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Author: Hardy et al. 2023

General comments: The manuscript entitled “Trait-based analyses reveal global patterns in diverse albacore tuna diets” is a well written piece of work that will provide a valuable contribution to the literature base on diet studies of albacore tuna. The authors provide a comprehensive meta-analysis that links traditional stomach contents data (i.e., taxonomic-based methods) to a contemporary trait-based approach whereby species-specific prey are assigned to traits based on a prey species’ vertical and horizontal habitat association and diel and seasonal migration patterns. Although taxonomically based diet data will remain an important part of trophic ecology (e.g., for quantifying energy flow in ecosystems), distilling diverse diet composition data into broad functional groups, or trait guilds, provides trophic ecologists with a novel and complementary tool to traditional diet studies that offers a different perspective. As the authors note in their review, some diet studies have already partially used traits in classifying for example, functional groups (“epipelagic prey”, “mesopelagic prey”) from taxa identified through stomach contents analysis. This approach in conjunction with taxonomic-based diet studies, will help ecologists to test hypotheses on how climate change might affect predator distributions based on the distribution of forage communities, but through a new lens. Knowledge on prey behavior—as related to the habitat and migration traits identified in this paper—along with prey taxonomy provides an indication of potential spatial and temporal availability of predators that may forage on prey with specific traits and may help contribute to identification of foraging hotspots. While assessing albacore trait-based prey data and the potential influence of environmental conditions, across space and time, on prey traits is beyond the scope of this paper, I wonder if similar studies have addressed this issue. I think the Discussion section could benefit from some text or an example of studies that may have examined linkages between specific environmental conditions and traits to show how trait-based approaches may be implemented.

Another consideration for future studies might be to include fisheries data, where available, to obtain perhaps more frequent time-series data as opposed to diet studies that often lack consistent time series. For example, fisheries data exists for some forage species including Pacific sardine and Northern anchovy. Such datasets may be able to fill some gaps in the time series, though it is acknowledged that information on forage species is often lacking.

Specific comments:

Lines 28-30: Please be clear and list the 4 traits.

Line 89: Remove the comma, and add an ‘and’ in between “(Muhling et al. 2019)” and “the number…”

Line 93: Please define or provide examples of ‘traits’ here, so the reader understands, early on, what ‘trait-based’ approaches entail.

Lines 99-102: This is also common in forming diet matrices in ecosystem mass-balance models where prey may be aggregated into functional groups (e.g., “mesopelagic fishes”, “epipelagic squids”).

Lines 104-105: Please elaborate on ‘there is little evidence for the influence of predator size on prey selection’. Do you mean predators do not select prey based on prey size? There are several papers that

discuss ontogenetic shifts in tuna diets, but large-bodied tunas continue to eat small-sized prey even though they have the gape size to eat large-sized prey.

Line 141: Add a comma after ‘i.e.’ for consistency.

Lines 150-151: Suggest changing ‘longlining’ to ‘longline gear fished’ and mention what the specified depths were (e.g., shallow or deep and define each categorization) and change ‘purse seining gear’ to ‘purse-seine gear’.

Lines 172-175: I think ‘metainformation’ should be changed to ‘meta-information’ throughout the paper, but this may be a comment better suited to the Editor. How was adult vs. juvenile life stage determined for these 221 species in albacore diet? What kinds of trait information were similar between juveniles or adults? Please provide an example of similarities in trait information here.

Line 188: Provide the equation.

Lines 189-193: Please elaborate. How did you match gear-specific length data? Length data can vary within a specific gear type. What statistical test was used to determine whether differences were significant? This information was not provided in the Appendix B either (same for Menard’s equation in line 188 or mentioned in Appendix B, these details have not been provided).

Lines 201-209: I think the section on prey traits should come before prey life stage because there is a fair amount of text on prey traits in the prey life stage section, but without any information on what the prey traits are. The prey traits are the most important part of this paper.

Line 274: Geographic region is not a typical environmental parameter (e.g. SST, chl-a etc.) and can encompass dynamic oceanographic conditions. I suggest changing ‘environmental variable’ to ‘geographic variable’ and remove ‘geographic’ from the parenthesis. Line 275 would then become ‘trait-geographic interaction’ instead of ‘trait-environment interaction’. Subsequent mention of environment would also need to be changed (e.g. Table 2, line 290)

Line 277: State the 7 trait guilds, particularly because you previously mentioned 4 traits.

