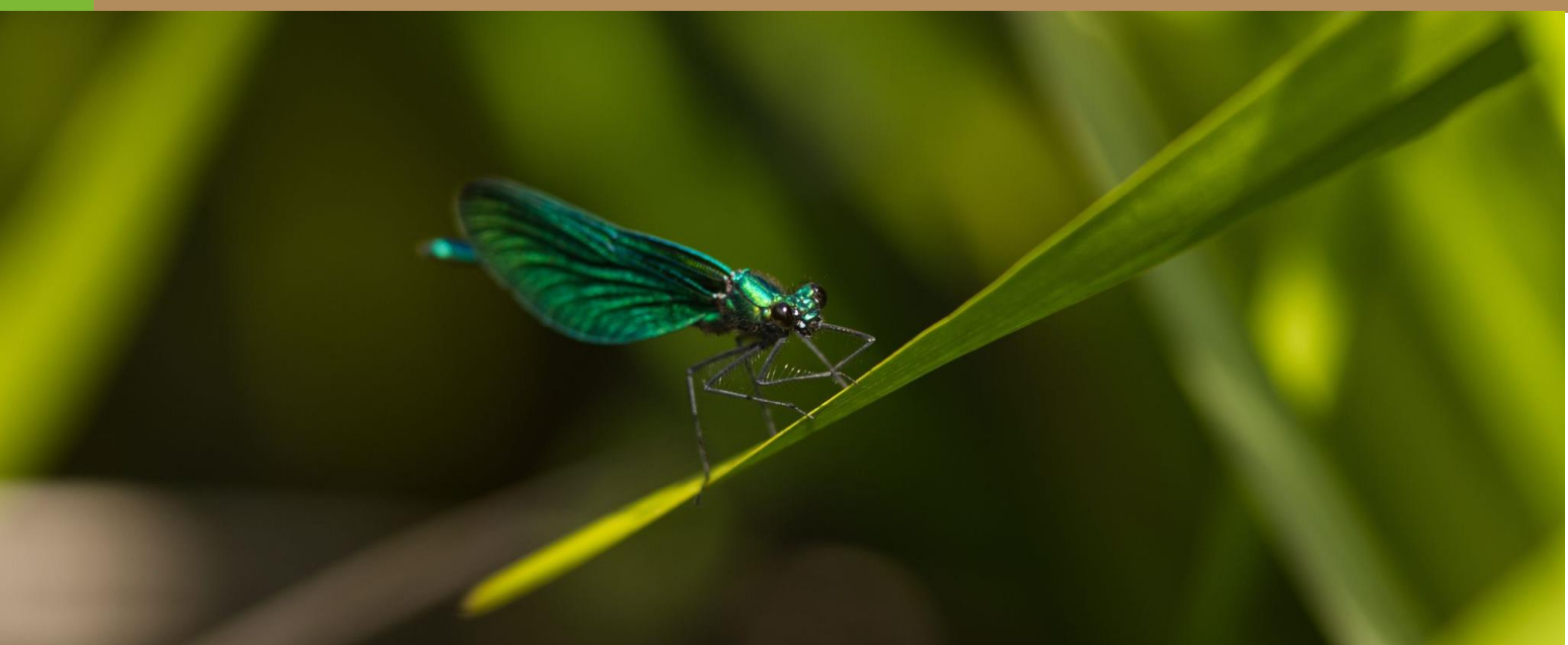


TIRERAGAN DRAGONFLIES



JUNE 2023 SURVEY

REPORT BY RACHEL BICKER

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SUMMARY

- ❖ A survey of Odonata (dragonflies and damselflies) was completed along four linear waterbodies and associated pools at the Tireragan peatbog site, during late June 2023
- ❖ We confirmed eight species of Odonata (four dragonflies, four damselflies) using the site:

Damselflies:

- ✓ Beautiful Demoiselle *Calopteryx virgo*
- ✓ Blue-tailed Damselfly *Ischnura elegans*
- ✓ Emerald Damselfly *Lestes sponsa*
- ✓ Large Red Damselfly *Pyrrosoma nymphula*

Dragonflies:

- ✓ Common Darter *Sympetrum striolatum*
- ✓ Four-spotted Chaser *Libellula quadrimaculata*
- ✓ Golden-ringed Dragonfly *Cordulegaster boltonii*
- ✓ Keeled Skimmer *Orthetrum coerulescens*

- ❖ The most abundant species on site was Keeled Skimmer
- ❖ The area with the highest number of species, highest abundances and the most breeding evidence was Transect 1 (the dammed ditch)
- ❖ Transects are to be walked a minimum of 3 times over the dragonfly survey season (May to September). A second survey should be carried out toward the end of July/early August, and a final walk in late September
- ❖ Later in the season, two additional species likely to be on the wing are Black Darter and Common Hawker
- ❖ The Northern Emerald Dragonfly is a Red Listed species which could be observed on the wing in June and July
- ❖ A special effort should be made to locate and officially record Banded Demoiselle *Calopteryx splendens*, either on or adjacent to the site
- ❖ A variety of habitat types and a dynamic system of newly dug pools along with older ones benefits the widest number of Odonata species.

