Appendix N Marine mammals effects assessment

Ngāi Tahu Seafood Resources Limited

Hananui Aquaculture Project

Marine Mammal Assessment

Evidence of Deanna Marie Clement regarding
Effects of Hananui Aquaculture Project on marine mammals,
Ngāi Tahu Seafood Resources: marine mammal management plan
and Proposed Conditions

Deanna Marie Clement
11-11-2025

Introduction

My name is Deanna Clement.

My role in relation to the Hananui Aquaculture Project ("**HAP**") has been to provide expert evidence in relation to marine mammals. I wrote / was the lead author of the *Effects of Hananui Aquaculture Project on marine mammals* and *Ngāi Tahu Seafood Resources: marine mammal management plan* which is provided within **Appendix N** of the application.

This evidence has been prepared to accompany the application by Ngāi Tahu Seafood Resources Limited ("**NTS**") for approvals required for the HAP under the Fast-track Approvals Act 2024 ("**FTAA**"). It has been prepared on the understanding that the process for determining applications under the FTAA does not require a hearing to be held, and accordingly the purpose of this evidence is to confirm that, relative to my area of expertise, the *Effects of Hananui Aquaculture Project on marine mammals* provides an appropriate description of the relevant environment, the proposed activities comprising the effects of the HAP on that environment, and the way those effects are proposed to be managed.

My findings are set out in full in the *Effects of Hananui Aquaculture Project on marine mammals* included within **Appendix N** of the application.

While this application is not being considered by the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing this evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Qualifications and Experience

My full name is Deanna Marie Clement. I am a Marine Ecologist specialising in marine mammal ecology. I have worked as a marine mammal scientist for almost 25 years in New Zealand and the United States. I currently work as a marine mammal ecologist at the Cawthron Institute (Cawthron) in Nelson. I have held this position for 17-years. Prior to this, I worked in the University of Otago's Zoology Department as a teaching fellow while continuing to undertake marine mammal research.

I hold a PhD in Zoology and Marine Science from the University of Otago, which I obtained in 2006. I also hold a MSc in Marine Ecology from the Florida Institute of Technology, obtained in 1998, and a BA in Biology, obtained from the University of Nebraska – Lincoln in 1993. I am also affiliated with the Society for Marine Mammalogy and the New Zealand Marine Sciences Society.

For the last twenty years, my research has focussed mainly on Hector's and Maui dolphins, their distribution and densities. I have authored (and co- authored) a number of publications and articles for both academia and the public and private sectors.

I was the lead scientist and co-author for the three-year aerial survey of Hector's dolphin commissioned by the Ministry for Primary Industries and Department of Conservation to update its population abundance and distribution around the South Island. The survey was the most intensive marine aerial survey ever conducted in New Zealand. The final results of this work received a landmark endorsement from the International Whaling Committee (IWC) at its annual meeting in June 2016.

More recently, I have been using remote technologies, such as underwater acoustics recorders and non-invasive digital suction cup tags, to study marine mammals in hard to study locations or situations around New Zealand.

I have approximately 20 years' worth of experience in assessing effects on marine mammals from activities such as aquaculture. In that time, I have authored or co-authored approximately 15 published or unpublished papers regarding aquaculture and marine mammals.

Of note, I authored the 2021 guidelines for open ocean aquaculture led by the Fisheries New Zealand (FNZ) and entitled *Best Practices and Technologies Available to Minimise and Mitigate the Interactions between Finfish Open Ocean Aquaculture and Marine Mammals* and prior to that the 2013 national review of effects of aquaculture on marine mammals in New Zealand with the Ministry of Primary Industries.

Based on the earlier 2013 review, I have been involved in regular discussions and invited to workshops with the United States' regulatory agency, the National Ocean and Atmospheric Administration (NOAA) - Office of Aquaculture, providing advice in regard to mitigation and monitoring of marine mammals with aquaculture. My 2013 report served as the basis for NOAA's subsequent global review in 2017, Protected Species & Marine Aquaculture Interactions. I have since been involved as a peer-reviewer for several aquaculture / marine mammal-related NOAA grants and proposals.

In providing this evidence in relation to marine mammals, I have considered the following matters as relevant to that topic:

- The project description provided by NTS as set out in section 6 of the application;
- The description of the existing environment, the effects of the HAP on that environment and their significance, and the proposed management and mitigation measures to manage those effects all as set out in the assessment of environmental effects accompanying the application;
- The technical assessments of seabed effects (by H Bennett, M Smeaton, L Floerl and P Casanovas), seabirds (by L Bull) and sharks (by B. Finucci); and

- Marine mammal species information and sightings data were collated from existing short-term or localised studies undertaken in Southland, Stewart Island, Otago and relevant offshore island waters (i.e. by the Department of Conservation [DOC], Cawthron Institute, University of Auckland, University of Otago, Orca Research Trust, National Aquatic Biodiversity Information System - NABIS). DOC maintains a marine mammal sighting database that includes opportunistic sightings reported by the public, tourism vessels, seismic surveys, etc., and strandings (previously collated through the Museum of New Zealand Te Papa Tongarewa) that were also reviewed. In addition, any records of previous Aotearoa New Zealand marine mammal interactions or entanglements with aquaculture (DOC marine mammal sightings and incidents database), along with overseas data (e.g. Young 2015; Price et al. 2017; DFO 2025), were used to inform which marine mammal species may be more vulnerable to risks from the proposal. Collectively, this information was used to evaluate those species most likely to be affected by the proposed project and to determine what is currently known about the relevant species' occurrence, behaviour and distribution within the area assessed. Confirmation of Contents of Report and Proposed Conditions

Confirmation of Contents of Report and Proposed Conditions

I confirm that in my opinion the *Effects of Hananui Aquaculture Project on marine mammals* and *Ngāi Tahu Seafood Resources: marine mammal management plan* contain an accurate and appropriate description of the environment, the actual and potential effects of the HAP, and the recommended actions to manage those effects within my area of expertise.

I confirm that in my opinion the contents of the *Effects of Hananui Aquaculture Project on marine mammals* and *Ngāi Tahu Seafood Resources: marine mammal management plan* may be relied on in making a decision on the approvals sought for the HAP and confirm that provided effects within my area of expertise are managed as proposed in the application those effects will not be unacceptable and will be managed to a standard that I consider meets good practice.

I confirm that I have reviewed the conditions that NTS proposes for the approvals being sought as they relate to my area of expertise. I confirm that in my opinion, those proposed conditions are appropriate.

Deanna Clement

11.11.2025

CAWTHRON

Effects of Hananui Aquaculture Project on marine mammals

Cawthron Report 4171

World-class science
for a better future

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Effects of Hananui Aquaculture Project on marine mammals

Deanna Clement

Prepared for Ngāi Tahu Seafood Resources Ltd

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Contents

Executive summary

Ngāi Tahu Seafood Resources Ltd is applying for a resource consent for a 1,285 ha offshore salmon farming area approximately 13 km northwest of Oban on the northern coast of Stewart Island / Rakiura (hereafter Stewart Island) in Southland. The proposal area would contain four main farms, each consisting of 20 circular pen structures within water depths of 20–40 m and positioned between 2 km and 6 km from the shore. This report provides a desktop assessment of the potential effects on marine mammals arising from this proposed marine farm off Stewart Island.

The greater Southland and Foveaux Strait region, in association with Stewart Island waters, is considered an important area for a large number of Aotearoa New Zealand's cetacean and pinniped species. At least seven marine mammal species are considered year-round residents and / or seasonal visitors of these waters, with several baleen whale species migrating to and through Foveaux Strait each winter / spring, and more offshore species wandering into shallow regions over warmer months. The species most likely to be affected by the proposal are New Zealand fur seals, New Zealand sea lions, bottlenose dolphins, southern right whales, humpback whales and orca. While the proposed farm area represents a small fraction of similar habitats available to support those marine mammal species that use this larger coastal region, it also potentially coincides with important winter mating habitats for southern right whales and forms part of humpback whales' migration corridor. Southland and Stewart Island waters also support a subpopulation of nationally vulnerable bottlenose dolphins, as well as a new breeding colony of nationally endangered New Zealand sea lions, which need to be considered.

The main effects of the current proposal are possible habitat displacement or avoidance and entanglement risk. Other impacts considered include underwater noise, artificial submerged lighting and trophic flow-on effects. While the overall likelihoods of these effects are considered low based on the proposed farm systems, the consequences of a rare event such as the death of a threatened species warrants appropriate mitigation actions.

To ensure that the most appropriate protection measures are in place, a marine mammal management plan (MMMP) has been developed. This includes several suggested best management practices and a comprehensive monitoring plan to help ensure any residual adverse effects on marine mammals will be less than minor. Recommended monitoring actions are aimed at addressing knowledge gaps while also assessing the effectiveness of any mitigation measures put in place. The intention is that monitoring data and any novel relevant research / knowledge will inform future reviews of the MMMP at regular intervals, as required by consent conditions, to ensure it remains fit for purpose and consistent with best practice over the life of the consent.

1. Background and scope

1.1 Hananui Aquaculture Project

Ngāi Tahu Seafood Resources Ltd (NTS) proposes developing a two-stage, exposed coastal water salmon farm off the northern coast of Stewart Island / Rakiura (hereafter Stewart Island), known as the Hananui Aquaculture Project. The proposed location is approximately 13 km northwest of Oban and positioned 2–6 km from the shore (Figure 1). The proposal is for a 1,285 ha coastal marine area that would contain four separate marine farms sites to grow king salmon (*Oncorhynchus tshawytscha*).

The proposed development comprises four marine farms (referred to as Farms 1–4; Figure 1), each divided into two blocks (referred to as Blocks A and B). Each block will contain ten 168 m-circumference pens (in a 5 × 2 configuration). As part of Stage 1, each of the four farm sites would establish 10 sea pens (e.g. 1 block), the associated mooring and anchoring systems, and a feed barge with a proposed feed discharge of 15,000 tonnes per annum.

Progression to Stage 2 will depend on the outcomes of environmental monitoring conducted over at least two full production cycles at each farm at the Stage 1 feed level, as set out in the proposed consent conditions and monitoring plan. Stage 2 may see the overall feed discharge rise to 25,000 tonnes per annum with the introduction of a second set of 10 sea pens (in the same configuration as the Stage 1 pens) at each of the four marine farm sites.

