

18 August 2026

Attention: Rebecca Clarkson  
Aquaculture Direct Limited  
c/- 2a Alfred Street, Mayfield,  
Blenheim, 7201

SLR Project No.: 840.030190.00001

Dear Rebecca

**RE: Technical Advice, Marine Mammals - Marlborough Aquaculture**

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## **1.0 Background**

This letter pertains to the proposed establishment of several new marine farms that will be considered for development under the Marlborough Aquaculture Fast-track Application (**'the application'**). The application is seeking the development of six separate sites (**Figure 1**) for the following specific purposes:

- Hapuku Rock – Green lipped mussel (*Perna canaliculus*) nursery (two blocks, 28.0 ha total);
- Guards Bay – Green lipped mussel nursery (one block, 78.5 ha total);
- Pig Bay – Green lipped mussel nursery (one block, 90.2 ha total);
- Okuri Bay – Green lipped mussel nursery and production (two blocks, 27.9 ha total);
- Richmond Bay – Green lipped mussel production only (three blocks, 42.2 ha total); and
- Onapua Bay – New Zealand flat oyster (*Ostrea chilensis*) production (three blocks, 15.7 ha total).

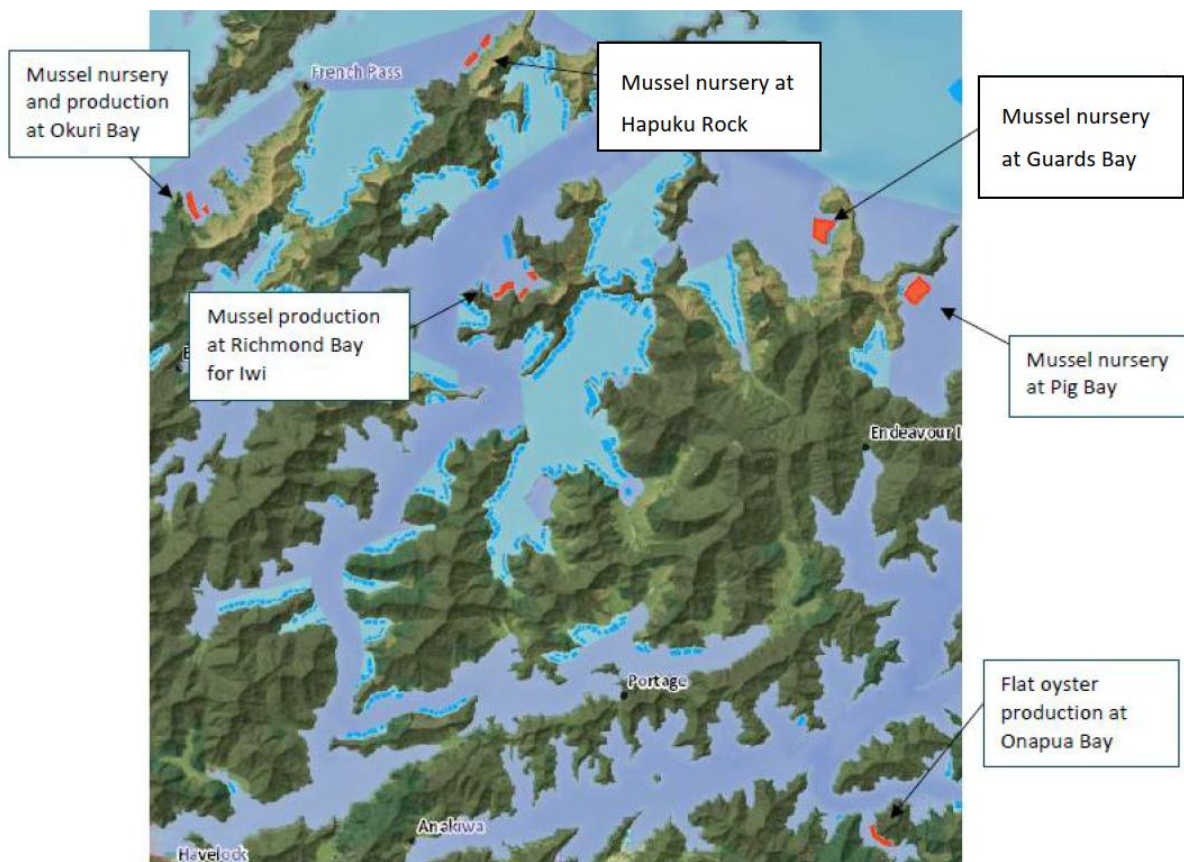
The potential effects of shellfish aquaculture on marine mammals have previously been reported by numerous authors (e.g. Lloyd, 2003; Keeley et al., 2009; Clement, 2013; MPI, 2013; Price et al., 2017; Wursig, 2020; Bath et al., 2023; Piwet et al., 2024 etc.). These studies provide both international and New Zealand specific examples of the following potential impacts of shellfish farming on marine mammals:

- Displacement from habitat;
- Entanglement;
- Behavioural modification;
- Underwater noise disturbance;
- Alterations to trophic pathways;
- Marine debris; and
- Boat strike.

This letter will focus on habitat displacement, which is recognised as the main impact of shellfish aquaculture to affect marine mammals in New Zealand and entanglement, which poses the only realistic risk of mortality associated with farm structures. For the purpose of the application, all six sites would be reliant on the subtidal presence of dropper ropes. Accordingly, this letter applies to all sites, and all cultivation species and purposes.

My focus herein is therefore to consider the impacts of displacement and entanglement of shellfish farming given its proposed development in the subtidal zone where it could overlap in distribution with coastal marine mammals.

**Figure 1: Locations of the proposed new marine farms**



## 2.0 Marine Mammal Displacement

Displacement, in this context, is the spatial exclusion of marine mammals from areas occupied by shellfish farms. Although displacement is not the only potential outcome from habitat modification (e.g. attraction is also possible as discussed in due course), displacement is considered to be the primary effect from inshore mussel farming on marine mammals both in New Zealand and globally (Lloyd, 2003; Würsig & Gailey, 2002; Clement, 2013; Bath et al., 2023) and can result in habitat loss in areas where marine mammal distributions overlap with marine farms. The ecological consequence of displacement depends on the significance of the affected habitat to marine mammal species.

While displacement from oyster farming in New Zealand has historically been irrelevant as oysters have traditionally been grown on fixed structures in the intertidal zone where overlap with marine mammal habitat is minimal, this application is to farm oysters subtidally by pinning them on to dropper ropes. These structures will be very similar to conventional mussel farm structures. For this reason, the discussion below is applicable to both mussel and oyster cultivation systems proposed.

Knowledge of marine mammal distribution is important in terms of predicting the species that could be subject to displacement, and how detrimental such displacement effects would be to the population. These predictions are typically underpinned by site-specific occurrence data that can originate from various data sources, e.g. the Department of Conservation (DOC) sightings and strandings data, habitat modelling, published and unpublished scientific literature and, in some instances, site-specific survey data.



For the application, I note that the only site for which a comprehensive assessment of marine mammal occurrence and effects has been done is Hapuku Rock. I prepared this assessment and it is included as SLR (2025) in the application; therefore, I do not consider the Hapuku Rock site specifically in this letter as no new information is available; hence my conclusions remain unchanged.

Equivalent assessments for the other proposed farm sites have not been undertaken to date, and this has been identified as a knowledge gap. However, while specific assessments are lacking, predictions about potential marine mammal displacement from the remaining sites is still possible on the basis that the marine mammals of Marlborough Sounds are relatively well studied, and reasonable assumptions can be made regarding potential marine mammal habitat use from this wealth of information.

**Table 1** outlines the information available in relation to marine mammal distribution and habitat use of the Marlborough Sounds.

