

Collaboration between HydroCen and FishPass

FORFATTER	Ana Teixeira da Silva
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SAMARBEIDSPARTNERE	NINA, NTNU, USA army corps of engineers, Great lakes fisheries commission

Objective

The project aimed at developing an international network of top-level researchers on fish migration that may open opportunities for future joint research projects.

Background

This initiative aimed to foster collaboration between HydroCen and the FishPass project, a 10 years restoration endeavor in the US/Canada region funded by the Great Lakes Commission. Much like various projects within HydroCen's WP4, this undertaking focused on enhancing the two-way migration of fish through the development, implementation, and assessment of innovative solutions.

Combining synergies between researchers from HydroCen and FishPass and create a network to unlock new opportunities for future projects, was both a strategic and essential move. To realize this objective, the "Cross-Continental Fish Passage and Conservation Research Workshop" was conducted virtually in May 2020. The workshop's purpose was to bring together scientists and engineers with significant expertise in fish passage and conservation research. Its aim was to facilitate the exchange of site-specific research goals, facility designs, capabilities, pitfalls/lessons learned, and avenues to contribute value to other (international) research questions. Additionally, it sought to establish new prospects for collaborative efforts on fish migration and conservation topics. Further details on the workshop, including the participant list, can be found in the report in Appendix A.

Results/Findings

During the workshop, a survey was distributed to all participants to pinpoint the primary collaborative topics. The following emerged as the main themes for collaborative research:

- #1) Coordination between experimental facilities and laboratories
- #2) Upstream fish passage (development & retrofitting, non-salmonid passage, different life stages, barrier mitigation prioritization)
- #3) Downstream migration of eels and Atlantic salmon
- #4) Behavioral guidance of eels (replication, thresholds, capture and collection methods, scaling)
- #5) Behavioral guidance and sorting technologies

- #6) Evaluation of results in different systems and scales
- #7) Control / sorting methods for invasive species
- #8) Environmental design / river restoration
- #9) Fish decision making (cognition)
- #10) Multispecies- interactions behavior
- #11) Development of tools to measure turbulence in the field.
- #12) Student exchange

Another significant outcome of this project was the initiation of the project titled "MODELS FOR FISH MOVEMENT PAST MIGRATORY BARRIERS: AN OVERVIEW OF CURRENT METHODS AND FUTURE DIRECTIONS." This collaborative effort involved NINA, GLFC, and the US Army Corps of Engineers, with funding from GLFC and leadership by Ana T. Silva from NINA. The project culminated in the authorship of a review paper on the subject, which has been submitted to the esteemed peer-reviewed journal, *Reviews in Fisheries Science & Aquaculture* (Q1 Journal, IF: 11.5 (2022)).

Furthermore, the collaboration between HydroCen and FishPass led to the establishment of a new partnership between NINA, EPRI, and DFO. In this undertaking, NINA, represented by Ana T. Silva and Kim Bærum, is serving as a consultant to assist both EPRI (Electric Power Research Institute, USA) and DFO (Department of Fisheries and Oceans of Canada) in developing a guidance system for eels at St. Lawrence River (USA). Following this successful collaboration, EPRI expressed interest in participating in HydroCen, prompting high-level representatives from both HydroCen and EPRI to delve further into this opportunity.

Relevance/utilization

Expert scientists, spanning from biologists, engineers, and ecologists, collaborated in the fields of freshwater ecology, ecohydrology, and hydraulics. With international experience in hydropower and collaborative management, this collaboration served as a platform for exchanging knowledge on sustainable hydropower development in a transdisciplinary and comprehensive manner. The discussions, along with potential future are poised to pave the way to generate innovative, efficient, and safe solutions for two-way fish migration, aligning with the imperative of fish conservation amidst necessary hydropower development to meet societal demands.

Conclusion

The project yielded several key conclusions:

- ***International Collaboration:*** Norway, the USA, and Canada are actively involved in similar research on fish conservation and river restoration. Prioritizing collaboration among these countries holds the potential to significantly advance scientific knowledge in these areas.
- ***Complementary Resources:*** The three countries possess complementary facilities and technology, providing a unique opportunity for cooperative research and facilitating student exchange, enriching the research landscape.

- *Data Exploration*: Norway, the USA, and Canada hold extensive data on fish movement and hydraulics. Analyzing this data could offer valuable insights into fish behavior and ecology, crucial for enhancing river management strategies.

- *Hydropower Impact Mitigation*: With hydropower being a major renewable energy source in all three countries, it is crucial to prioritize the development of solutions that mitigate its impact on fish populations.

- *Diverse Collaborative Network*: The collaboration involves various entities, fostering opportunities for research mobility and student exchange. This diversity creates a unique network bridging scientists and industry.

- *Interdisciplinary Synergy*: Recognizing the need for collaboration across disciplines, there is a call for integrating basic scientists, applied scientists, and engineers. This integration aims to translate laboratory insights into practical solutions for fish conservation and invasive species management.

References and links to publications and thesis

APPENDIX A:

Report on Cross-continental Fish Passage and Conservations Research Workshop