Hydrodynamic preferences of Chinese sturgeon in the spawning sites of Yangtze River: Effects of in-stream hydraulic structures

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The restoration of the damaged ecosystem caused by dams is the current international focus, and is also significant for habitat protection in the Yangtze River. Chinese sturgeon ( Acipenser sinensis ) is the fl agship species of the Yangtze River.Their natural reproduction on the downstream of the Gezhou Dam has been interrupted by accident for four consecutive years. Analyzing the reasons of reproductive interruption and verifying the function of spawning grounds are the basis for making scientific strategies to rehabilitate the spawning grounds.This study examines the changes of local flow characteristics through three-dimensional physical habitat simulations in an effort to identify ecohydraulics preferences of Chinese sturgeon during spawning season. The location shift of spawning sites is considered here as a referencing factor that indicates the most suitable conditions for the gravid sturgeons. Two key parameters, namely the current speed and horizontal eddy viscosity, are identified as key drivers for attracting sturgeons away from the historical spawning locations to present locations following the construction of in-stream partition dike, immediately downstream of Gezhouba Dam. Additionally, channel topography is discussed here as it dictates the effect of local hydrodynamics on micro-habitat. This third parameter does not have immediate impact on Chinese sturgeon and its influence varies mildly under natural conditions. The presence of an in-stream partition dike can alter the aforementioned parameters by different degrees, with the horizontal eddy viscosity being by far the most sensitive of the three.  This study aims to systematically analyze the evolution process of habitat suitability and hydrological situation of spawning grounds under Gezhou Dam during a series of typical events in which the breeding effect of Chinese sturgeons has changed. This results provides qualitative description and quantitative analysis of the effects of a partition dike on the spawning sites for better riverine habitat management.