Willow Emeralds in the Winter

Although there can be few dragonfly enthusiasts who are unaware of the recent arrival of Willow Emerald Damselfly to our shores, and its subsequent spread through the UK, I wonder how many are actually alert to its true status in their immediate local surroundings? Until the winter of 2021/22 I would have counted myself amongst this number, but over the cold and leafless months a light of Odonata revelation shone in Leicestershire and Rutland!

Willow Emerald Damselfly arrived in the UK, in Suffolk, in 2007 and immediately began to spread westwards. It had reached Northamptonshire by 2016 and Lincolnshire by 2017, and in 2019 it was discovered for the first time in VC 55, at the widely spaced localities of Eyebrook Reservoir and Watermead Gravel Pits. By the end of 2020 it was still only known from six VC 55 locations, all to the east of Leicester, however 2021 was to prove to be something of an exceptional year.

With many Covid-related restrictions still in place and with more local observer time available, combined with focussed recording effort, by the close of the 2021 flight season Willow Emerald Damselfly had been proven to be present at no less than 53 sites within VC 55. These discoveries added an 800% uplift in its recorded range, which is an amazing increase in its own right, but were to prove to be just the start of my journey of recording enlightenment.

Willow Emerald Damselfly can be notoriously difficult to locate during the flight season, especially where population densities are low, as it can remain motionless for long periods in dense leafy cover. Other observers had previously commented on the ease with which the evidence of Willow Emerald Damselfly colonisation could be tracked in the winter months, and although I had previously found winter oviposition scars at a known site I was yet to put this theory to a true test.

Willow Emerald Damselfly is unique amongst UK Odonata, by laying its eggs directly into the outer layers of bark of trees and shrubs overhanging water. The eggs remain in diapause over the winter months, then in spring they hatch and larvae drop into the water below, where they rapidly develop to emerge as adults in July, August and September; adults can sometimes still be found on the wing as late as mid November. The eggs, which are oviposited just below the protective covering of the bark, give rise to distinctive swellings on the branches of host species which are most easily found once the trees have shed their leaves. Anyone wanting to find out more about this fascinating life cycle should look up the excellent papers in the BDS Journal by Mark Tyrrell (Vol 35 No 2) and Steve Cham (Vol 37 No 1).

In early December 2021 I began to search likely-looking habitat and immediately found several sets of ovipositing scars within an hour of my arrival at my first selected pond. I had already surveyed the site several times in the summer flight season, but to no avail; this is much easier, I thought! In the months which followed I visited site-after-site, also encouraging other VC 55 observers to do the same. By the end of March 2022 an additional 42 new 1km grid squares and 12 new 10 km grid squares had been added to the known range of this species. It became very apparent that Willow Emerald Damselflies were actually all around me, yet I had been blissfully unaware! In fact it was quite obvious that ovipositing had occurred for at least two previous seasons at well-populated sites in the east of VC 55, as proven by the presence of older scars. In total, the known range of Willow Emerald Damselfly in VC 55 had expanded by an incredible 1500% in a single season!

One fact which struck me, especially at the western edge of the range, was how single sets of scars were often all that could be found in a thorough search of a site. This led me to hypothesise that fertilised females must set off in search of new habitat, perhaps moving from site-to-site, where they lay a small speculative batch of eggs before moving on again. In the east of its VC 55 range, sites with large numbers of scars make it very evident that large populations are already present, suggesting that other individuals remain to breed at the sites from which they emerged.

Subsequent discussions with Steve Cham and Adrian Parr, on the likely triggers for female dispersal, suggested that weather conditions are likely to be an important parameter. Soon after its colonisation of the UK, the Willow Emerald Damselfly seemed to be expanding by

approximately 20 km every year. Later, this became more erratic, with more expansion in some years and very little in others, then during the hot weather of 2019 there was a dramatic push northwards of 150 km. The late summer of 2021 certainly provided some favourable warm weather conditions, no doubt driving the Willow Emerald Damselfly's westward push through VC 55. Many questions still remain to be answered, with this species certainly proving to be a fascination, if an unpredictable subject of study.

