Peer Review: Differentiation and adaptation among fishers in Western Canada: Evidence for validity of *Pekania pennanti columbiana* subspecies

Richard D. Weir[1]

Collaborators: Tyler Brasington, Nathan Chabaud, Jody Tucker + 2 other reviewers

Accepted by 5 of 5 reviewers

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[1] Artemis Wildlife Consultants, Duncan, British Columbia, Canada
RW: https://orcid.org/0000-0002-5381-8514

Transparent Peer Review

- View reviewer summaries
- View resubmission 2 with reviewer comments
- View resubmission 1 with reviewer comments and author responses
- View initial submission with reviewer comments and author responses

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Conflicts of Interest

The author declares no conflicts of interest.

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Corresponding Author

Richard D. Weir
rweir@artemiswildlife.com


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Reviewer Summaries

Tyler Brasington

Initial Submission

Do you have any conflicts of interest that could bias your ability to provide an independent review?

No

What did the authors do a good job with?

The author(s) morphological results presented within the manuscript are extremely interesting. The author(s) discussion surrounding historical refugia/biogeographical history and context is also very detailed and well presented, but maybe too in depth. Topics discussed within the manuscript are well researched.

How do you think this research will contribute to the field?

I am not entirely convinced with the author(s) evidence presented making a case for two subspecies. I do believe that there is a lot of merit in the material presented in the paper currently, but I believe the author(s) will need to make some major revisions/adjustments to their interpretation for some literature cited.

Regarding the study design and methods, what do the authors need to fix or improve upon to be fit for publication?

The author(s) should explain and elaborate on subjectivity of cementum annuli aging as a method and provide clarification on the tooth sampled for aging purposes. Mixing tooth types in samples can cause error in datasets per Matson's Laboratory, which the author referenced. The author(s) should provide clarification on foot dimensions; when measuring the foot pad, were measurements minimum or variable outline metrics? This needs to be clarified for consistency with other sources of literature.

Regarding the analysis and interpretation of their findings, what do the authors need to fix or improve upon to be fit for publication?

Some word choice is strong (reference my comments). I have reservations about the author(s) interpretation of some results (e.g., evolved adaptive differences, different diets). Restructuring will be necessary. Some statements/interpretations of data within the paper are unsupported by current existing literature (see comments in the manuscript). The author(s) will need to adjust their word choice, and interpretation accordingly for a more accurately portrayal and representation of what has been found in current literature (without embellishing or over extrapolating). Some of the statistical results/numbers should be input and formatted in tables.

Is there anything else you think the authors need to fix in their article to be fit for publication?

Overall, there are several formatting issues I have found throughout the manuscript (e.g., British English) and numbers reported under 10 (e.g. 5 or five). This will largely depend on the journal editorial criteria. Either way, it should be consistent throughout the paper. Stick with British English or American English do not mix the two.

Do you have any concerns about the ethics of this research?

I do not have any concerns about the ethics of this research.

Do you believe the article, in its current form, is fit for publication?
Revise & Resubmit

Revised Submission 1

Do you have any conflicts of interest that could bias your ability to provide an independent review?
No
How well did the authors respond to your comments?
5/5
What - if any - feedback do you feel the authors did not adequately respond to?
Foot loading questions related to the measurement of feet. There are some inconsistencies that were not addressed; someone with an expert tracking background may dispute some of the methods (i.e., measuring outer width of the foot w/ and w/o fur)
What else do the authors need to fix for this article to be ready for publication?
I think the author needs to elaborate and strengthen the foot loading and tracking section. Everything else is fairly straight forward and the author did an excellent job adjusting and revising the entire manuscript.
If the authors make these changes, will the article be ready for publication?
Yes
Should this article be published?
Yes - accept with the revisions I mentioned
Do you need to see the article again before it gets published?
No - I don't need to see it again
Would you like to be listed as a Collaborator on the final publication?
Yes, please list me as a Collaborator