Site information

Tireragan is located on the south-west tip of the Ross of Mull, Scotland (UK National Grid Map Reference NM 337 188). It comprises 625 hectares of rocky coastline, upland heath and bog, grassland and nationally important ancient native oak and hazel woodland. The nearest designated land is Ardalanish Bay, around 3km to the east of Tireragan, and is a Site of Special Scientific Interest (SSSI). The Cnuic agus Cladach Mhuile is 5km to the east and a Special Protection Area (SPA). The waters around Mull have a conservation designation; the Inner Hebrides and the Minches Special Area of Conservation (SAC) and Sea of the Hebrides are a Marine Protected Area (MPA).

An area of peatbog adjacent to the old, abandoned clachan (hamlet) at Tireragan was the focus of a habitat restoration project in March 2023. Volunteer groups worked to build a series of peat-based dams by hand, blocking off a deep drain and increasing the amount of standing water on site. This work will be highly beneficial to Odonata, which can be rapid colonisers of new water bodies and act as indicators of changing conditions in wetland landscapes.

Odonata (dragonflies and damselflies) in Scotland

The insect order Odonata can be split into two broad groups; damselflies (suborder: Zygoptera) and dragonflies (suborder: Epiprocta, infraorder: Anisoptera). These two suborders can be distinguished visually, with dragonflies usually being larger, eyes touching and wings up or out at rest, and the damselflies generally smaller, with eyes placed apart and wings held along the body at rest.

Around 57 species of Odonata have been recorded in the UK, several of which are only rare visiting vagrants. Currently 29 species have been recorded in Scotland, 23 of which are deemed resident breeding, and 3 of which breed in Scotland alone. These are **Northern Damselfly** *Coenagrion hastulatum*, **Azure Hawker** *Aeshna caerulea* and the **Northern Emerald** *Somatochlora arctica* (British Dragonfly Society). The aquatic life stage of Odonata can last around 4 years or more, which can make them important indicators of water quality and ecosystem health. Threats to dragonflies include nutrient levels, soil run-off, algal blooms, diffuse pollution, sewage events and increasingly, high water temperatures, affecting flow rates and the rapid drying of breeding pools. This latter threat is most relevant to the peat bog habitats at Tireragan. The populations and ranges of Odonata are deemed to be undergoing rapid changes due to climate change effects, which makes them an important group for continuous study.

Survey aim

The aim of the survey is to provide a baseline year of Odonata records for the Tireragan site, comparing the different waterbodies occurring in the area and recording change as species colonisation occurs in the newly created habitats.

Prior to the surveys, the volunteering ecologist Rachel Bicker made email contact with the county dragonfly recorder Pat Batty, who covers the Argyll and Bute area of Scotland. Pat provided a list of species records for the local area, extracted from the National Biodiversity Network (NBN) database, supplied by the British Dragonfly Society (BDS) Recording Scheme. There are 14 species which have been recorded on Mull to date (see Appendix I), and below is a list of 12 species most likely to occur in the Tireragan area:

Table 1. Odonata species previously recorded in the locality of the Ross of Mull

Common Name	Scientific Name	Previous Ross of Mull records	Conservation designation
Beautiful Demoiselle	<i>Calopteryx virgo</i>	Yes	None
Black Darter	<i>Sympetrum danae</i>	Yes	None
Blue-tailed Damselfly	<i>Ischnura elegans</i>	Yes	None
Common Blue Damselfly	<i>Enallagma cyathigerum</i>	Yes	None
Common Darter	<i>Sympetrum striolatum</i>	Yes	None
Common Hawker	<i>Aeshna juncea</i>	Yes	None
Emerald Damselfly	<i>Lestes sponsa</i>	Yes	None
Four-spotted Chaser	<i>Libellula quadrimaculata</i>	Yes	None
Golden-ringed Dragonfly	<i>Cordulegaster boltonii</i>	Yes	None
Keeled Skimmer	<i>Orthetrum coerulescens</i>	Yes	None
Large Red Damselfly	<i>Pyrrhosoma nymphula</i>	Yes	None
Northern Emerald	<i>Somatochlora arctica</i>	No (but possible)	Red list (near threatened)

Transect walking

Four fixed transects were walked on two days during late June, using survey methodology based on guidance from the British Dragonfly Society (BDS) 'Dragonfly Monitoring Scheme Manual' (Smallshire & Beynon 2010). Ideally transects should be walked monthly between the months of May and September; the optimal flight season for most Odonata. The first transect walk at Tireragan was carried out in late June, but it is unlikely that any of the earlier emerging species were missed in this region. The selected waterbodies to be walked as transects were those within the peatbog area, the main focus being the ditch with the newly created peat dams and small adjacent pools. The transects were mapped as a record to help guide future walks, as consistency in transect walking is of high importance. The precise length and route of a transect are less important than the need to conduct counts over the same route on all visits.

