grateloupia turuturu</i>	Devil's Tongue Weed	2021	No	1
5	<i>Arcuatula senhousia</i>	Asian Date Mussel	2021	No	12
6	<i>Varicorbula gibba</i>	European Clam	2021	No	12
7	<i>Theora lubrica</i>	East Asian Bivalve	2018	No	9
8	<i>Asterias amurensis</i>	Northern Pacific Seastar	2017	Yes	5
9	<i>Magallana gigas</i>	Pacific Oyster	2021	No	8
10	<i>Ciona intestinalis</i>	Vase Tunicate	2021	No	1

Several introduced exotic species can be found within the Port of Geelong and therefore the use of vessels usually residing in this port increases the risk of translocating marine pest species present in Corio Bay that have not been previously recorded in Corner Inlet. 20 invasive species were found within Geelong Port waters during a 1997 survey, five of these species were recorded in high abundance and considered likely to cause a significant impact on the Port of Geelong ecology (Currie et al. 1998).

The five most abundant marine pest species recorded in the Port of Geelong are:

- The European fan worm *Sabella spallanzanii*.
- The stalked Ascidian *Styela clava*.
- The solitary Ascidian *Ascidella aspersa*.
- The Asian date mussel, *Arcuatula senhousia*.
- The east Asian bivalve *Theora lubrica*.

None of these five species is listed in the APMPL. Among these marine pest species, *Sabella spallanzanii*, *Styela clava* and *Ascidella aspersa* have not been previously recorded in Corner Inlet, however, based on our risk assessment process, they were excluded from the top ten ranked species (see Appendix 1 for Introduction Risk Score).

3.3. Marine Invasive Species Risk Assessment

This risk assessment is set within the context of existing shipping activity within an existing commercial port. The construction of the PA-BBMT port facility was subject to an approvals process that required assessment of impacts to Ramsar wetland values and therefore there is a base assumption that current (background) shipping activity does not represent an unacceptably high risk of marine invasive species impacts.

This risk assessment also considers the facts that marine invasive species have been detected in Corner Inlet, monitoring of marine invasive species in the area is episodic, there is scientific uncertainty in relation to the ecological effects of marine invasive species and the effects of marine pests are notoriously and difficult to manage once outbreaks occur.

These factors amplify the importance of measures to mitigate marine invasive species introduction. These will be implemented and monitored under an Environmental Management Plan framework.

3.3.1. Criteria

The assessment of risks involves the evaluation before, and after the assumed successful implementation of mitigation and management measures for adverse impacts. The assessment considers likelihood, magnitude and sensitivity components and addresses the natural environment and ecosystem services (benefits to humans). For this project the assessment follows the environmental risk assessment process as prescribed in DCCEEW Environmental Management Plan Guidelines (DCCEEW, 2024). The risk assessment uses a structured process to populate each component as described in the subsections below.

This risk assessment aligns with the Precautionary Principle. This is necessary due to the fact the impacts of marine invasive species are often found to be pernicious and there is a relatively high degree of uncertainty associated with true existing distributions of marine pests and the synergistic and antagonistic interactions that may occur (e.g. climate change, interactions with other disturbance regimes such as urchin barrens). Furthermore, marine invasive species profiles are prone to change with changes in global shipping and climate change impacts.

3.3.1.1. Sensitivity

Sensitivity criteria for this project are formally defined in Table 3-2. The rule applied in selecting a sensitivity rating is a one-in, all-in approach to the criteria listed in Table 3-2, whereby a single affirmative trigger in one component of the rating fixes the rating to that level regardless of other non-affirmative attributes. This project considers risks and potential impacts to a Ramsar site and this site is adjacent to Marine Protected Areas. Furthermore, Corner Inlet and Nooramunga represent unique ecophysical habitats and biotopes in Victoria. Therefore, the setting used for sensitivity is fixed at the rating of **Very high**.

3.3.1.2. Magnitude and Consequence

The magnitude of the impact is considered a combination of its extent, severity and duration. In the marine environment, marine invasive species impacts have the potential

to be widespread and long-term. Information from Port Phillip Bay indicates that if marine invasive species become established, eradication is either impossible, unfeasible, or prohibitively expensive and these species may have significant impacts on the ecological functioning of the area. However, information available for other ports and harbours indicates that some marine invasive species incursions can be temporary or, if the species does establish, its range can be restricted to the harbour environment (e.g. *Undaria pinnatifida*).

Magnitude and consequences of potential incursions and establishment should also factor in cumulative and synergistic impacts which could work together to, for example, decrease natural ecosystem resilience. For example, risks of over-abundant urchins in Corner Inlet to spatially unique *Posidonia australis* seagrass beds have been identified (Carnell et al. 2020). *U. pinnatifida* and its senescence traits have been found to promote urchin grazing in other Victorian locations. Therefore, spread of this algal species through Corner Inlet could promote urchin population enhancement that promotes grazing on seagrass when drift algae supply reduces. Furthermore, marine invasive species effects can cause decreased ecosystem resilience and recovery to natural or anthropogenic disturbances, including climate-related extreme events that are predicted to become more frequent and intense with under climate change scenarios. These kinds of feedback and cumulative effects are considered in the assessment herein.

The process for determining magnitude is as follows:

1. Identification of the geographic extent of the potential impact (Table 3-3).
2. Identification of the severity and timescale of the impact within the geographic extent, taking the higher of the two results (where they differ) (Table 3-4).
3. Combination of the two scores to produce a single magnitude score.

Table 3-2 Sensitivity rating used for risk assessment.

