Response to RC2

RC2: Reviewer comment (black)
AC: Author response (gray)

AC: We thank the reviewer for their time and contributions to improving the database and manuscript. We have responded to each point of the review below.

RC2: Overall, I think this work addresses an important and recurring challenge with paleoclimate/ocean datasets garnered from archaeological samples. This is a nice first attempt to synthesize a wide range of species, ecologies, time periods, and sampling strategies, which is no easy feat!

My main concern is that the geographic designation (Northeast Pacific) of the study area is far broader than the data represented within this manuscript. Most of the data is concentrated along the California coastline. While I do think there may be a greater density of isotopic work on shellfish from California middens, the authors chose to include a handful of data from species found along the coastlines of Washington and southern British Columbia. Therefore, I do think it is important that they also include work that has been done with Saxidomus gigantea (both modern and archaeological) in Washington and British Columbia. Moreover, the usage of Northeast Pacific does imply the coastline of the North American continent, leaving me questioning if it appropriate to exclude work done in the Gulf of Alaska (Hallmann et al., 2009, 2011, 2013; Bassett et al., 2019). To summarize, if the authors wish to include their current data from Washington and southern British Columbia, they also need to include work done with Saxidomus gigantea and if they are truly considering the Northeast Pacific, this does also include Alaska (although I think it's perfectly acceptable to omit work in Alaska and more precisely define their geographic focus instead).

AC: We will refine the terminology to define the scope of the study to the "California Current System" rather than the "Northeast Pacific." As such, we will add data from *Saxidomus gigantea*, yet we choose to omit work from Alaska as it is outside the scope of the study.

RC2: My other comment is that I do not think the discussion of how changes in d18O(water) makes direct cross-site and even cross-species comparisons difficult, if not impossible. This is especially true for SST reconstructions from d18O(shell). The locations of the habits of each of these species varies considerably and so too then does their exposure to terrestrial freshwater influences, which is difficult to constrain in archaeological studies. I think section labeled 3.6 (the sub-headers 3.5 and 3.6 are out of order) could be greatly strengthened by detailing this challenge more thoroughly.

AC: We will correct the numbering error of the two sections, and we will add further discussion of these two points in the text.

RC2: Line 28: Is the comosition calcite for all of the species include in this study?
AC: We will update the text to say "calcium carbonate."

RC2: Line 43: Recommend including additional citations - Schone and Gillikin, 2013; Gillikin et al., 2019
AC: We will add recommended citations.

RC2: Line 45: Recommend including additional citation for "...as resources for human communities" - Thomas, 2015a, 2015b; Twaddle et al. 2016
AC: We will add recommended citations.

RC2: Line 47: These citations are only relevant to the California coastline, there are citations for work in southern B.C. as well that should be included since data is included from this region. See Burchell et al. 2013a, 2013b, Cannon and Burchell, 2017. Depending on the final determination of the geographic span of this article, there are several other citations that could be include for northern B.C. and the Gulf of Alaska.
AC: We will add recommended citations. We do not include a discussion of the Gulf of Alaska.

RC2: Line 61: "Biocalcite," again, do all of the species featured in this study produce only calcitic shells?
AC: We will update text to say “shells” to be inclusive of all shell types.

RC2: Line 62-3: "... as a proxy for changes in SST, salinity, and ice volume" needs citation.
AC: We will add recommended citations.

RC2: Line 67-8: Yes, this is correct. I would suggest fleshing out in more detail how biological processes affect oxygen and carbon isotopic values.
AC: We will add an additional sentence describing vital effects. “The metabolic rate, calcification rate, growth mechanisms, ontogenetic patterns, and site of calcification within the organism can all lead to offsets between environmental and shell carbon and oxygen stable isotope values (Ford et al., 2010, Gillikin et al., 2006, McConnaughey and Gillikin 2008, Schone and Gillikin, 2013).

RC2: Line 105-107: It is unclear how the categories of "multiple subsamples" and "higher resolution sequential sampling" are distinguished from one another. Are you defining these groups based on #samples/annuli? Overall time-averaged?
AC: We will clarify this in text. To clarify here, ‘higher resolution sequential sampling' refers to high sample density, or lots of closely spaced samples to capture as much environmental variation as possible. 'Multiple subsamples' simply refers to more than one subsample taken at the terminal margin of the shell to capture conditions closer to the time of collection"

RC2: Line 122: It is unclear to me how you selected data from modern samples. Are they only from museum collections? If you are generally considering live-collected modern samples, there are certainly data from the PNW region as well (see map in Bassett et al., 2019 and citations therein for review of these modern data points).
AC: We aim to be inclusive of modern data and we will add in the recommended datasets and submit the changes to the Pangea database.

RC2: Line 170-1: Again, there's actually more data from southern Washington and B.C. that could be included. See suggested citations from Line 47.
AC: We will add in the data as suggested.

