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Attention: Emma Deason

Potential effects on seabirds of proposed longline aquaculture projects, Marlborough Sounds

Introduction

A consortium of marine farmers has lodged a Fast Track application for six separate aquaculture proposals in the Marlborough Sounds. Five of these are longline mussel nursery and/or production farms, located at Okuri Bay, Tasman Bay (28 ha), Hapuku Rock, Admiralty Bay (29 ha), Richmond Bay, Pelorus Sound (40 ha), Guards Bay (77 ha), and Pig Bay, Port Gore (90 ha). A sixth proposed farm is for flat oyster production at Onapua Bay, off Tory Channel (16 ha).

The potential effects of mussel farming on kawau pāteketeki | king shag (Threatened-Nationally Endangered) were the subject of considerable debate for many years. The species has a historically small, fluctuating population, restricted to the Marlborough Sounds. The debate was a catalyst for a wave of scientific research that began in approximately 2018 that has provided critical data on the interactions of king shags and mussel farms, but also a much more informed understanding of the relative impact of different threats to this species.

I have been asked by the consortium to provide an overview of the seabirds of the Marlborough Sounds, their interactions with longline marine farms, and the potential effects of the proposed nursery and production farms on seabirds, particularly king shag. My specific expertise lies with the effects of mussel farms and salmon farms on seabirds, but I will address the proposed oyster farm in the wider context.

Code of Conduct

In preparing this advice, I confirm that the statements made within it are based on my qualifications and experience and are within my area of expertise. I am not aware of any material facts which might alter or detract from these findings. Though acknowledging the application is not before the Environment Court, I have read and agree to comply with the Code of Conduct for Expert Witnesses as set out in the Environment Court Consolidated Practice Note 2023. Where I rely on the evidence or opinions of others in these documents, my statements clearly acknowledge this.

Seabirds of the Marlborough Sounds

An analysis of eBird records from the wider Marlborough Sounds indicates the presence of at least 40 species of seabird (a table of species is attached as an Appendix to this letter). For those species with breeding populations in New Zealand waters, all except two are At Risk or Nationally Threatened. Hundreds of seabird colonies in the Marlborough Sounds (kororā, petrel, prion and shearwater

species, gannets, white-fronted terns, four shag species, and red-billed gull) have been mapped in detail¹.

Many of the petrel and shearwater species, and particularly the albatrosses, rarely enter the Sounds. In general, petrels and shearwaters will forage within the Sounds but are much more common in the open ocean. The main exception is pakahā | fluttering shearwater (At Risk-Relict), which are commonly observed within the inner Sounds. Kororā | blue penguin (At Risk-Declining) breed throughout the Sounds. Takapū | Australasian gannet (Not Threatened) nest in two colonies, one in the inner Pelorus Sound, and one near the entrance to Queen Charlotte Sound. Four species of shag breed in the Marlborough Sounds, and a fifth forages in the Sounds. All are Threatened or At Risk. King shag is the most threatened of these and only breeds in the Marlborough Sounds. Tarāpunga | red-billed gull (At Risk-Declining) and tara | white-fronted tern (At Risk-Declining) also have breeding colonies in the Marlborough Sounds. Karoro | black-backed gull (Not Threatened) nests and forages throughout. Other species such as tarāpuka | black-billed gull (At Risk-Declining) and tarāpirohe | black-fronted tern (Threatened-Nationally Endangered) visit out of the breeding season.

Longline mussel farms as bird habitats

A commonly observed sight at mussel farms is the presence of birds roosting on buoys. The buoys provide a safe place to roost, inaccessible to terrestrial predators, and are situated within foraging habitats. But do the farms themselves provide foraging habitat for birds?

Mussel farms have been shown to support similar rates of recruitment of a comparable suite of fish species², and a greater abundance and diversity of fish species^{3,4}, than adjacent non-farmed habitats. Benthic biodiversity and structural complexity of habitats beneath mussel farms have been summarised in detail⁵. It could be expected then that mussel farms have the potential to provide a food source for a range of bird species.