Drawing upon my recent personal experience in VC 55, the following is a summary of how to best to focus Willow Emerald Damselfly winter recording efforts. I would advise potential observers to primarily search in willow branches, which represent in excess of 90% of oviposition sites in VC55. A pair of close-focussing binoculars are a useful aid, as scars are always above water. It is also worth noting that branches must be above water in the summer months, so don't waste time at seasonally flooded sites. Scars can be anywhere from 1m to 4m above the water's surface, with 1.5 to 2.5m generally the prime places, hence one is searching at head-height or just above.

Given the choice, ovipositing females seem to favour sites with a sunny south-facing aspect, although I have found many exceptions to this rule, especially when suitable habitat is limited. Look on branches that are roughly pencil-sized to finger-sized in diameter, with fresh-looking growth as opposed to gnarled, lichen-encrusted bark. Most scars seem to be on small branches set at an angle between vertical and 45 degrees, a few may drop towards the horizonal, but downwards-angled stems appear to be avoided (other than on Weeping Willow); I have wondered if such downwards-angled branches are less conducive as ovipositing sites as they may form water-paths during wet periods which could be detrimental to overwinter egg protection?

The smaller, more shrubby varieties of willow, i.e. Grey, Goat and Crack Willows, are favoured. These species support more suitable branches within the 'ovipositing zone', whereas large and mature White Willows will have fewer low branches to attract ovipositing insects. Mature White Willows will be used where other options do not exist, as will Weeping Willows, but in my experience they are much less favoured as ovipositing sites; I have only found scars on Weeping Willow at two sites in VC 55. It is also worth mentioning that scars are infinitely more easy to find at sites with fewer host trees adjacent to a waterbody; if you are within range of the Willow Emerald Damselfly and only have a handful of suitable shrubs in which to search, you are likely to find ovipositing scars very rapidly!

In the absence of willow I have also found scars on ash, though this species is the host in less than 10% of VC 55 sites. With ash, the oviposition scars are typically on the most recent growth tips of branches, which are generally near-vertical, with the scars being very obvious on these candelabra-like growth spikes. Alder seems to be much less favoured, with scars certainly more difficult to spot on the more textured bark of this species; I have found alder scars at just three sites in VC 55. By the nature of the structure of this species, scars are often on horizontal stems on alder, representing the majority of the branches over water. I also found a single example of oviposition on hawthorn in VC 55, and this is clearly a shrub of last resort, when no other options exist. The literature suggests that Willow Emerald Damselfly may occasionally oviposit in a wide variety of other suitably placed trees and shrubs, but as yet I have not observed this myself.

The accompanying images illustrate some typical locations of oviposition scars and show the appearance of scars on different host species. Typically they form straight or slightly spiralling sets of neat double-bumps. To my eye, it is the unnatural symmetry which draws attention as one scans through the haphazard blemishes and bumps of normal tree development; in some ways the scars have the appearance of marks made by the run of a sewing machine. Good light and calm weather are also a benefit and I find that shadows cast in strong sunshine can be a great giveaway to the presence of these tiny pimples; avoid windy days which shake frail branches and dull days when the light in flat and unrevealing.

Finally, it is worth visiting a site with a known population of Willow Emerald Damselflies, where scars should be easy to locate and it is then possible to get a feel for typical sites and an appreciation of scar appearance and variation; some scars can be blindingly-obvious, some

are so subtle that they are very easily overlooked. From then on, set forth on a voyage of winter revelation, bringing a wealth of surprise discoveries while adding to the growing knowledge and understanding of one of the most fascinating species of damselfly in the UK. For me, the buzz of finding a wonderfully symmetrical, spiralling set of bumps on a smooth green willow stem on a fresh January morning is every bit as exciting as the shimmer of a sparkling green adult on a sultry September afternoon.

