
**SUPPLEMENTARY STATEMENT OF EVIDENCE BY PAUL RICHARD FISHER FOR ROYAL FOREST & BIRD
PROTECTION SOCIETY OF NEW ZEALAND IN RESPECT OF SUBMISSION ON MINISTRY OF PRIMARY
INDUSTRIES POTENTIAL RELOCATION OF KING SALMON LTD SALMON FARMS IN THE
MARLBOROUGH SOUNDS
(AVIFAUNA)**

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Introduction

1. My name is Paul Richard Fisher. I prepared a statement of evidence for the Royal Forest & Bird Protection of Society of New Zealand Inc (**Forest & Bird**) filed with the Panel on 27 March 2017.
2. This supplementary statement is filed in response to the Panel's 2nd Minute of 20 April 2017 and in preparation for hearing.
3. Expert caucusing has been directed. A date and time is yet to be confirmed. I would like to thank the Panel for shifting the date from 10 May in order for me to participate.
4. The Panel has requested each expert prepare a document prior to caucus identifying:
 - Matters of agreement with other experts.
 - Matters of disagreement with other experts.
 - Why the panel should prefer my expert opinion/that of experts sharing my opinion.

Matters of agreement

5. From review of the relevant expert statements I understand that all experts agree:
 - The proposed salmon farm relocation will result in a number of environmental effects including salmon feed and faeces discharged to the water column and seabed, loss of natural open water and benthic habitat to farm structures, artificial lighting, and boat activity amongst other effects.
 - There are a number of potential adverse effects on the New Zealand King Shag (**King Shag**) that are not fully understood and are difficult to quantify given the lack of supporting technical information and appropriate baseline environmental monitoring, including accurate population counts and breeding success over a number of years, foraging behaviour (dive profiles), and habitat use (fidelity to a foraging area) with respect to prey abundance and availability across each colony.

6. I agree with Mr Schuckard that the proposal's additional feed levels are not consistent with the adaptive management approach prescribed by the board of inquiry in respect of previous salmon farms. This is because the cumulative effects of this and other existing aquaculture activities:

- Extend over a significant proportion of the King Shag foraging area in the Waitata Reach.
- Are likely to increase nitrogen loads with resultant increases in phytoplankton and turbidity that will more than likely reduce foraging efficiency of King Shags.
- Could lead to shifts in the phytoplankton community structure (including harmful algal blooms) and cascade through wider marine food webs.

These outcomes are not consistent with sustainable management of the Marlborough Sounds.

Matters of disagreement

7. The Ministry for Primary Industries (**MPI**) avian experts have been tasked with assessing information to determine effects on seabirds with particular emphasis on the King Shag and its diet. The information assessed included technical information and external reports/analyses of the King Shag. Initial assessments have been subject to peer review initiated by MPI.

8. A number of the issues about which I disagree with MPI's avian experts have arisen because of the limited scope of their analysis/peer review and of the supporting technical information provided by MPI. Some analyses have been completed prior to all technical information being made available. To this end my comments do not reflect any lack of scientific rigor by the experts or undue respect for their professionalism.

Key points

9. Overall I disagree with the general conclusions of MPI's avian experts that the proposed relocation of up to six salmon farms will have no more than minor environmental effects on seabirds and their habitat. The evidence of those experts on seabirds is of limited scope and the approach taken does not recognise:

- The global importance of the Marlborough Sounds for seabirds.
 - The King Shag threatened species status.
 - The extent of adverse effects (including cumulative effects) from natural events and anthropogenic activities.
10. These matters have important implications when assessing the extent and the level of potential effects and whether adverse effects on threatened species, habitats, and the relevant marine ecosystem will be avoided.

Global importance of the Marlborough Sounds for seabirds

11. The Marlborough Sounds marine ecosystem is of global importance for seabirds generally. It is of specific importance to the King Shag. The habitat occupied by the King Shag in the Marlborough Sounds is significant based on IUCN criteria for defining the extent of habitat to maintain the species and because of its susceptibility to adverse effects from human activities and natural events. Dr Thompson has previously stated this fact as an expert witness but has omitted this when considering effects for this proposal.
12. The extent of the Marlborough Sounds Important Bird Area (IBA) marine is defined by the King Shag foraging area, which is part of a network of global sites representing seabird biodiversity hotspots.

NZCPS Policy 11 avoid adverse effects on threatened species and habitats

13. The MPI review of effects has made no reference to Policy 11 NZCPS.
14. The proposal is based on relocating farms and existing fallow farms recovering over a number of years. It is suggested this approach will mitigate some adverse effects. It does not avoid all adverse effects on threatened and at risk species. In particular, because:
- Lag time in regeneration of the seafloor environment under discontinued sites means there will be a period where a significantly increased area of foraging area and habitat of prey species is inaccessible or compromised.
 - Even when discontinued sites have regenerated the cumulative effect of aquaculture and other activities within King Shag foraging area is that a large area

is still likely inaccessible (i.e. within the structural or depositional footprint) which will have an adverse effect.

