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Hydrology and Earth System Sciences
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Discussions

Interactive comment on "Illustrating a new approach to estimating potential reduction in fish species richness due to flow alteration on a global scale" *by* S. Yoshikawa et al.

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Editorial Board and Reviewers

Hydrology and Earth System Sciences/ Earth System Dynamics

Dear Editors and Reviewers,

We would like to submit "Author Comments" for our manuscript entitled "Illustrating a new approach to estimating potential reduction in fish species richness due to flow alteration on a global scale [Doi: 10.5194/hessd-10-7837-2013]" submitted to the special issue on "Predictions under change: water, earth, and biota in the anthropocene"

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Interactive Discussion
Discussion Paper

which is jointly organized by Hydrology and Earth System Sciences and Earth System Dynamics.

First of all, we would like to express our deepest gratitude to the editor and reviewers for their invaluable and constructive suggestions. All the comments were very insightful, and, hence have been addressed in the revised manuscript. A detailed one-by-one response to each comment has been prepared as well.

In summary, reviewers are concerned about the following four issues:

1. Number of selected basins;

2. Time period of river discharge simulation used;

3. Addition and revision in Sections 2 and 4;

4. Readability of the manuscript and clarity of figures;

Here, we briefly introduce the direction/approach followed during revision process.

1. Number of selected basins

Three reviewers pointed out that our original manuscript used only 26 river basins and did not consider any basins in Africa and South Asia. We have increased the number of selected river basins in the revised manuscript. Using the following four criteria, 84 river basins, out of 6,158 gauging stations in the Global Runoff Data Centre, have been selected for this study.

a) Avoid the gauging station in which the simulated and observed river discharge data are different by orders of magnitude (e.g., observation is 100,000 but simulation is 100).

b) Avoid the river basins with characteristics that have not yet been robustly represented in the CaMa-Flood river routing model. For example, the model cannot represent seasonal variation of river discharge in dry rivers in flat topography. The limitation is also caused by the current status of elevation data, in which the values are inte-

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gers. Therefore, the accuracy of flow direction calculation in the flat regions is still a challenging issue.

c) Avoid selecting the river basins where the ratio of the catchment area (i.e. provided by GRDC) to the total basin area estimated in previous studies (i.e. Tockner et al., 2008; Lehner et al., 2008) is less than 50%.

d) Avoid using several gauging stations along the same river to provide robustness and diversity. In this study, the gauging station with the largest upstream catchment area is selected.

2. Time periods of river discharge

Reviewers pointed out that 15-years river discharge data might be too short for establishing flow characteristics. We would like to clarify that the selection of the duration of data was based on previous studies (Kennard et al., 2010; Iwasaki et al., 2012). Following Kennard et al. (2010), Iwasaki et al. (2012) formulated their method using discharge data for a 15-years period. Kennard et al. (2010) showed that the performance of hydrologic metrics stabilizes when the data period is 15-years or longer (Figure 3 in Kennard et al. 2010), even through the biases are large when the data period is much shorter (e.g. less than 5-years). We have included this explanation in the revised manuscript.

3. Addition and revision in Sections 2 and 4

Reviewer #3 mentioned that the possible positive impact of climate change on FSR should not be excluded. Even though the increase in FSR could be expected in some regions, the manuscript does not explicitly focus on increase in FSR, as it is likely to require a much longer time scale than the decrease in FSR (see Xenopoulos et al. (2005) for more detailed discussion). To be precise, our study also ignores the time scale of the species loss, and merely estimates the number of fish species with potential of extinction (as in Tedesco et al., 2013). Similar assumption was made in other previ-

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ous studies as well, such as that by Xenopoulos et al. (2005), Xenopoulos and Lodge (2006) and Döll and Zhang (2010). The scope and limitation of the current study have been added in Section 2 of revised manuscript (Section 2). Reviewer #2 suggested that additional discussion on how the selected hydrologic metrics are relevant at broader scales, and how water use and dam operation would affect our results. Reviewer #3 suggested that the manuscript should describe the uncertainty caused by physical and chemical mechanisms. To address these concerns, a thorough discussion has been added in Section 4 of the revised manuscript. In addition, all other issues pointed by reviewers has been added and modified in the manuscript.

4. Readability of the manuscript and clarity of figures

The original manuscript had some issues of vocabulary, grammar and repetition of information. Additionally, abbreviations were unconventional and figures were too small and difficult to read. To address these issues, the figures are adapted for better clarity and the writing is proof-read by professionals. The revised manuscript is more 'smooth' and readable compared to the earlier draft.

We look forward to kind consideration from reviewers and editors towards the publication of the revised manuscript. Thank you, again.

Sincerely yours,

Sayaka YOSHIKAWA (On behalf of my co-authors)

References

Döll, P., and Zhang, J.: Impact of climate change on freshwater ecosystem: a global-scale analysis of ecologically relevant river flow alterations, Hydrology and Earth System Sciences, 14, 783, 2010.

Iwasaki, Y., Ryo, M., Sui, P., and Yoshimura, C.: Evaluating the relationship between basin-scale fish species richness and ecologically relevant flow characteristics in rivers worldwide, Freshw. Biol., 57, 2173-2180, 2012.

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10, C5775–C5779, 2013

Kennard, M. J., Mackay S. J., Pusey, B. J., Olden, J. D., Marsh N.: Quantifying uncertainty in estimation of hydrologic metrics for ecohydrological studies, River. Res. Applic, 26, 137-156, 2010.

Lehner, B., Verdin, K., Jarvis, A.: Hydrological data and maps based on Shuttle elevation derivatives. U.S. Geological Survey, online resource: http://hydrosheds.cr.usgs.gov/ (last access: 10 October 2013), 2008.

Tedesco, P. A., Oberdorff, T., Cornu, J.-F., Beauchard, O., Brosse, S., Dürr, H. H., Grenouillet, G., Leprieur, F., Tisseuil, C., Zaiss, R. and Hugueny, B.: A scenario for impacts of water availability loss due to climate change on riverine fish extinction rates, J. Appl. Ecol., 50, 1105–1115, 2013.

Tockner K, Uehlinger U, Robinson CT (eds): Rivers of Europe, Oxford, UK, Academic Press, 2008.

Xenopoulos, M. A., and Lodge, D. M.: Going with the flow: using species-discharge relationships to forecast losses in fish biodiversity, Ecology, 87, 1907-1914, 2006.

Xenopoulos, M. A., Lodge, D. M., Alcamo, J., Marker, M., Schulze, K., and Van Vuuren, D. P.: Scenarios of freshwater fish extinctions from climate change and water withdrawal, Glob. Change Biol., 11, 1557-1564, 2005.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 7837, 2013.