**Table 1 Information of relevance to marine mammals in the Marlborough Sounds.**

| Species               | Spatial extent                                                                                       | Source/s                                    |
|-----------------------|------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Dusky dolphins        | Admiralty Bay                                                                                        | McFadden, 2003                              |
|                       | Queen Charlotte Sound, outer Pelorus Sound, greater Admiralty Bay area, Current Basin, and Kaikoura. | Markowitz, 2004<br>Markowitz et al., 2004   |
|                       | New Zealand wide                                                                                     | Würsig et al., 2007                         |
|                       | Admiralty Bay and Kaikoura                                                                           | Duprey, 2007                                |
|                       | Admiralty Bay and Current Basin                                                                      | Vaughn et al., 2007;<br>Vaughn et al., 2010 |
|                       | Admiralty Bay                                                                                        | Pearson, 2008;<br>Pearson et al., 2012      |
|                       | Admiralty Bay and Current Basin                                                                      | Srinivasan et al., 2012                     |
|                       | Admiralty Bay                                                                                        | Piwetz et al., 2013;<br>Piwetz et al., 2024 |
|                       | Admiralty Bay                                                                                        | Halliday., 2013                             |
|                       | Admiralty Bay                                                                                        | Clement & Halliday., 2014                   |
| Bottlenose dolphins   | Queen Charlotte Sound, Pelorus Sound, Admiralty Bay                                                  | Merrimen, 2007;<br>Merrimen et al., 2009    |
| New Zealand fur seals | Cape Farewell to Cape Campbell (including all of the Marlborough Sounds)                             | Taylor et al., 1995                         |
| Multiple species      | Marlborough region                                                                                   | Slooten et al., 2002                        |
|                       | Marlborough region                                                                                   | Davidson et al., 2011                       |
|                       | Admiralty Bay                                                                                        | Halliday, 2013                              |
|                       | Admiralty Bay                                                                                        | Clement & Elvines, 2015                     |
|                       | New Zealand wide                                                                                     | Stephenson et al., 2020                     |
|                       | New Zealand wide                                                                                     | MacKenzie et al., 2022                      |
|                       | Queen Charlotte Sound and Tory Channel                                                               | Cross, 2019                                 |
|                       | Outer Marlborough Sounds and Cook Strait                                                             | Clement & Elvines, 2019                     |
|                       | Outer Marlborough Sounds and Cook Strait                                                             | Clement, 2021                               |
|                       | Marlborough Sounds and the Blue Endeavour Salmon Farm site off Cape Lambert.                         | SLR, 2025a                                  |
| Beaked whales         | Cook Strait and Queen Charlotte Sound                                                                | Goetz & Hupman, 2017                        |



Based on the information available from these (and other) sources, I make the following observations about the general distribution of key species that are known to frequent the Marlborough Sounds and immediate surrounds, and how that is likely to relate to displacement potential from the proposed farms. Note that marine mammal distributional knowledge for Cook Strait is also of relevance to those proposed farms that would be located in the outer Sounds (i.e. Hapuku Rock, Guards Bay and Pig Bay).

- New Zealand fur seals

This species occurs widely throughout the Marlborough Sounds (and Cook Strait), with breeding colonies located on the Trio Islands, Stephen's Island, and D'Urville Island. Numerous established haul-out sites occur, including locations in the outer Sounds (e.g. Cape Jackson, and the Chetwode Islands), in the Current Basin (e.g. southern D'Urville Island, Jag Rocks, Bonne Point, Stewart Island, Clayface Point, Garden Point, and Hamilton Island), and locations in inner Pelorus Sound (e.g. Maud Island, and Ngawhakawhiti Bay) (Taylor et al., 1995). Fur seal presence can therefore be assumed on a regular basis at each of the proposed farm sites.

- Bottlenose dolphins

A semi-resident population of bottlenose dolphins is known from the Marlborough Sounds with an estimated abundance of 211 (% CI: 195 – 232) individuals (Merrimen et al., 2009). This species ranges widely throughout the entire sounds complex (890 km<sup>2</sup>) and has a year-round presence throughout this broad distribution (Merrimen et al., 2009). Further, their distribution probably also extends along the west coast of the South Island (see Halliday, 2013), and bottlenose dolphins are well documented using Cook Strait (Clement & Elvines, 2019; DOC, 2025). Therefore, each proposed farm site should be considered as a very small part of a much larger home range for this population.

