Dragons in the Dales: A species recovery project looking at peatbog dragonflies on restored peatlands in Yorkshire and studying the habitat requirements for white-faced darter reintroductions

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Introduction

Leucorrhinia dubia, or the white-faced darter, is a peat-bog dragonfly which particularly thrives on lowland raised bogs (Boudot & Kalkman, 2015). This is a small red (male) or yellow (female) dragonfly with a creamy-white face, which requires bog pools covered with *Sphagnum* bog mosses to breed. The first documented record for *L. dubia* in Britain was made in Yorkshire, in Thorne Moor in 1837; unfortunately, it has become extinct in this county since the middle of the last century (Merritt et al, 1996).

In England and Wales today, the white-faced darter is restricted to a handful of sites and is now classed as Endangered on the British Red List. The State of Dragonflies 2021 report revealed that the three species which have declined the most are also peatbog dragonflies: the black darter (*Sympetrum danae*), common hawker (*Aeshna juncea*), and emerald damselfly (*Lestes sponsa*) (Taylor et al, 2021). The decline of all these species is likely because of habitat loss and degradation of our precious peatlands, which have faced many threats such as industrial peat extraction for horticulture, draining for agriculture and development, and burning for game shooting.

But all is not lost for these peaty dragonflies. In recent years, several reintroduction programmes have managed to translocate the white-faced darter to old and new habitats in Staffordshire (Beynon, 2001), Cumbria (Clarke, 2014) and Cheshire (Meredith, 2017), and there are a number of other reintroduction programmes in progress elsewhere such as in Lancashire.

Furthermore, organisations in the UK, such as Yorkshire Peat Partnership (YPP), are now working to restore our peatlands and bring them back to boggy health. This involves blocking drainage channels, reprofiling eroding peat hags, revegetating bare peat, and planting bog plants such as *Sphagnum* mosses. As of 2024, YPP has brought 45,592 hectares of peatland into restoration management across the Yorkshire Dales and North York Moors National Parks, Nidderdale National Landscape, and beyond in the Great North Bog (YPP Annual Report, 2024).

Whilst the aim of this peat restoration work is the re-wetting of these vast and important peatlands, the outcomes of this work are far more wide-reaching, boosting biodiversity because healthy peat bogs are home to rare and special wildlife, such as the white-faced darter.

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Yorkshire Peat Partnership c/o Yorkshire Wildlife Trust (2024) *Yorkshire Peat Partnership Annual Report, April 2023 – March 2024,* https://www.yppartnership.org.uk/resources

Dragons in the Dales

In 2023, YPP was granted funding from Natural England's Species Recovery Programme. This project, 'Dragons in the Dales', was focused on the red-listed white-faced darter dragonfly and the priority peatbog dragonflies: the black darter, common hawker, and emerald damselfly.

With the increased interest in white-faced darter reintroductions across the country, there is a need to collate and review the data on this species. Therefore, we have produced a literature review of the distribution and past reintroduction programmes of *L. dubia* which will be available from the YPP website and the Journal of the British Dragonfly Society. In this literature review, we have described the ideal habitat requirements for this species and have detailed the optimal range of each parameter for a population to thrive in the UK.

Equipped with this database of habitat requirements, the next task was to apply this to a real-world site. Our chosen target site was Swarth Moor, a SSSI lowland raised bog with associated lagg fen habitat in the Yorkshire Dales. The questions we wanted to answer were as follows: does Swarth Moor meet the habitat requirements for a potential future white-faced darter reintroduction, and if it doesn't currently, could we create and restore the habitat to improve its habitat suitability?

To answer these questions, we designed a habitat suitability survey protocol which could gather the data we needed. The field survey factors were as follows: 1) vegetation community, 2) peat depths, 3) pH, 4) electrical conductivity, 5) water depths, 6) nitrate pollution, 7) phosphate pollution, 8) aquatic invertebrate abundance & biodiversity, and 9) presence of aquatic vertebrate predators. The UAV (uncrewed aerial vehicle) survey factors were: 1) pool surface area, 2) pool access, 3) tree roost access, 4) shrub shelter access, 5) emergent vegetation, and 6) pool vegetation cover. From this we developed a new Habitat Suitability Index, for objectively scoring a peatland for *L. dubia* suitability.