Rating	Ecosystems and habitats	Species (populations)	Physical environment
Very High	• Ecosystem or habitat supports EPBC Act 1999 listed places including wetlands of international importance as listed under Ramsar Convention • Ecosystem or habitat is critical to the survival of a species • Ecosystem or habitat is unique or very rare locally and regionally	• EPBC Act 1999 listed species or communities present and these species are only recorded from this location • Endemic or restricted-range species with very low abundance in area of occurrence	• Environment is in natural condition with no evidence of modification; all environmental benchmarks are met • Environment supports physical properties or processes that are considered rare or exceptional at regional scale
High	• Ecosystem or habitat supports high/regionally important concentrations of conservation-listed species (or equivalent based on expert opinion) and/or endemic or restricted-range species • Ecosystem or habitat supports a unique assemblage and/or high proportion of habitat specialist species • Ecosystem or habitat is of local or regional importance for migratory species • Ecosystem or habitat is within a protected area • Ecosystem or habitat is unmodified • Ecosystem or habitat is rare locally and regionally with limited connectivity to comparable ecosystems or habitats	• EPBC Act 1999 listed species or communities present but these species are also recorded elsewhere • Victorian FFG listed species or communities present, regardless of their range • Endemic or restricted-range species with low abundance in area of occurrence • Species that are highly adapted habitat specialists	• Environment is in near-natural condition with minimal human-induced modification; most environmental benchmarks are met • Environment supports physical properties or processes that are considered rare or exception at local scale but well represented regionally

Moderate	• Ecosystem or habitat supports viable assemblages of native flora and fauna species that are largely unaltered from original composition; conservation-listed species may be present • Ecosystem or habitat has not been significantly modified in terms of primary ecological functions and composition • Ecosystem or habitat has a moderate number of local and regional equivalents with some connectivity to comparable ecosystems or habitats	• Endemic or restricted-range species with moderate to high abundance in area of occurrence • Species that are habitat specialists but able to occur in other marginal habitat • Fish or macro crustacean species of fisheries significance	• Environment is in near-natural condition, with some human-induced modification; most environmental benchmarks are met
Low	• Ecosystem or habitat supports viable assemblages of some native species but flora and fauna communities are significantly altered from original composition found elsewhere locally; invasive species may be present • Ecosystem or habitat is subject to some degradation • Ecosystem or habitat is common locally and regionally with moderate connectivity to other comparable ecosystems or habitats	• Species and communities are representative of common and widespread distributions in the region	• Environment is moderately degraded comparative to equivalent areas and/or as measured by environmental benchmarks • Physical properties or process of environment experience very high natural variability as result of extreme events (e.g. cyclones, floods) that have a frequency <1 per year
Negligible	• Ecosystem or habitat supports few or no native species and/or invasive species are prevalent • Ecosystem or habitat is highly degraded • Ecosystem or habitat is common and widespread locally, regionally and nationally, and has high connectivity to other comparable ecosystems or habitats	• Native species in low abundance and biodiversity significantly impacted, and species well adapted to habitat loss/degradation • Invasive species present	• Physical properties or processes of environment experience very high natural variability on an annual basis • Environment is highly degraded comparative to equivalent areas and/or as measured by environmental benchmarks

Table 3-3 Magnitude criteria – geographic extent.

Rating	Geographic extent
5	Impact to >15% of the ecosystem or habitat type range within the Context Area
	Impact to >10% of species distribution in Buffer Area
	Impact to any environmental feature that extends significantly beyond Buffer Area
4	Impact to 5-15% of the ecosystem or habitat type range within the Context Area
	Impact to 5-10% of species' distribution in Buffer Area
	Impact to any environmental feature that extends beyond Buffer Area
3	Impact to <5% of the ecosystem or habitat type range within Context Area
	Impact to 1-5% of species distribution in Buffer Area
	Impact to any environmental feature that extends beyond PA-BBMT area but does not extend beyond Buffer Area
2	Impact to <1% of species' distribution in Buffer Area
	Impact to any environmental feature within a PA-BBMT area
1	Impact to any environmental feature within highly localised sub-area in PA-BBMT area

Table 3-4 Magnitude ranking criteria – severity and duration.

Rating	Feature	Severity	Duration
5	<i>Ecosystems and habitats</i>	• Impact to habitat very large/severe relative to natural variability; or • Very high impact to habitat that severely reduces ecosystem viability within the affected area; or • Significant change in the composition of ecosystem communities, including the functional loss of keystone species and potentially leading to ecosystem collapse.	Impact to any environmental feature lasts >30 years
	<i>Species (populations)</i>	• A very large population decline that threatens the viability of the Buffer Area population and that may threaten the viability of the Context Area population.	
	<i>Physical environment</i>	• Extreme impact to water quality and sediment quality, such that: ○ Intensity, frequency and duration of adverse events well outside the range of natural variability; or ○ One or more environmental values of waters (social and biodiversity) are no longer supported.	
4	<i>Ecosystems and habitats</i>	• Impact to habitat large relative to natural variability; or • High impact to habitat that reduces ecosystem viability within the affected area; or • Loss/decline of multiple populations that alters the composition and may reduce the viability of ecosystem communities and/or keystone populations.	Impact to biological environment lasts 15-30 years
	<i>Species (populations)</i>	• A large population decline that may threaten the viability of Buffer Area population.	
	<i>Physical environment</i>	• Severe impact to water quality and sediment quality, such that: ○ Intensity, frequency and duration of adverse events is slightly outside the range of natural variability; or ○ One or more environmental values of waters (social and biodiversity) are adversely affected but supported in a highly modified condition.	Impact to physical environment lasts 5-15 years

3	<i>Ecosystems and habitats</i>	• Moderate impact to habitat readily detectable with respect to natural variability; or • Moderate impact to habitat that may reduce ecosystem viability within the affected area; or • Decline in multiple populations, with moderate change to community composition that is unlikely to reduce the viability of ecosystem communities or keystone populations.	Impact to biological environment lasts 5-15 years
	<i>Species (populations)</i>	• A moderate population decline unlikely to threaten the viability of the Buffer Area population.	
	<i>Physical environment</i>	• Moderate impact to water quality and sediment quality, such that: ○ Intensity, frequency and duration of adverse events is slightly outside the range of natural variability; or ○ One or more environmental values of waters (social and biodiversity) are adversely affected, but still supported in a slightly to moderately modified condition.	Impact to physical environment lasts 1-5 years
2	<i>Ecosystems and habitats</i>	• Low impact to habitat marginally detectable with respect to natural variability and habitat can readily regenerate on remaining habitat; or • Minor decline in one or more populations, though no detectable change in the composition or viability of ecosystem communities/populations.	Impact to biological environment lasts 2-5 years
	<i>Species (populations)</i>	• A minor population decline that does not threaten the viability of the Buffer Area population.	
	<i>Physical environment</i>	• Minor impact to water quality and sediment quality, such that: ○ Intensity, frequency and duration of adverse events is within the upper range of natural variability, but below levels experienced during extreme events such as major land slips, extreme droughts, severe storms or tropical cyclones; and ○ All environmental values of waters (social and biodiversity) are maintained.	Impact to physical environment lasts weeks to months
1	<i>Ecosystems and habitats</i>	• Very low impact to habitat/populations - not detectable with respect to natural variability.	Impact to biological environment lasts 2-5 years
	<i>Species (populations)</i>	• No measurable population decline.	
	<i>Physical environment</i>	• Very minor to no impact to water quality and sediment quality, such that: ○ Intensity, frequency and duration of adverse events is within the average range of natural variability; and ○ All environmental values to waters (social and biodiversity) are maintained.	Impact to physical environment lasts weeks to months
Positive	<i>All</i>	• Net benefit to the ecosystem	

Magnitude is aggregated to an overall rating based on the matrix in Table 3-5.