Revised Submission 2

Do you have any conflicts of interest that could bias your ability to provide an independent review?
No
How well did the authors respond to your comments?
5/5
What - if any - feedback do you feel the authors did not adequately respond to?
My biggest criticism with previous manuscripts was focused on a section in the methods focused on tracks. Tracks widths are measured at the cusp of the upward curvature from the track base (Halfpenny 2000) are referred to as the minimum outline. The full width of a track including the upward curvature, is referred to as the variable outline. My question was whether the author was measuring tracks, and foot pads on captured individuals, or only measurements from captured individuals. Zielinski and Truex, 1995 measured tracks. My question focused on when the author described measuring the foot pad, were their measurements minimum or variable as defined previously in literature. I was pleased to see the author revisited this section. "Upon closer examination of the foot measurements of live-captured fishers from the Columbian population, and in speaking with the data collectors, the methods used to measure feet were applied very inconsistently with this sample. Because of this and the fact that I did not have comparable data from live-captured fishers in the Boreal population, I decided to remove this data from the manuscript." I believe this was a sounds decision, and removed skepticism I had with these specific methods. All things considered, I believe the author did an excellent job responding to almost all of the

feedback from reviewers. I believe the author accepted all major revisions - the author should be proud of this work, and it deserves to be published.

Based on your review, what should happen next?

This paper requires minor revisions but does not need further peer review

Would you like to be listed as a Collaborator on the final publication?

Yes, please list me as a Collaborator

Nathan Chabaud

Initial Submission

Do you have any conflicts of interest that could bias your ability to provide an independent review?

No

What did the authors do a good job with?

The hypotheses and methods used correspond well to the objective of the study, to determine the validity of a subspecies of fisher, and are complementary to the literature.

How do you think this research will contribute to the field?

Yes, although at this stage I'm dubious about the findings on diet in particular.

Regarding the study design and methods, what do the authors need to fix or improve upon to be fit for publication?

N/A

Regarding the analysis and interpretation of their findings, what do the authors need to fix or improve upon to be fit for publication?

Generally speaking, the study does not take sufficient account of the general context of the fisher. Recontextualise the results obtained on diet with other studies showing the great dietary plasticity of the fisher. The differences observed, although significant, do not seem to me to be that great in relation to the plasticity of the species. Diet only in winter : this limit should be emphasied.

Is there anything else you think the authors need to fix in their article to be fit for publication?

Rebelance discussion section

Do you have any concerns about the ethics of this research?

No

Do you believe the article, in its current form, is fit for publication?

Revise & Resubmit

Revised Submission 1

Do you have any conflicts of interest that could bias your ability to provide an independent review?

No

How well did the authors respond to your comments?

4/5

What - if any - feedback do you feel the authors did not adequately respond to?

N/A

What else do the authors need to fix for this article to be ready for publication?

Rewording according to reviewers' comments. Figure 2 can be improved. Pay attention to figure number.

If the authors make these changes, will the article be ready for publication?
Yes
Should this article be published?
Yes - accept with the revisions I mentioned
Do you need to see the article again before it gets published?
No - I don't need to see it again
Would you like to be listed as a Collaborator on the final publication?
Yes, please list me as a Collaborator

Revised Submission 2
Do you have any conflicts of interest that could bias your ability to provide an independent review?
No
How well did the authors respond to your comments?
5/5
What - if any - feedback do you feel the authors did not adequately respond to?
None. They responded to comments and clarified points in sections
Based on your review, what should happen next?
This paper requires minor revisions but does not need further peer review
Would you like to be listed as a Collaborator on the final publication?
Yes, please list me as a Collaborator

Michael Joyce

Initial Submission
Do you have any conflicts of interest that could bias your ability to provide an independent review?
No
What did the authors do a good job with?
The discussion, while long, was really well written and discusses some interesting hypotheses for the type of biogeographical differences that could have resulted in the differences reported here. Some reviewers have interpreted these as conclusions, while I interpret them more as hypotheses. I also think the morphometric analyses and diet analyses are interesting and important.
How do you think this research will contribute to the field?
They help to establish morphological differences between two genetically differentiated populations of fishers that have limited breeding and suggest interesting hypotheses for the evolutionary background that resulted in the modern day differences. These results provide hypotheses for future studies to consider regarding the evolutionary history of fishers. Perhaps more importantly, this paper sets up a testable hypothesis regarding the conservation of fishers in this region -- that introductions from one area to the other will not be successful, and that maintaining current genetic diversity is imperative to success of fishers in this region.
Regarding the study design and methods, what do the authors need to fix or improve upon to be fit for publication?

The authors did a good job overall with study design and methods. I would like to see some analysis (in supplementary material) addressing the potential for unbalanced design to influence the results, as I suggested in the manuscript comments. Otherwise, I think the study design and methods are solid.

Regarding the analysis and interpretation of their findings, what do the authors need to fix or improve upon to be fit for publication?