Species identification was carried out by observing the adult Odonata as they hovered, flew by slowly or landed up. Binoculars were used along with butterfly nets to capture specimens for closer checks in the hand. This proved helpful in learning the distinguishing features between dragonfly groups and ruling out similar species. The estimated number of adults of each species seen was recorded on the transect, along with any evidence of breeding such as copulating pairs, ovipositing females (laying eggs), or freshly emerged adults from their exuviae (larval skin).

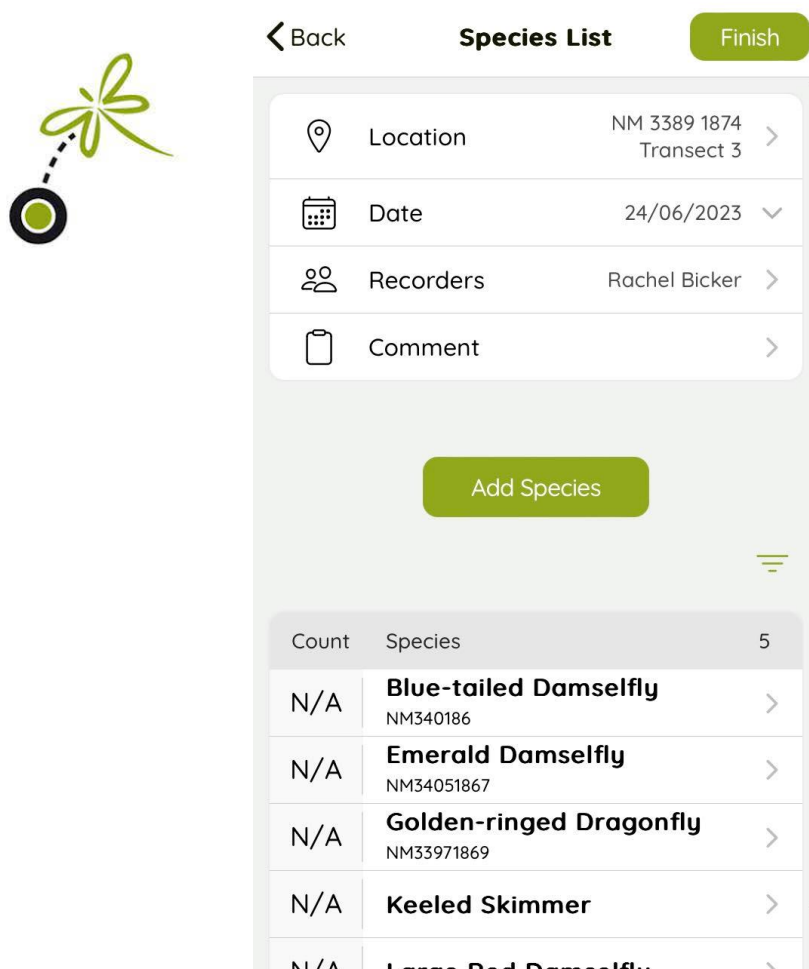
The general survey conditions adhered to were as follows:

- Counts carried out between 10:00 and 16:00 BST. On hot days (above 22°C), counts between 09:30 and 16:30 are permissible
- Ideally sunny weather, with cloud cover less than 60%
- Avoiding wind stronger than force 4 on the Beaufort scale (i.e., 18 mph or less, when small trees in leaf begin to sway)
- Temperatures of at least 17°C are required in the shade. On sunny, calm days, counts can be made at a slightly lower temperature, but never lower than 15°C
- No counts are made when the temperature exceeds 30°C
- No counts are made during rainy conditions.

Data collection and sharing

Recording forms were used to collate information such as species counts, survey dates, times, weather conditions, transect start and finish points (noted as What3Words locations). A survey logbook was created to help with collating additional information such as site information, a transect map, raw survey data and previous species records.

iRecord is a secure system used for collecting and storing biological records in the UK (made up of a species name, precise date and a minimum six figure grid reference), which are then made available to relevant individuals and organisations, in this case the BDS and the Vice County dragonfly recorder. The iRecord smartphone application is a highly useful tool for entering data live in the field, storing the information offline ready to be uploaded back at base. The general survey feature prompts relevant data fields whenever a dragonfly species is entered. Incidental dragonfly records were also collected outside of the timed surveys, but entered as casual records so that they were not included within the analysis. Photographs were made to help confirm species identification and added to the records.