To examine this, a paired study of eight mussel farms and adjacent non-farmed habitats in the Marlborough Sounds was undertaken to assess king shag and other bird species use of mussel farms. Thirteen king shags were observed in total at six of the eight mussel farms; five birds only roosted, four only foraged, and four both roosted and foraged. A king shag was observed foraging in a mussel farm alongside two boats undertaking farm maintenance, and another king shag was observed foraging next to a farm while harvesting was taking place. King shags were observed bringing flatfish (their primary dietary item) to the surface within mussel farms.

The study also found that, including king shag, 11 species of birds used the mussel farms, eight of which foraged within the farms, diving, surface feeding, or feeding on detritus on ropes: king shag,

¹ McClellan R. 2019: Potential effects on seabirds of open ocean fish farming, Cook Strait. *Wildland Consultants Contract Report No. 4594*. Prepared for New Zealand King Salmon Ltd. Maps are available online as part of the resource consent application for 'Blue Endeavour – Open Ocean Salmon Farm', consent number U190438, Application document (Part 2 of 4).

² Underwood L.H. and Jeffs A.G. 2023: Settlement and recruitment of fish in mussel farms. *Aquaculture Environment Interactions* 15: 85-100.

³ McClellan R., Reid A., Bycroft C., Smith D. and Cameron C. 2020: Pilot study on the use of mussel farms in Pelorus Sound | Te Hoiere by king shag. *Wildland Consultants Contract Report No. 5074*. Prepared for Marine Farming Association Inc. and Seafood Innovations Ltd. 61 p.

⁴ Grange K. 2002: The effects of mussel farms on benthic habitats and fisheries resources within and outside marine farms, Pelorus Sound. *NIWA Client Report No. NEL2002-603*. 28 p.

⁵ Stenton-Dozey J. and Broekhuizen N. 2019: Provision of ecological and ecosystem services by mussel farming in the Marlborough Sounds. *NIWA Client Report: 2019020CH*. 141p.

kāruhiruhi | pied shag (At Risk-Recovering), kawaupaka | little shag (At Risk-Relict), kawau tiktiki | spotted shag (Threatened-Nationally Vulnerable), red-billed gull, black-backed gull, tōrea pango | variable oystercatcher (At Risk-Recovering), pūtangitangi | paradise shelduck (Not Threatened). A ninth species, taranui | Caspian tern (Threatened-Nationally Vulnerable), used buoys for roosting and foraged adjacent to the farms. Control sites were generally unused or used by single birds, whereas up to 23 birds per 15-minute observation interval were recorded at mussel farms. Pied shags, black-backed gulls and red-billed gulls were observed following harvesting boats.

Concurrent with the observational study, the foraging of king shags was investigated using GPS devices⁶. In all, 43 birds were tracked from four different colonies: Duffers Reef and Tawhitinui (Pelorus Sound), Kuru Pongi | North Trios (near Durville Island), and The Twins (Queen Charlotte Sound). Twenty-three of the 26 Pelorus Sound birds foraged within farms, whereas only one bird from the other two colonies used farms for foraging, most likely because there were few mussel farms within foraging range. Of those Pelorus Sound birds that used mussel farms, an average of 39% of total foraging time was spent within the farms. One king shag foraged almost exclusively within 13 separate mussel farms.

Petrels, shearwaters, and penguins tend to have very large foraging ranges. For example, kororā on Motuara Island (entrance to Queen Charlotte Sound) were found to forage up to 214 km from the colony in the Taranaki Bight while incubating but remained closer to the colony during chick rearing⁷. Diet was dominated by squid during incubation, and fish during rearing. Fluttering shearwaters travelled on average 289 km/day and foraged in waters with an average depth of 738 m, but also used shallow coastal waters, and remained within 276 ± 225 km of their colony year-round⁸. Of these species, kororā are likely to use mussel farms for foraging on occasion. Petrels and shearwaters are less likely due to large foraging ranges that tend to be offshore.

The effects of flat oyster farming on birds have not been studied in New Zealand. However, given the method of farming is largely the same as for longline mussel farms, it has been assumed that the potential effects on birds will be likewise similar.