The results of the first survey in 2023/2024 revealed that our test site had a potential habitat suitability for white-faced darters; however, to fulfil that potential it would need custom-designed white-faced darter ponds. In autumn 2024, we constructed three new 'dragonfly' ponds on Swarth Moor which would meet the habitat requirements for white-faced darter, and the requirements of the other priority dragonflies.

Following the pond creation and peat restoration, the habitat suitability index for the intervention area on Swarth Moor increased from 65 (σ = 22) pre-works to 82 (σ = 34) post-works, compared to the known white-faced darter site Fenn's & Whixall which scores 96 (σ = 27), identifying that establishment of *Sphagnum cuspidatum* on the ponds is currently limiting Swarth Moor's scoring. This presents a novel tool which can be used by groups interested in monitoring sites with an existing white-faced darter population, or groups investigating new sites for reintroduction programmes.

In this project, we also presented the results of two models for white-faced darter distribution in Great Britain. Under the future model, the suitability for white-faced darter undergoes extreme climate pressure in the next decades, as annual temperatures rise and precipitation levels shift. This model should be used in conjunction with habitat data; in other words, good lowland raised bog habitat under good management shouldn't be overlooked because it has a poor climate scoring. Nevertheless, these results do serve as a stark warning to continue and increase efforts to preserve this species and its habitat.

Peat Restoration and Dragonflies

Part of this project's work has been to gather more data about how peat restoration corresponds to dragonfly biodiversity. We surveyed four peatland sites in 2024, all of which are under restoration delivered by YPP. Swarth Moor had not been systematically surveyed for Odonata before to our knowledge, and as a result of volunteer-led surveys the dragonfly records for this site on iRecord have increased 27-fold.

One of the most encouraging findings was the range and abundance of dragonflies recorded post-restoration on the severely degraded upland blanket bogs in both the Yorkshire Dales and North York Moors. The style of the interventions appears to impact the diversity of the dragonflies which recolonise a restored peatland. For instance, two similar sites revealed very different Odonata results; the most records were found on the site which had formed 10s of large, deep pools behind peat dams over a small area, instead of a larger site with 100s of shallow peat dams which had only two records.

The results of these surveys show that peat restoration plays an important role in restoring habitat for dragonflies and damselflies. In future, we would like to see more peat restoration work monitoring biodiversity outcomes such as dragonfly surveys pre- and post-works.

What's next for Yorkshire's dragonflies

Although the Species Recovery Programme fund comes to an end in March 2025, Yorkshire Peat Partnership intends to continue the work on the white-faced darter.

We are seeking further funding to continue the research towards a white-faced darter reintroduction to suitable site(s) in Yorkshire, and we are collaborating with reintroduction projects in other counties to achieve the joined-up approach which is needed for this species to survive. We are supporting our volunteers to continue monitoring the dragonfly records on Swarth Moor and beyond, and we are working towards measuring biodiversity outcomes such as dragonfly data alongside peat/carbon outcomes in our peat restoration work.

Project outcomes:

- *Leucorrhinia dubia* - Distribution expansion and increased population:
    - Not progressed
- Other Odonata species - Distribution expansion and increased population:
    - Progressed including black darter, common hawker, emerald damselfly
- Swarth Moor - improved habitat condition:
    - Peat restoration and new ponds created
- Increased public awareness of *L. dubia*/Odonata and the vulnerability thereof
    - Achieved, through social media, talks, school trip, and community group site visit
- Increased support for peatland restoration
    - Achieved, through community action for Swarth Moor
- Increased knowledge of L. dubia ecology
    - Literature review and report published
- Improved methods for establishing L. dubia populations
    - Report published

Project outputs:

- Research and literature review report: 1 full report, 1 summary report
- Odonata surveys completed: 15 surveys
- Creation and enhancement of suitable bog pools: 3 ponds
- Habitat Suitability surveys: 2 rounds
- UAV surveys: 2 surveys
- Volunteer involvement: 3,336 hours
- Public engagement events: 1 talk, 1 site trip
- Press releases: ≥1