Response to Editor's comments on "Variability and drivers of carbonate chemistry at shellfish aquaculture sites in the Salish Sea, British Columbia"

Thank you Dr. Frédéric Gazeau for your helpful and constructive comments on the previous revision of this manuscript. We are in agreement with all of your suggestions. Here we repeat your suggestion text in bold and explain how each was implemented below in regular font.

Dear authors,

Many thanks for the modifications applied to your revised manuscript following the reviewers suggestions. I agree with your arguments when you did not follow these suggestions (e.g. combining surface and lower layer plots).

I am happy to accept your revised manuscript following very few minor changes:

L37: Please replace "Juvenile shellfish" by "Shellfish larvae" as the cited study from Waldbusser only focuses on larvae

Thank you, we have removed the word juvenile in line 37.

L75: please remove larvae (keep only outplanting juveniles)

Agreed this sentence is incorrect, thank you for catching this mistake, we have removed the word larvae in line 75.

L83: please consider rephrasing to: "... although the contribution of carbonate chemistry conditions to these mortalities..."

This sentence had become too long and unwieldly. We have added a break, and started a new sentence. We also add some clarity to so as not to misrepresent the findings of Drope (2023), so that this now reads:

"The cause of these mortalities is not well understood, but mortalities have been linked to elevated water temperatures and the presence of the marine bacteria *Vibrio aestuarianus* (Cowan, 2020). In contrast, local grower's feel that OA is not the key issue (Morin, 2020, Drope et al., 2023). However, the role that changing carbonate chemistry conditions contributes to these mortalities in the SOG remains unknown."

Fig. 2, 3 and 4: please consider defining DIC and TA in the figure captions (to me a figure can be easily read without having to go back to the text) – same comment for other figures and tables.

Thank you for this suggestion, it does make the figures more easy to interpret – we have added definitions in the captions for figures 2-5, and tables 1 and 2.

Fig. 4: Maybe a misunderstanding from my part but I believed these data only concern the 0-5 m layer. If so, it should be added to the caption. Also in Table 2.

Yes you are correct, we have added this distinction to make it clearer which data are presented in this figure and table.

Fig. 4: Please consider using the same legend order than in Fig. 2
We think that the legend order

We have reordered the box plots in figure 4 so that they are displayed in the same order as the preceding figures.

Fig. 2, 3, 4: Please check whether you can increase the police size, I am getting old and blind….

We have increased the font size in figures 2-4 where possible, hopefully they are now easier to read.

L405 and below: Weird text formatting in your revised version

This formatting issue only occurs in the PDF, and so does not show as a tracked change in the word document submitted. We have checked the PDF after conversion for any formatting issues and believe that the formatting is correct in this submission.

Table 1: Please consider homogenizing the order of the stations with Fig. 5

This is a great suggestion that will make it much easier to refer between the figure and table, we have revised the table accordingly.

Section 3.3: I believe this section could be shortened as you do not only focus on diel variability but also compare average values across sites and seasons (but with only one day sampled) which has already been presented in section 3.1 (over several days, and therefore more representative). In my view, you should only present the range of variability here.

Thank you, this suggestion prevents repeating information that is better represented in the more comprehensive data presented for the seasonal changes. We have edited this section to remove averages or comparisons of these averages at different sites. We have added explicitly the diel range in variability where it was missing and kept any comparison of variability between sites. This section now reads:

3.3.1 Temperature and salinity

There is little variability (no more than 1.1 °C) in winter T on the days that we investigated (Sect. 2.4) (Fig. 4b, Table 2). In summer, Baynes Sound experiences little T variability (<1° C) in summer, but T varies by ~2 to 3 °C at the other nearshore locations. Sansum Narrows has the greatest variability in diel summer T (4.4 °C). There is typically low diel variability in S in both seasons (Fig. 4c, Table 2). However, Baynes Sound experiences a large range in diel S on the winter day, spanning from 22 to 28. This larger diel variability was driven by heavy rainfall during the week preceding our sampling (17 November 2017) which also reduced the median surface S to 22.5. Some summer diel variability is also detected in Sansum Narrows as S decreases from 28 to 26 over the day, as new water is brought in with tides.

3.3.3 DIC and TA

Winter diel variability in both DIC and TA is low at Sansum Narrows and Evening Cove beach where the salinity range is low; but variability is high in Baynes Sound, following the large variability in salinity. Variability in summer DIC is greater than in winter at most locations, as biological fluxes during this productive season decrease DIC into the afternoon (Fig. 4d). In contrast, we found almost no summer diel variability in DIC in Baynes Sound in our observations. Variability in summer TA (Fig. 4f) is negligible and either within or close to uncertainty (Table 2).

We investigate the summer day in Okeover during the unusual coccolithophore bloom (August 2016). Total alkalinity has been drawn down as the coccolithophores take up and use dissolved CO32- to build their shells. The mean TA drawdown is approximately 140 μmol kg−1 compared to “typical summer” conditions (at the same salinity), resulting in a reduction of pH by -0.3, Ωa by -1.4 and Ωc by -2.2. There appears to be no diel TA change on the day that we sampled, when the bloom was already well developed (Table 2). Diel DIC change during the coccolithophore bloom is lower than at other locations, but overall DIC is lower, and median DIC (~1550 μmol kg-1) is similar to a “typical summer’, indicating that DIC drawdown has already occurred on a longer temporal scale.

3.3.4. Dissolved Oxygen

Winter DO was undersaturated on our sampled days in Baynes Sound and Sansum Narrows, with little variability over the day at both locations (Fig, 4a). The beach location in Evening Cove however, has higher DO on the sampled day, with some oversaturation occurring in the afternoon. Dissolved oxygen tends to increase throughout the day at the beach site in winter, and all of our nearshore locations in summer, when there is widespread DO supersaturation. Sansum Narrows has the lowest summer saturation state of the four locations, with a smaller increase over the day, resulting in lower variability.

3.3.5 pH

In our observations, the maximum winter diel pH variability is lower than in summer at all locations. Winter diel pH variability is higher (~0.2 to 0.3) in Baynes Sound and Evening Cove beach than in Sansum Narrows. At the beach, winter pH increases throughout the morning into the afternoon, whereas winter pH in Baynes Sound does not increase over the day but fluctuates with salinity (Fig 4h). In summer, pH is higher than winter and pH variability is higher at Evening Cove and Sansum Narrows, but is lower in Baynes Sound.

3.3.6 Saturations states Ωa and Ωc

In our observations, winter diel Ωa variability is low in Baynes Sound and Sansum Narrows, but up to ~ 0.6 at Evening Cove beach, as Ωa increases over the course of the day (Fig 4i). Winter variability in Ωc is similar to Ωa, with low variability in Baynes Sound and Sansum Narrows, and greater variability at the beach. In our observations at all locations, there is greater diel variability in Ωa and Ωc in summer as saturation states increase throughout the day.