Table 3-5 Magnitude aggregated rating matrix.

Magnitude – Severity and duration	Magnitude - Geographic Extent				
	1	2	3	4	5
1	Negligible	Minor	Moderate	Moderate	Moderate
2	Minor	Minor	Moderate	High	High
3	Minor	Moderate	High	Major	Major
4	Moderate	Moderate	High	Major	Major
5	Moderate	Moderate	Major	Critical	Critical
Positive	Positive	Positive	Positive	Positive	Positive

3.3.1.3. Consequence

Sensitivity and Magnitude combine to define the Consequence component of the risk assessment. The interaction is expressed in a matrix form which is structured as shown in Table 3-6.

Table 3-6 Consequence rating matrix.

Magnitude of Risk/Impact	Sensitivity of Value				
	Very High	High	Medium	Low	Negligible
Critical	Critical	Critical	Critical	Major	Major
Major	Major	Major	Major	High	Minor
High	Major	High	High	Moderate	Minor
Moderate	High	High	Moderate	Moderate	Minor
Minor	High	Moderate	Moderate	Moderate	Minor
Negligible	Minor	Minor	Minor	Minor	Minor
Positive	Positive	Positive	Positive	Positive	Positive

The Consequence rating matrix adopts the terminology used in the DCCEEW Environmental Management Plan Guidelines (DCCEEW, 2024), which defines five classes of consequences (Minor, Moderate, High, Major and Critical), and introduces an additional rating for positive consequences (Positive). Definition of DCEEW Consequences is provided in Table 3-7.

Table 3-7 Consequences (source DCCEEW, 2024).

Qualitative measure of consequences	What will be the consequence/result if this issue does occur rating
Minor	Minor incident of environmental damage that can be reversed.
Moderate	Isolated but substantial instances of environmental damage that could be reversed with intensive efforts.
High	Substantial instances of environmental damage that could be reversed with intensive efforts.
Major	Major loss of environmental amenity and real danger of continuing.
Critical	Severe widespread loss of environmental amenity and irrecoverable environmental damage.

3.3.1.4. Controls, Mitigation and Management

Mitigation measures associated with modern commercial shipping ballast water and biofouling management systems are mature and generally effective in preventing major marine invasive species incursions globally. All vessels operating within Australian waters must comply with legislative obligations provided by the Australian Ballast Water Management Requirements (ABWMR), which come under the *Biosecurity Act 2015* and the International Convention for the Control and Management of Ships' Ballast Water and Sediments (Department of Agriculture, Water and the Environment 2020b). In general, ballast water from port and coastal waters outside Australia's territorial sea is considered to be high risk and capable of introducing exotic marine pests, while "domestic ballast water" is considered low risk. The risk assessment for the Gelliondale Wind Farm project assumes that wind farm components will not be shipped directly to Corner Inlet from overseas ports, therefore the risk associated to ballast water is considered negligible in this shipping scenario.

Similarly, commercial ship biofouling management practices, while subject to state-specific requirements and variations, is a generally effective and mature practice. National Biofouling Management Guidelines were developed in 2009 by the Commonwealth to provide practical guidance on biofouling management for vessels within Australia. These guidelines, whilst helpful, are not mandated so their uptake and use by vessel owners is voluntary making it difficult to monitor. Australian Biofouling Management Requirements (ABFMR) were developed in 2022 to manage biofouling risks associated with international vessels arriving in Australia and to comply with the *Biosecurity Act 2015*, however, these only apply to vessels under biosecurity control. The International Maritime Organisation (IMO) Biofouling Guidelines were first published in 2011 and recently reviewed with a revised set of guidelines published in 2023 (International Maritime Organization 2024), which stipulate general advice on biofouling control measures to reduce the risk of invasive marine species introductions.

For the Gelliondale Wind Farm Project, mitigation measurements are necessary to reduce the risk of marine pest translocation via biofouling due to the risk associated with the use of tugs and barges to transport wind farm components from the Port of Geelong to PA-BBMT. The National Biofouling Management Guidelines for non-trading vessels provide voluntary biofouling management guidance to manage the risk associated with biofouling for a variety of vessels, including barges and tugs (Marine Pest Sectoral Committee 2018).

According to these guidelines (Marine Pest Sectoral Committee 2018) the biofouling risks associated to barges and tugs can be minimised by:

- Selecting, applying and maintaining an effective antifouling coating.
- Completing regular inspections (including regular inspections of niche areas), scheduled dry-dockings, cleaning and maintenance as necessary.
- Ensuring that anchors and cables are cleaned after use, and checked clear of mud, sediments, biofouling or entangled biofouling (seaweeds) before stowage.
- Ensuring that warps and lines are free of any biofouling or entangled biofouling.
- Physically removing any obvious biofouling from berthing lines (by hand and/or high pressure washdown), then leaving lines to thoroughly dry before being stowed or re-used in a new location.
- Using an effective marine growth prevention system (MGPS), such as copper dosing or chlorination systems, or other inspection and treatment routines, for any internal seawater systems.
- Visually inspecting lines received from visiting vessels to check that there is no obvious biofouling either attached or entangled.

In addition to these guidelines, vessel operators are recommended to maintain a biofouling record book for each vessel, recording details of inspections and biofouling management measures undertaken. A biofouling record book is useful in assessing the potential biofouling risk and provides verifiable evidence that a vessel is unlikely to present an unacceptable biofouling risk (Marine Pest Sectoral Committee 2018).

For the Gelliondale Wind Farm project, it is essential that vessels delivering wind farm turbine components adopt biofouling management practices to reduce the likelihood of introducing marine pests to Corner Inlet. The use of barges and tugs poses a high risk of marine pest translocation as they are likely to accumulate biofouling on their hulls, however mitigation measures are considered sufficient to reduce the risk to as low as reasonably practicable, particularly given the limited increase in PA-BBMT commercial shipping traffic attributed to the project (<5% increase in shipping traffic).

