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ESR 10: Effects of hydrological and water quality alteration on river fish and macroinvertebrate production.

3 year fixed- term PhD position.

Host institute: Universidad de Cantabria – Instituto de Hidráulica Ambiental de Cantabria, Spain

Supervisors: José Barquín, Francisco Peñas (UC-IHC, Spain), Gabriel Singer (IGB, Berlin, Germany), Lee Brown (University of Leeds, UK)

Project Description:

A major challenge that resource planners face today is managing ecosystems to provide multiple services to societies. In many cases, management for services involves trade-offs, such that increasing the supply of one reduces the supply of another. For example, water for irrigation is made possible by massive storage in reservoirs although this may also have serious implications for the provisioning of other services (e.g. water quality or fish biomass). This PhD will explore how water quality changes (e.g., thermal regimens and suspended solids) link to different reservoir uses and how these changes scale down to affect secondary production of benthic macroinvertebrates and fishes.

Secondary production is a very important ecosystem function that quantifies the growth of heterotrophic biomass and that it relates to the energy transfer in ecosystems. Secondary production estimates will allow us to understand how hydrological alteration and water quality changes (e.g., changes to temperature regimens) alter river food webs and affect the provisioning of a range of river ecosystem services (e.g., fish-food). This PhD will use specific control-impact designed field surveys and a number of experiments in order to better understand how hydrological alteration and water quality changes affect secondary production in river ecosystems.

Objectives:

(1) Establish the link between hydrological alteration types and water quality changes

(2) Quantify secondary production of fishes and macroinvertebrate river reaches affected by different reservoir operation rules and in natural ones.

(3) Study wider implications of biomass production for the aquatic food web and provisioning services

Expected outcomes:

(1) Knowledge of how water characteristics (i.e. temperature, suspended solids, dissolved organic matter and nutrients) change in different hydrological alteration groups

(2) Effects of hydrologic/water quality alteration on secondary production of fishes

(3) Effects of hydrologic/water quality alteration on secondary production of benthic macroinvertebrates

Secondments:

A 3 month stay at University of Leeds (Leeds, UK, host: Lee Brown) with the purpose of data collection and carrying out food web analysis.

A 3 month stay at ISPRA (Rome, Italy, host: Martina Bussettini) with the purpose of understanding EU e-flow policy and dissemination routes.