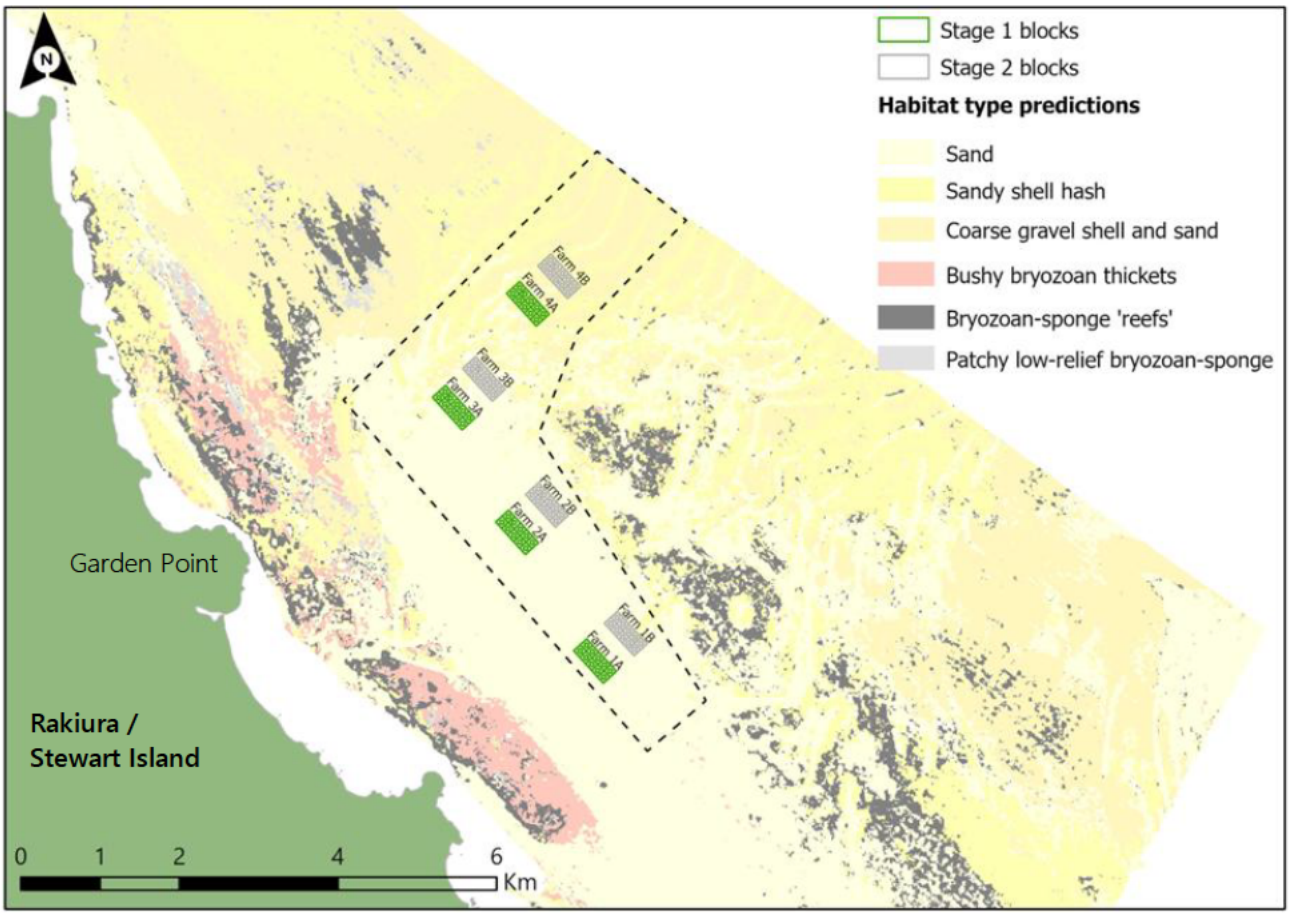

Figure 1. Proposed location and layout of the four marine farm sites (black outline) on the north coast of Stewart Island / Rakiura over the predicted benthic habitat types found within the Hananui proposal area.

The proposed pen structures will be large, 168 m-circumference circular pens, similar to those produced by various aquaculture suppliers, including AKVA and ScaleAQ. NTS is proposing to use a single-net system for each circular pen. This will be made with underwater mesh less than 40 mm in size, using predator-resistant materials (e.g. semi-rigid or core-stiffened nets, or heavy monofilament) to prevent easy tearing (i.e. from chewing). At the surface, jump fences approximately 3–3.5 m tall will be used to keep pinnipeds out and off the farms by ensuring there are no structures onto which they could haul out or enter the farm, with the exception of a small vessel landing platform.

Each marine farm site will consist of two blocks of pens, with blocks located at least 300 m apart and nets extending to 17–22 m depth with a clearance of 5 m from the seabed. Each pen will be individually moored using a combination of dual shank anchors, chain and 5-tonne concrete anchor mooring blocks. On-site servicing barge(s) will be moored within each farm using similar anchor and chain systems but without concrete anchor blocks. The physical characteristics of the net material provide effective predator exclusion and greater resistance to predatory attacks than previous netting, as well as effective escape prevention to contain the fish. Each net would also have a 'false' bottom separated from the outer net to catch dead fish or a mortality collection system that would hold/contain them away from access to marine species swimming underneath the pens.

Farm stocking is proposed to be on a single-year-class rotational basis, so that in general:

- one farm has stock introduced
- one farm is at grading
- one farm is at harvest
- one farm is fallow.

1.2 Assessment scope

Cawthron Institute (Cawthron) was contracted to provide a comprehensive desktop assessment of the potential effects on marine mammals that might arise from the activities of the proposed Hananui Aquaculture Project off Stewart Island. The specific scope of this desktop assessment consists of the following components:

1. Description of the existing environment in relation to the known residency, migratory and seasonal patterns of marine mammals in the greater Stewart Island / Southland Region, including Foveaux Strait itself.
2. Review of national and international literature to robustly and accurately describe the potential effects associated with salmon farming activities located further offshore that could impact upon marine mammals, in particular (a) known versus potential effects, (b) indirect versus direct effects and (c) cumulative effects.
3. Summary of the overall risk of any resulting effects on marine mammals in terms of their possible scale, duration / persistence, likelihood and possible consequences, while taking into consideration the findings of other assessments being undertaken for the project.
4. Recommendations for possible mitigation and monitoring options, where applicable. A monitoring plan is not included in the assessment.

2. Description of existing environment

2.1 General approach

When considering potential implications of offshore developments on marine mammals, the appropriate scale of concern is not at the site level but rather at the temporal and spatial scales relevant to the marine mammals involved. For instance, while humpback whales may be considered only seasonal migrants through Southland waters, Foveaux Strait may represent an important corridor that this species uses to reach key habitats elsewhere. As a result, the importance of the proposal area is placed in context of the species' regional (i.e. Southland and Otago) and nationwide distributions. This is because most marine mammals regularly range for hundreds to thousands of kilometres. Hence, Figure 2 highlights the extent of the region examined in order to assess the potential marine mammal species passing through Foveaux Strait and the Stewart Island area. This is referred to as the area of interest, or AOI, for the remainder of this report.

In the absence of long-term and spatially explicit baseline research on marine mammals in the larger Southland Region, species information and sightings data were collated from existing short-term or localised studies undertaken in Southland, Stewart Island, Otago and relevant offshore island waters (i.e. by the Department of Conservation [DOC], University of Auckland, University of Otago, Orca Research Trust; Appendix 1 list the various information sources used). DOC maintains a marine mammal sighting database[1] that includes opportunistic sightings reported by the public, tourism vessels, seismic surveys, etc., and strandings (previously collated through the Museum of New Zealand Te Papa Tongarewa) that were also reviewed. In addition, any records of previous Aotearoa New Zealand marine mammal interactions or entanglements with aquaculture (DOC marine mammal sightings and incidents database), along with overseas data (e.g. Young 2015; Price et al. 2017; DFO 2025), was used to inform which marine mammal species may be more vulnerable to risks from the proposal. Collectively, this information was used to evaluate those species most likely to be affected by the proposed project and to determine what is currently known about the relevant species' occurrence, behaviour and distribution within the AOI.

[1] Department of Conservation's New Zealand marine mammal sightings and incidents database [accessed 9 May 2025].

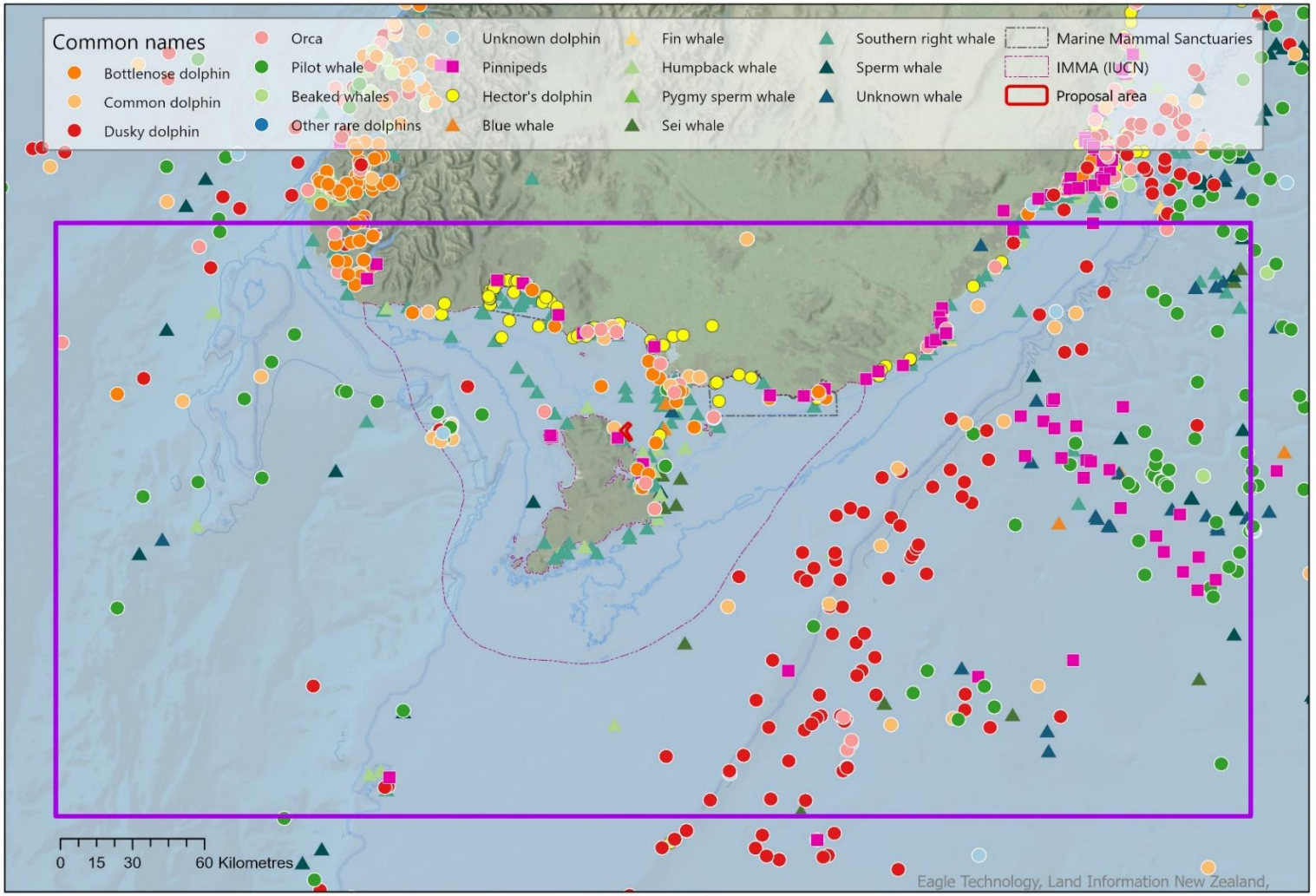

Figure 2. The spatial extent (purple polygon) of Southland and Stewart Island / Rakiura waters considered for the assessment of effects on marine mammals and referred to as the area of interest (AOI).