This does not implement Policy 11(a).

15. The proposal to relocate farms will result in more waste dispersed over a larger area, within the King Shag's area of occurrence. This does not avoid adverse effects.
16. The value of ecosystem services provided by unmodified marine habitat where King Shag's forage is recognised in NZCPS Policy 11(b). It has not been considered by MPI's experts.
17. Pursuit of an activity with the potential effects outlined above is not consistent with a precautionary approach.

King Shag population stability

18. It is my opinion that the status of King Shag population stability remains unclear because of infrequent population surveys across the main colonies over the last 30 years and because there are no measures of population regulating parameters to properly assess the long term population trend.
19. The population trajectory can be described as "stable" in terms of remaining at low numbers.
20. The population estimates used to derive a trend do not span a relatively long period (most population estimate data spans between 1994-2002) and the level of accuracy of population counts cannot be assessed because of sampling errors and correction factors. Mackenzie (2006)¹ acknowledged that the 1994-2002 early morning counts used to derive the King Shag population model are not completely accurate and will display some degree of (unknown) variation.
21. The Mackenzie (2006) model developed for the NZ King Salmon King Shag Management Plan is predicting a slight decline in the population trend (using a model accommodating for different trends at the four main colonies) based on the limited data available. The assessment of the population model also shows that annual population counts will

¹ Page 22.

increase the power of analysis, which will increase the probability of detecting a significant ($P < 0.05$) 3% change in population.² Annual aerial photographic surveys will also provide valuable observations for conservation management, other than just metrics that can be used to interpret antecedent population and environmental conditions leading up to stochastic events or significant changes in population size.

22. Recent aerial surveys of total birds at colonies and counts of occupied nests over the winter breeding season, show a ~40% population decline in breeding pairs between 2015 and 2016 and shift in numbers of breeding pairs between the two largest colonies at Duffers Reef and North Trio island. The loss of some nests is possibly attributed to colonies washed out in stormy seas; however, breeding effort may also decline in years of low prey abundance due to a number of possible reasons.
23. One of the major threats of King Shag conservation management is the relict distribution and low genetic diversity, which has significant implications for the survival of the only endemic avian species of the Marlborough Sounds. The Environment Court (***Davidson Trust vs Marlborough District Council***) has recently noted that the assumed “stable” condition of a threatened species is no reason for comfort by stating:

“However, when a taxon is reduced to less than 1,000 individuals on the planet, because of the risk of stochastic events, waiting for a reduction in population is no longer regarded as an appropriate trigger for protecting the taxon”.

24. In my opinion stability in King Shag population does not mean a more lenient approach can be taken. Policy 11(a)(iv) requires avoidance of adverse effects of habitats of indigenous species that are “naturally rare”.

Assessment of adverse effects

25. A number of key adverse effects have not been considered by MPI avian experts, e.g. significant increases in maximum feed levels and organic waste, the potential for declines in water clarity from increases in particulate matter, harmful algal blooms, and increases

² The NZ King Salmon King Shag Management Plan has adopted triennial aerial surveys and a trigger threshold of 3% decline in population at Duffers Reef, with annual surveys if this trigger was reached. Mackenzie (2006; p32) recommended triennial aerial surveys for detecting a 5% or greater change in population.

in red bill and black billed gulls predating King Shags, which limits the value and weighting of their comments.

Relocation of farms and increases in maximum feed levels

26. The Thompson review of potential effects is based on all factors being similar, and uses the comparison that the current Forsyth Bay farm is a similar distance to Duffers Reef compared to the proposed Blowhole North and South sites. Thompson concludes that for those reasons the two proposed Blowhole farms are *“highly unlikely to cause any disturbance”*.
27. However, the two farms by Blowhole Point are proposed for maximum feed levels of 9,500 tonnes per annum, more than 10 times the amount of feed used for the Forsyth Bay farm. That proposed increase to a total of 33,000 tonnes for Waitata Reach farms is a significant increase on the total maximum feed level of 10,000 tonnes set by the board of inquiry. The effects of the difference in feed levels should be considered.
28. The Thompson review also concludes that the Blowhole farms are considered to be *“...sufficiently far from the colony to pose negligible disturbance”*. It is unclear what threshold is being used to identify ‘sufficiently far’ or ‘negligible disturbance’, as both locations are within King Shag feeding areas from the Duffers Reef colony.
29. The Knight (Cawthron) peer review of the Marlborough Sounds Biophysical Model Predictions concludes that:

“The models are being stretched beyond their original scope and purpose, particularly in the Pelorus Sound (Waitata Reach). If the models are to be used as the sole source of assessment, they will require a high level of confidence”.
30. Given the uncertainty in the biophysical model, the lack of monitoring information from the NZ King Shag Management Plan, and the potential adverse effects (in particular cumulative effects) that have not been quantified I do not understand how the Thompson review can conclude that environmental effects are *“negligible”*.