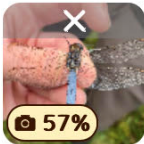


The image shows a screenshot of the iRecord App's 'Species List' data entry form. At the top, there are navigation buttons: a green 'Back' button, a 'Species List' title, and a green 'Finish' button. Below the title, there is a green dragonfly icon. The form contains several input fields: 'Location' (NM 3389 1874, Transect 3), 'Date' (24/06/2023), 'Recorders' (Rachel Bicker), and 'Comment'. Below these fields is a green 'Add Species' button. At the bottom, there is a table with 5 columns: 'Count', 'Species', and a right arrow. The table lists five species: Blue-tailed Damselfly, Emerald Damselfly, Golden-ringed Dragonfly, Keeled Skimmer, and Large Red Damselfly. Each species entry has a count of 'N/A' and a unique identifier (e.g., NM340186).

Count	Species	
N/A	Blue-tailed Damselfly NM340186	>
N/A	Emerald Damselfly NM34051867	>
N/A	Golden-ringed Dragonfly NM33971869	>
N/A	Keeled Skimmer	>
N/A	Large Red Damselfly	>

Figure 1. iRecord App species list data entry form

Back
Edit

Keeled Skimmer

Orthetrum coerulescens

Location

NM 3389 1874

Comment

11

Site type

Stream

1.2.3 Adults

6-20

1.2.3 Cop. pairs

1.2.3 Ovip. females

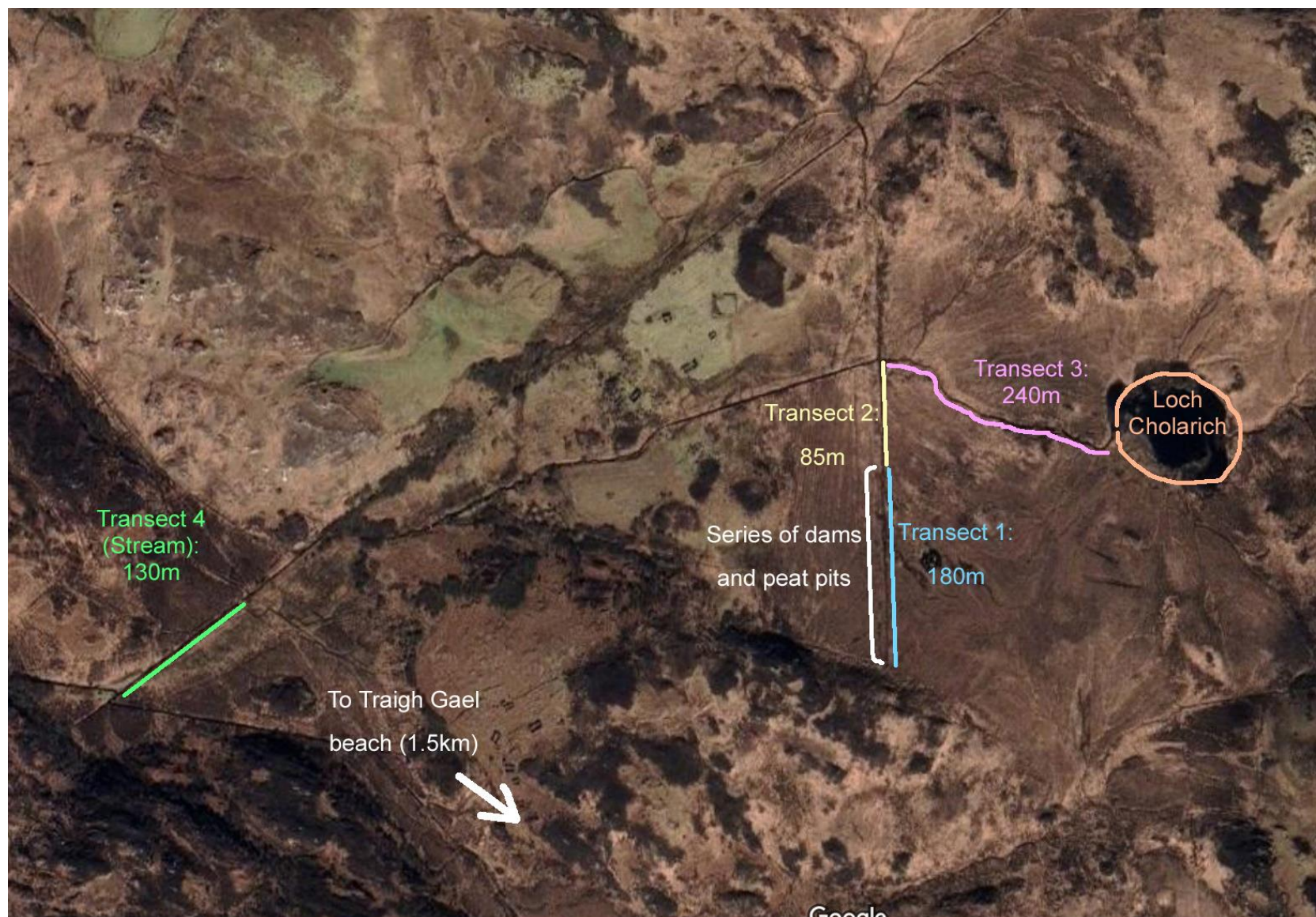
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1.2.3 Ovip. scars