Ian Merrill
BDS Dragonfly Recorder for Leicestershire and Rutland
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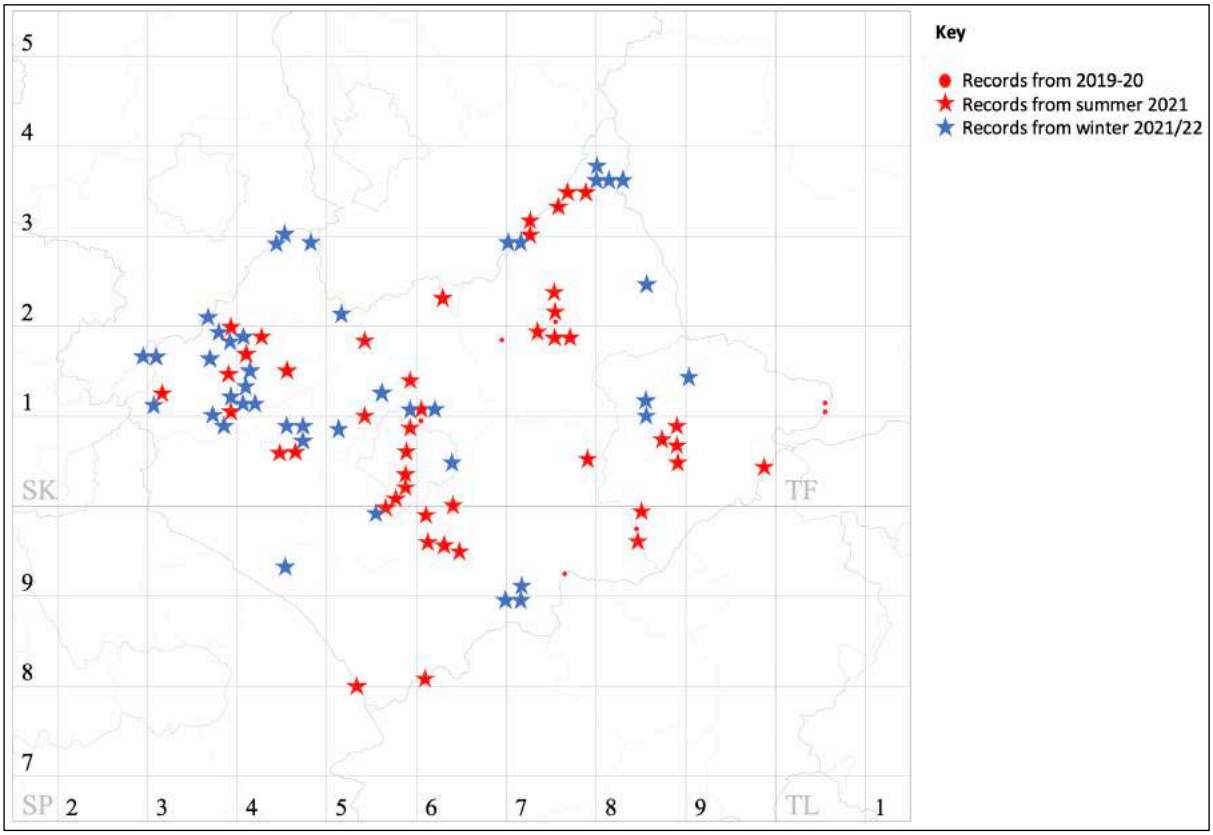

Distribution of Willow Emerald Damselfly in VC 55

Typical Willow Emerald Damselfly ovipositing sites in willow branches overhanging water

Examples of Willow Emerald Damselfly oviposition scars in willow, with finger to show scale

Willow Emerald Damselfly oviposition scars on willow branches

Willow Emerald Damselfly oviposition scars on ash branches

Willow Emerald Damselfly oviposition scars on alder branches

Willow Emerald Damselfly oviposition scars on hawthorn branches