

## **IF AND HOW DOES PERSONALITY AFFECT THE PASSAGE SUCCESS IN FISHWAY?**

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Animal personalities, defined as behavioral differences among individuals that are consistent through time and across contexts, are found in a variety of taxa (Wolf et al., 2007). Personality differences can affect how individuals and thus populations respond to disturbance, translocation, and reintroduction, and consequently, it can greatly impact the success of conservation efforts such as habitat restoration, corridor designs, and crossing structures (Merrick & Koprowski, 2017). Personality differences can lead to biases in wildlife sampling (Biro & Dingemanse, 2009) and the evidence for personality-related sampling bias is accumulating among many taxa, including mammals, birds, reptiles, and fish (Merrick & Koprowski, 2017). To assess the importance of personality-related sampling bias in applied conservation studies, my colloquium focused on the use of fishways. Fishways are hydraulic structures placed on or around man-made barriers to assist the natural migration of diadromous fish (Alvarez-Vázquez et al., 2011). They alleviate the detrimental effects of barriers on the environment (Baumgartner et al., 2010) and fish species (Zhang et al., 2020). Here, I investigated if and how personality affects the passage success in fishway. 3 out of 4 case studies indicated that the personality can induce the passage bias and that bolder and explorer individuals are more prone to have a higher fishway passing rate (Hirsch et al., 2017; Landsman et al., 2017; Lothian & Lucas, 2021; Mensinger et al., 2021). However, if these mixed results that personality can affect the success of fishway passage are convincing remains to be questioned because 1) only four studies were found and compared; 2) the data were collected from different contexts (natural environment & laboratory); 3) the assumptions of the models in the studies can be questioned; 4) if the study species are migratory is not consistent. Assuming that personality can affect passage success, it can be implied that 1) part of the populations may be forced to unfavorable habitats; 2) the population size can thus decrease especially to anadromous species 3) Since the personality is heritable (Kortet et al., 2014), the personality block from the barriers might cause the depletion of the genetic variation. To alleviate the effect from personality to fishway passage success, some actions can be taken, 1) the designer might consider raising the attraction of the fishways like some ecoducts; 2) compare what types of fishway might be easier for fish to pass; 3) include individual personality into the evaluation of such anthropogenic barriers. From this colloquium, broader enlightenment can be induced. Apart from the conservation of commercial and endangered species, a deeper understanding of the passage rate and personality can also be used to control the dispersal of invasive species. The implications from personality to passage bias might not only apply to fishways, but also to other passages like ecoduct. With more data collected, a better understanding and broader application can be foreseen.

## REFERENCE

- Alvarez-Vázquez, L. J., Martínez, A., Vázquez-Méndez, M. E., & Vilar, M. A. (2011). The importance of design in river fishways. *Procedia Environmental Sciences*, 9, 6–10.  
<https://doi.org/10.1016/j.proenv.2011.11.002>
- Baumgartner, L. J., Boys, C. A., Stuart, I. G., & Zampatti, B. P. (2010). Evaluating migratory fish behaviour and fishway performance: Testing a combined assessment methodology. *Australian Journal of Zoology*, 58(3), 154. <https://doi.org/10.1071/ZO10035>
- Biro, P. A., & Dingemans, N. J. (2009). Sampling bias resulting from animal personality. *Trends in Ecology & Evolution*, 24(2), 66–67. <https://doi.org/10.1016/j.tree.2008.11.001>
- Hirsch, P. E., Thorlacius, M., Brodin, T., & Burkhardt-Holm, P. (2017). An approach to incorporate individual personality in modeling fish dispersal across in-stream barriers. *Ecology and Evolution*, 7(2), 720–732. <https://doi.org/10.1002/ece3.2629>
- Kortet, R., Vainikka, A., Janhunen, M., Piironen, J., & Hyvärinen, P. (2014). Behavioral variation shows heritability in juvenile brown trout *Salmo trutta*. *Behavioral Ecology and Sociobiology*, 68(6), 927–934. <https://doi.org/10.1007/s00265-014-1705-z>
- Landsman, S. J., Wilson, A. D. M., Cooke, S. J., & van den Heuvel, M. R. (2017). Fishway passage success for migratory rainbow smelt *Osmerus mordax* is not dictated by behavioural type. *River Research and Applications*, 33(8), 1257–1267. <https://doi.org/10.1002/rra.3176>
- Lothian, A. J., & Lucas, M. C. (2021). The role of individual behavioral traits on fishway passage attempt behavior. *Ecology and Evolution*, 11(17), 11974–11990.  
<https://doi.org/10.1002/ece3.7964>
- Mensingher, M. A., Brehm, A. M., Mortelliti, A., Blomberg, E. J., & Zydlewski, J. D. (2021). American eel personality and body length influence passage success in an experimental fishway. *Journal of Applied Ecology*, 1365–2664.14009. <https://doi.org/10.1111/1365-2664.14009>
- Merrick, M. J., & Koprowski, J. L. (2017). Should we consider individual behavior differences in applied wildlife conservation studies? *Biological Conservation*, 209, 34–44.  
<https://doi.org/10.1016/j.biocon.2017.01.021>
- Wolf, M., van Doorn, G. S., Leimar, O., & Weissing, F. J. (2007). Life-history trade-offs favour the evolution of animal personalities. *Nature*, 447(7144), 581–584.  
<https://doi.org/10.1038/nature05835>
- Zhang, H., Jarić, I., Roberts, D. L., He, Y., Du, H., Wu, J., Wang, C., & Wei, Q. (2020). Extinction of one of the world's largest freshwater fishes: Lessons for conserving the endangered Yangtze fauna. *Science of The Total Environment*, 710, 136242.  
<https://doi.org/10.1016/j.scitotenv.2019.136242>