1.2.3 Larvae

Figure 2. iRecord App dragonfly record data entry fields

8



Map 1. Aerial map of surveyed waterbodies in the Tireragan peatbog area

[3] – RESULTS

A total of 8 Odonata species were recorded during the surveys in June 2023. None of the species recorded on the site currently have a conservation designation. Transect 1 produced the highest count of Odonata (95); this was the longest transect to be surveyed and also contained the most varied habitat, with pools of varying depths created by dams and newly excavated side pools.

Our most numerous species of the day was **Keeled Skimmer** (a count of 50 adults), a species with a patchy distribution across the UK, but reportedly increasing its range in Scotland. **Blue-tailed Damselfly** was the second most numerous species (47), closely followed by **Large Red Damselfly** (32).

It was pleasing to record **Emerald Damselfly** for the site, as no previous records from Tireragan had been noted. It was observed on both Transect 1 and 3. The closest previous records to occur are from Bunessan and Loch Pottie. **Common Darters** were present in small numbers, with their adult flight season just beginning and due to last until October.

Beautiful Demoiselle has been previously reported as occurring on Transect 4 (the burn downstream of the bridge), and it is a highly distinctive species. The closely related **Banded Demoiselle** has also been reported as occurring nearby on another stretch of burn, which is intriguing as no previous records exist for this species here.

Four-spotted Chasers were seen ovipositing into some of the freshly excavated pools on Transect 1, which highlights the opportunistic nature of this species. **Golden-ringed Dragonflies** showed a preference for the running waters of the burn along Transect 4.

Common Blue Damselfly was expected to be present (with previous records existing from nearby Traigh Gael) and the adults should have been on the wing at the time of the survey. **Black Darter** and **Common Hawker** adults were not on the wing at this time but should be expected as species likely to occur at Tireragan from July onward.

Table 2. Odonata species recorded on Tireragan during the June 2023 survey

Zygoptera (damselflies)		Transect 1 (dammed ditch)	Transect 2 (un- dammed ditch)	Transect 3 (Burn heading toward lochan)	Transect 4 (Burn heading southwest from the bridge)	Species count totals
Beautiful Demoiselle	<i>Calopteryx virgo</i>	0	0	0	6	6
Blue-tailed Damselfly	<i>Ischnura elegans</i>	37	3	7	0	47
Emerald Damselfly	<i>Lestes sponsa</i>	3	0	1	0	4
Large Red Damselfly	<i>Pyrrhosoma nymphula</i>	14	3	3	12	32
Eipiprocta (dragonflies)						0
Common Darter	<i>Sympetrum striolatum</i>	1	1	0	0	2
Four-spotted Chaser	<i>Libellula quadrimaculata</i>	11	1	0	1	13
Golden-ringed Dragonfly	<i>Cordulegaster boltonii</i>	3	2	3	7	15
Keeled Skimmer	<i>Orthetrum coerulescens</i>	26	12	11	1	50
Transect totals		95	22	25	27	

Table 3. Tireragan transects and species breeding presence, June 2023.

[✓ = Adult present, Co = copulating pair, Ov = ovipositing, Em = emergent juveniles]

Waterbody name	Type	Beautiful Demoiselle	Blue-tailed Damselfly	Common Darter	Four-spotted Chaser	Golden-ringed	Keeled Skimmer	Large Red Damselfly	Emerald Damselfly	Total no. species
Transect 1	Dammed ditch		Ov	✓	Ov	✓	Ov	Co	✓	7
Transect 2	Un-dammed ditch		✓	✓	✓	✓	Co	✓		6
Transect 3	Stream to lochan		✓			✓	✓	✓	✓	5
Transect 4	Stream away from bridge	✓			✓	✓	✓	Co		5