However, complications for mitigation and management arise when there are existing marine invasive species present at Port Welshpool and activities indirectly related to the windfarm shipping component risk spreading these species. Such activities include pilotage movements, maintenance vessels moving between Port Welshpool and PA-BBMT to service the industry and port upgrade developments that may involve the addition of new attachment surfaces and vectors. Furthermore, the efficacy of controls is complicated by the activities of recreational vessels that risk spreading or introducing new species.

Experiences of marine invasive species control and management from other areas in Victoria have indicated that:

- Incursions that are detected early in small ports or contained water bodies have the potential to be conducive to eradication with human intervention.
- Eradication is expensive, risky and often unfeasible in less benign and controlled areas such as busy ports, low visibility environments, tidal environments, etc.
- Surveillance is generally limited and may be technically impractical, rendering early detection unlikely. In several areas, it is community members that first identify marine pests and at a port where there is no community access, surveillance would need to be directed by the port operators or regulators.
- Once marine invasive species become established at a significant scale, there are few actions that have been demonstrated to be effective at large scale.

Therefore, it is important to be realistic and precautionary about assumptions of the efficacy of monitoring and management measures. Marine invasive species management necessarily has a strong reliance on regulatory requirements associated with ballast water and biofouling as the main forms of control. Regular monitoring allowing early detection of incursions is the most useful way of maintaining options for eradication. However, again the feasibility and efficacy of eradication attempts needs to be weighed against the fact that *Undaria pinnatifida* already exists in Corner Inlet and the risks and efficacy of eradication methods, which are species-specific and dependent on the environmental conditions and safety dimensions.

3.3.1.5. Likelihood

Likelihood is defined as shown in Table 3-8 and for this project the primary mitigating factor that is accounted for is the proportional increase in commercial shipping activity attributed to this single project. Likelihood is a qualitative ranking but is informed by:

- The proportional contribution of the Gelliondale project compared to the baseline shipping rates.
- The adoption of mitigation strategies to reduce risk associated to biofouling.
- The evidence provided in Appendix 1 and with due consideration to the present marine invasive species profile.
- A reasonable interpretation of the future development objectives for the port which could affect risk.

Table 3-8 Likelihood ranking matrix.

Qualitative likelihood	How likely is it that this event/issue will occur <u>after control</u> strategies have been put in place
Highly likely	Is expected to occur in most circumstances. Has been frequently reported and has become a consistent pattern or trend that occurs regularly.
Likely	Will probably occur during the life of the project. Commonly reported event and professionals making this assessment know of this event occurring often but irregularly with no consistent pattern.
Possible	Might occur at some time. A number of reported occurrences and the professionals making this assessment know of this event occurring several times.
Unlikely	Could occur but considered unlikely or doubtful. Only a few occurrences reported and the professionals making this assessment know of this event occurring.
Rare	May occur in exceptional circumstances. There is no published report of this event happening, the professionals making this assessment have never heard of the event occurring.

3.3.1.6. Residual Risk Assessment

Using the inputs of the consolidated Consequence and Likelihood, the residual risk assessment rates the risk after controls have been implemented and assumed to be effective. The ratings are described in Table 3-9 and adopt the risk rating used in the DCCEEW Environmental Management Plan Guidelines (DCCEEW, 2024).

Table 3-9 Residual risk rating matrix (source DCCEEW, 2024).

Likelihood	Consequence					
	Critical	Major	High	Moderate	Minor	Positive
Highly likely	Severe	Severe	High	High	Medium	Positive
Likely	Severe	High	High	Medium	Low	Positive
Possible	Severe	High	Medium	Medium	Low	Positive
Unlikely	High	High	Medium	Low	Low	Positive
Rare	High	Medium	Low	Low	Low	Positive

The assessment of residual risk takes into account remaining uncertainty (see below). The risk assessment is provided in Table 3-10.

3.3.1.7. Uncertainty

There are a number of important uncertainties that need to be accounted for in the assessment of risk of a single project introducing invasive marine species. Given the baseline existence of four invasive species in Corner Inlet and the shipping activity present at PA-BBMT, it will be impossible to trace the spread of introduction of new species to any particular project's shipping component. Rather, the assumption, leaving controls aside, is that the risk of marine species introduction increases in proportion to increases in shipping rates.

Overlaid on that base assumption are a range of factors that may increase risk, including port upgrade developments, recreational vessel movements, climate change etc. While these are not under the direct control of the Gelliondale Project, a risk assessment for the project needs to account for these factors.

Section 2.2 outlines some of the key ecological uncertainties associated with marine invasive species introductions which include synergistic and antagonistic effects with other species and the effects of climate change on risk of introduction, spread and establishment. Uncertainty is relatively high in relation to the potential for infectious diseases to be introduced by marine invasive species which is a poorly understood component of risk.

Table 3-10 Risk assessment for top-10 priority marine invasive species.

Risk	Magnitude - geographic	Magnitude – severity & duration	Consequence before controls	Controls/Mitigating Factors	Likelihood after controls	Residual Risk after controls
Direct Impacts – Background Commercial Shipping Activity						
Background commercial shipping regime at PA-BBMT causing introduction of top-10 priority listed species as defined by this assessment into Priority Area, but no long-term establishment and spread throughout Buffer Area and Context Area	1 Under this scenario, temporarily introduced species marooned on structures or habitats in Priority Area but not able to establish or spread due to physiological constraints or manual scraping/jet wash etc. effects of the shipping activity.	1 Under this scenario, any effects would be short-lived (weeks to months) and would impact only an existing modified environment.	Minor	- National biofouling management protocols. - Biofouling record book. - Port implements controls on the access of recreational vessels to PA-BBMT. - Port operator's own compliance and monitoring obligations. - Federal ballast water management protocols.	Possible	Low
Background commercial shipping regime at PA-BBMT causing introduction of top-10 priority listed species as defined by this assessment into Priority Area and long-term establishment and spread throughout Buffer Area	3 - Under this scenario, species introduced to PA-BBMT survive and spread throughout Buffer Area. - Scale of spread is limited for some species that required hard attachment substrata given the predominance of sediments, many of which are exposed to tidal flows. However, within Corner Inlet a wide variety of habitats exist and spread through Buffer Area and the Ramsar Area may be expected through the existence of circulation regimes, transmission vectors and availability of suitable habitat.	4 - Corner Inlet a unique ecosystem setting. - Once established, marine invasive species likely to persist for long duration. - Uncertainty in antagonistic and synergistic effects. - Marine invasive species establishment and spread would reduce Ramsar values and ecological resilience.	High	- PA-BBMT port facility approved under regulatory oversight with due consideration of the risks of shipping to Ramsar values. - National biofouling management protocols. - Biofouling record book. - Port implements controls on the access of recreational vessels to PA-BBMT. - Port operator's own compliance and monitoring obligations. - Federal ballast water management protocols.	Unlikely	Medium