Foraging ecology

31. The MPI assessments of King Shag prey preferences and potential effects of the proposal have largely been considered with respect to anecdotal studies of diet composition, flatfish stock abundance (reduced by commercial catches), and infauna prey availability for flatfish and other predatory fish under fallow farms. These assessments have not considered the potential adverse effects from the proposal on changes in foraging behaviour and prey assemblages on the energetic requirements of the *Leucocarbo* King Shag foraging behaviour, based on research of other *Leucocarbo* shag species. Potential changes in foraging behaviour may occur as a result of displacement from foraging areas by salmon farms or their wider ranging effects on water quality and marine habitat and ecosystem services.
32. The King Shag is part of a group of *Leucocarbo* shags that breed on islands in the sub-Antarctic oceanic zone between the subtropical and Antarctic convergence, where the marine environment is largely unmodified. The upwelling associated with this convergence provides a natural source of plankton and fish larvae driven by large oceanic processes.
33. The *Leucocarbo* shag research shows that foraging requirements of individuals can vary with depth/habitat and can be specific to individuals and colonies (e.g. learn efficient foraging strategies for a particular prey species, foraging habitat and foraging area). In general, this species has evolved and adapted (deep diving) to feed in benthic habitat. A common foraging strategy for the *Leucocarbo* shags relies on disturbing and capturing prey escaping from the seafloor rather than active pursuit of prey in the water column (open water).
34. The Taylor (Cawthron) assessment of shifts in benthic community composition over time indicates the potential increase in abundance of polychaete worms within a year of fallowing, which could provide feeding grounds for flatfish species. Both salmon and mussel farms create eutrophic conditions supporting pollution tolerant polychaete worms and other opportunistic fauna.
35. However, the habitat structure (sediment size, organic and contaminant profile) and physico-chemical state associated with eutrophic conditions under farms would be

unsuitable for witch and other flatfish to hide from predators, and therefore not necessarily provide alternative feeding grounds for King Shags. King Shags also prey on epi-benthic fauna, however, the circumstance of this prey capture and the relative importance in diet is unknown.

36. There is no evidence to date, based on the few sightings of King Shag foraging around mussel and salmon farms, to support the suggestion that King Shags would take advantage of an influx of flatfish to feed in fallow mussel or salmon farm sites (if that were to occur). Studies are required to assess the prey resource and availability to King Shags in natural (unmodified) benthic habitat, the recovery of fallow marine farms, and potential increase in flatfish attracted to suitable habitat adjacent to fallow sites.

Cumulative loss of marine habitat

37. There has been no thorough assessment of cumulative effects from all marine farms and commercial fisheries on the threatened King Shag and other seabirds, e.g. such as quantifying the disturbance (modification) and loss of connectivity between marine and coastal habitat from mussel farms and from scallop dredging and benthic trawling for flatfish that occur in Marlborough Sounds. I understand that the extent of the cumulative adverse effects from mussel farms alone is already considered more than minor at a bay-scale (Beatrix and Admiralty Bay) where species and habitats of conservation concern occur. The addition of potential adverse effects from this proposal cannot be assessed with any certainty based on the available information. A number of adverse effects highlighted above cannot be avoided, which in my opinion, is inconsistent with the Policy 11(a) (i), (ii), and (iv) NZCPS.

Limited baseline monitoring of key marine wildlife

38. To date there has only been one aerial survey of the main colonies to provide a total count of King Shag, undertaken in February 2015. The next NZ King Salmon funded survey is due in February 2018 as part of the King Shag Management Plan. Annual surveys of King Shag over the next 5 years would provide a baseline for determining the population size, movements of birds between colonies, and some confidence in assessing annual variability and significance in terms of conservation management.

39. In conclusion, there is insufficient information to assess adverse effects on King Shag. There is almost no information to describe the baseline for a “stable” population (i.e. in terms of natural annual variability in numbers of breeding pairs, breeding success and mortality rates), with respect to the changing prey resource and marine productivity.
40. With limited baseline monitoring of key wildlife species and a limited biophysical model for assessing assimilative capacity, the adaptive management staged approach and associated monitoring is inappropriate for conserving a threatened species that is endemic to the Marlborough Sounds and adapted to surviving in this unique marine environment.

Panel Preference

41. In summary, the Panel should prefer the opinion of myself and experts with the same opinion on the potential adverse effects of the relocation proposal because:
 - Of the gaps in the MPI expert assessments outlined above.
 - The severity of outcome if effects of King Shag are not properly assessed and managed: extinction of an endemic species.
 - Legal requirement under the NZCPS to avoid adverse effects on King Shags.
 - Appropriateness of a precautionary approach in this instance.

Dr Paul R. Fisher