Data limitations

Most of the sighting records available were collected opportunistically from public sources over several decades rather than systematically from research studies. Consequently, the number of sightings in the figures in this report does not necessarily represent unique animals (i.e. the same animal may be reported by multiple members of the public or on separate days / in separate years) or their regular distribution patterns. As collection effort is not considered with opportunistic data, favourite fishing spots and tour boat tracks are likely to be over-represented, especially during periods of more favourable conditions (e.g. summer, daylight periods).

Sighting (or lack of sighting) records of pinnipeds were not considered a useful indicator of their occurrence patterns as very few sightings are generally reported. The pinnipeds that are reported tend to be the more unusual species (e.g. elephant seals) or more aggressive species (e.g. leopard seals) and not the more expected species (e.g. fur seals). Instead, the locations of known pinniped haul-out sites and breeding colonies are considered more informative.

Marine mammal stranding records are similar to pinniped records, in that they are a broad indicator of occurrence and supplemental to sighting records rather than evidence on their own. Records include animals that have stranded alive and then later died, and animals that have died at sea and washed ashore. With the latter, it is more difficult to determine the species' normal distribution range, as once they are dead, their final destination is dependent on current flows and tides.

Relevant species

Collated information was used to determine what is currently known about the occurrence, distribution and general behaviour of marine mammals within the AOI to determine those species most likely to be affected by the proposed project. For this assessment, more emphasis was placed on the timing of a species' presence in the Southland Region than on the exact sighting location or number of sighting records. Overall, those species with multiple sightings and stranding reports were included in Table 1 and divided into three general categories describing the current knowledge about their distribution and seasonal patterns across the wider southern coastal region (i.e. resident, migrant or visitor – see Section 2.2).

The potential risks of the proposal to these relevant species (discussed further in Section 3) were then assessed based on their life-history dynamics (e.g. species-specific sensitivities, conservation status, lifespan, main prey sources, etc.) and previous aquaculture interaction evidence as summarised from several national and international data sources (see Appendix 1).

2.2 Marine mammals in the area of interest

Of the more than 50 species of cetaceans (whales, dolphins and porpoises) and pinnipeds (seal and sea lions) known to live and / or migrate through Aotearoa New Zealand waters, at least 24 cetacean and four pinniped species have been recorded within the AOI. Figure 2 highlights the various marine mammal species recorded within the AOI and in the context of other nearby regions (i.e. parts of Otago,

offshore islands and continental shelf waters) over the past several decades. Figures 2 and 3 also indicate the locations of the two marine mammal sanctuaries created and managed by DOC (Te Waewae Bay and Porpoise Bay) and the Rakiura Stewart Island and Te Ara a Kiwa Important Marine Mammal Area (IMMA)[2] as described by the International Union for Conservation of Nature (IUCN-MMPATF 2020).

Most Foveaux Strait sightings were reported between Bluff and Paterson Inlet / Whaka Te Wera (hereafter Paterson Inlet) on Stewart Island (Figures 2 and 3). The large number of reported sightings in this area is most likely a reflection of the number of marine ferry and tour trips undertaken between these locations. Other hotspots of opportunistic records within Foveaux Strait are known tourist destinations, such as Te Waewae Bay, Porpoise Bay and the coastal town of Riverton / Aparima. More offshore sightings outside of the strait likely correspond with either fishing destinations or seismic survey locations, as both activities are required to carry marine mammal and / or fisheries observers onboard in Aotearoa New Zealand waters. The Solander Trough, located along western Stewart Island and Foveaux Strait, also appears to be an active area for offshore species. However, as noted previously, this assessment places less emphasis on the actual location of a sighting and more importance on the general timing of their presence in the wider region.

A list of the more prevalent and commonly reported species within the AOI is highlighted in Figure 3 and presented in detail in Table 1. These species are divided into three general categories that describe the current knowledge about their distribution and seasonal patterns:

- **Resident** – a species that lives (either feeding and / or breeding) within the AOI and surrounding waters either permanently (year-round) or for regular time periods.
- **Migrant** – a species that regularly travels through part(s) of the AOI but remains only for temporary time periods that may be predictable seasonally within coastal or more offshore waters.
- **Visitor** – a species that may wander into the AOI intermittently. Depending on the AOI's proximity to the species' normal distribution range, visits may occur seasonally, infrequently or rarely, or be limited to coastal or offshore waters.

[2] The Rakiura Stewart Island and Te Ara a Kiwa IMMA is one of seven such designated areas around Aotearoa New Zealand. The IUCN's Marine Mammal Protected Areas Task Force (MMPATF) is currently in the process of identifying and establishing IMMAs worldwide. IMMAs are not marine protected areas with any legal or regulatory status. Instead, an international community of scientists has assessed areas for marine mammal species worldwide that have the potential to be delineated and managed to promote the conservation of marine mammals and their habitats.

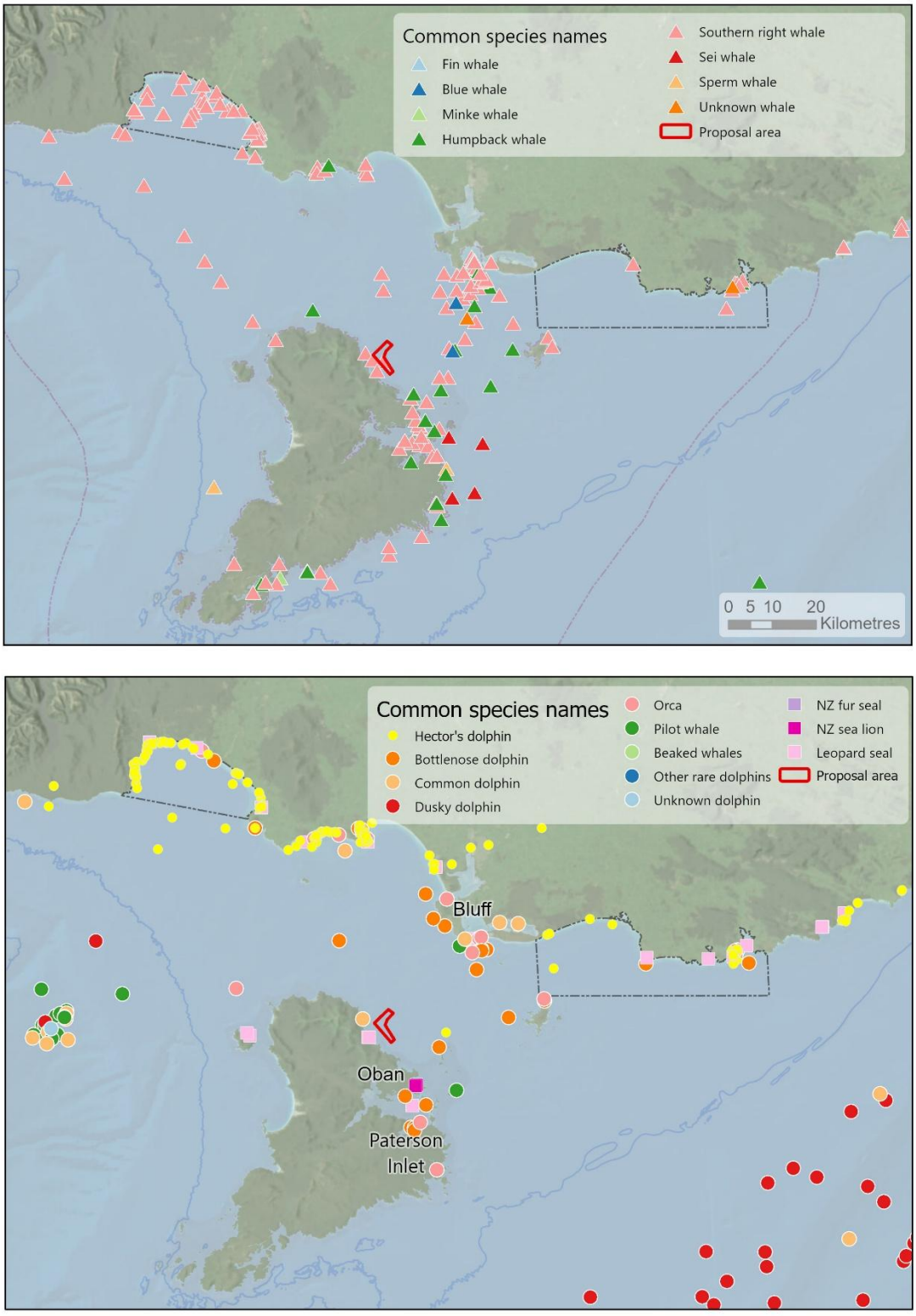

Figure 3. The distribution of opportunistic sightings (1977–2023) reported in the DOC marine mammal sightings and incidents database within the area of interest. The spatial extent of these maps is more detailed than Figure 2 to help distinguish those species reported around Stewart Island / Rakiura waters. Migrating baleen whale species (and sperm whales) are shown in the top image, and toothed whales, dolphins and pinnipeds (seals and sea lions) are in the bottom image. Marine mammal sanctuaries are outline in black dotted lines.

Table 1. Residency patterns of the marine mammal species most relevant to the proposal and known to frequent the area of interest (AOI). Species' conservation threat status is listed for the New Zealand Threat Classification System (NZTCS; Baker et al. 2019; Lundquist et al. 2025) and International Union for Conservation of Nature (IUCN) Red List.

Common name	Species name	NZTCS classification		IUCN Red List classification	Residency category in AOI
RESIDENTS					
New Zealand fur seal	*Arctocephalus forsteri*	NZ native & resident, evaluated	Not Threatened	Least Concern	Year-round resident
New Zealand sea lion	*Phocarctos hookeri*	NZ native & resident, evaluated	Nationally Endangered	Endangered	Year-round resident
Hector's dolphin	*Cephalorhynchus hectori hectori*	NZ native & resident, evaluated	Nationally Vulnerable	Endangered	Year-round resident
Bottlenose dolphin	*Tursiops truncatus*	NZ native & resident, evaluated	Nationally Vulnerable	Least Concern	Seasonal to semi-resident
POTENTIAL OFFSHORE SPECIES					
Long-finned pilot whale	*Globicephala melas*	NZ native & resident, evaluated	Not Threatened	Least Concern	Potential offshore semi-resident
Sperm whale	*Physeter macrocephalus*	NZ native	At Risk: Declining	Vulnerable	Potential offshore visitor
Beaked whales	*Ziphiidae* spp. (7 species)	NZ native & resident	Data Deficient to Not Threatened	Data Deficient to Least Concern	Potential offshore visitor
MIGRANTS					
Southern right whale	*Eubalaena australis*	NZ native & resident, threatened	Nationally Increasing	Least Concern	Seasonal migrant
Humpback whale	*Megaptera novaeangliae*	NZ native & non-resident, evaluated	Migrant	Endangered	Seasonal migrant
VISITORS					
Dusky dolphin	*Lagenorhynchus obscurus*	NZ native & resident, evaluated	Not Threatened	Data Deficient	Seasonal visitor
Common dolphin	*Delphinus delphis*	NZ native & resident, evaluated	Not Threatened	Least Concern	Seasonal visitor
Leopard seal	*Hydrurga leptonyx*	NZ native & non-resident, evaluated	Migrant	Least Concern	Seasonal to infrequent visitor
Orca (killer whale)	*Orcinus orca*	NZ native & resident, threatened	Nationally Critical	Data Deficient	Seasonal to infrequent visitor
Sei whale	*Balaenoptera borealis*	NZ native & non-resident, evaluated	Not Threatened	Not Threatened to Data Deficient	Seasonal to infrequent visitor
Blue whale	*Balaenoptera musculus brevicauda* & *B. m. intermedia*	NZ native & non-resident, threatened / evaluated	Nationally Vulnerable to Migrant	Critically Endangered to Data Deficient	Seasonal to infrequent visitor

2.3 Species of interest

The more common species occurring within the AOI, and those therefore most likely to be affected by the proposed project, include New Zealand fur seal, New Zealand sea lion, bottlenose dolphin, southern right whale, humpback whales and the occasional orca. A short summary of these and other relevant species is given below.