Risk	Magnitude - geographic	Magnitude – severity & duration	Consequence before controls	Controls/Mitigating Factors	Likelihood after controls	Residual Risk after controls
Background commercial shipping regime at PA-BBMT causing introduction of top-10 priority listed species as defined by this assessment into Priority Area and long-term establishment and spread throughout Buffer Area and release into Context Area	4 - Under this scenario, species introduced to PA-BBMT survive and spread throughout Buffer Area and release from the confines of Corner Inlet to invade the Context Area. - Under this scenario, release to the open coast environment would expose large area to risk. - Under this scenario, detection of marine invasive species outside Corner Inlet would be assumed to trigger significant eradication response to protect high value ecosystems.	4 - While the likelihood of spread to open coast high energy ecosystems may be reduced, if this occurs, the severity and duration are high because Wilsons Promontory represents a large proportion of spatially unique and high value habitats, in addition to those in Corner Inlet. - While the likelihood of spread to open coast high energy ecosystems may be reduced, increasing environmental disturbance regimes, climate change and increased vessel activity due to offshore developments potentially increases likelihood and therefore risk. - Marine invasive species establishment and spread would reduce regional values, including those in state marine protected areas and ecological resilience.	Major	- Consistent examples of marine invasive species introductions in Port Phillip Bay being confined to the embayment and not releasing to the open coast. - Risk of spread of marine invasive species out of Buffer Area (Corner Inlet) is reduced due to the fundamental differences in ecosystem properties of the open coast. - National biofouling management protocols. - Biofouling record book. - Port implements controls on the access of recreational vessels to PA-BBMT. - Port operator's own compliance and monitoring obligations. - Coordinated responses to monitoring results showing presence of invasive species outside Corner Inlet. - Federal ballast water management protocols.	Rare	Medium

Direct Impacts – Project-Specific Commercial Shipping Activity						
Project commercial shipping causing introduction to PA-BBMT of a top-10 priority listed species as defined by this assessment into Priority Area, but no long-term establishment and spread throughout Buffer Area and Context Area	1 Under this scenario, temporarily introduced species marooned on structures or habitats in Priority Area but not able to establish or spread due to physiological constraints or manual scraping/jet wash etc. effects of the shipping activity.	1 Under this scenario, any effects would be short-lived (weeks to months) and would impact only an existing modified environment.	Minor	Project represents an estimated <5% increase above baseline shipping movements in PA-BBMT. - National biofouling management protocols. - Biofouling record book. - Port implements controls on the access of recreational vessels to PA-BBMT. - Port operator's own monitoring and eradication obligations. - Federal ballast water management protocols.	Possible	Low
Project commercial shipping causing introduction to PA-BBMT of a top-10 priority listed species as defined by this assessment into Priority Area and long-term establishment and spread throughout Buffer Area	3 - Under this scenario, species introduced to PA-BBMT survive and spread throughout Buffer Area. - Scale of spread is limited for some species that required hard attachment substrata given the predominance of sediments, many of which are exposed to tidal flows. However, within Corner Inlet a wide variety of habitats exist and spread through Buffer Area and the Ramsar Area may be expected through the existence of circulation regimes, transmission vectors and availability of suitable habitat.	4 - Corner Inlet a unique ecosystem setting. - Once established, marine invasive species likely to persist for long duration. - Uncertainty in antagonistic and synergistic effects. - Marine invasive species establishment and spread would reduce Ramsar values and ecological resilience.	Major	Project represents an estimated <5% increase above baseline shipping movements in PA-BBMT. - National biofouling management protocols. - Biofouling record book. - Controls on the access of recreational vessels to PA-BBMT - PA-BBMT monitoring and eradication. - Federal ballast water management protocols.	Rare	Medium

Project commercial shipping causing introduction to PA-BBMT of a top-10 priority listed species as defined by this assessment into Priority Area and long-term establishment and spread throughout Buffer Area and Context Area	4 - Under this scenario, species introduced to PA-BBMT survive and spread throughout Buffer Area and release from the confines of Corner Inlet to invade the Context Area. - Under this scenario, release to the open coast environment would expose large area to risk. - Under this scenario, detection of marine invasive species outside Corner Inlet would be assumed to trigger significant eradication response to protect high value ecosystems.	4 - While the likelihood of spread to open coast high energy ecosystems may be reduced, if this occurs, the severity and duration are high because Wilsons Promontory represents a large proportion of spatially unique and high value habitats, in addition to those in Corner Inlet. - While the likelihood of spread to open coast high energy ecosystems may be reduced, increasing environmental disturbance regimes, climate change and increased vessel activity due to offshore developments potentially increases likelihood and therefore risk. - Marine invasive species establishment and spread would reduce regional values, including those in state marine protected areas and ecological resilience.	Major	Project represents an estimated <5% increase above baseline shipping movements in PA-BBMT - Consistent examples of marine invasive species introductions in Port Phillip Bay being confined to the embayment and not releasing to the open coast. - Risk of spread of marine invasive species out of Buffer Area (Corner Inlet) is reduced due to the fundamental differences in ecosystem properties of the open coast. - National biofouling management protocols. - Biofouling record book. - Port implements controls on the access of recreational vessels to PA-BBMT. - Port operator's own compliance and monitoring obligations. - Coordinated responses to monitoring results showing presence of invasive species outside Corner Inlet. - Federal ballast water management protocols.	Rare	Medium
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Indirect Impacts						
Project commercial shipping causing spread of existing invasive species already in Context Area throughout other parts of Context Area.	3	4	High	- Project represents an estimated <5% increase above baseline shipping movements in PA-BBMT Project not directly interacting with Port Welshpool. - National biofouling management protocols - Controls on the access of recreational vessels to PA-BBMT. - Federal ballast management protocols	Rare	Low
	- Project will not directly interact with Port Welshpool where existing invasive species have been recorded. - As a result of normal commercial operations outside the control of the Gelliondale Project, support vessels currently operated out of Port Welshpool may be used in PA-BBMT. - Natural spread but these are outside the control of the Gelliondale Project. - Causation of spread unable to be linked to particular projects.	- Corner Inlet a unique ecosystem setting. - Once established, marine invasive species likely to persist for long duration. - Spread to open coast high energy ecosystems reduced but increasing disturbance regimes, climate change and increased vessel activity risks spread and if there is spread out of Corner Inlet, habitats in Wilsons Promontory are exposed which represent a large proportion of spatially unique and high value habitats. - Uncertainty in antagonistic and synergistic effects.				