I agree with other reviewers that some of their conclusions are better interpreted as hypotheses and are at times speculative. I think that tying the results more directly to genetic differences and proposing what future analyses would help test their hypotheses would be a better way to present the findings. Additionally, I think it is impossible from the current data to tell whether differences in diet are the result of evolutionary adaptation, caused by differences in prey availability, or caused by other factors. The author should more explicitly indicate that dietary differences could result from past adaptive radiation, but could also result from many other factors not considered.

Is there anything else you think the authors need to fix in their article to be fit for publication?

I provided several small comments that I think are worth addressing, but I don't have any other major issues.

Do you have any concerns about the ethics of this research?

No

Do you believe the article, in its current form, is fit for publication?

Revise & Resubmit

Revised Submission 1

Do you have any conflicts of interest that could bias your ability to provide an independent review?

No

How well did the authors respond to your comments?

3/5

What - if any - feedback do you feel the authors did not adequately respond to?

The authors did not respond well to statistical concerns related to sample size or comments from myself or others regarding concerns about whether their diet data were informative.

What else do the authors need to fix for this article to be ready for publication?

I think the author needs to really consider what should go in this manuscript. There are a lot of different components. While some provide interesting results (e.g., morphology), others don't really add a lot (e.g., age structure and sex ratios) or that are hard to interpret based on sample sizes (e.g., forest structure data). Additionally, the biogeographic history section should be substantially reduced in the discussion. Some discussion of that is necessary, but the length and level of detail don't really align well with what the authors have found. I also think the author needs to re-evaluate whether the diet differences are actually informative and consider removing them or softening the strength of the inferences drawn from them. The discussion has a lot of speculation that I do not think can be supported by the results (e.g., differences in foraging efficiency due to modest differences in body size when the actual skull and likely foraging apparatus is not significantly different). Finally, I still have concerns about their analyses that I think need to be addressed with additional analysis rather than simply being dismissed because the author doesn't deem them necessary.

If the authors make these changes, will the article be ready for publication?

Yes

Should this article be published?

Yes - accept with the revisions I mentioned

Do you need to see the article again before it gets published?

Yes - I'd like to see it again

Would you like to be listed as a Collaborator on the final publication?

No, I do not want to be listed as a Collaborator

Revised Submission 2

Do you have any conflicts of interest that could bias your ability to provide an independent review?

No, none that I am aware of.

How well did the authors respond to your comments?

4/5

What - if any - feedback do you feel the authors did not adequately respond to?

I still have major issues with the interpretation of the diet differences in the Discussion. The author(s) have taken steps to soften the language and ensure their ideas are interpreted as hypotheses, but I think that unless/until they have data to support the notion that the dietary differences are due differences in morphology and forest structure, it is far form the most parsimonious explanation for their results. Additionally, I find the discussion of relative prey availability (particularly hare densities from other studies with other objectives) to be misleading. I think the authors should be able to suggest that additional work is needed to test *if* the dietary results could relate to differences in morphology and forest structure between the populations, but should defer to more likely explanations until data supporting this idea are available and should change their discussion of prey availability from other studies so it is more faithful to what those studies actually reported.

Based on your review, what should happen next?

This paper requires minor revisions but does not need further peer review

Would you like to be listed as a Collaborator on the final publication?

No, I do not want to be listed as a Collaborator

Maryana Ranyuk

Initial Submission

Do you have any conflicts of interest that could bias your ability to provide an independent review?

No

What did the authors do a good job with?

The authors do a good job with collecting material, morphologic and diet analysis, review of biogeographical history

How do you think this research will contribute to the field?

Description of the population structure of a species is very important for commercial species as fishers. Previously, the description of subspecies was based on morphological data. The analysis of genetic data allows much more precise identification of population boundaries, but the use of morphological data allows a more complete analysis of the ecology and dispersal history of the species.

Regarding the study design and methods, what do the authors need to fix or improve upon to be fit for publication?

A figure with a picture of morphometric measurements may be useful

Regarding the analysis and interpretation of their findings, what do the authors need to fix or improve upon to be fit for publication?

The observed differences between the two populations in morphometric traits and diet are quite convincing. Perhaps only the author's prediction that individuals from one population will not survive introduction into the territory of the other population is very discussable. Examples of other species of the genus Martes (sable) show that successful introduction of individuals of one subspecies into the area of other subspecies with very different morphological and genetic characteristics can be successful.

Is there anything else you think the authors need to fix in their article to be fit for publication?

N/A

Do you have any concerns about the ethics of this research?

No

Do you believe the article, in its current form, is fit for publication?

