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Editorial

Global Perspectives on Ecohydrology and River Connectivity with a Summary and Outlook of the Fish Passage 2025 International Conference

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1. Introduction: Fish Passage and River Connectivity

While hydropower development provides clean energy, it also disrupts river connectivity, significantly affecting the migration, reproduction, and population sustainability of migratory fish species [1]. Fish passage facilities, including fishways, fish ladders, and fish lifts, are widely recognized as essential engineering measures for mitigating the negative impacts of hydraulic structures on river ecological connectivity [2].

In recent years, with the advancement of ecological civilization and the increasing emphasis on river conservation, research on fish passage has evolved from traditional engineering design to an integrated approach combining ecohydraulics and fish behavior [3]. Developing efficient fish passage systems that simultaneously satisfy hydraulic conditions and biological requirements has become a key scientific challenge in aquatic ecosystem restoration.

2. Conference Overview and International Participation

The Fish Passage 2025 International Conference, part of The International Fish Passage Conference series, was held in Yichang, Hubei Province, China, from 30 March to 3 April 2025, under the theme of "Ecohydrology and River Connectivity". Organized by China Three Gorges University and the Chinese National Committee on Large Dams-Professional Committee on Fish Passage Facilities, together with other institutions, the conference marked the first time that the series was hosted in China.

The conference attracted more than 300 experts, scholars, and engineers from over 10 countries and regions, including China, the United States, the United Kingdom, Switzerland, Norway, Brazil, and Spain. A total of 115 institutions participated, including Harvard University, ETH Zurich, the University of Southampton, Tsinghua University, Wuhan University, Sun Yat-sen University, Sichuan University, and China Three Gorges Corporation, among other well-known universities and research organizations.

The conference featured plenary lectures, keynote presentations, and multiple parallel sessions, with a total of 94 academic presentations. The topics covered a wide range of research areas, including ecohydrology, fishway hydraulics, fish behavior, river restoration, and monitoring and evaluation. The

conference program was comprehensive, highlighting the latest advances and interdisciplinary developments in fish passage research.

3. Significance of the Conference and the Special Issue

The Fish Passage conference series serves as an important international platform for academic exchange in the fields of fish passage and river connectivity. This conference further strengthened international collaboration in ecohydraulics and river restoration, promoting the integration of engineering practice and ecological theory.

This Special Issue, entitled "Selected Papers from the Fish Passage 2025 International Conference and Related Research", aims to present the latest research findings in this field and to provide scientific support and technical references for global river ecological restoration and fish passage optimization.

4. Overview of the Included Study

A representative study included in this Special Issue addresses the disruption of river connectivity caused by hydraulic projects and proposes a novel island-type fishway. This design combines island structures with arc-shaped configurations to effectively dissipate flow energy and reduce flow velocity, thereby minimizing resistance to upstream fish migration.

The study focuses on the influence of island angles on the hydrodynamic characteristics within the fishway. The results indicate that when the island angle is set to −60° or 60°, larger low-velocity zones are formed downstream, which are beneficial for fish passage. When the island angle is 0°, both the maximum and average flow velocities are reduced, and turbulence kinetic energy is maintained at low levels.

In addition, variations in water levels under different island angles are minimal, indicating good hydraulic stability. These findings provide valuable insights for the design and optimization of novel fishway structures and have practical significance for improving fish passage efficiency.

5. Conclusions and Outlook

The Fish Passage 2025 International Conference successfully promoted international collaboration and academic exchange in the field of fish passage and river connectivity, demonstrating a trend toward integrating ecohydraulics and engineering practice.

The studies included in this Special Issue reflect the development of fish passage facilities toward higher efficiency, greater precision, and improved ecological compatibility. In the future, with the further integration of multidisciplinary approaches, fish passage technologies are expected to play an increasingly important role in global river ecological restoration and biodiversity conservation.

Finally, we would like to express our sincere gratitude to all authors, reviewers, conference organizers, and participants for their valuable contributions.

Statement of the Use of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this manuscript, the author used OpenAI to improve readability and grammatical clarity. After using this tool, the author reviewed and edited the content as needed and take full responsibility for the content of the published article.

Declaration of Competing Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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