- Dusky dolphins

Admiralty Bay provides important seasonal foraging habitat for this species (Markowitz et al., 2004; Duprey, 2007; Markowitz et al., 2010; Davidson et al., 2011; Pearson et al., 2012); where individuals that breed in summer in deep waters off Kaikoura (c. 275 km away), and elsewhere, travel to the bay from mid-autumn to spring (Clement & Halliday, 2014). In Admiralty Bay, residency times varied slightly with season (from between 3 and 27 days in autumn, and between 2 and 18 days in spring), but in general individual dolphins only remain in the bay for a few days to a few weeks at a time (Clement & Halliday, 2014). Dolphins that visit Admiralty Bay are part of a much wider and larger population, extending at least down the east coast of the South Island. Harlin et al. (2003) estimated the New Zealand population of dusky dolphins was 15,000-17,000 individuals. Dusky dolphins also occur in mid-outer Queen Charlotte Sound during winter and spring (Cross, 2019) and are relatively common in Pelorus Sound and Cook Strait (DOC, 2025). Therefore, each proposed farm site should be considered as a very small part of a much larger home range for this population.

- Common dolphins

Occurring around most of the New Zealand coastline, common dolphins here comprise two genetic sub-populations: one on the west coast (which is linked with Tasmania) and one on the east coast (Barcelo et al., 2021). While total abundance is unknown it is likely to be substantial (Berkenbusch et al., 2013). Clement and Halliday (2014) provide evidence that Admiralty Bay (and the wider Marlborough Sounds) may represent important seasonal habitat, where numbers of common dolphins in the sounds have increased since 2005 (Duprey, 2007; Clement & Halliday, 2014; Piwetz et al., 2024). Common dolphins are the most frequently



encountered cetacean in the wider Cook Strait region (Torres, 2012; Clement & Elvines, 2019) and habitat modelling suggests high habitat suitability (Stephenson et al., 2020). Within the Marlborough Sounds, frequency of occurrence is most regular in Admiralty Bay, although sightings of this species also occur in Queen Charlotte Sound (Cross, 2019), Pelorus Sound, and elsewhere throughout the Sounds complex (DOC, 2025).

- Killer whales

Killer whales are commonly seen in the Marlborough Sounds year-round; however, the highest number of sightings occurs in summer (Slooten et al., 2002) with substantially fewer sightings in winter and spring (Pearson, 2009). While the majority of sightings occur in Queen Charlotte Sound and Port Underwood, sightings in nearly all parts of the Sounds have been reported (DOC, 2025). New Zealand's coastal killer whale population is small (65 – 167 individuals; Visser, 2006) and comprised of three sub-populations. Two of which, the South Island only sub-population, or the sub-population that occurs around both the North and South Islands (Visser, 2000) are of relevance to the application. Killer whales travel an average of 100 – 150 km per day (Visser, 2000). Therefore, each proposed farm site should be considered as a very small part of a much larger home range for this population.

- Hector's Dolphins

This species occurs regularly in Queen Charlotte Sound, with a widespread distribution throughout the sound in summer, autumn and spring, but a more restricted distribution to the central sound (and lower densities) in winter (Cross, 2019). While Queen Charlotte Sound is considered their core distribution, they do occasionally occur throughout other parts of the Marlborough Sounds (including Admiralty Bay and Pelorus Sound) (DOC, 2025). This is the least likely delphinid species to occur around the proposed farms. Hector's dolphins in the Marlborough Sounds belong to the large East Coast South Island population for this species, with the overall distribution occurring from Farewell Spit to Nugget Point (MacKenzie & Clement, 2014).

- Southern right whales

Historically this species bred around mainland New Zealand during winter breeding (Bannister, 1986; Dawbin, 1986); however, commercial whaling reduced numbers to near extinction (Gaskin, 1963). The New Zealand population is now recovering (Carroll et al., 2015) with a slow recolonisation of breeding range around the mainland (Patenaude, 2003; Carroll et al., 2014; Carroll et al., 2015). While the Marlborough Sounds are not specifically recognised as a hotspot for southern right whales (Carroll et al., 2014), they do enter the Sounds as occasional visitors (DOC, 2025); hence could infrequently occur in the vicinity of any of the proposed farm locations.

