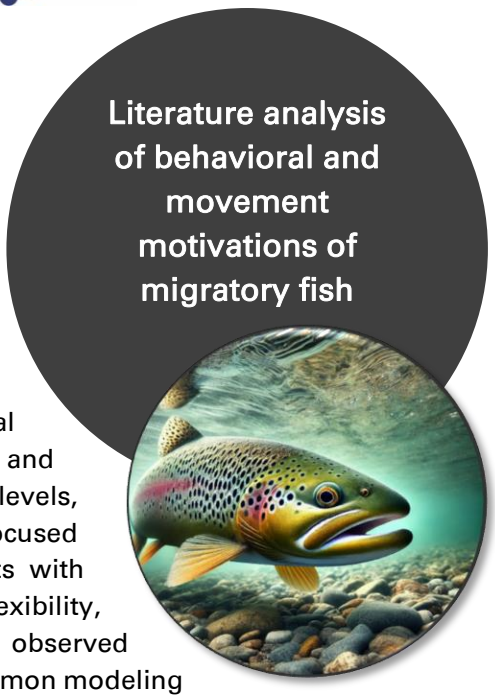
Universität Stuttgart

IWS Department of Hydraulic Engineering and Water Resources Management
Prof. Dr.-Ing. Silke Wieprecht

B.Sc. (M.Sc) Topic

"Literature analysis of behavioral and movement motivations of migratory fish"



Background

This thesis aims to synthesize current research on how migratory fish respond to hydraulic, environmental, and sensory factors. Building on insights from the past decades, the review will examine how species such as salmonids and eels navigate flow velocity gradients, turbulent zones, and changing water quality. Particular emphasis will be placed on the interplay between physical swimming capabilities (burst-and-rest, boundary layer use) and the sensory cues fish rely upon (olfactory signals, turbidity levels, temperature gradients). By contrasting laboratory findings focused on physiological thresholds and controlled preference tests with field-based studies demonstrating real-world behavioral flexibility, this review will highlight consistency and divergence in observed migratory patterns. In addition, the thesis will summarize common modeling approaches, ranging from statistical models of upstream/downstream movement to more detailed simulations that integrate turbulence and temperature. These models aim to illustrate how fish movement can be predicted under various scenarios. Technical advances in telemetry and environmental sensing will also be discussed, demonstrating how high-resolution data can inform more fish-centric design features in fishways and river connectivity projects. Ultimately, this synthesis will identify critical behavioral "bottlenecks" and propose how those can be addressed by refining existing models of two fishways. By integrating knowledge from multiple disciplines, the project will offer guidance on designing future research and infrastructure that accommodate the nuanced behaviors of these essential migratory species.

Thesis Overview

1. Familiarize with ecohydraulics, ethohydraulics, and critical flow characteristics, such as turbulence.
2. Analyze the scientific literature on distinct behavioral patterns and modeling procedures using Web of Science.
3. Substantiate a well-structured and comprehensive technical compendium (thesis report) that synthesizes the state of the art on the behavior and movement motivations of migratory fish, including summaries of key data in clear tables and informative, original figures.
4. If written as a Master's thesis, the key information of the literature review is additionally to be bundled into the format of a scientific manuscript.

Required Skills

1. Basic understanding of fluvial and environmental hydraulics.
2. Good analytical and writing skills.

Apply now!

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Examiner: Prof. Dr.-Ing. Silke Wieprecht

Due to the frequent use of technical terms in English, the thesis should preferably be written in English.