New Zealand fur seal

The main species of pinnipeds found around Stewart Island are the New Zealand fur seal and New Zealand sea lion. New Zealand fur seals are the only pinniped species regularly observed year-round on both mainland and Stewart Island rocky shores. Known breeding colonies and haul-out sites are found around most of Stewart Island, with the closest breeding colonies to the proposed site within 9–20 km at Motunui / Edwards Island and Jacky Lee Island to the east (NABIS 2025). Fur seals are considered non-migratory but are known to easily and repeatedly cover large distances to find food (e.g. Chilvers and Goldsworthy 2015). Some adults will travel out to open waters over winter, while younger animals focus over shallower continental shelf waters (FNZ 2025). Fur seals are regularly observed around salmon farms in the Marlborough Sounds, hauling out on structures where possible and raiding pens for food (Cawthorn 2011; see Section 3.2 for more details). Sightings of fur seals around salmon farms in the Marlborough Sounds tend to peak soon after pups depart from colonies around late winter / spring (Clement and Elvines 2019). There are no regular surveys of fur seal colonies in the AOI, and therefore the current status of the populations in this area is unknown.

New Zealand sea lion

A colony of New Zealand sea lions discovered in Port Pegasus (southeastern tip of Stewart Island) was formally recognised as a breeding colony in 2018 (FNZ 2022). The population has continued to grow from roughly 180 individuals in 2017 (Roberts 2017) to approximately 96 pups being recently tagged in March 2025 (DOC 2025). Additional haul-out sites for this species around Stewart Island include an area known as The Neck, at the entrance to Paterson Inlet, Ulva Island, and in Foveaux Strait, on Ruapuke and Dog Island. Based on a limited number of satellite-tracked juvenile and adult female sea lions (n = 12), Port Pegasus females appear to undertake limited foraging trips (within 50 km of tag site) mainly off and around the southern tip of Stewart Island (Roberts 2017). Male sea lions are known to travel up to twice the distances of females off the Auckland Islands (Leung et al. 2012). The presence of sea lions around current salmon farms in Big Glory Bay has not resulted in any reported mortalities or injuries to date, but finfish farms in Australia and Chile have reported interactions – including fatal entanglements – with local sea lion species (Bath et al. 2023). Too many incidental mortalities (particularly of adult female sea lions) could significantly slow the continued growth of the local breeding colony off Stewart Island, given its current size, but are unlikely to adversely affect the larger sea lion population. This species is currently listed as Nationally Endangered by the New Zealand Threat Classification System (NZTCS; Lundquist et al. 2025) and Endangered by the IUCN (Chilvers and Goldsworthy 2015).

Southern elephant seal and leopard seal

While both southern elephant seals and leopard seals have been observed around Stewart Island, they are considered vagrant or seasonal visitors to the AOI (Figure 3). There are a few reports of these species becoming fatally entangled in salmon farms in southeast Tasmania, Australia, in the 1990s (Kemper et al. 2003), but there have not been any interactions to date in Aotearoa New Zealand. Although mainly occurring around the Antarctic pack ice, leopard seals will disperse northwards over the colder winter and early-spring months (e.g. Hückstädt 2015), when individuals can be observed in both Southland and Stewart Island waters (Hupman et al. 2020). Regardless of their distribution and residency patterns, all pinniped species are granted protection under the Marine Mammals Protection Act 1978.

Hector's dolphin

The main resident dolphin species in AOI waters is Hector's dolphins (Figure 3). While there has been one stranding (unverified) in the 1970s and one unconfirmed sighting on or near Stewart Island, this species is recognised as exclusively distributed within mainland coastal waters between Te Waewae Bay and Porpoise Bay (MacKenzie and Clement 2019). As a small subpopulation (approximately 200–500 individuals; MacKenzie and Clement 2019) that is genetically distinct from both the east and west coast sub-populations, these semi-isolated dolphins are considered Nationally Vulnerable and Endangered by the NZTCS and IUCN, respectively (Baker et al. 2019; Reeves et al. 2013). While this species is unlikely to be found within the proposed area of activity, it is mentioned here due to its status and the public's awareness of its plight. It is highly unlikely that the current proposal will have any effects on the species, and it will not be considered in the assessment section.

Bottlenose dolphin

Other resident dolphins include groups of bottlenose dolphins, which are thought to range between Fiordland through Foveaux Strait and around Stewart Island and Otago (Figure 3; Brough et al. 2015). Very little is known about this possible 'southern' subpopulation; however, a preliminary study suggests that a small sub-set of approximately 17 individuals out of a potential larger population of at least 80–111 individuals regularly visit Paterson Inlet. It is thought that bottlenose dolphins inhabiting Fiordland (i.e. Milford, Dusky, and Doubtful Sounds) are potentially at their temperature limits due to the extreme variations experienced in the fiords. This southern subpopulation, while observed year-round, may travel to avoid these variations as they are generally more frequent over warmer spring, summer and autumn months than the colder winter period within AOI waters (DOC marine mammal sightings and incidents database). Bottlenose dolphins are generalists in their feeding preferences and can be quite adaptive in their feeding styles. For instance, the species has been known to opportunistically pull salmon out through the bottom of aquaculture pens in the Marlborough Sounds (D Clement, unpublished data). The bottlenose dolphin in Aotearoa New Zealand is current listed as Nationally Vulnerable by the NZTCS (Lundquist et al. 2025) due to ongoing population declines in at least one, and possibly two of the three regional sub-populations (Baker et al. 2016).

Dusky dolphin and common dolphin

Groups of dusky dolphins are regularly sighted in deeper continental shelf waters off the Otago coastline and Stewart Island, along with common dolphins, which are also observed within Foveaux Strait and associated inshore waters (Figure 2). Group sizes of both species vary from one to two individuals up to 500. Sightings of both species are almost exclusively reported between late spring (November) and autumn (April), when southern waters are warmer, suggesting these species may be potential seasonal visitors to the AOI. These trends fit with the larger movements of dusky dolphins around the South Island, in which animals appear to move north over colder periods and south during warmer months (e.g. Lusseau and Slooten 2002; Würsig et al. 2007). Common dolphins are known to feed within inshore waters during daylight hours and migrate into deeper shelf waters at night to take advantage of vertically migrating prey (e.g. Neumann 2001; Meynier et al. 2008). Little is known about the actual population sizes and movements of either species outside local study areas (i.e. Hauraki Gulf / Tīkapa Moana and Bay of Plenty – Stockin et al. 2008; Dwyer 2014; Kaikōura – Würsig et al. 2007), but neither species is considered threatened.

Orca

Groups of orca are not often reported throughout the year, but when they are recorded, they are often observed multiple times over short periods (several days to weeks) within AOI waters (Figure 3). It is thought that there are three overlapping sub-populations of orca: North Island, North and South Island, and South Island only. These sub-populations move seasonally around Aotearoa New Zealand coastal waters in search of prey (Visser 2000). As seasonal transients through AOI waters, orca likely wander up and down the coastline taking advantage of those habitats where rays and other prey species may be more common (e.g. Hupman et al. 2014). Orca are currently listed as Nationally Critical by the NZTCS (Lundquist et al. 2025) based on their naturally low abundance numbers.

Southern right whale

The migrations of several baleen whale species through Foveaux Strait and along both the east and west coasts of Aotearoa New Zealand commence in early winter (May) and cease again with their return to southern Antarctic waters by late spring (November / December). Southern right whales are by far the most prevalent species sighted within the AOI (Figure 3), and the region is known for having the highest sighting concentration of the species around Aotearoa New Zealand's mainland (Carroll et al. 2014). Historically, both Southland and Otago were important whaling sites for this species, with at least 11 stations (Dawbin 1986). While sightings indicate that southern right whales are observed year-round across the AOI (Figure 3), numbers generally peak between May and September as they gradually move into their traditional mainland wintering grounds (Patenaude 2003).

Southern right whale group sizes in Aotearoa New Zealand are generally small, comprising one or two individuals. However, Southland is unusual in that it is the only region where reproductive, mixed (i.e. males and females) groups of 3–20 whales are observed, suggesting this area may be the only known mainland mating habitat (Carroll et al. 2014). Southern right whales can be observed with newborn calves from August onwards; however, only 10% of Southland sightings reported having a calf in the group (Carroll et al. 2014). Southern right whales have been listed recently as Nationally Increasing by the NZTCS (Lundquist et al. 2025), as their population numbers continue to grow. However, their

preference for shallow, protected bays and coastal waters (particularly for calving) overlaps with numerous anthropogenic activities in Aotearoa New Zealand's waters.

Humpback whale

Humpback whales mainly migrate through AOI waters from May to August as they head up both coastlines of the South Island (Dawbin 1956). They have been observed throughout Foveaux Strait, and within embayments and more sheltered waters on both Stewart Island and the mainland (Figure 3). This species appears to be more abundant within the AOI during its northern migration than on its southbound return in spring, with only the occasional sighting in October / November.

Sei, blue and pygmy right whales

Three other species of baleen whales are also thought to occasionally visit AOI waters: sei, blue and pygmy right whales (Figure 3). Most sightings of these species are from further offshore on continental shelf waters south or east of Stewart Island, but both sei and blue whales are regularly reported around Stewart Island and Foveaux Strait, particularly during the warmer months over summer and late autumn (DOC marine mammal sightings and incidents database). The inconspicuous pygmy right whale has historically stranded in AOI coastal areas, and in particular around Paterson Inlet on Stewart Island (Brabyn 1990, 1991). Very little information is available on this species or its occurrence in the region, but it is thought to concentrate in plankton-rich waters (Kemper et al. 2013). The most recent stranding off Stewart Island was in 2003. This species is listed as Data Deficient by the NZTCS (Lundquist et al. 2025) but has no known threats.