- Humpback whales

Cook Strait is a recognised part of primary migration corridor during the northward migration of humpback whales past New Zealand. During winter surveys in Cook Strait (2004 – 2015), 659 whales were observed (Gibbs et al., 2017). While relatively few sightings (n = 5) of humpback whales have been reported by DOC inside Admiralty Bay, their occasional seasonal presence here should be expected (SLR, 2025). When considering the Marlborough Sounds in its entirety, most sightings of humpback whales occur in the outer Sounds and beyond in Cook Strait, with only occasional sightings reported from locations of the inner Sounds (DOC, 2025). On this basis, this species could occur in the vicinity of any of the proposed farm



locations, but frequency of such events is anticipated to be very low (particularly for locations in the inner Sounds).

- Beaked whales

Several species of beaked whale have been reported from the wider region in both the DOC strandings and sightings data, and via acoustic detection (Goetz & Hupman, 2017) (e.g. Arnoux's beaked whale, Cuvier's beaked whale, and Gray's beaked whales). Cook Strait (particularly the deep eastern reaches) are considered a hotspot for beaked whales (IUCN MMPATF, 2025). On rare occasions live beaked whale sightings have been made in Marlborough Sounds; however, these species are not routinely expected around any of the proposed farm locations given their preference for deeper pelagic waters.

- Other species

While other species (e.g. blue whales, pilot whales, minke whales, pygmy right whales, sei whales, southern right whale dolphins, and leopard seals) could occur as rare visitors from time to time, generally they remain outside of the Marlborough Sounds in deeper waters of Cook Strait (SLR, 2025); hence, they are not considered to be at risk from marine farms in the Marlborough Sounds (including any of the proposed new farms).

In summary, site-specific assessments are ideal for predicting fine-scale habitat use; however, there is sufficient available information to enable a good understanding of the marine mammal species that are likely to occur in and around the Marlborough Sounds. On this basis, robust inferences about potential effects can be made. It is undeniable that during marine farm planning, the gold standard is pre-application site-specific monitoring (e.g. acoustic or visual surveys) for marine mammals to inform the assessment of effects. While this is the best possible approach, as discussed above, information about marine mammal use of the Marlborough Sounds is plentiful; hence, I am of the opinion that sufficient information exists in lieu of such monitoring to predict which species are most likely to be affected by any new displacement effects associated with the proposed farm sites.

As stated previously, displacement is the primary effect from inshore mussel farming on marine mammals in New Zealand (Lloyd, 2003; Clement, 2013), with displacement being well recognised for some species, e.g. dusky dolphins (McFadden, 2003; Duprey, 2007; Markowitz et al., 2004; Pearson, 2009; Cross, 2019) and Hector's dolphins (Valdez Hernandez et al., 2024). However, for other species, their displacement from or use of marine farms appears to be inconsistent, e.g. killer whales (Visser, 2007; Visser, 2020), and bottlenose dolphins (Duprey, 2007; Clement, 2013; Diaz-Lopez & Methion, 2017; Cross, 2019). These findings are fully discussed in my Hapuku Rock Report (SLR, 2025).

Given this apparent variability (between species and locations) in whether displacement from farms is expected, the most conservative approach would be to assume that displacement will occur from the confined areas that would be occupied by the new farm structures of the application; noting that this represents a 7.6% increase in the total area of mussel farms in the Marlborough Sounds (where the existing area occupied is approximately 3,700 ha, and the new farms would constitute an additional 280 ha: pers. comm. R. Clarkson, Aquaculture Direct Ltd).

There is, however, no evidence to suggest that the presence of farms alone specifically causes displacement on a broader scale (i.e. wider scale displacement is typically the result of multiple factors that interact in a complex manner, e.g. Srinivasan et al., 2012). Indeed there is emerging evidence that some species preferentially use habitat adjacent to mussel farms. For example, and in regard of Admiralty Bay, Piwetz et al. (2024) states that "habitat patches in proximity of mussel farms appeared to be an attractant for foraging dusky dolphins", and Pearson (2008) states that "dusky dolphins appeared to be using areas near,



but not in, mussel farms for foraging". Given the large home ranges of marine mammals, it therefore seems unlikely that localised displacement from any discrete area occupied by shellfish farms would result in population levels effects for any species with an identified potential presence.