Threats facing Marlborough Sounds seabirds

Seabird species breeding and foraging within the Marlborough Sounds may be affected by multiple threats. I have discussed the threats faced by king shags in considerable detail elsewhere⁹; they include competition with commercial and recreational fishing for key prey species, as well as potential direct mortality from accidental capture in pots or setnets, predation by introduced terrestrial mammals and native gulls (the latter, particularly when disturbed), adjacent land use (e.g. forestry)

⁶ Bell M. (ed.) 2022: Kawau pāteketeki/king shag (*Leucocarbo carunculatus*) research 2018-2022. Final report on the Marine Farming Association and Seafood Innovations Ltd. king shag research project. Contract report prepared for Marine Farming Association Inc. and Seafood Innovations Ltd. 98 pp.

⁷ Poupart T.A., Waugh S.M., Bost C., Bost C.A., Dennis T., Lane R., Rogers K., Sugishita J., Taylor G.A., Wilson K.J., and Zhang J. 2017: Variability in the foraging range of *Eudyptula minor* across breeding sites in central New Zealand. *New Zealand Journal of Zoology* 44: 225-244.

⁸ A separate, smaller group of birds travelled to the Australian east coast. Berg, M., Linnebjerg, J.F., Taylor, G., Ismar-Rebitz, S.M., Bell, M., Gaskin, C.P., Åkesson, S. and Rayner, M.J., 2019. Year-round distribution, activity patterns and habitat use of a poorly studied pelagic seabird, the fluttering shearwater *Puffinus gavia*. *Plos one*, 14(8), p.e0219986.

⁹ For example, McClellan R. 2022: A review of king shag information for an assessment of potential effects of two mussel farms, Okuri Bay, Marlborough Sounds. Contract Report prepared for Clearwater Mussels Limited and Talley's Group Limited. 22p. Available on Marlborough District Council property files online, resource consent no. U230237.

and trawling causing major alterations to the seabed through sedimentation and disturbance, climate changes altering prey availability and leading to more frequent and damaging storm events, and human disturbance. These threats also affect other seabird species to varying extents, for example, multiple species are caught as bycatch in commercial fisheries, and kororā nesting and survival is affected by prey availability in La Ninã years when marine heatwaves can occur.

Mitigation

Two main management actions are undertaken by the longline aquaculture industry to minimise effects on seabirds. While entanglement in discarded mussel farm equipment is likely to be only a minor threat to seabird species, the industry adheres to operational guidelines for general waste management to avoid or minimise ropes and ties and other items entering the water¹⁰, combined with a mussel float recycling programme, and ongoing beach clean-ups.

The second management action is avoiding the disturbance of king shag colonies. King shags are notoriously flighty, and if disturbed, can knock eggs out of nests, or allow opportunistic predation of eggs by black-backed gulls and red-billed gulls. The Proposed Marlborough Environment Plan identifies breeding and roosting sites for the king shag and puts in place a 100 m exclusion zone that applies to all boating activities¹¹. The aquaculture industry, through both the A+ programme and the MFA environmental programme, have set their own standards that require all marine operators stay a minimum of 200 m away from any colony.¹² None of the proposed nursery or production farms are near king shag colonies. The closest is the Pig Bay nursery farm which is approximately 3 km north of the king shag colony at Hunia Rock. This is well beyond the distance at which king shags might be disturbed by work at the farm, and boats attending the farm come from the north, and will not move further south than the farm itself.

Conclusion

In my opinion, the proposed spat nursery and mussel production farms will not have negative effects on seabird species of the Marlborough Sounds. The farms are more likely to have positive effects on species that use the farms for safe roosts from which they can forage, both within and adjacent to mussel farms. Pelagic seabird species forage out to sea and are the least likely to be affected.

King shag are a very rare species restricted to the Marlborough Sounds. Research focused on the interactions of the species with longline farms has unequivocally shown that birds use the farms for foraging, and that the farms have a neutral effect on the species overall, with individuals exhibiting a variety of foraging strategies from almost exclusive use to low use of mussel farms.

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¹⁰ AQNZ A+ Sustainable Management Framework www.aplusaquaculture.nz and the MFA Environmental Certification Programme <https://www.marinefarming.co.nz/environment/>.

¹¹ Proposed Marlborough Environment Plan, method of implementation 9.M.1, rule 16.7.10 and king shag breeding sites in Appendix 25. <https://www.marlborough.govt.nz/your-council/resource-management-policy-and-plans/proposed-marlborough-environment-plan-operative-in-part>

¹² This is also being volunteered as a consent condition in this application.