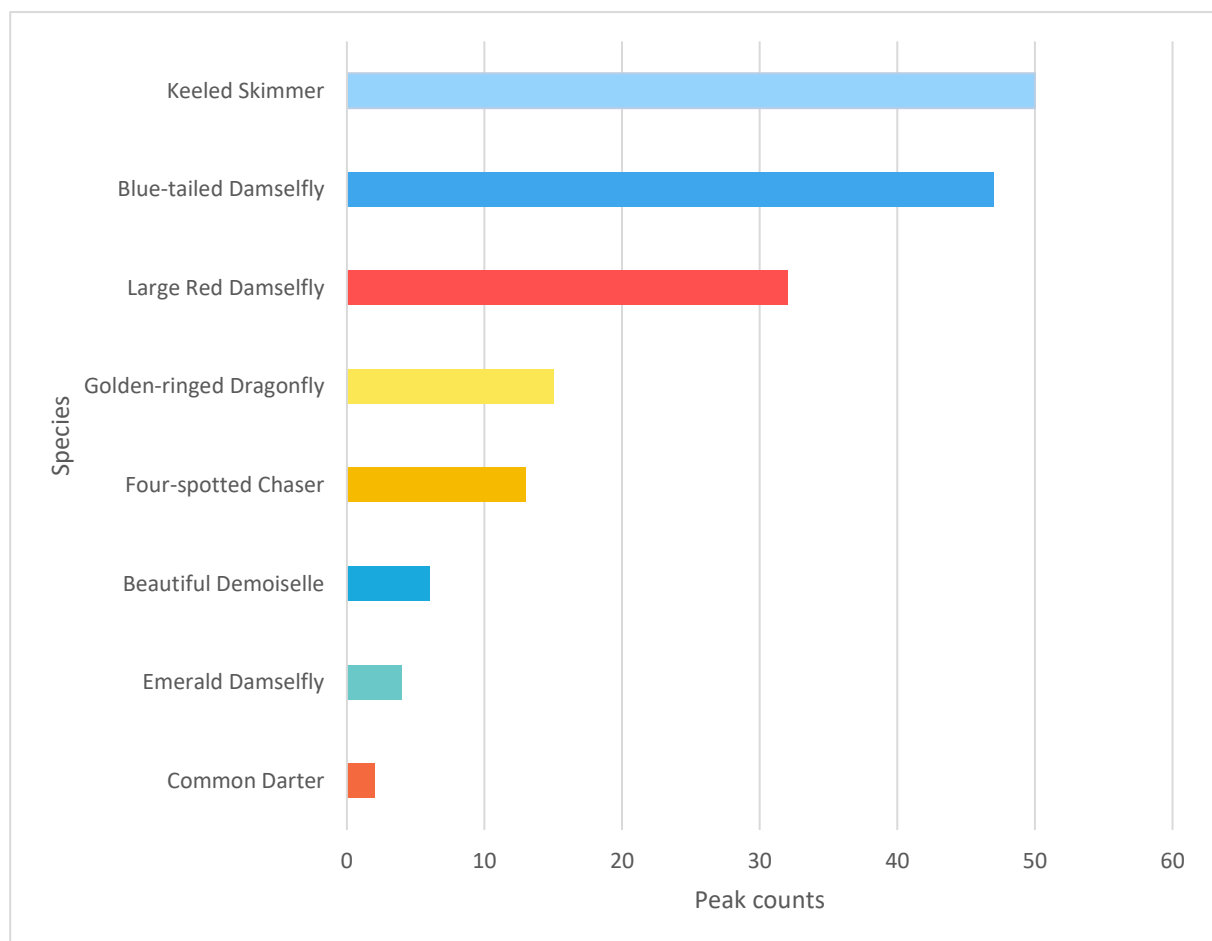


Figure 1. Odonata species peak counts June 2023

[4] – SPECIES PHOTOS

LIBELLULIDAE (CHASERS, SKIMMERS AND DARTERS)

Four-spotted Chaser *Libellula quadrimaculata*



(Rachel Bicker)

Description: Male and female similar in appearance. Brown body with dark tip to abdomen, two dark spots on each wing, yellow tint at wing base

Habitats: Shallow ponds and lakes with a mix of emergent vegetation and open water

Current Status: Common throughout most of Britain and increasing its range.

Keeled Skimmer *Orthetrum coerulescens*



Male (Rachel Bicker)



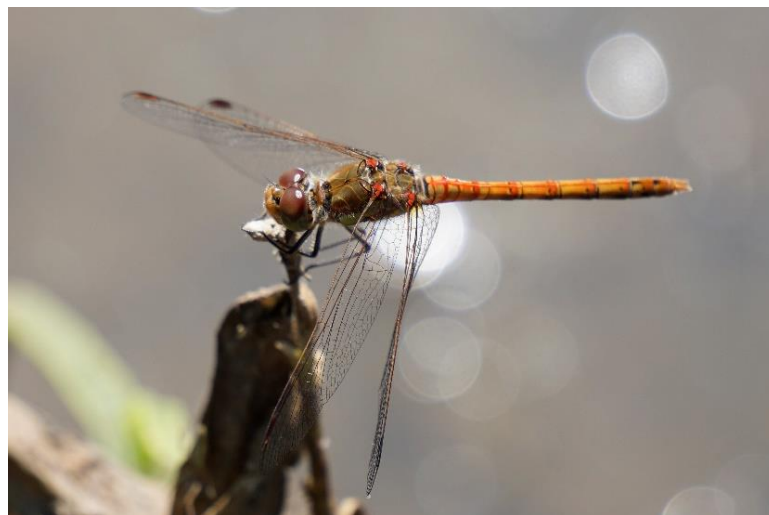
Female (Rachel Bicker)

Description: Slim and tapered bodies, male with a powdery blue body, fine black dorsal line down the abdomen (the keel). Female yellow/ochre with pronounced black ladder patterning on abdomen

Habitats: Pools and streams in wet heathland sites are favoured, seen resting on heather

Current Status: Patchy distribution across Britain; more common in the west. Has been expanding its range in Scotland since 1990.