Pilot, sperm and beaked whales

Potential offshore residents, migrants and visitors to AOI waters include pilot whales, sperm whales and a few species of beaked whales (Figure 3; DOC marine mammal sightings and incidents database; Baker 2001; Brabyn 1990). Medium to large groups of pilot whales are regularly observed throughout the year within the AOI but tend to live more offshore (e.g. near and / or along the edge of the continental shelf), travelling into shallower AOI waters only over warmer summer months (DOC marine mammal sightings and incidents database). However, this species is known for its occasional large mass strandings (100s of animals) around Stewart Island beaches (Brabyn 1990, 1991). Similar distribution trends are noted for sperm whales, with only the occasional inshore sightings over warmer periods (DOC marine mammal sightings and incidents database). There are very few live sightings of beaked whales, a group of fairly cryptic and solitary species (e.g. Dalebout et al. 2004). However, the stranding records in this area suggest that these deeper-water species may also occasionally visit AOI regions during periods when Southland waters are warmer (DOC marine mammal sightings and incidents database; Brabyn 1990).

2.4 Species summary

Based on the available data, and in reference to both Section 6(c) of the Resource Management Act 1991 (RMA) and Policy 11(b) of the New Zealand Coastal Policy Statement (NZCPS), there is no evidence

to indicate that any of the species of interest have home ranges restricted solely to northern Stewart Island waters. Nor is there evidence to suggest that these waters are considered ecologically more significant in terms of feeding, resting or breeding habitats for most of these species relative to other regions around Stewart Island or the greater Foveaux Strait region. Instead, the proposed farm area represents a small portion of similar habitats available to support those marine mammal species that use this larger coastal region.

The possible exceptions are southern right whales, given their use of Foveaux Strait (and associated Southland) waters as potentially important winter mating habitats, and to a much lesser extent, humpback whales, which use the strait as part of their northern migration corridor. As highlighted in Table 1, Stewart Island waters also support potential sub-populations of endangered or vulnerable species such as bottlenose dolphins and orca, as well as local recovering colonies of the New Zealand sea lion. These species are particularly relevant in regard to Policy 11(a) of the NZCPS, which refers to avoiding any adverse effects on nationally and / or internationally recognised threatened species.

3. Assessment of effects

A global review of aquaculture and marine mammals by the United States National Oceanic and Atmospheric Administration (Price et al. 2017) acknowledges that there are few empirical data on marine mammal responses to aquaculture, despite the presence of aquaculture farms in nearshore regions worldwide for more than 30 years. Other than reports of fatalities (due to entanglement), there is an absence of data globally on marine mammal interactions with farms, and more importantly, the consequences of their reactions (if any). Interactions are defined as any event when a marine mammal makes physical contact with a farm structure and may or may not lead to an incident in which an animal is injured (e.g. rope cut, abrasion) or becomes entrapped or entangled (Clement et al. 2021).

The probability of an interaction occurring is dependent on the species and individual animal itself, which also influence the nature of the reaction. Certain species of whales or dolphins may be highly sensitive to any disturbance, while other cetacean species may be attracted to marine structures (e.g. Clement and Halliday 2014). The situation is complicated in that some individuals within a given population – such as juveniles and old, diseased or disoriented individuals – may be more prone to becoming involved in direct interactions, such as entanglements or collisions with certain types of gear (e.g. Kemper et al. 2003; Wilson et al. 2006). Consequently, the type of gear used, the operational procedures employed, and the timing of activities will also influence the probability of interactions occurring and the subsequent responses of the animal.

To date, documented effects of aquaculture on marine mammals relate mainly to habitat exclusion / displacement issues and entanglement in structures (e.g. Würsig and Gailey 2002; Kemper et al. 2003; Markowitz et al. 2004; Heinrich and Hammond 2006; Pearson et al. 2012; Valdés 2021; Piwetz et al. 2024). Depending on the size of the farm and nature of operations, other issues such as underwater noise, submerged lighting and possible flow-on effects due to alterations in trophic pathways may also apply (MPI 2013). These effects are reviewed in more detail below.

3.1 Habitat exclusion / displacement

The proposed farms, which will be located within exposed waters 2–6 km off the Stewart Island coastline, may be perceived by local marine mammals as a physical, visual or acoustic obstacle along a once open coastline that they may choose to ignore, investigate or avoid. As noted in a global review by Price et al. (2017), the little information we have on how marine mammals respond to farm structures is within mainly nearshore or bay waters only. However, the expansion of aquaculture into more exposed ocean waters now means that the likelihood of marine mammal interactions with farms may shift from these smaller, inshore populations of dolphins and pinnipeds, where species may be more desensitised to anthropogenic activities, to larger pods of offshore species and curious baleen whales. Such occurrences have been rare to non-existent at inshore farm locations, and as such, there is less information on which to assess these species' possible reactions.

Baleen whales

Baleen whales, such as southern right whales and humpback whales, travel annually through Foveaux Strait during their northern (May to August) and southern migrations (September to December) to and from breeding and feeding habitats. In the case of humpback whales, their migratory routes are assumed to be socially and culturally driven (e.g. calves learn migratory paths from their mothers) rather than environmental (e.g. based on certain water temperatures). As baleen whales do not have the ability to echolocate (i.e. navigate underwater using sound waves), they mainly rely on normal visual, audio and tactile cues to inform them about their environment. Consequently, individuals have been recorded swimming through finfish farms in Australia, seemingly unaware of the structures (e.g. Pemberton et al. 1991; Kemper et al. 2003). Alternatively, some whale species are known for their curiosity and gentle play when encountering novel objects in the water (e.g. Vallejo et al. 2022; Meynecke and Kela 2023). In a study of humpback whale entanglements off British Columbia, Canada, between 2008 and 2021, several juveniles became entangled when passing by farms, often outside the main migratory seasons (Storlund et al. 2024).

Conversely, too much activity near sensitive habitats may result in active avoidance by whales, particularly mother and calf pairs (e.g. Herman 1979; Glockner-Ferrari and Ferrari 1990), or potentially displacement into sub-optimal or less favourable habitats. While the active avoidance of farm structures by a few migrating whales would not be considered a significant disruption, complete avoidance of nearby resting or nursing habitats could have larger-scale repercussions on the population if these responses led to a reduction in fitness (i.e. extra travel time causing reduced reproduction rates in pregnant females).

Odontocetes and pinnipeds

More information is available on how echolocating species (e.g. bottlenose dolphins, dusky dolphins and orca) may respond to farm structures in their habitats as these species generally occur year-round and use more inshore habitats in Aotearoa New Zealand, where aquaculture development has historically taken place. Previous dolphin studies in Aotearoa New Zealand (Markowitz et al. 2004; Pearson et al. 2012; Valdés 2021; Piwetz et al. 2024), Australia (Watson-Capps and Mann 2005) and Chile (Ribeiro et al. 2007; Heinrich and Hammond 2006; Heinrich et al. 2019) have shown that marine farming can restrict available nearshore space for dolphins and potentially reduce the extent of habitat used for important biological and social activities. A review for Fisheries New Zealand by Würsig (2020) on marine mammals and aquaculture concluded that 'besides data we have for exclusion of several odontocete species from nearshore shellfish facilities in Australia, Chile and Aotearoa New Zealand – we have no further evidence of meaningful exclusion of habitat'.

In contrast, pinniped species will likely be attracted to the proposed farms. New Zealand fur seals are clearly attracted to salmon farms within the Marlborough Sounds, with individuals regularly found resting on structures and / or attempting to feed on fish in the pens (D Clement, pers. obs.). Finfish stock in the farms can also attract dolphins, such as bottlenose and dusky dolphins, due to the curious nature of these species and the associated wild fish aggregations under and near farms. Studies off the coast of Sardinia in Italy found that local bottlenose dolphins were more often observed in areas with finfish or mussel farms, which is likely a result of wild fish prey aggregating around farms in more open waters and thus becoming more accessible to the dolphins (Díaz López and Bernal-Shirai 2007; Díaz López and Methion 2017). This suggests attraction, which can have its own repercussions in the form of damaged nets / structures, stock loss and entanglement (see Section 3.2), could be greater at offshore aquaculture sites.

Summary

Based on the limited evidence available, the likelihood for habitat displacement or avoidance behaviours associated with the proposed farm in more open waters is considered low for most pinnipeds, dolphins and most whale species. Some species, such as bottlenose dolphins, New Zealand fur seals and orca, are more likely to be attracted to the farm structure as a food source, and thus the risk of displacement is also considered low. However, the likelihood of any displacement effects on whale species is uncertain at this stage due to the lack of open-water precedents and any subsequent reaction data. This assessment is based on the relevant factors summarised below and listed in Table 2.

Spatial and temporal factors

- Several established breeding colonies for New Zealand fur seals occur relatively close (within 9–20 km) to the proposed farm sites. New Zealand sea lions have established a haul-out site at The Neck near Big Glory Bay, approximately 20 km away.
- Bottlenose, dusky and common dolphins travel through Foveaux Strait and use nearby coastal waters. Bottlenose are observed year-round, while the other species are mainly sighted within warmer seasons.
- Several different species of whales are sighted within Foveaux Strait and nearby coastal waters throughout the year, with more migratory species passing through the strait from early winter (May) to late spring (November / December).
- The exact size of migration pathways of whales are not well known, but increasing numbers of humpback, southern right and blue whales have been documented in the AOI in recent years as populations continue to recover from the impacts of commercial whaling.
- The proposed farm area is not considered to be particularly rare and / or unique in terms of marine mammal feeding, resting or breeding habitats nor does it overlap with any areas designated as such for marine mammals (e.g. sanctuaries). The exception being that the AOI, along with other coastal waters in Southland, may represent important winter mating habitats for southern right whales.
- The proposed Hananui farms in Foveaux Strait, as well as the current aquaculture farms in Big Glory Bay waters, represent a relatively small part of the overall home ranges of resident and / or visiting marine mammal species. These home ranges are large and overlap with similar types of habitats in other parts of Foveaux Strait and associated regions.

Known displacement / avoidance factors

- Exposure to existing salmon farms within inshore or sheltered regions of Stewart Island has resulted in the attraction of bottlenose dolphins, sea lions and fur seals to farm sites rather than known displacement effects.
- Farming structures are not expected to exclude dolphins from moving through the AOI, while the concentrated block formation of farms is expected to discourage visiting whales from swimming between or among mooring lines.
- Currently, finfish aquaculture is not known to generate intense or consistently loud underwater sounds or involve large volumes of vessel traffic (with the exception of short-term construction phases) that may result in habitat displacement relative to other anthropogenic coastal activities in the general area (e.g. ferry lane).

Table 2. Summary of potential effects from the proposal on relevant marine mammal species within the area of interest.

