Memorandum

For Your Information

To:	Rebecca Robertson, Southern Land and Water Planning.
cc:	Nick Ward, Team Leader Policy and Planning, Environment Southland
From:	Ash Rabel, Team Leader Aquatic Ecosystems, Environment Southland
Date:	Friday, 7 July 2023
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Subject:	***Coastal Plan Change 5 - further technical information***

Message:

This memo is to address questions posed by Rebecca Roberston working on coastal plan change 5. It is understood that it is being used for clarification around submitted questions regarding previously supplied technical advice.

Let me know your qualifications and experience?
I hold a Bachelor of Science in biological sciences from the University of Canterbury, a Post Graduate Diploma in Zoology (Distinction) from the University of Canterbury, and a Master of Science in Zoology from the University of Canterbury.

I have three and half years' experience in application of science for environmental management, and are currently the Team Leader of the Aquatic Ecosystems science team within Environment Southland.

I have research experience in the field of Ecophysiology in marine species, and assisted in tertiary level teaching of animal Behavioural Sciences and Environmental Animal Physiology.

I have had low level involvement with the coastal plan change process, with my prior memo being the first technical advice sort.

Advice whether based on the research available to date you consider the 2007 Marine Mammal (and other Wildlife) Code of Practice Milford Sound / Piopiotahi or the 2008 Marine Mammal (and other Wildlife) Code of Management Doubtful Sound/Patea and their implementation the potential for adverse effects to occur on Marine Mammals?

Due to the lack of information on marine mammals of species that are not bottlenose dolphins, my responses will be limited to this species unless otherwise stated.

The code of practices mentioned above have two main components; voluntary measures for tour vessel behaviour around marine mammals and the establishment of dolphin protection zones (DPZs). These measures

were intended to reduce physical interactions between marine mammals and vessels as well as provide protection of critical habitats for bottlenose dolphins within Te Moano-o-Atawhenua Fiordland Marine Area.

The most recent survey results, 15 years after the implementation of these management codes, indicate that bottlenose dolphin populations have stabilised in Patea Doubtful and Tamatea Dusky sounds (Crowe, 2021, Bennington et al., 2022). Pipiotahi Milford sound does not have a permanent monitoring programme so I cannot comment on the populations there. Given that populations have stabilised in the years since the advent of the codes, it would indicate the scale of adverse effects from direct vessel-dolphin interaction has reduced, as reviewed by Guerra & Dawson (2016) and Fumegalli et al. (2021). However, other impacts from anthropogenic noise (as shown in Lusseaus many works), the impact of fisheries on key prey species, and conjecture over how applicable the DPZs are to overall bottlenose behaviour (Bennington, 2022) suggest that there is still potential for adverse effects from surface water activities on marine mammals in Te Moana-o-Atawhenua Fiordland.

Do you consider there is a lack evidence that Fiordland CSWA are adversely impacting on marine mammals within the Fiordland CE or could impact on marine mammals?

There are a number of scientific papers giving evidence that vessel presence can cause stress response behaviours in bottlenose dolphins within Fiordland and that there is likely masking of social communications from motorised vessel noise (e.g. Lusseau, 2003a; Lusseau, 2003b; Lusseau, 2004; Lusseau, 2005; Lusseau, 2006) Research is otherwise limited for other marine mammal species in Fiordland, e.g. Lalas & Bradshaw (2001). The dolphin studies show that bottlenose dolphins are changing their behaviour before vessels are visible in Tamatea Doubtful and Patea Dusky fjords depending on the vessel and ambient sound (Lusseau, 2003b) as well as shifts in general ecology (Bennington et al., 2020). Benningtion et al., (2020) focuses more on the importance of ecosystem health for dolphin survival and includes discussions around other surface water activities including recreational fisheries potential impacts on dolphins within Tamatea Doubtful and Patea Dusky sounds. Lusseau's papers, on the other hand, explore more direct impacts of surface water activities and at what distance vessels engender behavioural shifts, and may even create non-natural selection pressures (e.g Lussea & Bjeder, 2007). As of writing this memo, there was no published work (national or international) I could find suggesting that human activities around dolphins do not have impacts, on this taxa, that are not adverse.

Your thoughts regarding The Dawson, Boisseau, Rayment and Lusseau 2005 Quantitative Acoustic Study of the Fiordland Underwater Environment?

The paper is an interesting exploration of sounds in Fiordland, but it does have its limitations, due in part to budget and scope of the work (as noted by the authors), as well as its age. Given that motor vessel type and numbers in the fiords have changed (FMG 2020), there would need to be further work to better understand whether and to what extent the acoustic environment of the fiords have changed.

Having noted the limitations of this study, there is still key information worth highlighting. The foremost of this is the theoretical propagation distances of individual motor vessels before their sound decays to ambient levels. These distances ranged from 0.2 – 4.9km in the noisiest ambient environment, to 1.0 – 9.0km in the quietest ambient environment, indicating that vessel noise is not a close range phenomena. The authors note these propagation distances are quite high due in part to a quiet environment and noisy boats, but they are approximations due to a number of uncertainties. However, in this same paper the authors clarify that vessels are "undoubtedly audible to dolphins over ranges of many kilometre, even on windy days [when ambient sound will be higher]". Given that this paper and other work by Lusseau and colleagues indicate that the dolphins shift their behaviour in the presence of vessel noise, it is clear (and observed by Dawson et al.) that motor vessels will have an impact beyond visible distance in the fiords. It is worth noting this will be complicated by both the actual intensity and frequency of vessel noise, as well the location of both dolphin and vessel within the fiord complex, as touched on in this paper.

Your first memo referred to a number of studies regarding vessel effects on marine mammals. Can you please advise where the studies were completed for the research, you referred to in your memo?

Given the specificity of location from the original questions, the majority of the references were spatially limited to Te Moana-o-Atwhenua Fiordland unless otherwise stated in the original memo. However, for the final question regarding other locations and species (i.e. the wider environment question) I had items from around Aotearoa New Zealand as well as the rest of the globe but limited it for brevity. If more information for marine

mammal species in other locations is requested I can supply a longer review of the current state of knowledge, noting that there are pieces of work in this same vein available in academic journals. Greater review of wider work would include greater information from locations within Aotearoa such the Bay of Islands (as Commissionaire McGarry mentioned) the Hauraki Gulf, Akaroa, rest of Banks Peninsula, Otago, and bits of other coastal regions. There is also a large amount of global research in this space, with applicable work being carried out around the Americas, Europe, and Asia.

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