SUPPLEMENTARY STATEMENT OF EVIDENCE BY ROB SCHUCKARD ABOUT POTENTIAL RELOCATION OF KING SALMON LTD SALMON FARMS IN THE MARLBOROUGH SOUNDS – KING SHAG

5th MAY 2017

Expert meeting King Shags 15th May 2017

1. David Thompson (DTh) Seabirds – Potential Salmon Farm Relocations in Marlborough: Update of Existing Seabird Report with Reference to Relocation of Existing Farms
2. David Taylor (DTa)- (Review of Salmon Farm Effects on King Shag Diet-15th March 2017)
3. Paul Taylor (PT) - Effects of salmon farming in the Marlborough Sounds on the prey of king shag, *Leucocarbo carunculatus* September 2016 Statfishtics
4. Paul Fisher (PF) - Statement of Paul Richard Fisher (Avifauna) in support of submission by the Royal Forest and Bird Protection Society of New Zealand Inc. 27 March 2017
5. Rob Schuckard (RS) STATEMENT OF EVIDENCE OF ROB SCHUCKARD for Friends of Nelson Haven and Tasman Bay Inc. and Kenepuru & Central Sounds Residents Association Inc. March 2017
6. Graeme Taylor (GT) DOC Expert Peer Review of draft Seabirds report: Principal Science Advisor, Marine Species and Threats team.

1. **Provide a bullet point list of the following matters to the Panel's Hearings Facilitator no later than 5 p.m. on Friday 5th May, 2017:**

i. The relevant points upon which you agree with opposing expert views in the materials placed before the Panel.

- The criteria of the IUCN for threatened species has identified King Shag with 32 other New Zealand Birds as "VULNERABLE", where this "species is facing a high risk of extinction in the wild in the medium-term future".
- The status of this bird is based on the latest 2000 criteria of IUCN: Area of occupancy estimated to be less than 2000 km2. King Shags are known to exist at no more than 9 localities within the Marlborough Sounds. The population of 839 individuals is less than 1000 mature individuals.
- This Important Bird Area depicts the feeding habitat of King Shag and is about 1,300 km². In a joint Statement for the Environment Court between the two avian experts, DTh and PF, the existence of this IBA was acknowledged and as such 'the area of importance to King Shags for foraging'.
- 'The Marlborough Sounds IBA is defined by the seaward extensions to seabird colonies and includes coastal congregations of non-breeding seabirds. The qualifying species include: King Shag (foraging range (25km) from colony and extent of foraging depth (50m)…'
- Witch is an important prey species but this should not be overstated. The information was gathered at the outer feeding distribution of King Shags from Duffers Reef. Also, this roost has not been in use since 1992.
- DTa is correct that the taxonomic groups of in faunal and epifaunal species of importance to King Shag prey are widespread throughout the sounds. However, the 1983[1] survey was a quantitative analysis of presence and absence of certain taxa. Areas with different densities may host different densities of prey fish.
- I agree with DTh that '***all other factors being similar'*** the population is likely to be stable in the new farm environment. Where we disagree on important matters is if that is the case with an additional 23,000 tonnes of salmon feed. In 2015, the total feed use of ALL NZKS farms was about 14,000 tonnes.

[1] McKnight, D.G. and Grange, K.R. 1991. Macrobenthos-Sediment-Depth Relationships in Marlborough Sounds. D.O.C.Investigation No.P692.

- I agree with DTh that enhanced levels of (primary – inserted) productivity may occur but predicting on how these changes may affect King Shags remains extremely difficult. I concur with that conclusion.
- The King Shag Management Plan was sufficient to overcome uncertainties for the species as a result of the 10,000 tonnes of extra feed in the Waitata Reach. This Management Plan is not designed to use the same protocol for adding an additional 23,000 tonnes or anything more to what the Board of Inquiry consented.
- I agree with Knight's final conclusion[2] (page 16) and share his concern in relation to impact of chlorophyll-a increase in King Shag feeding habitat:

  > *The sensitivity of phytoplankton to additional nutrients is at the core of the model results. In my opinion, the models are being stretched beyond their original scope and purpose, particularly in the Pelorus Sound. If the models are to be used as the sole source of assessment, they will require a high level of confidence.*

- I agree with Knight's concerns presented about water quality modelling scenarios:' ***Concern that baseline was not 'existing' scenario from 2012/2013.***'
- I agree with Knight's peer review where he is concerned that the responses of the model to substantial feed increases is going far beyond the levels for which they are validated:'

  > *….there would need to be a higher standard of proof on the accuracy of the models if they are the sole method of estimating effects.'*

- I agree with the modellers identifying uncertainties about the approved farms and their impact on the overall environment of the Waitata Reach[3] (page 69). Based on the following statement a precautionary approach should be adopted:

  > *Certainly, chlorophyll concentrations in the baseline$_{2016}$ scenario are often greater than 3.5 mg chlorophyll m−3 (and even 5 mg Chl m^{-3}). To a small degree, this may be a result of the two newly approved farms (Waitata and Richmond) but previous modelling suggests that the model tends to over-predict chlorophyll even in the absence of these farms.*

- I agree with the uncertainties about the model's predicted nutrient inputs associated with the additional fish farms. In particular the increase of summertime near-surface

