Peer Review Summary Document

(04/07/2025)

Peer Review Plan

distribution-selenium_in-large-cold-temperate-riverine-ecosystem [70 KB PDF].

Title and authorship of Information Product Disseminated

Bioaccumulation and trophic transfer of selenium in a large oligotrophic river, By Christopher A. Mebane, A. Robin Stewart, Erin M. Murray, Terry R. Short, Veronika A. Kocen, and Lauren M. Zinsser.

Peer Reviewers Expertise and Credentials

Reviewer #1 has a PhD in zoology and has more than 30 years of experience working with selenium ecotoxicology issues and has co-authored more than 40 publications relevant to selenium (Se) in aquatic environments.

Reviewer #2 holds a PhD in biology and has authored or co-authored at more than 65 publications, including two on selenium in aquatic food webs.

Anonymous reviewers #3 and #4 were selected by the editor of the journal *Environmental Toxicology and Chemistry* for their subject matter expertise.

Charge Submitted to Peer Reviewers

The USGS selected reviewers were asked to make an objective evaluation of the research, clarity, the logic and objectivity of the interpretations of the results, and compliance with data policies. The journal editor asked the anonymous reviewers selected to specifically address the following 5 aspects of the manuscript: (1) ***Knowledge Presented*****:** Is new knowledge presented? Is the quality of the science adequate? Are scientific statements supported by the results presented or by reference to authoritative literature? (2) ***Methods*****:** Are experimental designs, statistical methods, and data-analysis techniques adequately described? For instance, if you (or another researcher directly in the field) sought to repeat the experiments or analyses, would you likely have enough information to do so? (3) ***Results*****:** Are results presented in tables and/or graphics in a way that is precise and unambiguous? Is the written description of results clear and concise? Are the tables and figures relevant? (4) ***Clarity of Expression****:* Are the hypotheses, methods, results, and discussion presented in a clear and logical way? (For example, does the introduction set the stage for what follows? Does the discussion make sense from the results reported? Do conclusions follow logically from the data and interpretations?) Is the writing clear, grammatically correct, and straightforward? and (5) ***Scientific Integrity and Transparency*****:** Is the study free from apparent bias? Are the actual data accessible to readers, such as by link to a data repository or as online supplemental data? Are funding sources and potential competing interests disclosed?

Summary of Peer Reviewers Comments

Reviewer #1 was complimentary of the draft manuscript and remarked: *"My overall impression of this manuscript is that it is an exceptional piece of work, a top five-percenter among all of the selenium ecotoxicology literature I have read over the past four decades! The study was well designed, the data collection was well executed using sound methods, and the data analysis and write-up are clear; presenting nontrivial results and conclusions that I expect will prove of great value in both the purely academic and applied science arenas."* Reviewer 1's most substantive comment was that the manuscript

did not emphasize regulatory implications of exceedances of water quality criteria. Other comments the reviewer made were editorial in nature.

Reviewer 2 thought that the manuscript was well written. Other comments and recommendations for clarification included having more consistency with scientific names needing italics, concern about the length of the manuscript with the 15 figures and tables, and the amount of detail covered in the discussion from the selenium in fish to the trophic transfer discussion to the implications section. The reviewer suggested this one manuscript could be separated into two manuscripts—although nothing to the reviewer seemed superfluous, and they did not offer a recommendation on how to cut the manuscript down.

Reviewer 3 noted that "*provides a comprehensive assessment of Se partitioning to several compartments of aquatic food webs along a major river of interest. Interestingly, it also demonstrates the high bioaccumulation of Se in fish in a system when water Se levels do not exceed chronic U.S. Environmental Protection Agency (USEPA) Water Quality Guidelines."* They also commented that the work *"will be of interest to the scientific community and is an important contribution to the field of selenium ecotoxicology."* Reviewer 3 provided additional comments and suggestions, including to(1) perform statistical analyses to better support statements such as selenium concentrations are different from this place to that or this species to that species, and so on; (2) they questioned a major conclusion of the manuscript which was, despite convention, whether waters are lentic or lotic was a poor predictor for whether water bodies waters were at a high or low risk of selenium bioaccumulation—contending that selenium speciation was a better predictor, and more should be done with that; and (3) comments contrasting the findings in this study with previous studies and perceived conventions, adding that the USEPA "egg/ovary" terminology should not be used because the study did not include collecting fish eggs from the river, and the "eggs" removed from the bodies of fish were more appropriately called "ovaries." Reviewer 3 also suggested placing greater emphasis on the regulatory implications of some of the findings.

Reviewer 4 noted that "*this study characterizes selenium movement through the food chain along an extensive stretch of the Kootenai River. This is a very large study and the authors are to be commended for the extensive effort required to collect this amount of data. The data analysis and interpretation was generally robust and scientifically sound. There were several points though where I think the authors could delve a little deeper into their data to better characterize patterns/trends in their data…. Overall, this is an excellent study that makes a valuable contribution to our understanding of selenium bioaccumulation in aquatic systems*." The reviewer's most substantive critiques included (1) skepticism that selenium was really being transported 185 km from Libby Dam to the Canadian border; (2) similar to Reviewer 3, in questioning the conclusion, that separating waters as being lentic or lotic was not a good predictor for whether water bodies waters were at a high or low risk of selenium bioaccumulation. Reviewer 4 also thought that selenium speciation likely had more to do with selenium bioaccumulation risk than expressed in the manuscript and suggested additional analyses be done; (3) suggested digging deeper into both the data and USEPA's data on selenium bioconcentration factors to see if they can be reconciled (which relates back to the major comment by Reviewer 3); and (4) thought a summary of literature on dietary effects of selenium on fish was biased towards listing low concentrations causing adverse effects.

Summary of USGS Responses to Reviewer Comments

In response to Reviewer 1 comment that regulatory implications were de-emphasized, the authors acknowledge this is correct, however, this deemphasizing was deliberate—while some findings do have regulatory implications, the point of the study is to get the science out as it is and leave to others the further study to evaluate regulatory implications. Revisions were made in response to editorial comments from Reviewer 1 and Reviewer 2.

The authors' recognized Reviewer 2's suggestion that they could get two publications out of the material. However, they thought the study's story would be harder to tell split among two manuscripts and opted to continue to seek publication of this single, more comprehensive manuscript.

Revisions in response to comments from Reviewer 3, statistical multiple group comparison analyses were performed and the manuscript text and figures revised accordingly In response to comments from Reviewer 2 that selenium speciation was more important than the authors realized, a compilation and evaluation of other published data on selenium speciation from both the Canadian and US portions of the Kootenai basin is included. The larger data analyses supported Reviewer 3's perspective and thus, the manuscript was revised accordingly. The authors also revised the manuscript to reflect that they sampled fish ovaries not "egg/ovary" tissue as used by USEPA.

Revisions made in response to Reviewer 4's major comments included adding information on the lack of evidence for additional local sources of selenium and that attributing all the selenium loading to the Lake Koocanusa upstream reservoir was appropriate. This included the additional analyses of independent data showed no signs of any downstream increases from a separate tributary, emphasis on USGS monitoring of tributaries in which selenium was very low, and referenced a recent USGS publication which looked directly at that question (i.e., https://doi.org/10.1021/acs.estlett.4c00222). The authors also conducted the reviewer's suggested comparative analyses of selenium bioconcentration factors measured in the Kootenai River with those published by USEPA and revised the manuscript accordingly. The authors rebutted the criticism of low bias in the examples of dietary selenium toxicity to fish by showing that the summary of literature values did include higher concentrations causing no effects.

Dissemination

The authors seek to publish the article in the journal *Environmental Science and Toxicology*.