Potential environmental effects	Spatial scale of effect on marine mammals	Persistence / duration of effect for marine mammals	Consequence(s) for marine mammals	Likelihood of effect	Avoidance factors / mitigation options (see Section 4 and Table 3)	Significance level of residual effect
Habitat / prey disturbance from farm structures and associated activities	**Medium to Large** Limited to immediate waters and habitats adjacent to the farms (AOI)	**Persistent** Farm structures permanent for the length of consent; species present in area for only hours to days	**Individual to Regional Level** • Local avoidance / abandonment by sensitive species / individuals or age groups (e.g. mating groups) • Individual pinnipeds / dolphins more likely to approach site	**Low** • Avoidance / displacement **to Moderate** • Attraction	• Record and report the type and frequency of marine mammal interactions (visual, acoustic or both) to build a local / regional picture (including absences)	**Negligible to Less than Minor** • Avoidance / displacement **Nil to Negligible** • Attraction
Entanglement in farm structures / debris	**Small to Medium** Limited to within / adjacent to the farm structures	**Short to Persistent** Farm nets / ropes permanent for length of consent; species present in area for only hours to days	**Individual to Population Level** • Death or injury of endangered or threatened species • Death or injury of non-threatened species	**Low**	• Avoid or minimise operational changes during critical migration periods • Avoid loose ropes / nets, keep all lines under some degree of tension, and use appropriate design • Regularly collect fish mortalities • Make lines easily detectable (i.e. orange coloured) • Minimise potential for loss of rubbish and debris from farms, and recover lost material	**Nil to Negligible**

Potential environmental effects	Spatial scale of effect on marine mammals	Persistence / duration of effect for marine mammals	Consequence(s) for marine mammals	Likelihood of effect	Avoidance factors / mitigation options (see Section 4 and Table 3)	Significance level of residual effect
Increase in underwater sound from farm structures / vessels	**Small to Large** Dependent on types of noise produced and frequencies	**Short to Persistent** Farm permanent for length of consent; noise sporadic and potentially more seasonal	**Individual to Regional Level** Individual avoidance by whales or certain age groups; local attraction of pinnipeds and some dolphins	**Low** • Avoidance **to Moderate** • Attraction	• Minimise above-water and underwater noise to reduce the exclusion (or attraction) of wildlife	**Nil to Negligible**
Attraction to artificial submerged lighting	**Small to Medium** Dependent on types of lights and their location within the farm	**Short to Persistent** Farms permanent for length of consent; seasonal lighting at night-time only	**Individual Level** Local attraction of pinnipeds and some dolphins	**Low to Moderate**	• Minimum amounts of lighting and proper positioning to reduce the attraction of wildlife	**Nil to Negligible**
Flow-on trophic effects to marine mammals	**Medium to Large** Limited to immediate / adjacent waters and habitats to the farm	**Short to Persistent** Farms permanent for length of consent; dependent on trophic effect; potential seasonality	**Individual Level** Local avoidance or individuals may approach for foraging opportunities	**Not Applicable to Low**	• Ensure proper site placement	**Nil to Negligible**

Definitions of terms used in table

Spatial scale of effect: Small (tens of metres), Medium (hundreds of metres), Large (> 1 km)
Persistence / duration of effect: Short (days to weeks), Moderate (weeks to months), Persistent (years or more)
Consequence: Individual, Regional, Population Level
Likelihood of effect: Not Applicable (NA), Low (< 25%), Moderate (25–75%), High (> 75%)
Significance level: Nil (no effects at all), Negligible (effect too small to be discernible or of concern), Less than Minor (discernible effect but too small to affect others), Minor (noticeable but will not cause any significant adverse effects), More than Minor (noticeable that may cause adverse impact but could be mitigated), Significant (noticeable and will have serious adverse impact but could be potential for mitigation).

3.2 Entanglement

The process of assessing entanglement risk follows the RMA and the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, and essentially combines the likelihood of the occurrence (e.g. the number of whales / dolphins likely to adversely interact with a farm) versus the magnitude of effect (e.g. interactions could lead to death, injury, avoidance or have no negative effect at all). As discussed in the previous sections, we lack sufficient data on most Aotearoa New Zealand marine mammal species within one or both of these categories, the exception being fur seals in the Marlborough Sounds. Instead, records of previous Aotearoa New Zealand entanglements along with overseas entanglement data (particularly from Australia) can help inform which marine mammal species may be more vulnerable to entanglement risk as well as which farm configurations or gear may increase or reduce the risk. This information has then been combined into a worst-case scenario in which any of the species found within the AOI are assumed likely to visit the farms at some point over the life of the consent.

Based on the 30-plus years of marine salmon farming within Aotearoa New Zealand waters, and several decades of oyster and mussel farming, marine mammal entanglement in aquaculture structures has been relatively low based on reported incidents (MPI 2013; Clement et al. 2021). However, it is unclear how this record relates to the frequency of interactions (e.g. physical contact with farms) taking place between species and farms. Without records of the absence of species near farms and / or the lack of interactions when animals are near farms (also known as negative data), we cannot quantify if farms are relatively benign or if the density of farms and reporting is too low to date to detect potentially injurious interactions (e.g. Price et al. 2017).

Pinnipeds

The marine mammals most at risk of entanglement with finfish farms globally are pinnipeds, and within Aotearoa New Zealand, fur seals. Overseas, predation of stock by pinniped appears to be a greater problem than entanglement in most countries that engage in aquaculture (Bath et al. 2023). Pinnipeds are thought to be strongly attracted to the farmed fish as a food source, and farms also serve as convenient haul-out sites for the animals. An increased pinniped presence can cause major problems for farmers through direct predation, destruction of gear, fish escapes through damaged nets, and reduced fish growth and performance due to stress (e.g. Kemper et al. 2003).

Consequently, entire salmon farms (i.e. all cages and accessways) in the Marlborough Sounds are surrounded by large predator nets that are designed to prevent fur seal access to the fish stock and onto the farm structures. Despite the strong attraction of New Zealand fur seals to salmon farms, fatal entanglements recorded within the Marlborough Sounds are considered low. Between 2014 and 2019, fur seal monitoring data indicated that approximately 17 fur seals drowned or were euthanised across nine different farm sites, equating to a 0.65% fatal entanglement risk for those fur seals found on farms (approximately 48 seals per farm annually). In the case of the New Zealand sea lion, this species is more vulnerable to adverse interactions with the proposed farms due to the low local population size. As the local population's continued growth is likely driven by adult female and / or pup survival rates (e.g. Roberts and Doonan 2016; Roberts 2017), the fatal entanglement of a reproductive female sea lion would have greater repercussions for the population than the loss of a male sea lion. As discussed in

Section 2.3, current movement data suggest that tagged juvenile and adult female sea lions undertake limited foraging trips from Port Pegasus to more southern waters. Finfish farms in Canada, Australia and the United States continue to report regular interactions (including fatal entanglements) with both local sea lion and seal species, however, they are generally lower compared to historical rates due to improved farm installation, designs for predator exclusion and mitigation measures (e.g. Kemper et al. 2003; Bath et al. 2023; DFO 2025).

To date, almost all pinniped fatalities on Aotearoa New Zealand farms have involved entanglement in predator nets or between predator nets and the salmon cage, and several of the incidents involved juvenile seals. It is thought that most pinniped entanglements occur when farm predator nets are not properly installed or maintained (e.g. Tanner 2007), and thus appropriate management and mitigation actions can help significantly reduce the chances of entanglement in such cases (e.g. Allen and Bejder 2003; Kemper et al. 2003; DFO 2025). Notably, existing salmon farms in Big Glory Bay on Stewart Island have regular visits and interactions with New Zealand fur seals, New Zealand sea lions and bottlenose dolphin. However, these farms do not use predator nets outside the fish pens, which may account for their zero marine mammal entanglement record to date (A. Undorf-Lay, Sanford, pers. comm., 17 October 2023).

Based on the above evidence, it is likely that any visiting pinniped will try to interact with the proposed farms. However, it is expected that entanglement opportunities will be prevented by the lack of predator nets and introduction of the proposed single-net system, which is made of predator-resistant materials with smaller gaps (mesh less than 40 mm) yet still maintains a more rigid structure. It is also expected that the lack of haul-out options (as well as potentially rougher sea conditions) will prevent animals from remaining on or near the farms.

Odontocetes

Odontocetes, or toothed whales and dolphins, use sonar clicks to explore their environment and hunt for prey (e.g. Markowitz et al. 2004; Madsen et al. 2006). Despite this ability, odontocetes still become entangled with finfish farms and, like pinnipeds, are often more at risk of entanglement due to the attraction of an easy food source or the associated aggregations of wild fish around farms.

Ten fatal entanglements of dolphins were reported in Aotearoa New Zealand salmon farms between 1987 and 2018 (Cawthorn 2011; MPI 2013; A Baxter, DOC Nelson, pers. comm., 2019). Dead species include dusky dolphin (n = 7), Hector's dolphin (n = 2) and bottlenose dolphin (n = 1). As with seal fatalities, almost all animals drowned after becoming entangled in predator nets (with teeth, beak or fin caught) or when nets were no longer under tension during construction or maintenance changes (i.e. switching out predator nets) and became trapped in the folds of nets. Similar entanglements of dolphins in finfish farms have been reported from Australia (Kemper and Gibbs 2001; Kemper et al. 2003; Bath et al. 2023), British Columbia (DFO 2025), Chile (Espinosa-Miranda et al. 2020), Scotland (Ryan et al. 2016) and Italy (Díaz López and Bernal-Shirai 2007). As discussed in relation to pinnipeds, evidence from overseas reports demonstrates that entanglement risk increases if farms use predator nets and these were poorly designed, installed or maintained (e.g. Kemper and Gibbs 2001; Allen and Bejder 2003; Kemper et al. 2003; Groom and Coughran 2012; Díaz López and Bernal-Shirai 2007).

Bottlenose dolphins are the species most likely to interact with the proposed farms, as they have been observed around existing salmon farms in nearby Big Glory Bay on Stewart Island. While Aotearoa New Zealand's entanglement rates have been similar to those in other countries, we have no data to place these rates in context as most aquaculture farms are not required to monitor or report marine mammal presence (absence) or interactions with their structures and / or vessels. However, it is clear that the collection of such information would assist in future consent assessments, underpinning consent mitigation decisions around offshore aquaculture in New Zealand.

Baleen whales

Being less agile and unable to echolocate, larger whales are considered susceptible to entanglement in marine gear, and three species in particular are commonly associated with incidents: humpback, minke and right whales (Benjamins et al. 2012; Young 2015). The extent to which the proposed farm sites may overlap the edge of southern right whales' winter habitats and the migration routes of humpback whales, in addition to these species' known vulnerability towards entanglement, make them the primary whale species of interest.

There are 20 reports of whales being entangled and / or damaging finfish farms globally, most of which involved humpback whales: Australia (n = 2 released alive; Kemper et al. 2008), British Columbia (n = 3 fatal entanglements, n = 5 released alive; Storlund et al. 2024), Chile (n = 1 released alive, n = 2 fatal entanglements, including a calf; Hucke-Gaetea et al. 2013; Espinosa-Miranda et al. 2020), Norway (n = 3 released alive, n = 2 fatal entanglements; Bath et al. 2023), and Scotland (n = 1 released alive; n = 1 fatal calf entanglement; Ryan et al. 2016). To date, there have been no reported entanglements of whales within any Aotearoa New Zealand salmon or other finfish farms, although there are three records of whales becoming entangled in mussel farm lines (Bath et al. 2023). However, the likelihood of entanglements of whales at offshore farms in Aotearoa New Zealand may be greater than for inshore farms due to the greater habitat overlap and chance of interaction.

