

***Interactive comment on* “Commercial traceability of *Arapaima* spp. fisheries in the Amazon Basin: can biogeochemical tags be useful?” by L. A. Pereira et al.**

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Jordaan Comments (1) comments from Referees The manuscript is well written, has a proper and logical layout and makes a valid and valuable scientific contribution. The text can, however, benefit from minor editing (see notes below under editing). The authors investigated a very complex river system draining an even more complex geological setting. Sr isotope analyses is a good method for investigating such a system as it is mainly determined by the weathering of up-stream geology which is not expected to vary much within a 10 or even 50 year period. Please see Jordaan, L.J., Wepener, W. and Huizenga, J.M. (2016). The strontium isotope distribution in water and fish within

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major South African catchments. *Water SA*, 42(2), 213-224. In this case, very similar data were obtained in a smaller and more controlled river system but it confirms the underlying assumptions made by the authors for the Amazon system. Data gathering can be much expanded over a multi-year sampling period to include seasonal variation if a further study is ever undertaken.

(2) author's response We fully agree that it is important to monitor river seasonal variation of Sr isotope to improve the Amazon system knowledge. The Hybam project has been providing pioneer monitoring and characterization of the Amazon system, including monthly water sampling for more than 10 years at 15 sites (Santos et al. 2015). This data set constitutes a baseline and background that has benefited several studies related to fishery sciences (migration pathways, fish stock localization, or like in our manuscript commercial traceability) as well as to the evolution of the basin. These data clearly highlight the Sr isotopic composition contrast among major Amazon sub-basins as well as seasonal isotopic fluctuations related differential erosion sources (see Santos et al. 2015). Due to the logistic complexity of water sampling in the Amazon system, it is difficult and expensive to expand the monitoring although it is surely an important issue. We hope that our work to provide a new application of this knowledge, thus reinforcing the argument to improve such a monitoring program.

Our finds are in agreement with Jordaan et al. (2016), which will be included in our revised manuscript. In the Amazon basin, Pouilly et al. (2014) established the correlation between Sr isotopic ratio in water and in fish, as provided by Jordaan et al. (2016) in South Africa.

(1) comments from Referees

Using C isotopes is a good approach for this problem. It has however several more factors influencing isotope fractionation than Sr isotopes and should be used within the constraints of the technique, as the authors rightfully did. Data can be much expanded if a further study is ever undertaken.

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(2) author's response As state in our conclusions, the C isotope results are still preliminary and need further understanding. Nevertheless, they are promising as a commercial traceability tool that can be improved based on trophic marker studies.

(1) comments from Referees The problem of obtaining fish samples with a known origin is not unique to this study and it is recommended that fish obtained from markets be treated with caution.

(2) author's response We agree with this remark.

(1) comments from Referees The value of this work lies in the fact that it can be extended to solve more than one issue. The biggest being the illegal use of protected natural fish populations. The techniques will work for other fish species as well and it will provide data as to the sediment load and erosion patterns of such large rivers.

(2) author's response We thank the reviewer for these positive points of view, which we share!

(3) author's changes in manuscript. Editions:

Page 2 line 9: replace "certificate" with "characterize" Page 3 line 17: replace with: "The Amazon basin represents a dynamic and heterogeneous ecosystem extending over more the 45% of the surface area of South America." Page 3 line 18: replace: "geologic" with "geological" Page 3 line 20: replace with "These habitats are therefore some of the most biodiverse in the world, particularly in regard to the Amazonian freshwater fish fauna which is under pressure of degradation by dams, buildings, mining, land cover and global climate change" Page 6 line 12: replace "Inter laboratorian" with "Inter-laboratory" Page 6 line 13: replace "repeatability" with "repeatability" Page 7 Figure 2: replace " $^{87}/^{86}\text{Sr}$ " with " $^{87}\text{Sr}/^{86}\text{Sr}$ " (numbers in superscript) and use this notation consistent throughout the entire document. Page 7 line 10: replace "The slice preparations were drilled per 6.8 mm interval" with "The slice preparations were drilled a 6.8 mm intervals" Page 7 line 18: replace "Also a test t was applied" with "A t-test

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was also applied” Page 9 Figure 4: replace “ $^{87}/^{86}\text{Sr}$ ” with “ $^{87}\text{Sr}/^{86}\text{Sr}$ ” (numbers in superscript) and use this notation consistent throughout the entire document. Insert “ $^{87}\text{Sr}/^{86}\text{Sr}$ ” (numbers in superscript) for part (b) of the figure also. Page 9 line 8: replace “interindividual” with “inter-individual” Page 10 Figure 5: replace “ $^{87}/^{86}\text{Sr}$ ” with “ $^{87}\text{Sr}/^{86}\text{Sr}$ ” (numbers in superscript) and use this notation consistent throughout the entire document. Insert “ $^{87}\text{Sr}/^{86}\text{Sr}$ ” (numbers in superscript) for Central Amazon part of the figure also. Page 11 Figure 6: replace “ $^{87}\text{Sr}/^{86}\text{Sr}$ ” with “ $^{87}\text{Sr}/^{86}\text{Sr}$ ” (numbers in superscript) Page 11 line 16: replace “(sample origin in a row, predicted origin in the column)” with “(sample origin rows predicted origin columns)” Page 12 line 4: replace “(sample origin in a row, predicted origin in the column)” with “(sample origin rows, predicted origin columns)” Page 12 line 19: meaning unclear, please re-write sentence: “The role of food is more controversial as revealed by Sturrock et al. (2012) that reviewed significant or nonsignificant food up taking processes on the Sr isotopic composition of fish.” Page 13 line 21: please confirm: “black water” or backwater” and be consistent throughout document.

We have accepted all of Jordaan’s editing suggestion.

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