### 3.0 Marine Mammal Entanglement

Longline mussel farms are comprised of 1) a horizontal surface 'backbone' line that is supported by regularly spaced floats along its length and secured to the seafloor at either end by diagonal anchor lines, and 2) suspended (typically looped) droppers that extend vertically from the backbone line to hold the crop (for a production farm) or collect/grow spat for a nursery farm. The application proposes similar structures for oyster cultivation, and for this reason the information pertaining to longline mussel farms is relevant to all proposed sites. While entanglement is theoretically possible with all of the line components of longline farm configurations, lines that are slack in the water column or at the surface pose the greatest risk of entanglement (Lloyd, 2003; Keeley et al., 2009; Clement, 2013; Bath et al., 2023). The consequences of entanglement include injury and/or mortality; and is therefore of primary concern. Mortality could be immediate (via drowning of animals that cannot break free from submerged lines) or delayed (via severe internal injuries sustained during the struggle to break free or the ongoing burden of dragging gear that breaks away from the farm). However, despite an extended history of longline mussel farming in New Zealand (c. 50 years) very few marine mammal entanglements have been reported.

**Table 2** summarises the known marine mammal entanglements in shellfish aquaculture structures in New Zealand. In total, only five incidents have been recorded (all involving baleen whales and all associated with mussel cultivation or spat catching farms), and for three of these it is probable that the whale was already dead before it became entangled. In contrast, 16 fatalities in finfish farms are reported over the same period.

**Table 2 Marine mammal entanglements in New Zealand shellfish farms in the last 50 years.**

| Culture Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Species Entangled                 | Number of Fatal Entanglements |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------|
| Mussel Spat Catching Farm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Bryde's whale (both Hauraki Gulf) | 2^                            |
| Mussel Spat Catching Farm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Humpback whale (Firth of Thames)  | 1*                            |
| Mussel Cultivation Farm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Sei whale (Port Ligar)            | 1*                            |
| Mussel Cultivation Farm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Minke whale (Admiralty Bay)       | 1*                            |
| <b>Notes:</b> <ul style="list-style-type: none"> <li>- Incidents marked with an asterisk denote animals found in an advanced state of decomposition and likely dead before they became entangled (A. Baxter, DOC, pers. comm. 2019; NZ Herald, 2015; M. Mandeno, Marine Farming Association, pers. comm. 2026), and for incidents marked with a ^, details are uncertain.</li> <li>- While the DOC Incident Database reports two entangled whales in Port Ligar (a day apart), this is likely a data entry replication, with two incident reports filed for the same animal.</li> </ul> |                                   |                               |

In addition to the events listed in **Table 2**, a juvenile humpback whale was entangled in a mussel farm in Marlborough in 2011; noting that this whale already had a craypot buoy tangled around its tail and had been marked with buoys by DOC the day before to assist with tracking the whale's movements. It was freed alive by marine farm workers (Stuff, 2011).

Entanglement rates have remained low despite the overall growth in the aquaculture sector through time (**Table 3**). Indeed, when the area of marine farms in New Zealand is considered alongside the contrasting low number of marine mammal entanglement incidents it is clear that the overall risk of entanglement of marine mammals in mussel farms is low.



**Table 3 Consented space for marine farming in New Zealand, 2000 - 2026.**

| Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Space (approx.)                        | Reference/s                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------|
| 2000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3,000 ha (occupied).                   | Lloyd (2003). <sup>a</sup> and Waitangi Tribunal WAI 953 Report (2002). <sup>b</sup> |
| 2007                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 13,000 ha consented, (5,800 occupied). | Industry estimate provided by Aquaculture Direct Ltd                                 |
| 2016                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15,107 ha (consented).                 | NZIER Preliminary Economic Analysis Report for MPI (2017). <sup>c</sup>              |
| 2020                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 20,000 ha (allocated)                  | Stenton-Dozy et al., (2021). <sup>d</sup>                                            |
| 2026                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 19,382 (consented)                     | Industry estimate provided by Aquaculture Direct Ltd                                 |
| a) <a href="https://www.doc.govt.nz/Documents/science-and-technical/mussel-farms01.pdf">https://www.doc.govt.nz/Documents/science-and-technical/mussel-farms01.pdf</a><br>b) <a href="https://forms.justice.govt.nz/search/Documents/WT/WT_DOC_68004143/Ahu%20Moana.pdf">https://forms.justice.govt.nz/search/Documents/WT/WT_DOC_68004143/Ahu%20Moana.pdf</a><br>c) <a href="https://www.mpi.govt.nz/dmsdocument/18358/direct">https://www.mpi.govt.nz/dmsdocument/18358/direct</a><br>d) <a href="https://www.tandfonline.com/doi/full/10.1080/00288330.2020.1752266">https://www.tandfonline.com/doi/full/10.1080/00288330.2020.1752266</a> |                                        |                                                                                      |

