**Quantifying the impact of beaver reintroduction on aquatic ecology**

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**Full Project Description**

Quantifying the aquatic ecological impact of beaver reintroduction is critical as the ecological status of many surface waters in the UK is poor and in need of restoration, having been degraded by multiple stressors over recent decades. Research around the world, in particular in North America, demonstrates that the reintroduction of beaver can enhance the aquatic ecology of freshwaters, ameliorating a wide range of ecosystem services, including salmonid habitat populations, as beavers enhance variability of surface water quality. The research will quantify what the wide range of aquatic ecological impacts of beavers might be, in locations where beavers are both well established and in new locations where beavers will be reintroduced during the project. The student will be embedded within a number of partnerships studying the impact of beaver reintroduction where Beavers already exist: The River Otter Beaver Trial, the Mid-Devon Beaver Trial, The Cornwall Beaver Trial, the Forest of Dean Beaver Trial and also a number of sites where Beavers are yet to be reintroduced, allowing for baseline monitoring pre-beaver to be undertaken: The Plymouth Beaver Trial, The Knepp Estate Beaver project and the Cumbrian Beaver project. The involvement with these partnerships, as well as project partners including the Environment Agency and Devon Wildlife Trust, gives a unique opportunity to impact upon a wide range of project partners and stakeholders, including major landowners and statutory agencies, upon whom the research will directly impact.

The research will blend research techniques from aquatic ecology, ecohydrology and water resource management to address the following hypotheses:

1. Beaver activity has a positive impact on the ecological status of surface waters in terms of: a. Numbers, size and diversity of fish species b. Macroinvertebrate diversity and abundance c. Aquatic vegetation diversity and abundance d. Aquatic structure, including bed sediment composition and variability of channel bed structure at reach scales.

2. Site-scale impacts of beaver activity across a range of ecosystems can be used to upscale and build a predictive tool to quantify the aquatic ecological change due to beaver behaviour at catchment scales.

The research project therefore represents a novel and innovative approach to understand the range of issues around beaver reintroduction which might impact aquatic ecology.

**Real Life challenges this project will address**

Beaver reintroduction is happening and will likely continue to happen across the UK. Understanding the impacts is a real-life challenge as we have not co-existed with beavers in the UK for >400 years. Since their extirpation the UK has become significantly more intensively farmed, densely populated and resources have consequently degraded. The challenge here is to quantify impacts and predict where they will manifest (as well as whether they will be positive or negative) across a range of ecosystems.

**What you should know about this project**

Beavers have recently begun to recolonise the UK after an absence of ca. 400 years. This PhD will study the impacts of beaver reintroduction across a range of sites in England on the aquatic ecology, including fish, macro-invertebrates and vegetation. The project team are leading beaver reintroduction monitoring and modelling across all major beaver sites in the UK.

**What expertise you will develop**

The student will become a leading expert in beaver impacts including; fish surveys and redd counting, species-level macro invertebrate surveys, aquatic vegetation surveys and ecohydrological observations in freshwater. The student will receive training in all field and lab-based approaches, statistical techniques and computer-based modelling and mapping. This training will be delivered within the host University laboratories, field-based traning with DWT and placements in the Environment Agency national analytical laboratories.

**Why this project is novel**

Full understanding of the impacts of beavers on aquatic ecology has not been demonstrated across lowland river systems in England, yet such ecosystems support critical populations of endangered species such as Atlantic Salmon and Sea Trout. Elsewhere, research findings around beaver impacts on such fish populations are positive, with beaver fish populations thriving under beaver reintroduction. Whether this, or other aquatic ecology impacts prove to be positive in a lowland Englad setting is a novel question that remains unanswered.

**Rest of Supervisory Team:**

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