Research stay in Scotland to investigate the contribution of ponds created as Natural Flood Management measures to freshwater biodiversity, Summer 2023

My name is Julie Fahy and I am a PhD student in freshwater ecology at the University of Geneva and at the University of Applied Sciences and Arts of Western Switzerland. I study the potential of ponds as Nature-based Solutions to support freshwater biodiversity at the pond and pondscape (i.e., network of ponds) scales.

From May to August 2023, and thanks to the generous support of the SSHL and other societies, I carried out a case study in the Scottish Borders to investigate how ponds recently created as Natural Flood Management (NFM) measures contribute to freshwater biodiversity. My study area, the Eddleston Water catchment, was indeed the subject of a restoration project led by Tweed Forum and aimed at alleviating the impact of floods to the downstream town of Peebles through re-meandering actions, flow-reduction measures, and pond creation.

I conducted dragonfly surveys (Insecta: Odonata, both adults and larvae) on 10 ponds recently created as NFM measures and on 10 other, pre-existing ponds, to see how the dragonfly communities of these two types of ponds differed in richness and composition. Dragonflies were chosen as the target taxa because they are considered to be an important indicator group: they are sensitive to changes to their habitats and quickly colonise new sites, which makes them ideal to follow the effects of restoration and pond creation.

Figure 1: One of the studied "NFM ponds" in the Scottish Borders (left); a tandem of Aeshna juncea *(middle); and various pictures of larvae and exuviae taken during the identification process (right). (Credits: Julie Fahy)*

Preliminary results show similar richness and composition in Odonata between the two types of ponds. Despite their younger age and main flood-reduction purpose, "NFM ponds" host dragonfly communities just as rich as other ponds – and sometimes even richer – and have strengthened the pondscape's existing populations. This is probably due in large part to their design and management, with large buffer zones and generally rich macrophyte communities. Odonata richness and the abundance of most species are indeed positively correlated with diverse vegetation metrics (e.g., macrophyte richness and the percentage of pond perimeter covered by emersed vegetation). The creation of new ponds as part of the Eddleston Water Project also increased connectivity at the pondscape scale, and my results show that Odonata richness per pond is also positively correlated with the number of ponds found in a 1 km radius.

This study was also an opportunity to establish a baseline of Odonata communities in an under-recorded area. Changes in community composition are expected due to climate change, with more

species progressively making their way up to higher latitudes, and future surveys will be able to look at this 2023 inventory for comparison.

From a personal perspective, this research stay was an amazing opportunity to develop my professional network and to get fieldwork experience in another setting. I am very grateful to all the people who made this project possible, including the team at SSHL. My results are still being analysed and will be reported in an upcoming publication which will be integrated into my PhD thesis.

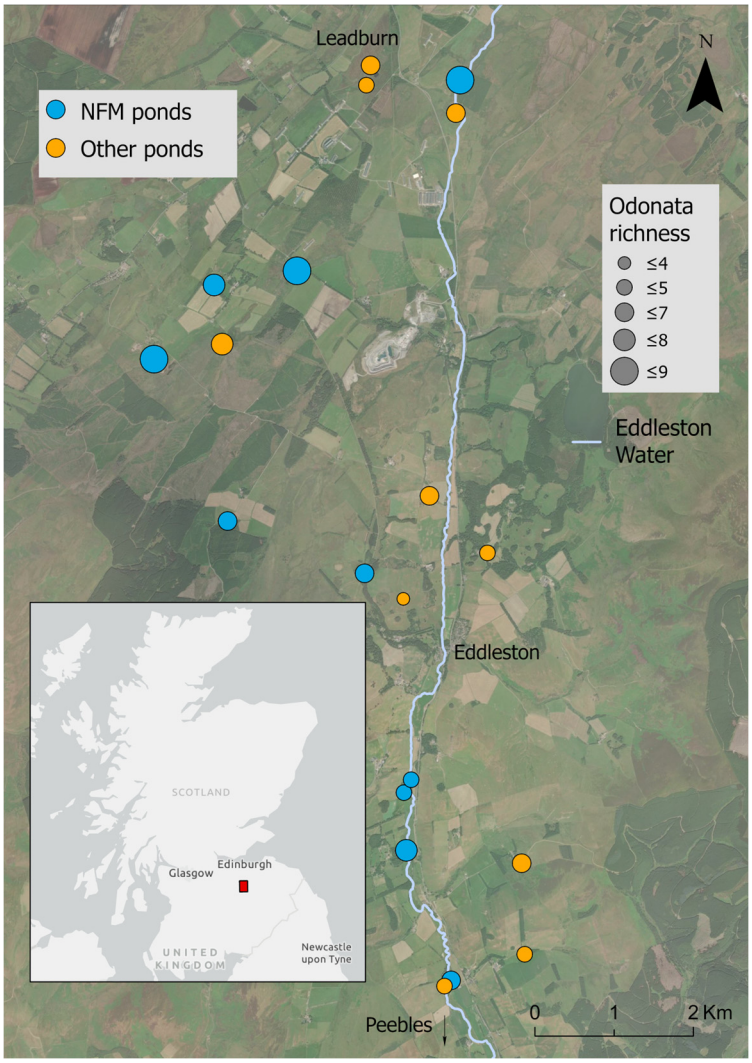

Figure 2: Location of the 20 studied ponds. The size of each point relates to the Odonata richness of each pond (number of species). "NFM ponds" from the Eddleston Water Project are in blue, other ponds in orange.

Figure 3: Sympetrum danae *(left); one of the studied ponds, with the Pentland Hills in the distance (middle); and* Lestes sponsa *(right). (Credits: Julie Fahy)*