The exact mechanism of entanglement is still under debate, but the whales potentially cannot detect the gear, or curious individuals may deliberately interact with the gear because they do not recognise it as a potential threat (e.g. Benjamins et al. 2014; Price et al. 2017; Storlund et al. 2024). Storlund et al. (2024) found that the presence (or lack of) farmed fish did not appear to attract the humpback whales that entangled in salmon farms along British Columbia's coastal waters. Instead, over half of these whales entangled in predator nets around fallowed (i.e. inactive) farms outside of the main migration periods. Individuals engaged in feeding, mating or resting may also have an increased risk of entanglement as they are distracted and less focused on the possible presence of unfamiliar structures in the water column. Global reviews have also noted that younger, less experienced animals (calves, juveniles and sub-adults) were found to be more at risk of entanglement, perhaps due to inexperience or a more inquisitive nature (e.g. Knowlton et al. 2012; Benjamins et al. 2014; Storlund et al. 2024).

Summary

Both national and international records demonstrate that predator nets are the main cause of most pinniped and cetacean entanglements in salmon farms . Overall, the likelihood for entanglement at the

Hananui site is considered low for all species owing to the lack of predator nets on the proposed farms. This assessment is based on the relevant factors summarised below and listed in Table 2.

Spatial and temporal factors

- Several established breeding colonies for New Zealand fur seals occur relatively close (within 9–20 km) to the proposed farm sites. New Zealand sea lions have established a haul-out site at The Neck near Big Glory Bay, approximately 20 km away.
- Bottlenose, dusky and common dolphins travel through Foveaux Strait and use nearby coastal waters. Bottlenose are observed year-round, while the other species are mainly sighted within generally warmer seasons.
- Most migratory whales occur in the area for a limited period each year (mainly in winter and spring), and most remain for only a day or less (the exception being southern right whales).
- Most baleen whale species (with the possible exception of southern right whales and southbound humpback whales) do not feed while migrating; hence, individuals are less likely to be 'distracted' and vulnerable to entanglement.
- The exact size of migration pathways of whales are not well known, but increasing numbers of humpback, southern right and blue whales have been documented in recent years as populations continue to recover from the impacts of commercial whaling.
- Southland waters may potentially represent important winter mating habitats for southern right whales.

Entanglement factors

- There is a possibility of entanglement for New Zealand fur seals, New Zealand sea lions, humpback and southern right whales, and bottlenose and dusky dolphins in Aotearoa New Zealand aquaculture farms based on previous entanglement incidences nationally and overseas.
- There is a higher entanglement possibility with predator nets during normal operations and during maintenance / construction / fallow periods. Most entanglements in Aotearoa New Zealand salmon farms have occurred in or with predator net systems.
- The relevant dolphin and pinniped species are currently exposed to similar types and levels of aquaculture activity in other Aotearoa New Zealand regions, and this has resulted in only a few reported entanglements in finfish farming gear. However, with the exception of fur seals, there is a lack of context data (e.g. absences and effort) to quantify risk.
- Evidence from overseas and within Aotearoa New Zealand demonstrates that entanglement risk can be reduced through proper farm siting, appropriate net design and maintenance, the absence of predator nets, and adherence to strict operational procedures and protocols. These factors are discussed in detail in the national best practice guidelines for open ocean aquaculture and marine mammals (Clement et al. 2021) and in Section 4.1.

3.3 Underwater noise disturbance

Associated closely with habitat exclusion is habitat degradation in the form of underwater noise disturbance, which is always a concern in regard to marine mammals. Noise has the potential to negatively affect cetacean species since they rely heavily on underwater sounds for communication, orientation, predator avoidance and foraging. Overlap in the hearing range of a species with an anthropogenic noise can mask important intra-species communication sounds and interfere with other acoustic cues such as those from predators or nearby vessels (e.g. Erbe 2002; Gerstein and Blue 2006; Lammers et al. 2013).

Potential effects on marine mammals associated with increases in underwater noise include auditory damage, behavioural changes such as avoidance of (and / or attraction to) the area and acoustic masking (e.g. Southall et al. 2007; Weilgart 2007; Wright et al. 2007). For example, Chilean dolphins (*Cephalorhynchus eutropia*) in an area of intensive aquaculture in Chile were found to respond to vessel noise by bunching, increasing speed and increasing reorientation rate (Ribeiro et al. 2007). Too much noise disturbance or masking could theoretically affect reproductive success if the noise is generated near an important breeding ground and continues for an extended period (Todd et al. 2015).

MPI (2013) noted that the level and persistence of any underwater noises associated with a finfish farm are expected to be minimal relative to other underwater noise sources. However, underwater noises associated with farms will vary according to farm features (e.g. type, size), habitat characteristics (e.g. location, depth, types of bottom sediments, shape of coastline) and compounding factors, such as the number of farms and / or other noise sources in nearby regions. Richardson (1995) also noted that marine mammal reactions to anthropogenic noise differ depending on the species (and even between individuals of the same species), characteristics of the noise (e.g. variability and rate of change, ambient levels) and local environmental factors.

Given the proposed activities, any effects of anthropogenic noise from the proposed salmon farm and associated operations on local marine mammal species are expected to be nil to negligible (Table 2). Any additional noise from farm operations and vessels will likely attract species such as fur seals and bottlenose dolphins to the farms, thereby increasing the risk of entanglement. Southern right whales may also be attracted, given their curious nature, or may avoid the area depending on the scale of operations and resulting noise levels. However, it should be emphasised that no research has assessed the types and level of noise associated with ongoing farm activities (including maintenance and harvesting), or the possible effects of other noise-producing activities near salmon farms.

3.4 Artificial lighting

To date, the few relevant studies focused on the effects of submerged lights associated with finfish farms suggest that they attract large aggregations of schooling baitfish to the pens, which in turn may increase night-time predation by nearby marine mammals and other wildlife (e.g. Cornelisen and Quarterman 2010; McConnell et al. 2010; Cornelisen 2011; SAD 2012). Cornelisen (2011) found that the

footprint of submerged artificial lights used on finfish farms is mainly confined within the cage structures and to mid-water depths.

Marine mammals will more likely be attracted to any increase in noise and activity of caged or wild fish in response to the lights rather than to the lights themselves. The effect of this attraction is therefore an entanglement issue (Table 2). To avoid any potential negative effects from artificial lighting, Cornelisen (2011) suggests using only the minimum level of lighting necessary to achieve the farms' outcomes.

3.5 Alterations to trophic pathways

There is the potential for wider, more indirect ecosystem effects on marine mammals due to aquaculture in the form of food-web alterations (e.g. Black 2001; Kaiser 2001; Würsig and Gailey 2002; Kemper et al. 2003). There are numerous studies quantifying the impacts that salmon farms can have on the benthos and water quality in Aotearoa New Zealand waters (Keeley et al. 2009; MPI 2013; Bennett et al. 2025). If farms are in suitable sites, this impact is likely to be localised to within several hundred metres. However, if a farm is in an area with insufficient current or is too close to particularly sensitive habitats, the result may be significant for the local ecosystem. It should be noted that there is currently no documented research on how the indirect effects of finfish farming on local ecosystems may affect Aotearoa New Zealand marine mammals or their potential prey.

In general, the large-scale home ranges and generalist feeding strategies of most marine mammals ensure that any localised impacts to potential prey resources do not often have any substantial flow-on effects to their populations. The only marine mammal found near the proposal area with any regularity is the New Zealand fur seal. However, this species is likely foraging along the entire coastline, through Foveaux Strait and off the nearby continental shelf (e.g. Chilvers and Goldsworthy 2015). The lack of any marine mammal species foraging extensively along this coastline of Stewart Island means that even if there are some localised effects on prey resources, they are likely to have only a nil to negligible effect on the relevant marine mammal species themselves (Table 2).

3.6 Cumulative impacts

The likely occurrence of most of the effects discussed above depends on the scale and intensity of the finfish farms within the proposed area relative to the amount and types of habitats needed for the various functional requirements of the different marine mammal species, as detailed throughout this report. Other anthropogenic activities affecting the environment in which Southland marine mammals live include bycatch in fisheries, bottom disturbance (e.g. fishing dredges and trawls), shipping and boating impacts, chronic anthropogenic underwater noise (e.g. shipping channel), land-derived sedimentation, reclamation, contaminant and nutrient enrichment, and other marine farms.

The review by Price et al. (2017) indicated that there is a need globally for a formal risk analysis of potential aquaculture interactions in comparison to other marine activities such as fishing, shipping, boating, military operations and so on. However, globally, there are few studies that have researched

the potential cumulative effect of multiple anthropogenic activities on marine mammals. Detailed information on fine-scale residency patterns, such as size of individual home ranges and the reason for the use of the area (e.g. foraging, calving), as well as individual responses (e.g. behavioural responses, physiological change) to disturbance are needed to determine habituation or cumulative effects (e.g. King et al. 2015; Pirotta et al. 2018). As this information is not available for marine mammal species that visit northern Stewart Island waters or the wider Foveaux Strait region, it is not currently possible to draw any meaningful conclusions. Instead, an important consideration for this project is that the various marine mammal species and most other anthropogenic activities are not stationary or restricted to the area of the proposal. In addition, there is no evidence that the regular movements of ships and ferries through Foveaux Strait may be deterring whale species from their migration paths based on wide-spread sightings (see Figure 3) and increasing numbers of whales throughout Aotearoa New Zealand waters each year (e.g. Carroll et al. 2014; Gibbs et al. 2017; Baker et al. 2019). As the farm does not lay in the direct migration route of any species, the expectation is that each migration period one or two whales may wander near and be curious enough to investigate the farms. As farms are stationary as well as low noise/ disturbance, any visiting animals will pass unharmed in close proximity around or under the farms. Furthermore, an adverse effect generated by several different activities within the AOI is not always additive. For instance, in the case of underwater noise, the actual level of noise heard by visiting marine mammals will be the loudest of the various sources – in other words, it will mask the other noise sources, rather than all the sources compounding to make an even louder background.

4. Mitigation and monitoring

4.1 Mitigation measures

Overall, the likelihood of any potential adverse impacts from aquaculture activities affecting local and visiting marine mammals is assessed as low to moderate. This is based on the consideration of the types of effects, their spatial scales and durations, and relevant species information. However, given that some of the possible consequences of rare events (e.g. entanglement) could have regional and / or population-level effects (i.e. injury or death of an endangered or threatened animal), mitigation is warranted. Hence, the final significance levels of any residual effects (Table 2) are contingent on the agreed implementation of several recommended mitigation actions by NTS at Hananui (Table 3) to help reduce these risks to as close to zero as possible.

To ensure that the most appropriate measures are in place, a draft marine mammal management plan (MMMP) has been developed by a marine mammal expert in consultation with DOC (Clement and McMullin 2025 [forthcoming]). This plan outlines in detail:

- mitigation procedures committed to by NTS that will be implemented and reviewed for effectiveness during operations
- timelines for subsequent reporting requirements
- a disentanglement protocol in the unlikely event that there is an entanglement (Table 3).