Common Darter *Sympetrum striolatum*



Male (Rachel Bicker)

Description: Slightly waisted abdomen, males dull to bright orange-red, especially on the upper surface of the abdomen. Females ochre in colour fading to more reddish with age

Habitats: Small to large ponds and other still, stagnant, or even brackish waters. Often basking on log piles and on exposed concrete

Current Status: Abundant across Britain, less common in upland areas.

CORDULEGASTRIDAE (SPIKETAILS)

Golden-ringed Dragonfly *Cordulegaster boltonii*



(Miek Zwamborn)

Description: Male and female similar in appearance. Distinctive yellow and black rings along the abdomen, bright green eyes that meet at the top of the head

Habitats: Breeds in acidic rivers and streams of all sizes containing sand, silt or peaty debris

Current Status: Widely distributed in western Britain, more locally in the south and north-east. Only recently recorded in Ireland (2005).

CALOPTERYGIDAE (DEMOISELLES)

Beautiful Demoiselle *Calopteryx virgo*



Male (Rutger Emmelkamp)

Description: Males with entirely dark wings with iridescent blue, and the body is metallic blue-green. Females have brown iridescent wings with a white wing spot, and the body is a metallic green

Habitats: Streams and rivers, particularly those with sand or gravel bottoms

Current Status: Found across Britain, particularly Wales, south-west England. A few scattered populations in northern England and western Scotland.

COENAGRIONIDAE (NARROW-WINGED DAMSELFLIES)

Blue-tailed Damselfly *Ischnura elegans*



Male (Rachel Bicker)

Description: Male eyes and thorax largely blue, with narrow shoulder stripes and abdomen almost entirely black, except for S8 which is blue. Females occur in multiple colour forms and S8 can be dull brown or blue

Habitats: A wide range of lowland habitats including brackish or polluted water where it may be the only species present. Avoids fast flowing water

Current Status: Abundant throughout Britain.

Large Red Damselfly *Pyrrosoma nymphula*



(Rachel Bicker)

Description: Male and female similar in appearance. Black legs, red eyes and yellow sides to thorax, deep red abdomen with black bands

Habitats: Most wetlands but prefers sheltered waters with abundant vegetation

Current Status: Common and widespread throughout Britain.

LESTIDAE (EMERALD DAMSELFLIES)

Emerald Damselfly *Lestes sponsa*



Male (Rachel Bicker)

Description: Male and female similar in appearance. Metallic green thorax and abdomen with wings spread at rest. Males have powder blue colouration on segments 1 and 2, 9 and 10.

Habitats: Rushy pools, small shallow standing water with grasses and sedges

Current Status: Locally common throughout Britain but has been declining since the 1990s.

Other species

Previous records of **Common Blue Damselfly** occur from nearby Traigh Gael, and so this species is notable in its absence from Tireragan. The flight season is broadly from May to September, so it would likely have been on the wing at the time of this survey. It inhabits a wide range of water bodies, both still and flowing, so will be worth keeping an eye out for through the season.

Two species which were not on the wing at the time of the June surveys are **Black Darter** and **Common Hawker**. Both have been recorded around Tireragan and Traig Ghael in recent years and will most likely be observed on the transects from July onwards. They are distinctive in their shape and colour and not easily confused with the other species confirmed as present on the site.

A species previously observed on Mull, but not at Tireragan, is **Northern Emerald** (Red list Near Threatened), with a scattering of records in recent years from the north and east of the island, but none from the south-west. This is a peat bog specialist of sphagnum-rich bog pools, and it would be thrilling if this species turned up at the site.

The only record for **Azure Hawker** (Red list Vulnerable) on Mull was made in 1982, close to the Tobemory area in the north. This species is similar in appearance to the Common Hawker, but males are more extensively blue in colour and lack the bright yellow markings. The range of this species has contracted markedly and if it were to turn up again on the island, it would most likely be at the nearest point to the mainland in the north-east.

The site

The availability of varied wetland habitats is key to Odonata abundances and species diversity. The more diverse the habitats, the greater the number of ecological niches available for different breeding and feeding behaviours. Areas with plentiful floating, emergent, and bankside marginal vegetation will usually attract the greatest diversity of species, although some will prefer more open or temporary waterbodies.

