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Comments on the reports “2017-2018 Annual Environmental Monitoring Report for the Nga Mahau Bay Salmon Farm” (Cawthron Report 3144), “2017-2018 Annual Environmental Monitoring Report for the Kopaua Salmon Farm” (Cawthron Report 3145), and “2017-2018 Annual Environmental Monitoring Report for the Waitata Reach Salmon Farm” (Cawthron Report 3146).

#### **General Comments:**

1. Generally the reports are straight forward reporting of results from the recent monitoring programme. The reports are well written, easy to follow and fit-for-purpose meeting the requirements for the consent conditions and the current Marine Environmental Monitoring Adaptive Management Plan (MEMAMP).
2. There is mention in the reports of a review after 3 years for general trends etc . Nga Mahua is now in its 3<sup>rd</sup> year of operation, Kopaua 2 years and 2 years. It is not clear whether this will involve additions to the annual report or a separate analyses. Should the 3 years of data for Nga Mahau have been included in this years report?
3. In accordance with the Consent Conditions, the initial WQS are required to be reviewed **in the Annual Report** at the end of the third year of farm operation. (e.g. Conditions 44b and 66, Ngamahau consent). The PRP understand that a workshop process – separate from the Annual Reports - is currently being planned to consult on the review of WQS. In accordance with the intent of those conditions, we would recommend that the PRP are included within those workshops, and then the process outcome is summarised/referred to in the next Annual Reports.
4. In some cases data from one pen may be quite different to the other two pens. Is there any information that would help explain this eg are all pens fully stocked when in production or could some pens be used more than others? Would also be good to have in the introduction clarification about what pen areas/farms are fallowed at which times in relation to sampling.

The PRP only have a few comments as listed below otherwise are happy with the reports. Most of these are minor and more around clarification.

**Report 1: 2017-2018 Annual Environmental Monitoring Report for the Nga Mahau Bay Salmon Farm (Cawthron Report 3144)**

1. On Page (i) and within the document there is mention of DO falling below certain values. It may be useful to confirm in the same bullet point, that the results were still compliant to the WQS (which, in the case of DO WQS require 3 consecutive months below the trigger value) It may be useful to mention if the observed levels cause any ecological concern.
2. On Page ii it is noted that a larger proportions of dinoflagellates were seen in the 2017 sampling compared to the 2016 results. Do the report Authors consider this to be of significance, for example could it contribute to in an increase in the chance of toxic bloom events? We also note that there is further comment about this on Page 35, and support further consideration as part of the third-year review of the WQS.
3. On Page 2 it is reported that nitrogen input for 2017 exceeded the maximum nitrogen discharge allowable in any year by 7 tonnes. Presumably this is a breach of the consent and should be clearly noted as such in the report? As this is an apparent breach of the conditions, it would be useful for the authors to also note if there was any associated observable ecological/environmental consequence. We also note the difference in %N in the feed for different farms, is this because different feeds are used?
4. On Page 3 last bullet point it would be useful to clarify that this station was required as per the MEMAMP
5. Page 12 – last line, should the reference to Appendix 4 be 65e?
6. In the last paragraph of Page 14, it is reported that “A review of at least three years of data....should be done prior to any feed increased at a given farm”. We agree with this, and note that for this farm, this monitoring round completes the third year of data, and so this review can now happen (see comment above).
7. Page 15. At station 75N “The substrate at the 75N station was similar to beneath the pens...” were there any feed pellets or fish faeces noticed at this station? If they were not observed a positive statement confirming they were not observable is recommended.
8. Page 20 – not clear how Fig 7 explains that sediment chemistry is the main driver, should the reference be to Table 6?
9. Page 24 – can we really say “Yes” that the farm is having an effect in the light of the following paragraph that shows same at mid-channel site? The “Yes” could be qualified in terms of “Yes, concentration gradients of ammonium, urea, and total nitrogen during August indicate that at that time, the farm operation locally elevated nutrient concentrations. However, the nutrient concentrations themselves were not outside historic ....”
10. Figure 10 – some plots show lower salinity at the pens and well away from the pens, is freshwater used in the pens or is there another explanation?
11. Page 31 – para 4, line 3, please clarify what part of the N suite the 191 mg/m<sup>3</sup> refers to (TN?).
12. Page 34 – don’t we have 3 years of chl-*a* data now?
13. Page 36 – Recommendation as part of 3<sup>rd</sup> year review but this is the 3<sup>rd</sup> year?
14. ON page 39 there is mention of a pending working group review of the water column approaches as they relate to the Marlborough Sounds salmon farming industry. Is it possible to include further information about when this review might happen?
15. We generally agree with the recommendations but note that the 3 years is now up for this site.

**Report 2: 2017-2018 Annual Environmental Monitoring Report for the Kopaua Salmon Farm (Cawthron Report 3145)**

1. On Page i it is noted that in the August sampling, a diatom bloom was captured, during which Chl-*a* concentrations up to 5.2 mg/m<sup>3</sup> were recorded. Are the Authors able to make further comment about whether this is a typical or a novel event? It would be good to know if this is something that naturally occurs on occasion in this area, or if it is this something

new that has not been seen in previous monitoring (both for the farms, and as part of the wider MDC monitoring effort).