Low marine mammal entanglement rates have also been reported internationally, where only a small number of marine mammal fatalities have been attributed to mussel farming structures. International incidents as summarised by Bath et al. (2023) include:

- **Mussel spat line entanglements (six events):** A humpback whale calf was cut free after becoming entangled in a mussel spat line in Western Australia in 2005. A harbour porpoise and a juvenile humpback whale both reportedly died after becoming entangled in single dropper spat collecting lines in Iceland in 1998 and 2010 respectively. In Argentina, a juvenile southern right whale was entangled in a suspected spat line in 2011. A young North Pacific right whale was released after becoming entangled in a mussel farm spat line in South Korean waters in 2015, and a Bryde's whale released itself after entanglement in a spat line in South Africa in 2019; and
- **Mussel cultivation line entanglements (one event):** In 2012 a minke whale reportedly released itself after entanglement in the backbone line (or head rope) and droppers of a longline mussel farm.

While there is no single, well-established statistic for the total global production occurs in intense localised clusters primarily in China, Spain, Chile and New Zealand. Mussel farms are known to overlap with marine mammal habitat in all of these locations. In Spain, bottlenose dolphins have a routine presence in the vicinity of mussel farms (Diaz-Lopez, & Methion, 2017), while in Chile the distribution of Peale's dolphin overlaps directly with areas used extensively for mussel cultivation (Heinrich et al., 2006). In China, the spatial overlap between marine mammals and farms is poorly quantified but is thought to include Indo-Pacific humpback dolphin, finless porpoise, and bottlenose dolphin (Yuan et al., 2025). In addition, it is not uncommon for humpback whales to be observed in and around mussel farms in Iceland (Young, 2015). Given the concentrated presence of mussel longline structures in core habitat of several coastal cetaceans and migratory corridors for some baleen whales, the low incidence of entanglement events is notable; however reporting requirements and entanglement detection rates vary between countries (Bath et al., 2023).

Factors that influence entanglement risk have been identified as follows:

- **Echolocation:** species that echolocate can more readily detect obstacles in the water column (MPI, 2013; Bath et al., 2023);
- **Behaviour:** inquisitive animals will be more at risk, as will species that have a propensity to roll (MPI, 2013; Bath et al., 2023);



- Morphology and size: large baleen whales with large fins/flukes and gaping mouths may be more at risk from entanglement in structures (MPI, 2013; Bath et al., 2023);
- Agility: smaller agile species may be at less risk (MPI, 2013; Bath et al., 2023); and
- Age: young animals tend to be more at risk, on account of their inexperience with potential threats and increased curiosity (Storlund et al., 2024).

In terms of operational factors that influence entanglement risk, spat lines present the greatest risk of entanglement as they are under less tension than cultivation lines which are taut under the growing product load (MPI, 2013; Price et al., 2017); with tension increasing as the crop matures. In comparison, spat lines (collecting and holding) are comparatively light weight and under less tension. All but one of the relevant examples of mussel farm fatalities listed in **Table 2** are attributable to spat collecting lines. This operational factor is thought to be of greatest relevance to medium-large whales (MPI, 2013; Young, 2015), a sentiment echoed by DOC (2025a). It is noteworthy that since the late 1990s weighted ropes for spat catching have been standard practice in New Zealand (pers. comm. S. McGhie, Gascoigne Wicks). This practice serves to reduce the entanglement risk associated with spat lines. General farm maintenance and up-keep also influences entanglement risk, where the risk will be lowest in farms that are regularly inspected and maintained.