The length of ditch with the newly built dams (Transect 1) has resulted in very slow-flowing sections and gradual water seepages. Some of the sections and associated pools are retaining water better than others, resulting in varying depths and vegetation types (see Appendix II, Photo 2 and 3). During the spring of 2023, Mull experienced lower than average rainfall, with areas of the peatbog drying up sooner than expected and water levels in ditches and streams becoming very low. The better sealed dams have helped retain water for longer, and the deeper pools will have provided important refuges for aquatic invertebrates and juvenile

amphibians. Over time, some pools may become concentrated with predators, out-competing certain species. Other pools which dry out on occasion may provide relatively predator-free refuges. Fish are notably absent from the ditch and pools, which is good news for Odonata.

The habitat works on site has also benefitted species other than Odonata. Some of the newly excavated pools have already begun to colonise with vegetation such as Round-leaved Sundew (see Photo 8), and these will change with succession over the years. The large collapsed dam built in the stream near the lochan has been a convenient basking spot for an Adder (see Photo 9). The newly dug pools have already attracted highly-mobile water bugs such as pond skaters as well as mosquito larvae, which are all important components of the ecosystem food web.

Climate change effects

The State of Dragonflies report highlights that recurring droughts may increasingly lead to impacts on dragonfly populations, with less available habitat leading to local extinctions. Conversely, it may trigger the wide dispersal of adults, resulting in new sites being colonised. There is also the advantage of deterring predatory fish and amphibians through unpredictable drought conditions, increasingly benefitting the more mobile generalist Odonata species. Despite the potential benefits of a warming climate for these mostly heat-loving insects, it will be important in future to ensure as many habitat niches are retained as possible to provide resilience to populations, as well as habitat corridors and connectivity for weakly dispersing species. Cold-adapted dragonfly and damselfly species are likely to struggle the most with the warming climate. None of those recorded at Tireragan so far are particularly cold-adapted, or are considered to be species with weak dispersal abilities.

[6] – REFERENCES

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APPENDIX I – ISLE OF MULL ALL ODONATA SPECIES LIST

Common Name	Scientific Name	Group	Previous Mull records	Year of last record	Conservation designation	Main season start	Main season end
Azure Hawker	<i>Aeshna caerulea</i>	Aeshnidae	Yes	1982	Red list (vulnerable)	June	Aug
Beautiful Demoiselle	<i>Calopteryx virgo</i>	Calopterygidae	Yes	2022	None	May	Aug
Black Darter	<i>Sympetrum danae</i>	Libellulidae	Yes	2022	None	July	Sept
Blue-tailed Damselfly	<i>Ischnura elegans</i>	Coenagrionidae	Yes	2022	None	May	Aug
Common Blue Damselfly	<i>Enallagma cyathigerum</i>	Coenagrionidae	Yes	2021	None	May	Sept
Common Darter	<i>Sympetrum striolatum</i>	Libellulidae	Yes	2022	None	June	Nov
Common Hawker	<i>Aeshna juncea</i>	Aeshnidae	Yes	2022	None	July	Sept
Emerald Damselfly	<i>Lestes sponsa</i>	Lestidae	Yes	2020	None	July	Sept
Four-spotted Chaser	<i>Libellula quadrimaculata</i>	Libellulidae	Yes	2022	None	May	Aug
Golden-ringed Dragonfly	<i>Cordulegaster boltonii</i>	Cordulegastridae	Yes	2022	None	May	Sept
Keeled Skimmer	<i>Orthetrum coerulescens</i>	Libellulidae	Yes	2022	None	June	Sept
Large Red Damselfly	<i>Pyrrhosoma nymphula</i>	Coenagrionidae	Yes	2022	None	May	Aug
Northern Emerald	<i>Somatochlora arctica</i>	Corduliidae	Yes	2020	Red list (near threatened)	June	July
Southern Hawker	<i>Aeshna cyanea</i>	Aeshnidae	Yes	2020	None	June	Oct



Photo 1. The dammed ditch (Transect 1) around 180m in length to the final dam (facing north)



Photo 2. Close up of Transect 1 demonstrating deep pools with floating vegetation (looking south)



Photo 3. Another part of Transect 1 demonstrating pool with emergent vegetation



Photo 4. Transect 2 which starts after the final dam. There was still a light flow as water seeped out of the final dam and surrounding peatbog (looking south)



Photo 5. Transect 3, the narrow and steep-sided burn flowing from Loch Colarich (looking east)



Photo 6. Transect 4, the burn flowing downstream from the bridge (looking south-west)



Photo 7. Recently excavated bog pool adjacent to Transect 1, showing bare soil areas. Rutger Emmelkamp sampling aquatic invertebrates



Photo 8. Newly colonising vegetation around the bog pools included Round-leaved Sundew *Drosera rotundifolia*



Photo 9. Adder basking on the old broken dam



Photo 10. Tireragan dragonfly survey volunteers



Photo 11. Surveyors with field books and fold out FSC guide (Photo by Miek Zwamborn)