Accept

Would you like to be listed as a Collaborator on the final publication?

No, I do not want to be listed as a Collaborator

Revised Submission 1

Do you have any conflicts of interest that could bias your ability to provide an independent review?

No

How well did the authors respond to your comments?

5/5

What - if any - feedback do you feel the authors did not adequately respond to?

N/A

What else do the authors need to fix for this article to be ready for publication?

N/A

If the authors make these changes, will the article be ready for publication?

Yes

Should this article be published?

Yes - accept with the revisions I mentioned

Do you need to see the article again before it gets published?

No - I don't need to see it again

Would you like to be listed as a Collaborator on the final publication?

No, I do not want to be listed as a Collaborator

Revised Submission 2

Do you have any conflicts of interest that could bias your ability to provide an independent review?

No

How well did the authors respond to your comments?

5/5

What - if any - feedback do you feel the authors did not adequately respond to?

N/A

Based on your review, what should happen next?

This paper is ready for publication
Would you like to be listed as a Collaborator on the final publication?
No, I do not want to be listed as a Collaborator

Jody Tucker

Initial Submission
Do you have any conflicts of interest that could bias your ability to provide an independent review?
No
What did the authors do a good job with?
I thought the paper was well written with concise and easy to follow language. Their morphological study methods were well done and I found the results very interesting. I also found their discussion of glacial history in relation to the species distribution, and subspecies designation very thorough and I enjoyed reading it.
How do you think this research will contribute to the field?
I cannot think of many studies of population based assessments of morphological differences for mustelidae of this thoroughness in terms of what was quantified as well their relatively large sample sizes given the species. I think the results contribute insight into morphological differences within a species, and raise interesting questions about why the observed differences may be occurring (biogeographic history, local adaptation, etc...). This morphological data provides a great foundation from which to further examine some of these questions.
Regarding the study design and methods, what do the authors need to fix or improve upon to be fit for publication?
I would like to see a more detailed explanation of the specimens measured and if and how long term freezing might impact the morphological measurements. Other than that I thought the description of the methods and study design was sound.
Regarding the analysis and interpretation of their findings, what do the authors need to fix or improve upon to be fit for publication?
As written I feel the article overstates the implications of their findings in terms of the level of support for subspecies designations, and it also implies links to a genetic basis for the morphological findings that were not empirically tested in this paper and not supported elsewhere in the literature. To be fit for publication the language needs to be refined to clarify areas of speculation vs what is actually supported by the data and analyses reported in this paper. There are also some inaccuracies in the reporting or interpretation of findings of some supporting genetics work that needs correction.
Is there anything else you think the authors need to fix in their article to be fit for publication?
There are a few places where referencing to existing research needs to be improved to incorporate more recent pertinent citations.
Do you have any concerns about the ethics of this research?
No
Do you believe the article, in its current form, is fit for publication?
Revise & Resubmit

Revised Submission 1

Do you have any conflicts of interest that could bias your ability to provide an independent review?
No
How well did the authors respond to your comments?
3/5
What - if any - feedback do you feel the authors did not adequately respond to?
1) Reviewer 4 comments/concerns that the language linking observed morphological differences as evidence of locally adaptive, heritable traits was not supported was not adequately addressed by the author(s) in the revision. While the author did soften the language in several places, these conclusion are still prevalent throughout the manuscript in a way that makes it feel like a main take home of this paper but I feel these conclusions are unsupported by the data analysis reported in this manuscript.

2) Reviewer 6's comments regarding unequal sample sizes between the Boreal and Columbiana samples and the suggestion to subset/bootstrap results to address these sample size discrepancies. I feel this is a valid concern that could significantly impact results and the author did not adequately respond, or complete the sub-setting request which would be relatively straightforward to do. The reader is not given enough information to conclude that the samples analyzed were indeed representative of each of the subpopulations. It would be very helpful to add sample locations to the map in figure 1 to help assess this as well. If set of samples were collected from a geographically restricted area or in a way that was otherwise unrepresentative of the overall population, the data presented may not fully reflect the sizes present in each of the subpopulation.