RC2: Line 173-4: Authors state that most of the studies included in the present study analyzed shells collected from open coast sites and few studies analyzed estuarine species. Are there no estuarine species present in middens at any of these sites? Certainly middens in Washington state include one estuarine species (Saxidomus gigantea). Is the lack of estuarine species in these datasets some kind of sampling bias or an acknowledgement of the difficulty of interpreting SST records from estuarine species?
AC: We use estuarine to refer to the site of the midden, rather than as an ecological designation. Further, we made some determinations about the environment based on the species (e.g., we know that *M. californianus* shells were harvested from open coast sites since this species is found exclusively in rocky intertidal environments with heavy wave disturbance and high salinity). We will clarify this point in the text and include a caveat addressing your point that species may have been moved large distances by those harvesting and consuming them.

RC2: Line 225: Yes, and I would imagine this is likely a result in shellfish collection technology/methods employed by past inhabitants.
AC: We agree.

RC2: Line 276: Very much appreciate the inclusion of land and data acknowledgement!
AC: Thank you.

RC2: Figure 1: Some of the greens are quite difficult to distinguish from one another and in black in white it would be impossible (also important to note that this color gradient is not very accessible to colorblind readers).
AC: The Viridis palette (R) used here is a recommended colorblind-friendly palette. We will examine alternative colorblind-friendly palettes (e.g., magma palette in the Viridis package).

RC2: Figure 3: Species names are very difficult to read (in fact, in print they are impossible to read). I do think the color gradient works much better here than on the map, where the greens are difficult to distinguish from one another.
AC: We will increase the font size in the figure.

RC2: Suggested citations:

Bassett, C., Andrus, C. F. T., and West, C. F. 2019. Implications for measuring seasonality in the marine bivalve, Saxidomus gigantea. Chemical Geology. 10.1016/j.chemgeo.2018.07.004

Burchell, M., Cannon, A., Hallmann, N., Schwarcz, H.P., Schöne, B.R., 2013a. Inter-site variability in the season of shellfish collection on the central coast of British Columbia. J. Archaeol. Sci. 40, 626–636. https://doi.org/10.1016/j.jas.2012.07.002

Burchell, M., Cannon, A., Hallmann, N., Schwarcz, H.P., Schöne, B.R., 2013b. Refining Estimates for the season of shellfish collection on the pacific northwest coast: Applying high-resolution stable oxygen isotope analysis and sclerochronology. Archaeometry 55, 258–276. https://doi.org/10.1111/j.1475-4754.2012.00684.x

Cannon, A. and Burchell, M., 2017. Reconciling oxygen isotope sclerochronology with interpretations of millennia of seasonal shellfish collection on the Pacific Northwest Coast. Quarternary International.10.1016/j.quaint.2016.02.037.

Gillikin, D., Wanamaker, A.D., and Andrus, C. F. T., 2019. Chemical Sclerochronology. Chemical Geology. 10.1016/j.chemgeo.2019.06.016.

Hallmann, N., Burchell, M., Brewster, N., Martindale, A., Schöne, B.R., 2013. Holocene climate and seasonality of shell collection at the Dundas Islands Group, northern British Columbia, Canada-A bivalve sclerochronological approach. Palaeogeogr. Palaeoclimatol. Palaeoecol. 373, 163–172. https://doi.org/10.1016/j.palaeo.2011.12.019

Hallmann, N., Schöne, B.R., Irvine, G. V., Burchell, M., Cokelet, E.D., Hilton, M.R., 2011. an Improved Understanding of the Alaska Coastal Current: the Application of a Bivalve Growth-Temperature Model To Reconstruct Freshwater-Influenced Paleoenvironments. Palaios 26, 346–363. https://doi.org/10.2110/palo.2010.p10-151r

Hallmann, N., Burchell, M., Schöne, B.R., Irvine, G. V., Maxwell, D., 2009. High-resolution sclerochronological analysis of the bivalve mollusk Saxidomus gigantea from Alaska and British Columbia: techniques for revealing environmental archives and archaeological seasonality. J. Archaeol. Sci. 36, 2353–2364. https://doi.org/10.1016/j.jas.2009.06.018

Schöne, B.R., Gillikin, D.P., 2013. Unraveling environmental histories from skeletal diaries - Advances in sclerochronology. Palaeogeogr. Palaeoclimatol. Palaeoecol. 373, 1–5. https://doi.org/10.1016/j.palaeo.2012.11.026

Thomas, K.D., 2015a. Molluscs emergent, Part I: Themes and trends in the scientific investigation of mollusc shells as resources for archaeological research. J. Archaeol. Sci. 56, 133–140. https://doi.org/10.1016/j.jas.2015.01.024

Thomas, K.D., 2015b. Molluscs emergent, Part II: Themes and trends in the scientific investigation of molluscs and their shells as past human resources. J. Archaeol. Sci. 56, 159–167. https://doi.org/10.1016/j.jas.2015.01.015

Twaddle, R.W., Ulm, S., Hinton, J., Wurster, C.M., Bird, M.I., 2016. Sclerochronological analysis of archaeological mollusc assemblages: methods, applications and future prospects. Archaeol. Anthropol. Sci. 8, 359–379. https://doi.org/10.1007/s12520-015-0228-5

AC: We thank the reviewer for the inclusion of the full citations. We will include all recommended citations.