ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

ENAC-SIE, Master Project, Spring	Start:	18/02/2019
30 ECTS credits	End:	21/06/2019

Title	**Assessing the effectiveness of environmental DNA sampling design strategies in river networks (joint EPFL-Eawag MSc project)**
	Prof. Andrea Rinaldo (ECHO, EPFL)
Supervisors	Dr. Luca Carraro (Aquatic Ecology Group, Eawag)
	Prof. Florian Altermatt (Aquatic Ecology Group, Eawag)
Objective	Apply an environmental DNA (eDNA) transport model as a predictive tool to address key questions concerning the design of eDNA sampling strategies in rivers: how many sampling points in a river network is it convenient to choose? How to distribute them across the catchment? In particular, the project consists in extensive testing of the above-mentioned model in synthetic river networks under different scenarios (e.g. spatial distribution of the target species, number of sampling points and their location).

Abstract	eDNA is an innovative technique allowing the detection of DNA fragments (from e.g. cells, tissues, faeces) of target species in environmental samples (water, soil, air). The use of eDNA as a noninvasive, rapid and cost-effective tool for monitoring biodiversity in riverine ecosystems has recently gained substantial popularity. However, the exact localization of the target species and the assessment of its density based on eDNA surveys in rivers remains challenging. In fact, the measured eDNA concentration at a river's cross-section is the outcome of decay processes from distributed species densities at any point upstream, connected by the drainage network. A recently developed model fills this gap by allowing to infer the upstream spatial distribution of target species within a catchment based on downstream eDNA measurements. Such model allows us to simulate sampling design scenarios, and the so-obtained insights will be beneficial to guide field ecologists in effectively monitoring freshwater biodiversity.

Task description	• Implement eDNA transport model in synthetic river networks • Analyse model output under different scenarios
Required skills	• Good programming skills (MATLAB and/or R) • Basic notions of environmental system modelling and graph theory
Location	This is a joint MSc project between EPFL and Eawag (Dübendorf, ZH). The student will be mostly based at EPFL, although meetings in Dübendorf are possible.
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