4. Recommended Management and Controls

Direct responsibilities for management and control of marine invasive species risk at PA-BBMT fall into several categories:

Commonwealth Department of Agriculture, Fisheries and Forestry: Under the *Biosecurity Act 2015*, implements the Maritime and Aircraft Reporting System (MARS) used by commercial vessel masters wishing to enter an Australian Port. The system requires persons in control of vessels to enter documentation around matters such as previous ports of call, management plans used by the shipping company, intentions for in-water cleaning, etc. The management plans provided by the shipping company would provide evidence of how the vessel operators complying with Australian guidelines for ballast and biofouling management. The Commonwealth conducts a risk assessment at this point and either allows the ship to proceed to the nominated Australian ports, or if there are any concerns, places the vessel under biosecurity control and further actions including inspection may occur.

Port operators: While there are no formal additional responsibilities, under the *Port Authorities Act 1999*, the operator has the ability to notify authorities if clear signs of mismanagement or biofouling are observed. The notifying authority is Agriculture Victoria, which would then coordinate responses. Individual port authorities, operators and harbours have jurisdictional Safety and Environmental Management Plans. Agriculture Victoria works with these entities to train and induct staff, integrate biosecurity to these plans, develop response plans, etc. Port and harbours can provide recommendations and incentives in relation to recreational vessels and commercial fishing vessels inside their operational area, but in general the default position is that it is the vessel owners who have responsibility to keep their vessels free of invasive species.

Agriculture Victoria: Responsible for coordinating any responses to incursions, education and training to improve detection and management in ports, and collaboration with Commonwealth counterparts to improve education and action plans. Through this role, Agriculture Victoria works with port operators as outlined above to bring biosecurity matters into normal port operational considerations (e.g. maintenance, moving buoys, etc.). Agriculture Victoria has members on the national Marine Pests Sectoral Committee and works to provide online training modules and support to port operators in matters around biosecurity. Agriculture Victoria ultimately has the responsibility to address marine pest incursions if they do occur and therefore, supports monitoring programs. For example, at this time eDNA techniques to monitor for the presence of *Didemnum vexillum* in Australia has included the installation of settlement plates at Barry Beach and work by South Australian Research and Development Institute (SARDI) to develop routines for detection.

Parks Victoria: Rangers and other staff are involved in monitoring of Parks-controlled areas. This includes Sealer's Cove at Wilsons Promontory due to the weather refuge used by vessels.

NOPSEMA regulated activities or sectors: Sectoral regulatory instruments and the potential negative impacts to operations should a vessel come under biosecurity control, require operators in the oil-and-gas industry to conduct their own in-house risk assessments of vessels being used for their project. Operators inform Agriculture Victoria of their in-house

assessments where the risk is assessed to be low, and where there are elevated risk concerns, operators engage further and work with Agriculture Victoria to implement additional assessment or actions to mitigate and eliminate risk.

The Gelliondale Project will charter normal commercial shipping supply deliveries to an operating port and the proportional increase in shipping activity represents a minor and short-term increase above existing baseline shipping rates at the port. Unlike operators in the offshore oil-and-gas industry, the Gelliondale Project will not contract the long-term services of supply or support vessels. Therefore, the Gelliondale Project does not have direct responsibility for monitoring for marine invasive species at the port and furthermore, possible future marine species detections at the port would be impossible to attribute to any one particular shipping operation given the existing shipping traffic at the port, the baseline existence of four marine invasive species at Port Welshpool and the prevalence of recreational vessel activity in the area that is outside the control of the port operators and the project.

However, to demonstrate best practice in environmental management and in recognition of the project's position as a responsible steward in the region, there are a number of administrative controls that the Gelliondale Project could apply which will reduce the likelihood of introduction to PA-BBMT:

- **Pre-construction:** The process of selecting the commercial shipping services contractor should include quality assurance checks and audits associated with past performance on biosecurity checks, with hull inspections, and confirmation of the shipping company's own policies and management systems for proving compliance with Australian ballast and biofouling management guidelines.
- **Pre-construction:** Working with the PA-BBMT port operator to ensure that the port's contracting of, or *ad-hoc* use of, ancillary vessels for use at PA-BBMT that are moored at Port Welshpool, Port Albert or other areas outside of the direct control of PA-BBMT (e.g. barges, commercial support vessels, tugs, pilot boats, commercial dive boats, etc.) complies with best available guidelines and advice associated with hull inspections and operations at the port.
- **Construction:** Gelliondale Project's information management system to document shipping movements and obtain proof of compliance with Australian Ballast and Biofouling Management Guidelines and National biofouling management guidelines for non-trading vessels.
- **Whole of project:** Coordination with port operators and the Victorian Government to implement their pre-existing marine invasive species monitoring processes and implementation of a document trail in the Gelliondale Project's information management system that traces relevant shipping movements, inspections and monitoring results.

5. Conclusions

The Corner Inlet Ramsar site and surrounding area harbours a range of high value habitats and is a spatially unique ecosystem in eastern Victoria. The development of a commercial port at Barry Beach and the existence of recreational vessels and commercial fishing vessels at Port Welshpool and Port Albert represent pre-existing vectors of potential marine invasive species introduction.

Four marine invasive species have been recorded within the Corner Inlet Ramsar site, two of which on the Australian Priority Marine Pest List. The impact of marine invasive species, if they become established and spread, can be significant and cause alteration to ecological function. The pattern of marine pest introductions in some ports of Victoria, most notably Port Phillip, is one of introductions becoming established and pernicious, but generally not escaping from the generally protected waters to the exposed open coast. However, one particular area of uncertainty is the effect of marine pests on ecosystem resilience to impacts such as climate change and disturbances, and the synergistic effects of disturbance regimes (e.g. urchin barrens, storm events) on exacerbating risk of spreading.