Overall, entanglement of marine mammals in mussel farms is low risk, where methods to minimise this risk include:

- Avoiding the placement of mussel farms in areas of important marine mammal habitat (Clement, 2013; MPI, 2013), noting that my discussion on displacement below considers the proposed new farm sites in relation to important marine mammal habitat;
- The adoption of good farm management practices, i.e. all lines to be kept tensioned, with no loose ropes trailing at the surface or in the water column (Clement, 2013; MPI, 2013). This is a requirement that should be included as a consent condition with inspection scheduling outlined in detail in a Marine Mammal Management Plan (**MMMP**). This requirement also generally aligns with the A+ New Zealand Sustainable Aquaculture Framework that I understand the farm operators will be members of.
- Minimising the number of vertical lines in the water column, as recommended in the most recent global review of protected species interactions with marine aquaculture by Bath et al. (2023). While I agree that fewer total lines in the water would reduce entanglement risk, reduced line density (resulting in lower production) may actually increase the demand for new sites and spread the entanglement risk over a larger area.



## 4.0 Marine Mammal Management Plan

I recommend that a MMMP be developed to outline the management measures that will be implemented to manage the effects of the proposed new farms on marine mammals. I note that the Department of Conservation (**DOC**) shares my views in this regard.

In the last five years I have drafted three MMMPs for various coastal projects (i.e. spat farm in Mercury Bay, port development in Tauranga, sand extraction in Bream Bay) and have reviewed a further six plans (i.e. salmon farm in Cook Strait, spat farm off Raglan, finfish farm in Firth of Thames, wharf redevelopment in Akaroa Harbour, marina refurbishment in Lyttleton Harbour, and pipe line construction in Otago harbour) for clients or local authorities during consent hearings or application pre-lodgement proceedings. While these plans were not all specific to mussel farms, this previous experience means that I am familiar with MMMP development and therefore I endorse their merit in managing potential effects of coastal development on marine mammals. Accordingly, I have been engaged to draft a MMMP for this application, noting that a single over-riding MMMP for all six proposed new sites is preferred given the commonalities between the potential risks the marine farms pose to marine mammals (e.g. entanglement) and the associated strategies to manage them. Where variances are identified between sites, site-specific annexes will be developed (e.g. Hapuku Rock).

For aquaculture projects, MMMPs typically contain the following components:

- General protocols – e.g. compliance with the Marine Mammal Protection Act 1978, the Marine Mammal Protection Regulations 1992, and any company practices (e.g. A+ New Zealand Sustainable Aquaculture Framework);
- Operational protocols to avoid marine mammal entanglement – e.g. requirements for marine farms structures to be well maintained and tensioned, and the schedule for periodic maintenance inspections and necessary repairs;
- Live marine mammal response – e.g. the procedures to follow in the event of a live animal becoming entangled in any farm structure or injured by vessel strike;
- Dead marine mammal response – e.g. the procedures to be followed in the event of a dead marine mammal being identified within the marine farm boundaries;
- Safe vessel operations around marine mammals – e.g. the procedures to be followed by farm vessel manoeuvring in the vicinity of marine mammals;
- Noise emissions around marine mammals – e.g. the procedures to be followed by farm workers in terms of noise generation when marine mammals are present around the marine farms;
- Marine mammal monitoring programme – e.g. the procedures to be following in terms of making routine observations for marine mammals both at the marine farm sites and during transit to and from the farm locations (either pre- or post-construction depending on individual site sensitivities).
- Waste management protocols – e.g. the debris management requirements to avoid entanglement of marine mammals or their ingestion of waste material generated by the marine farms;
- Recording and reporting protocols – e.g. the requirements to collect marine mammal sightings (systematic or opportunistic) as deemed necessary based on individual site sensitivities, and who and when these data will be reported to;
- Staff training – e.g. the training requirements that staff will need to undergo to facilitate a basic level of understanding of the MMMP requirements as dictated by their specific role in farm operations; and



- Process for MMMP certification and review.

In terms of monitoring for marine mammals, the only site that I recommend additional pre-construction (baseline) monitoring for is the Hapuku Rock site (refer SLR, 2025) where Admiralty Bay is recognised as an important seasonal foraging site for dusky dolphins and common dolphins. The available information suggests there are no known marine mammal sensitivities at the other proposed sites.

Regards,

**SLR Consulting New Zealand**



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Email: [REDACTED]



## 5.0 References

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