3) Two reviewers commented on the biogeographical history section of the discussion being overly long at 10 paragraphs. The author did not seem to revise the length at all in response to this. I concur that this section is indeed too long and detracts from the overall flow of the manuscript. I do think this discussion section is well written and very interesting in its own right but is confusing to follow in the context of the rest of the manuscript. I actually think this section would be a great stand-alone publication on the biogeographical history of this species, but it does not fit well as currently written within the morphological data manuscript.
What else do the authors need to fix for this article to be ready for publication?
1) My main concern continues to be that I consider much of the interpretation of the morphological and diet results as evidence of heritable and locally adaptive traits to be speculative and somewhat misleading. I do not support these conclusions given the complete lack of genetic data presented in the paper that in any way ties the morphological observations to genetically heritable traits- this is too big a leap from the data presented or any other previously published genetic work cited. While there certainly is past work showing significant substructure and limited gene flow between the Columbian and Boreal areas, the amount of substructure (Fst= 0.046, migrants/generation = 3-5, Weir et al. 2024) is hardly enough to support a convincing argument to the amount of isolation to necessarily result in local adaptation – it is possible, but there is no evidence provided to support this conclusion in this paper, and no specific functional genes have been identified in other work in relation to heritable body size that I know of in mustelids.

I strongly disagree with the concluding statements that I feel are not supported or even addressed by the data presented in the paper and this needs revision to align conclusions with the data presented in the analysis. "Furthermore, I contend that fishers in the Columbian population had an evolutionarily

significant period of isolation that generated an evolutionary history with localized adaptations that cannot be reasonably expected to be practically reconstituted. Specifically, fishers in the Columbian population possess traits that appear adaptive, heritable, and unlikely to be reconstituted if this population were lost because individuals from other populations would not have the same heritable adaptive traits or hallmarks of the same evolutionary history as those they are replacing."

I do think the morphological and diet work presented in the manuscript is a valuable contribution, interesting, and worthy of publication. But for me to be publishable the interpretation of it needs significant reframing to focus on the results supported by the data presented and minimize the repeated ties to genetic or evolutionary causes which are purely speculative.

2) The author needs to provide more information on sample locations for fishers in each area (add to figure 1) and better address this issue of unequal sample sizes to ensure the reader the results are not the result of a biased sample. While a small sample is not necessarily biased it certainly could be (disproportionally sampling larger or smaller individuals compared to the overall population), and as a reviewer I have no information from which to assess if bias may be a factor.

3) The length of the biogeographical history section needs reduced and streamlined to focus on just the pieces that are relevant to interpretation of the data presented. Perhaps pull into a separate publication? As I mentioned earlier it is a very interesting historical perspective, but it is too long as currently written is detracting to the rest of the paper and makes the paper extremely long.

If the authors make these changes, will the article be ready for publication?

Yes

Should this article be published?

Yes - accept with the revisions I mentioned

Do you need to see the article again before it gets published?

Yes - I'd like to see it again

Would you like to be listed as a Collaborator on the final publication?

No, I do not want to be listed as a Collaborator

Revised Submission 2

Do you have any conflicts of interest that could bias your ability to provide an independent review?

No

How well did the authors respond to your comments?

4/5

What - if any - feedback do you feel the authors did not adequately respond to?

I appreciate the opportunity to contribute my thoughts to this paper. I do feel it reports some very interesting morphological results and hypotheses worthy of publication. But I have a few outstaning issues: 1) I still feel like the characterization of the magnitude of genetic isolation overstates what is found in literature (principally Weir et al. 2004). This happens a number of times throughout the paper and needs revision to more accurately reflect what is in Weir et al. 2024 as that work is central to the aims of the paper 2) A number of reviewers commented that the manuscript was overly long with too many components that distracted from the main subject.

I think this is still the case and while the author did address this to some extent in the revision the issue still persists. The length detracts from the overall readability, and some of the results such as age structure, and reproduction data are not that informative toward the issue of differentiation between the populations. If the author wants to include this data as part of this effort I would suggest minimizing the description/discussion of these topics in the main manuscript and rather move the bulk of those sections to supplementary information. This would help reduce length and improve the flow of the manuscript. As this would mainly entail simply moving blocks of text out of the main document into a supplement and some minor revision to the main text to add in supplementary material references, I would consider this a minor revision. 3) I do not think the discussion of Cascades translocation should be included in the discussion as there is not enough information provided to properly evaluate if the conclusion they present as being evidence of local adaptations for columbiana is true or not 4) While I still do not agree with all of the author's hypotheses and interpretations in the discussion, I do feel that they have revised the language sufficiently to acknowledge uncertainty and need for further research to support their interpretations, compared to the previous draft.

Based on your review, what should happen next?

This paper requires minor revisions but does not need further peer review

Would you like to be listed as a Collaborator on the final publication?

Yes, please list me as a Collaborator