While the magnitude and consequences of marine invasive species incursions and establishment may be high, the likelihood of introduction of species from the Gelliondale Project specifically is low. This is due primarily to:

- The mitigation and management processes involved for commercial shipping practices at the national and state levels.
- The shipping activity specially associated with the project representing <5% of the PA-BBMT port's annual commercial shipping traffic.

The risk assessment focused on the risk of introduction, long-term establishment and spread of marine pest species into PA-BBMT Priority Area, Corner Inlet Ramsar site and Corner Inlet Context Area. Overall, the risk of the Gelliondale Project resulting in a marine species incursion is ranked as Low. The risk of the Gelliondale Project resulting in a marine species incursion that results in establishment and spread is ranked as Medium. While the likelihood of the latter is ranked as rare, the magnitude of this is elevated, thus elevating the total ranking.

Notwithstanding the risks associated with the Gelliondale Project specifically, the development and potential future upgrades of a commercial port in the Ramsar site, in an area where marine invasive species already exist, and the known risks of recreational and commercial fishing vessel activity in spreading marine pests, presents a risk that requires management, surveillance and cooperative action plans. Existing arrangements outline responsibilities of Commonwealth and Victorian regulators and the port owners/operators. While the Gelliondale Project is not deemed to have specific jurisdiction and responsibilities for monitoring, ways in which the project can engage with these existing arrangements are identified.

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APPENDIX 1: Marine Invasive Species List and Scoring

									Detected regions (presence/absence) in Victoria weighted by proximity to Buffer Area								Vectors identified on NIMPIS weighted by relevance to shipping								Introduction Risk (sum of blue columns)
Species	Common Name	Taxonomic Category	Trophic Status	Year of earliest record	Year of latest record	Australian Priority Marine Pest List	No. years recorded in Context Area	No. years b/w first & last record in Context Area	Warrnambool / Portland	Surf Coast / Port Campbell	Port Phillip Bay	Western Port Bay	Inverloch / Wilsons Promontory	Corner Inlet / Nooramunga	Gippsland Lakes	Marlo / Mallacoota	Vessels - dry ballast	Vessels - ballast water	Vessels - biofouling	Fisheries & Aquaculture - accidental	Fisheries & Aquaculture - discarded bait	Marine Infrastructure	Natural Dispersal	Research - accidental release	
<i>Carcinus maenas</i>	European Shore Crab	Crustacean - crab	Omnivore	1974	2024	1	9	50	0	1	1	1	3	4	2	1	1	2	2	1	0	1	0	0	80
<i>Undaria pinnatifida</i>	Japanese Kelp / Wakame	Seaweed - brown	Autotroph	1999	2021	1	7	22	1	1	1	1	3	4	0	0	0	0	2	1	0	0	0	0	44
<i>Codium fragile subsp. fragile</i>	Dead Man's Fingers	Seaweed - green	Autotroph	2021	2021	0	1	1	1	0	1	1	0	4	0	1	1	2	2	1	0	0	1	0	17
<i>Grateloupia turuturu</i>	Devil's Tongue Weed	Seaweed - red	Autotroph	2021	2021	0	1	1	0	0	1	0	0	4	0	0	0	0	2	1	0	0	1	0	11
<i>Arcuatula senhousia</i>	Asian Date Mussel	Mollusc - bivalve	Suspension Feeder	2009	2021	0	3	12	0	0	1	1	3	0	2	1	0	0	2	1	0	0	0	0	26
<i>Varicorbula gibba</i>	European Clam	Mollusc - bivalve	Suspension Feeder	2009	2021	0	2	12	1	0	1	0	3	0	0	0	0	2	2	0	0	0	0	0	23
<i>Theora lubrica</i>	East Asian Bivalve	Mollusc - bivalve	Deposit Feeder	2009	2018	0	3	9	1	0	1	1	3	0	2	0	1	2	0	0	0	0	0	0	23
<i>Asterias amurensis</i>	Northern Pacific Seastar	Seastar	Carnivore	2012	2017	1	3	5	0	0	1	1	3	0	2	0	0	2	2	0	0	0	1	0	21
<i>Magallana gigas</i>	Pacific Oyster	Mollusc - bivalve	Suspension Feeder	2013	2021	0	2	8	0	0	1	1	3	0	0	1	0	0	2	1	0	0	1	0	20
<i>Ciona intestinalis</i>	Vase Tunicate	Sea Squirt	Suspension Feeder	2021	2021	0	1	1	0	0	1	1	3	0	2	0	0	2	2	1	0	1	1	1	17
<i>Sabella spallanzanii</i>	European Fan Worm	Polychaete Worm	Suspension Feeder			0			1	0	1	1	0	0	0	0	0	2	2	0	1	0	1	0	9
<i>Amathia distans</i>	White Bushy Bryozoan	Bryozoan	Suspension Feeder			0			1	0	1	1	0	0	0	0	1	2	2	0	0	0	0	0	8
<i>Styela clava</i>	Stalked Ascidian	Sea Squirt	Suspension Feeder			0			0	0	1	0	0	0	2	0	0	2	2	1	0	0	0	0	8
<i>Maoricolpus roseus</i>	New Zealand Screw Shell	Mollusc - gastropod	Suspension Feeder			0			0	0	0	0	0	0	2	1	1	2	0	0	0	0	1	0	7
<i>Cryptosula pallasiana</i>	Bryozoan	Bryozoan	Suspension Feeder			0			1	0	1	1	0	0	0	0	0	2	2	0	0	0	0	0	7
<i>Boccardia proboscidea</i>	Californian Polydorid	Polychaete Worm	Deposit Suspension Feeder			0			0	0	1	0	0	0	0	0	0	2	2	1	0	0	1	0	7
<i>Euchone limnicola</i>	Fanworm	Polychaete Worm	Deposit Feeder			0			1	0	1	0	0	0	0	0	0	2	2	0	0	0	0	0	6

