**Mark DuFour,**

Thank you for your willingness to serve as a peer reviewer for the Upper Midwest Environmental Sciences Center.

I have attached a copy of the manuscript to this email. If you have any questions or comments feel free to contact me. A copy of the instructions for reviewers of UMESC manuscripts is provided, after my contact information.

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**Due Date: May 24, 2022**

Thank you for agreeing to review the attached manuscript for the U.S. Geological Survey’s Upper Midwest Environmental Sciences Center.

To maximize the value and impact of your review, please read and follow the INSTRUCTIONS TO REVIEWERS OF SCIENTIFIC DOCUMENTS. If you wish, your identity will be withheld from the author. Please indicate this when you return your comments.

Please complete the information at the bottom of this letter and return it along with your completed review by **May 24, 2022**. If you cannot complete your review within the allotted time frame, please let me know as soon as possible.

An integral projection model for gizzard shad (Dorosoma cepedianum) utilizing density-dependent age-0 survival by Peirce, James, Sandland, G., Bennie, B., Erickson, R.

Sincerely,

Theresa Schreier

Name of Reviewer: \_\_\_Mark DuFour\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date of review \_\_\_5/24/2022\_\_\_\_\_

Area(s) of expertise: \_\_\_\_\_\_fish ecology, population dynamics, and statistical modeling\_\_\_\_\_\_\_

INSTRUCTIONS TO REVIEWERS OF SCIENTIFIC DOCUMENTS

Your responsibility as a reviewer for the Upper Midwest Environmental Sciences Center is to help us to improve the quality of our science by providing constructive, thoughtful, but forthright comments on the degree to which the attached document meets current standards recognized by the scientific community, and the degree to which the work is timely and relevant.

Please read the document carefully and evaluate it objectively. Restrict your technical comments to your area of expertise, but feel free to render opinions or raise questions about larger scientific issues that may be relevant. To the extent possible, justify your comments with supporting evidence just as you would do when presenting your own scientific work. Please do not refrain from offering relevant opinions, but also label them as such. Test your comments for fairness, objectivity and tone of delivery by asking yourself if you would be comfortable presenting your comments, face-to-face, to the author and a panel of your peers.

Do not consider prevailing opinion infallible and risk rejecting an important scientific document only because its method or conclusions are different from current orthodoxies. Creativity and innovation are important, and must be valued and weighed commensurately. On the other hand, do not be misled by persuasive writing if the document shows inadequate data or deficient analyses.

You may add your comments directly to the document, but also summarize and explain the important ones in the comment section of this form. Indicate which comments are mandatory and must be addressed in subsequent drafts.

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Please address each of the following questions as you review the enclosed manuscript:

1. Is the objective of the study scientifically relevant and clearly stated?

Yes.

1. Are the study design and methods appropriate for the purposes of the study? Are the methods presented in sufficient detail to enable the reader to repeat the study?

Yes.

1. Are there demonstrable errors of fact or interpretation?

No errors detected.

1. If your expertise includes statistics, do you find that the statistical methods are applied appropriately and interpreted accurately? If your expertise does not include statistics, do the analyses convince you that the conclusions are correct?

Yes – the applications are appropriate and convincing.

1. Is the study innovative?

Yes – IPMs are relatively new to the fisheries field and a detailed model from gizzard shad does not exist.

1. Is the writing clear, concise, and unambiguous? If not, suggest by example how the document could be improved.

Yes – the text is well written.

1. Has pertinent literature been used effectively and convincingly? If not, provide specific recommendations.

Yes – the literature appears sufficient.

MANUSCRIPT REVIEW

This manuscript applies a modeling technique (integral projection models, IPM) to gizzard shad populations from the Mississippi River basin. Applications of IPMs are relatively new to the fisheries field and appear to be beneficial, especially when length (a continuous variable) is used as a discriminating characteristic. The model builds on previous population projections by incorporating a density dependent survival component in the recruitment function. The model was developed using literature values and data from the LTRM database (sites along the Mississippi River) and validated using data from the LTRM database (site from the Illinois River). The model does a nice job of predicting size distributions through time, although slightly overestimates densities of larger individuals. The authors provide reasonable explanations for the differences between predicted and observed densities. This manuscript will be a valuable contribution to the population modeling and fisheries management literature.

REVIEW COMMENTS

General Comments:

The manuscript is interesting, well written, and will be a valuable contribution to the population modeling and fisheries management literature. There are no major flaws that would prohibit moving forward with publication. There are two areas where suggested edits might improve clarity of the modeling description, and the studies impact on future readers. For example:

Model description – The authors state that the IPM technique is relatively new to the fisheries field. Future readers, I included, may be more familiar with Leslie matrix population models. It may benefit future readers if the authors juxtaposed the two approaches in some minimal way to help readers make the mental transition and get onboard with IPM. I have provided some thoughts in the accompanying .pdf. These are just suggestions for the authors to consider.

There have been earlier papers in fish models (Erickson 2017, 2018, for example) and now a seminal book (Ellner 2018 for plant/general models) that have discussed the transition of matrix models to IPMs. As 3 of the 4 authors are academics, we love the idea of adding a more instructive connection, however we errored on the side of being more concise with our short review. We added more detail, echoing the review’s comments, in the paragraph before Section 2.2.1.

Study impact – Currently, the model does not include environmental or invasive species factors or predictors; however, in several locations they authors note that the model could be used to infer the impact of each. This is a reasonable next step, and it might be helpful if the authors provided some concrete examples/suggestions for how the model could be adapted in the future. This might be a beneficial addition to the discussion.

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The model in this paper is a first application of IPMs to gizzard shad. While it does include intraspecific density effects, it does not include other complicating factors such as environmental stochasticity and interspecific competition. The authors have recently explored modified versions of this model which include some of these factors, but those investigations are still ongoing and will likely comprise follow-up papers. The mention of invasive species is included in the paper to emphasize the importance of modeling the gizzard shad population as it has been shown to be 1) an important component of Midwest riverine systems and 2) affected by the establishment of invasive carp.

Specific Comments:

See .pdf for specific and detailed comments.