Line 282: change ‘include’ to ‘included’

Line 302: Please add the total number of taxa consumed by albacore to assist the reader with the various numbers provided in this paragraph.

Line 337: remove the space between ‘(Figure 4)’ and the period.

Line 347: Remove the ‘,’ after ‘(Figures 4 &5)

Lines 370-372: This sentence is confusing because you mention 7 trait guilds and 4 sets of traits but list 3 descriptions (prey habitat association, seasonal and diel vertical migration). I suggest revising this sentence for clarity and remind the reader what the 4 traits are by listing them instead of the 3 descriptors. It would also be helpful to remind the reader what the 7 guilds are.

Lines 389-392: This is an important sentence because trait-based approaches should not replace taxonomic approaches but rather be complementary.

Lines 458-466. This is a great paragraph for informing future diet studies. Not only would more consistent low-level diet studies create improvements in monitoring communities and predator-prey interactions over time and under variable environmental conditions but including information on both predator and prey size in future diet studies is helpful for determining ontogenetic shifts in diet. It seems the trait-based approach is complementary to traditional diet studies where disaggregated diet data is essential to more accurately reduce complex taxa-specific data into simplistic habitat guilds to infer changes in species distributions and availability.

Line 520: Should this title be capitalized?

Line 534: italicize Thunnus alalunga.

Line 567: italicize Thunnus alalunga.

Lines 680-682: Fix the formatting of this reference.

Line 686: Please italicize Thunnus alalunga.

Line 722: Italicize Thunnus orientalis.

Lines 728-729: italicize Thunnus alalunga.

Line 758: italicize Thunnus alalunga.

Fig 4. This is a great figure to show the trait guilds in albacore diet over time. I suggest adding to the caption a link to Table S5 and including an additional column in S5 to connect each prey species to the prey trait guilds listed here. This would allow the reader to filter the data in the table on a specific prey trait guild to see what species were included in this guild.

SI: Line 143: Italicize Thunnus alalunga

List of supplementary information Tables - captions

Table 1 caption. The caption lists 3 traits, but the table lists 4. For clarity, I suggest either adding ‘vertical and horizontal’ before habitat use or deleting the text in parentheses, since the traits are repeated in the table.

Table S5 caption: Change ‘prey species information’ to ‘prey taxa information’ since you also include class, order, and family. Please list the 4 traits for clarity (only 3 are currently listed). I think adding a field for ‘prey trait guild’ would be a nice way to link the prey trait guild to each prey species and help the reader to see which prey species were assigned to which trait guilds (see my comment for Figure 4). If researchers wish to conduct further research on prey trait guilds, they could consult this table for which you have already assigned prey species to a specific trait.

Table S6 caption. The font is different. Please change to be consistent.

Table S7 caption: Change ‘form’ to ‘from’. Also in some instances ‘1900’ is used and others ‘1880’. Please be consistent.

Table S3: Define the LocatName’s with letters (i.e. A, B, C).

Table S3: What does field ‘stomachs_used’ indicate? Is this the number of stomachs in the original study or the number of stomachs used in this meta-analysis?

Table S3: For ease of future analysis, consider changing ‘SampleMethod’ to ‘FishingMethod’ or ‘Gear’ since the data in this field consists of fishing gear. Also, where possible, combine different gear spellings (e.g. ‘longline’ & ‘long-line’; ‘troll, pole-line’ & ‘troll/ pole-line’).

Table S5: How were the prey assigned to vertical & horizontal habitat use and diel & seasonal migration traits? Were these ‘traits’ identified in the literature or assigned from online tools (e.g. Fishbase) or from expert opinion? Please define maxFO, maxN, and maxM. This is an important table because the prey are linked to the traits. I realize this is an extensive table, but I wonder if this table might be better suited for the main text instead of supplementary material.

Table S7: Please elaborate on the table caption. For example, taxonomic information is included in Table S5, so how are the taxonomic lists different? Why is this list longer than the list in S5? Could Tables S5 and S7 be combined? If they remain separate, I suggest using the same terminology for the column headers for consistency (e.g. ‘PreyLife’ and ‘PreyLifeNote’ would change to ‘life_stage’ and ‘life_note’ or vice versa to be consistent with Table S5).