2. Page i and summary – as above re: DO and level not of concern
3. Location of Fig 1 caption?
4. The caption on Figure 2 (Page 7) has the words “at the” doubled up.
5. Page 24, para 1 and Page 25 second to last sentence – a good example of why the assessment needs to look at key drivers, not just overall ES score.
6. Page 30 – is “eutrophic state” defined anywhere within the MEMAMP / Annual Reports?, if not maybe it should be in the next MEMAMP.
7. Page 33 – same as above re salinity at pen lower like FF site in Aug 2017??

### **Report 3: 2017-2018 Annual Environmental Monitoring Report for the Waitata Reach Salmon Farm (Cawthron Report 3146)**

1. At the end of the Executive Summary, as noted also for the Kopaua report above, it is reported that in the August sampling, a diatom bloom was captured, during which Chl-a concentrations up to 5.2 mg/m<sup>3</sup> were recorded. Are the Authors able to make further comment about whether this is a typical or a novel event? It would be good to know if this is something that naturally occurs on occasion in this area, or if it is this something new that has not been seen in previous monitoring (both for the farms, and as part of the wider MDC monitoring effort).
2. It is interesting that the 600 S station had a higher enrichment score than would be expected. Some thought will need to go into how this might be further analysed. It is unclear to us whether the suggested time series analysis (mentioned on Page 45) will be suitable to ascertain if the observed enrichment is actually farm related.
3. Executive summary – as above re: DO being below the 90% threshold and if any ecological concern.
4. The terms moderate, slightly, minor etc are commonly used and think we have raised this before i.e how are these terms defined. An example is Fig 7 in this report and free sulphides, in the text it says the levels under the farms are moderately elevated but these look considerably higher than refs? This is particular relevant to Section 4.1.2.
5. Note comment above re difference with pens. Pen 3 here seems quite different and there is mention on Page 6 about fallowing. Are they all stocked and fallowed at the same time (presumably production related)?
6. Page 11/12 – there is no mention why sampling was changed from March to May (Table 2)?
7. Page 13 – It would be beneficial to provide the reason/justification to support the non-sampling of replicates for Chl-a and phytoplankton from August 2017 onwards (e.g. as it was not required in accordance with the MEMAMP?, a consent change to condition xx was endorsed by the MDC and the sampling program adjusted in agreement with the PRP ? etc...)
8. It is also noted that some parameters are sampled more frequently than the MEMAMP requires so may need to revise for next MEMAMP (eg TP, DRP, DRSi).
9. Page 21 para 2 – At station 150N “*The substrate at the 150N station was similar in appearance to beneath the pens...*” were there any feed pellets or fish faeces noticed at this station? If they were not observed a positive statement confirming they were not observable is recommended.
10. Page 21 para 3 – does this suggest at 600 m the effects are still evident? Any additional comments on why sediments are similar to under pens to 600 m in both directions (maybe natural?)?

11. Page 25 – similar to comment above. The overall scores was 2.4 was described as mild to moderate enrichment but would have thought this was only slightly enriched and similar to 600 m and reference levels?
12. We agree that a more comparable reference site could be considered (Page 28).
13. Page 29 – again high sulphides under farms, are these levels of concern?
14. Figure 8 – is this referenced anywhere?
15. Figure 13 – does this need a legend?
16. Page 45 – as above will the assessment after 3 years be in the next annual report?

We note that we have also reviewed three additional reports with supplementary information relevant to each of the three farms:

**“Reef Environmental Monitoring Results For the New Zealand King Salmon Company Ltd Salmon Farms: 2017” (Cawthron report 3158).**

We have very few comments on this report which as for the above meets the requirements of the consent and MEMAMP.

1. There is clearly a lot of natural variability which makes assessment of effects difficult. As the authors says a longer time series will help this assessment.
2. Some aspects such as cup sponge health at a RB site needs to be followed to see if the effects are long-term. The presence of filamentous algae at this site could be an issue and needs to be followed carefully.
3. Page 27 – It appears that the likes of echinoderm abundance is lower at the site sin Pelorus than the reference sites but looks like this has always been the case. Maybe clarify and comment on how useful the reference sites are and the need to look at general trends at the sites.
4. We agree with the recommendations.

**“Heavy Metal And Organohalogenated Compounds in Blue Cod Near Salmon Farms in the Marlborough Sounds” (Cawthron Report 3153)**

1. It would be useful if this report had an Executive Summary up front.
2. Given the aim of this study, it seems counter intuitive that the sampling was undertaken at a farm that was not in production at the time of sampling (see Page 14). The farm was fallowed about 2.5 months before the sampling, and so there was probably little salmon feed on which the cod could forage. This study will probably therefore need to be repeated, at a farm and time where salmon feed pellets will actually be available for potential cod consumption. We agree this could wait until the UoO study is completed to ensure it is focussed on the right questions and contaminants.
3. Although it would have to go via sediments there is no mention of whether antifoulants are used which also contains likes of copper.
4. A number of the observations would appear to be wider issues than the salmon farms so need to be carefully interpreted.

**“Effects of Underwater Lighting On The Marine Environment At The Kopaua Salmon Farm” (Cawthron Report 3149)**

1. This is a relatively straight forward study and report and findings are in line with expectations and assessments elsewhere.
2. It does seem strange that observations can't be made at night when that is the point of this. Agree should discuss further with MDC.