If the farm is consented, NTS has agreed to a range of best management practices (BMPs) regarding the set-up and operation of marine farms that will help reduce risks of entanglement and other adverse effects (Table 3), and that are consistent with the national best practice guidelines to support open ocean aquaculture (Clement et al. 2021). BMPs are advised even where effects are expected to be negligible. One such recommendation is that the industry encourages or supports specific research into potential effects of underwater noise (MPI 2013). Many of these practices are already reflected in the Finfish Aquaculture Environmental Code of Practice developed by the New Zealand Salmon Farmers Association and incorporated into the Sustainable Management Framework (SMF) for New Zealand Salmon developed by Aquaculture New Zealand (AQNZ 2015), as highlighted in Table 3.

NTS has also agreed to regular reviews of the MMMP, which will ensure that the MMMP remains consistent with current best practice and informed by monitoring data, as supporting data and knowledge will evolve over the duration of the consent.

4.2 Monitoring programme recommendations

The Price et al. (2017) review emphasises that there is a '[global] lack of scientific reporting on entanglement frequency, severity of resulting injuries and mortality rates associated with interactions, effective deterrent methods and technological innovation to reduce interactions and decrease harm if

contact occurs'. To quantify the current level of marine mammal presence and interactions with finfish farms in southern Aotearoa New Zealand, companies with farms in Stewart Island waters should be following the recommendations of the national open ocean aquaculture guidelines for marine mammals (Clement et al. 2021). These recommendations are based on the approach of marine farmers in British Columbia (e.g. DFO 2025) and some Australian companies (NSW DPI 2018), in which they monitor and report in a transparent, open database all visual sightings and interactions with marine mammals near farms or while travelling to and from farms. These encompass fatal entanglements, injuries and all other interactions (e.g. rubbing ropes, bumping against structures), including when animals are not seen (e.g. to confirm absences at the site), or seen but not observed to interact.

Use of passive acoustic underwater monitoring, an established technique internationally for monitoring marine mammal vocalisations (e.g. Southall et al. 2007; Weilgart 2007), is recommended as an alternative (or complementary) approach to visual observations. Passive acoustic recorders (i.e. moored underwater acoustic recorders) automatically listen to and record any underwater sounds at frequencies likely to be marine mammal vocalisations. These recordings (also known as detections) can be transmitted in real time or stored and downloaded later to assess whether marine mammals may have been present in a particular area. However, acoustic recorders are limited in range for some mid- and high-frequency species, and they cannot assess group size, abundance or whether marine mammals are truly absent (i.e. they may be present but not vocalising or echolocating). Yet, the advantage of using acoustic moorings is that they can 'listen' for the presence of any marine mammals both day and night and when sea conditions are not favourable for visual sightings. In addition, acoustic recorders can provide data on any underwater noise generated from the farms themselves and associated operations (e.g. feeding, vessels).

Adoption of these recommended approaches means that if future interactions with a species change (e.g. reduce or increase), industry have an informative baseline from which to evaluate the magnitude of the change, pinpoint possible reasons, and develop potential solutions more effectively and efficiently. For example, the fatal entanglement of a single animal after daily sightings of the species over 10 years demonstrates that effective operational measures are in place. In addition, record-keeping around sightings of marine mammals (either visual, acoustic or both) in proximity to the structures, as well as when travelling to and from the proposed farms, would provide an important context for any future development stages and / or decisions around site selection in nearby areas. Being able to benchmark the expected levels of interaction with marine mammals based on local records will provide a more realistic picture of species-specific risk of the proposed farms for any current or future development stages or consent applications.

Table 3. Proposed best management goals and practices to minimise the risk of any adverse effects of the farms on marine mammals. DOC = Department of Conservation, ES = Environmental Southland (Southland Regional Council), SMF = AQNZ Sustainable Management Framework (2015), ASC = Aquaculture Stewardship Council certification requirements (2019), BAP = Best Aquaculture Practices certification processes (2023), OOAGMM = MPI's Open Ocean Aquaculture Guidelines for Marine Mammals (Clement et al. 2021).

Management goal	Best management practice	Reporting
1. Minimise the exclusion of marine wildlife from their critical habitat, or modification of such habitat	1a. Record marine mammal interactions (either visually, acoustically or both) to build a baseline occurrence in waters near farms.	• Record and report the type and frequency of marine wildlife interactions (including absences and effort) in a standardised format (SMF 3.6.4; BAP 7.2 & 7.3; ASC 2.4.1; OOAGMM table 3).
	1b. Avoid use of any pinniped acoustic deterrent devices in favour of methods that are more effective and / or less harmful.	• Keep records of the extent to which deterrent techniques are successful or unsuccessful (SMF 3.2.1; BAP 7.9; ASC 2.5.1; OOAGMM table 2).
2. Minimise the attraction of marine wildlife to farms	2a. Secure feed storage, and minimise wastage during feeding, to reduce associated attraction of fish.	• Nothing required but encourage or support specific research into effects (SMF 3.3.1 & 3.5.2; OOAGMM table 2).
	2b. Collect and appropriately store and dispose of fish mortalities to reduce marine mammal attraction.	• Continue to record and report the type and frequency of fish mortalities and / or subsequent predation interactions in a standardised format (OOAGMM table 2).
	2c. Minimise above-water and underwater noise to reduce the exclusion (or attraction) of marine mammals.	• Nothing required but encourage or support specific research into effects (OOAGMM table 2).
	2d. Minimise artificial lighting to reduce attraction of prey fish.	• Nothing required but encourage or support specific research into effects (OOAGMM table 2).

Management goal	Best management practice	Reporting
3. Aim to minimise entanglement, with a goal of zero mortality	3a. Avoid loose ropes and / or nets (i.e. keep all nets weighted and taut). All lines should be under some degree of tension. Consider / investigate methods to stiffen lines with rigid or semi-rigid cores.	• Self-checking as part of marine mammal management plan, with up-to-date records made available to DOC and ES (SMF 3.2.3; OOAGMM table 2).
	3b. Ensure appropriate net design to minimise the likelihood of entanglement; completely enclose structures and use net mesh sizes less than 40 mm and predator-resistant materials (e.g. chewing).	• Self-checking as part of marine mammal management plan, with up-to-date records made available to DOC and ES (SMF 3.2.3; OOAGMM table 2).
	3c. Investigate methods to make lines more easily detectable in the water column, including type, colour, texture, reflectivity.	• Self-checking as part of marine mammal management plan, and encouraging or supporting specific research into effects with up-to-date records made available to DOC and ES (OOAGMM table 2).
	3d. Implement a regime for net inspection (semi-rigid or well-tensioned net material, no billowing), maintenance (e.g. repair holes) and replacement to minimise the potential for adverse effects.	• Self-checking as part of marine mammal management plan, with up-to-date records made available to DOC and ES (BAP 7.2 and 7.5; OOAGMM table 2).
	3e. Minimise the potential for loss of rubbish and debris from farms and recover lost material.	• Self-checking as part of marine mammal management plan, with up-to-date records made available to DOC and ES (SMF 3.4.1 & 3.4.2; OOAGMM table 2).
	3f. Record all entanglement incidents, regardless of outcome (e.g. injury or mortality; BAP 7.7; ASC 2.5.5. and 2.5.6).	• Records made available to DOC and ES. In case of a fatal incident, carcass(es) recovered, given to DOC, and steps taken in consultation with DOC to reduce the risk of future incidences (SMF 3.2.3 & 3.6.4; ASC 2.5.2; OOAGMM tables 2 & 3).

5. Conclusions

The purpose of this report was to describe the area of interest (AOI) in terms of the local and visiting marine mammals that use Stewart Island waters and the associated Southland / Foveaux Strait ecosystem. Available information on the various species was reviewed for any life-history dynamics that could make them more vulnerable to salmon farming activities or where proposal sites may overlap with any ecologically significant feeding, resting or breeding habitats. This, in turn, enabled the potential effects associated with the proposal on marine mammals to be assessed.

The marine mammals most likely to be affected by the proposed project include those species that frequent the AOI year-round or on a semi-regular basis. These species are New Zealand fur seals, New Zealand sea lions, bottlenose dolphins, southern right and humpback whales, and the occasional orca. Other species – including Hector's dolphin, dusky and common dolphins, several species of baleen whale, pilot whales, beaked whales and sperm whales – were also considered in this assessment because of their records of occurrence in the general area, their known species-specific sensitivities (e.g. underwater noise), and / or potential public and iwi concerns.

The northern coastal waters of Stewart Island are not currently considered significant habitats for any marine mammal species, with the possible exception of the southern right whale (the area may overlap with potential winter mating habitats), and to a lesser extent, the humpback whale (the area forms part of its northern migration corridor). Instead, these waters represent a small fraction of similar habitats available to those marine mammals that use the wider AOI region. However, it is important to note that several of the above listed species are nationally and / or internationally recognised as threatened or at-risk species that live in semi-isolated sub-populations or new breeding colonies and thus need to be considered in regard to Policy 11(a) of the NZCPS.

Based on the assumption that any of the relevant species may be present around the farms (regardless of season or migration period) at some point over the life of the consent, the overall effects of the Hananui farms are assessed as less than minor, provided the recommended management and mitigation actions are implemented.

6. Appendices

Appendix 1. Marine mammal literature resources

Only broadscale regional information is available for most marine mammals using the general Southland Region and area of interest (AOI). Some finer-scale studies have been undertaken out of Te Waewae Bay, Porpoise Bay and various areas around Stewart Island. The studies and databases used to make summaries and assessments of the various species discussed in this report are listed below:

- Department of Conservation opportunistic database and stranding record database (formerly maintained by the Museum of New Zealand Te Papa Tongarewa).
- National Aquatic Biodiversity Information System (NABIS).
- Scientific research through the Department of Conservation:
    - L Chilvers – several projects on New Zealand sea lions on Stewart Island and Aotearoa New Zealand's subantarctic islands
    - L Boren – several projects with New Zealand fur seals around the South Island.
- Scientific research through the University of Otago:
    - A Auge – PhD on New Zealand sea lions off Otago
    - E Slooten / S Dawson (and associated students) – various Hector's dolphin and bottlenose dolphin studies in Southland's coastal waters
    - T Brough – various bottlenose dolphin studies within Fiordland, Stewart Island and off Otago
    - C Lalas (and associated students) – New Zealand sea lions and New Zealand fur seals at Stewart Island, Otago and Aotearoa New Zealand's subantarctic islands.
- Scientific research through the University of Auckland:
    - EL Carroll – several projects on southern right whales around Aotearoa New Zealand's mainland and subantarctic islands.
- Scientific research through Texas A&M University (USA):
    - B Würsig (and associated students) – several dusky dolphin projects within Admiralty Bay, off Kaikōura and around the rest of the South Island.
- Scientific research through Cawthron Institute:
    - Hector's dolphin aerial surveys (D MacKenzie and D Clement 2011, 2019).
- Orca Research Trust – various publications by I Visser and sightings database.
- Berkenbusch K, Abraham ER, Torres L. 2013. New Zealand marine mammals and commercial fisheries. Wellington: Fisheries New Zealand. New Zealand Aquatic Environment and Biodiversity Report No. 119.
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