<i>Alexandrium minutum</i>	Toxic Dinoflagellate	Dinoflagellate	Autotroph			0			1	0	0	0	0	0	0	0	1	2	0	1	0	0	1	0	6
<i>Alexandrium tamarense</i>	Toxic Dinoflagellate	Dinoflagellate	Autotroph			0			1	0	0	0	0	0	0	0	1	2	0	1	0	0	1	0	6
<i>Alitta succinea</i>	Pileworm	Polychaete Worm	Omnivore			0			0	0	1	0	0	0	0	0	0	2	2	0	0	0	1	0	6
<i>Pseudopolydora paucibranchiata</i>	Japanese Polydorid	Polychaete Worm	Deposit Feeder			0			0	0	0	0	0	0	0	0	0	2	2	1	0	0	1	0	6
<i>Perna viridis</i>	Asian Green Mussel	Mollusc - bivalve	Suspension Feeder			1			0	0	0	0	0	0	0	0	0	2	2	1	0	0	0	0	6
<i>Styela plicata</i>	Pleated Sea Squirt	Sea Squirt	Suspension Feeder			0			0	0	1	0	0	0	2	0	0	0	2	0	0	0	0	0	5
<i>Bugula neritina</i>	Bryozoan	Bryozoan	Suspension Feeder			0			1	0	1	1	0	0	0	0	0	0	2	0	0	0	0	0	5
<i>Ascidella aspersa</i>	Solitary Ascidian	Sea Squirt	Suspension Feeder			0			1	0	1	0	0	0	0	0	0	0	2	1	0	0	0	0	5
<i>Hemigrapsus sanguineus</i>	Asian Shore Crab	Crustacean - crab	Omnivore			0			0	0	1	0	0	0	0	0	0	2	2	0	0	0	0	0	5
<i>Cirolana harfordi</i>	Speckled Pill Bug	Crustacean - isopod	Carnivore			0			0	0	1	0	0	0	0	0	0	2	2	0	0	0	0	0	5
<i>Cordylophora caspia</i>	Hydroid	Hydroid	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	2	2	0	0	0	1	0	5
<i>Gymnodinium catenatum</i>	Toxic Dinoflagellate	Dinoflagellate	Autotroph			0			0	0	0	0	0	0	0	0	0	2	0	1	0	0	1	1	5
<i>Mytilopsis sallei</i>	Black Striped Mussel	Mollusc - bivalve	Suspension Feeder			1			0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	5
<i>Myxicola infundibulum</i>	Slime Fan Worm	Polychaete Worm	Suspension Feeder			0			0	0	1	0	0	0	2	0	1	0	0	0	0	0	0	0	4
<i>Bugulina flabellata</i>	Bryozoan	Bryozoan	Suspension Feeder			0			0	0	1	1	0	0	0	0	0	0	2	0	0	0	0	0	4
<i>Monocorophium insidiosum</i>	English Corophiid	Crustacean - amphipod	Suspension Feeder			0			0	0	1	0	0	0	0	0	0	0	2	1	0	0	0	0	4
<i>Botrylloides leachi</i>	Colonial Ascidian	Sea Squirt	Suspension Feeder			0			0	0	1	0	0	0	0	0	0	0	2	1	0	0	0	0	4
<i>Botryllus schlosseri</i>	Star Ascidian	Sea Squirt	Suspension Feeder			0			0	0	1	0	0	0	0	0	0	0	2	1	0	0	0	0	4
<i>Acanthogobius flavimanus</i>	Yellow Fin Goby	Fish	Carnivore			0			0	0	1	0	0	0	0	0	0	2	0	0	0	0	1	0	4
<i>Acentrogobius pflaumi</i>	Streaked Goby	Fish	Carnivore			0			0	0	1	0	0	0	0	0	0	2	0	1	0	0	0	0	4
<i>Chiton glaucus</i>	New Zealand Chiton	Mollusc - chiton	Omnivore			0			0	0	0	0	0	0	0	0	1	0	2	1	0	0	0	0	4
<i>Monocorophium sextonae</i>	Corophiid Amphipod	Crustacean - amphipod	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	4
<i>Eurylana arcuata</i>	Cirolanid Isopod	Crustacean - isopod	Carnivore			0			0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	4
<i>Paracerceis sculpta</i>	Sponge Isopod	Crustacean - isopod	Herbivore			0			0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	4

<i>Hydroides elegans</i>	Fouling Serpulid	Polychaete Worm	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	4
<i>Caulerpa taxifolia</i>	Aquarium Caulerpa	Seaweed - green	Autotroph			0			0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	4
<i>Didemnum vexillum</i>	Carpet Sea Squirt	Sea Squirt	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	4
<i>Ectopleura crocea</i>	Hydroid	Hydroid	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	4
<i>Alexandrium catenella</i>	Toxic Dinoflagellate	Dinoflagellate	Autotroph			0			0	0	0	0	0	0	0	0	0	2	0	1	0	0	1	0	4
<i>Tridentiger trigonocephalus</i>	Chameleon Goby	Fish	Carnivore			0			0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	3
<i>Obelia dichotoma</i>	Hydroid	Hydroid	Suspension Feeder			0			0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	3
<i>Raeta pulchella</i>	Bivalve	Mollusc - bivalve	Suspension Feeder			0			0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	3
<i>Monocorophium achersicum</i>	Mediterranean Corophiid	Crustacean - amphipod	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	3
<i>Schizoporella unicornis</i>	Lace Coral	Bryozoan	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	3
<i>Watersipora arcuata</i>	Lace Coral	Bryozoan	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	3
<i>Antennella secundaria</i>	Knotted Thread Hydroid	Hydroid	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	3
<i>Plumularia setacea</i>	Hydroid	Hydroid	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	3
<i>Astrostele scabra</i>	New Zealand Seven Armed Seastar	Seastar	Carnivore			0			0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2
<i>Megabalanus rosa</i>	Pink Acorn Barnacle	Barnacle	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
<i>Megabalanus tintinnabulum</i>	Striped Acorn Barnacle	Barnacle	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
<i>Pyromaia tuberculata</i>	Fire Crab	Crustacean - crab	Omnivore			0			0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
<i>Ulva lactuca</i>	Sea Lettuce	Seaweed - green	Autotroph			0			0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
<i>Forsterygion lapillum</i>	New Zealand Triple Fin	Fish	Carnivore			0			0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
<i>Coryne eximia</i>	Hydroid	Hydroid	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
<i>Halecium delicatulum</i>	Hydroid	Hydroid	Suspension Feeder			0			0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
<i>Mnemiopsis leidyi</i>	Comb Jelly / Sea Walnut	Comb Jelly	Carnivore			0			0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
<i>Teredo navalis</i>	Naval Ship Worm	Mollusc - bivalve	Herbivore			0			0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
<i>Polycera hedgpethi</i>	Hedpeth's Dorid	Mollusc - gastropod	Carnivore			0			0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2

[illegible]