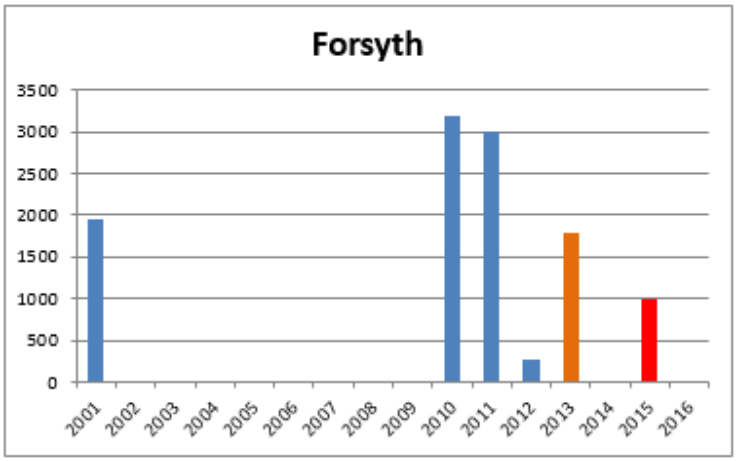
[2] Knight, B. 2016. Peer Review of the Marlborough Sounds Biophysical Model Predications. Cawthron Institute – Report 2913.
[3] Broekhuizen, N., Hadfield, M. 2016. Modelled water column effects on potential salmon farm relocation sites in Pelorus Sound. Min. Primary Industry 18 October 2016.

phytoplankton standing stocks by 5–10% relative to the existing conditions (present day/existing farms scenario) have not been accommodated and may have an impact on King Shag feeding habitat. Whereas the Marlborough Sounds exhibit phytoplankton levels that are oligotrophic, the simulated phytoplankton concentrations are now higher than is the norm for New Zealand coastal waters, but they would not be higher than values that are intermittently (but fairly frequently) recorded in our coastal waters. This shift, only vaguely described, can have significant implications for King Shag. This is close to predicting a baseline shift.

ii The relevant points upon which you differ from the opposing expert views in the materials placed before the Panel.

- Estimate at what point during the seabed recovery trajectory fallowed sites are likely to become feeding grounds for king shag prey species.
- The recovery of compromised sites also takes longer as suggested by PTa, but can be complete after five years. However, subsequent on-going benthic instability was observed in the same study to go beyond five years during recovery projects.
    - Recovery of *Capitella capitate* may provide the wrong comparison as indication for an environment where fish can survive. *Capitella capitate* exhibits a relatively high tolerance for sediment hypoxia, hydrogen sulphide concentration and other sediment conditions avoided by many infauna. Concentrations of more than 300 individuals/m^2 were found to occur in a self-sustaining population in proximity to a South Australian lead-zinc smelting facility.
    - Positive reinforcing feedbacks of biogeochemistry and homeostasis shift ecosystems to new stable states; such shifts can be gradual or abrupt and communities may not return to their original state once the disturbance (in this case, altered nutrient loads) is removed (Glibert, 2012).
    - Lags in recovery, ‘‘hysteresis’’, can be protracted and in some cases result in ecosystems becoming locked into degraded conditions, which can be described as being in an alternative stable state (in Nyström et al., 2012, McGlathery et al. 2007).
    - Areas with diverse communities tend to have a wider range of ecological functions, including species’ mobility and reproductive strategies, and such communities will take longer to recover from salmon farm practices than those where diversity is low and the communities are simple (Macleod et al. 2007, Thrush et al. 2001).

- Consequently, impacts will be more significant in areas with inherently high diversity and the presumption to locate farms in more exposed locations to reduce the environmental impact of organic enrichment by spreading the effects may in fact be unfounded (Macleod et al. 2006). The oxygenation of the benthic environment will play a fundamental role in accommodating the range of prey species linked to King Shag. Description of 'recovery' of vacated site is too simplistic for comfort.
- Recovery as proposed is also contradicted by the performance of Forsyth Bay after episode of overstocking in 2010 and 2011. Recovery of resilience was stretched beyond the recovery of 5 years.



- Approximately 90 percent of King Shag prey is witch flounder (*Arnoglossus scapha*). This is likely overestimated for the King Shags from Duffers Reef. Knowledge and information provided on King Shag diet is overestimating the relevance of old studies, which are sometimes from unknown sites. Inaccurately quoting these rare and old studies is inappropriate. The only systematic information gathered so far is our study from 2011.
- None of the experts have identified parameters of change in King Shag feeding habitat that should or should not be allowed. It was only Sagar (NIWA expert 2012 for NZKS application for 9 new farms) who identified such an allowable decline: '…. I would consider a loss of up to 5 percent as being no risk and then increasing risk as the percentage of habitat lost goes up.' I contend that the proposal is well beyond this threshold already. Without the relocation going ahead, already 12% of the habitat of King Shag is covered by mussel farm and salmon farm deposits.
- Impact of primary production on the feeding habitat of King Shag is most profound during changes from the natural low oligotrophic situation at the moment. About 40% of the feeding habitat will be changed if the Chl a concentrations move between 1 and 2 mg m^3. A 5% decline in feeding habitat will occur well within a change from 1.0 to 1.5 mg Chl a m^{-3}.

- Effect on the turbidity/clarity of the water column as a result of the proposal has been confused through a change of the baseline, lack of modelling of full proposal and feed levels that are not reflecting applications for the existing farms. These uncertainties are fundamentally undermining the information required to avoid adverse effects on a threatened species.

- All experts seem to agree that King Shag biology is very poorly known. The Environment Court ruled in a recent decision about the expansion of a mussel farm in Beatrix Bay on this particular matter of uncertainty:

  > *However, the prediction remains: potentially the King Shag could be driven to extinction by the accumulated and accumulative effects of mussel farms which are part of the environment in Beatrix Bay. That is a low probability event, but extinction is indubitably a significantly adverse effect which would be exacerbated, to a small extent, by the Davidson proposal*[4]

- Such a concern raised about one mussel farm has relevance to this proposal.

Rob Schuckard

5th May 2017

[4] *R.J.Davidson Trust* v *Marlborough District Council* [2016] NZEnvC 81[280]