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Threatened Spider Survey 2021

17 January 2022

Rebecca Lewis



Saving the small things that run the planet

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Executive Summary

Spiders are just as vulnerable to habitat degradation and loss as any other taxon. Often very habitat-specific, some restricted to a very specific microhabitat within recognised broader habitats, making them extremely vulnerable. Surveys and monitoring is therefore a crucial part of the conservation effort for many species. Between July and October 2021 a survey was conducted focusing on 7 species of spider: *Clubiona subsultans*, *Dipoena torva*, *Haplodrassus soerenseni*, *Philodromus emarginatus*, *Philodromus margaritatus*, *Robertus scoticus*, and *Xysticus luctuosus*. Each of these species is recognized as having both an elevated conservation status and an association with Caledonian pine forest habitat, which has suffered historical decline in extent. Surveys included both areas with known records and those without, as well as providing some temporal and spatial spread. Four survey sites were chosen: Abernethy Forest (Forest Lodge, Loch Garten and Dell Woods), Dundreggan, Black Wood of Rannoch and Gallin, Glen Lyon. A total of 96 bark traps and 31 nest traps were installed in these 4 locations around Scotland. Bugvac samples were also taken for each trap location in 3 of the 4 sites, equating to 48 location samples. Traps remained in place for a minimum of 4 weeks.

A total of 41 species of spider were identified from 12 families contained in samples collected across all of the 4 locations. Of the 7 focal species surveyed, 2 were found, *Dipoena torva* and *Clubiona subsultans*. In addition, 4 other species with elevated conservation status were found: *Clubiona norvegica*, *Gongylidiellum latebricola*, *Robertus neglectus* and *Zora nemoralis*. The 2 focal species found were present on all sites apart from Gallin. Additional notable species were recorded at Dundreggan and Black Wood of Rannoch; Dundreggan having the largest diversity and abundance of notable species, largely dominated by the presence of *Clubiona subsultans*. Overall, *Linyphiidae* dominated the samples with a large number of immature specimens. *Amarobiidae* was the second largest family to dominate with *Amarobius fenestralis* present in most of the samples. Bark traps and nest traps were successful in trapping individual spiders. Forty of the 48 trap locations were populated by spiders, only 5 were empty. Bark traps were populated by a variety of species while nest traps were populated mainly by the *Clubionidae*. There was a clear observable difference between the large and small bubble traps with the small bubble being more successful in trapping a larger diversity and abundance of spiders, the majority of large bubble traps were empty. Bugvac samples collected the largest numbers of spiders, the samples dominated by immature *Linyphiidae*.

The results of this survey show that species with elevated conservation status are present in 3 of the 4 areas surveyed. This information shows that the reserves provide important habitat for these species. Surveys such as these are important for providing evidence that can be used to form management plans that can ensure the survival and prosperity of these species. It is recommended that this survey is repeated to monitor population health and the impact of any implemented or ongoing management.

Introduction

Spiders are found almost everywhere: in our gardens, urban spaces and waste ground, from the top of our mountains to our deep caves and freshwaters. Spiders even share our houses, more noticeably during the autumn months when their increased presence running across our living room floors is often documented through headlines in our local media. However, despite their apparent abundance, Britain's spider fauna is impoverished compared to that of our neighbours in Northern continental Europe (Bee, et al. 2020). Habitat loss through anthropogenic action has a detrimental effect on all our flora and fauna, however, the impact on invertebrates often goes undetected through the lack of information available on population abundance and diversity. In addition, the difficulty in identification to species level presents a further problem, often requiring specialist knowledge and identification possible only through microscopic differences in genitalia which can often require lethal sampling.

Spiders, whilst for the most-part non-specialist with regard to their diet, may be very habitat-specific, and indeed may be restricted to a very specific microhabitat within recognised broader habitats (Harvey, et al. 2017). Spiders are just as vulnerable to habitat degradation and loss as any other taxon. Loss of semi-natural habitats, intensification of agriculture, agro-chemical pollutants, invasive species and climate change are some of the main drivers of declines and can lead to competitive exclusion of some species by others as ranges shift and new colonists are able to establish. The increasing frequency of arrival in the UK of both pathogens and herbivorous insects that have the potential to devastate trees and herbaceous species posing a further threat to spider species that live on them or in the habitats they provide. Diseases of Juniper and Scots Pine, for example, could have devastating effects on already threatened species such as *Dismodicus elevatus* and *Robertus scoticus* (DEFRA 2015). Recent reports of *Phytophthora pluvialis*, now confirmed across Britain affecting several pine species, presents yet another potential threat.

There are 680 species of spiders in the UK in 38 families – over 440 of these have been recorded in Scotland (from at least 28 different families). These are mostly split into two broad groups: micro – mostly consisting of *Linyphiidae*; and macro which are all the rest! Spiders native to the UK have a great range of body sizes – from the tiny Maro money spider (*Maro minutus*) to the huge Cardinal spider (*Tegenaria parietina*) with a leg span of more than 10 centimetres. The Four-spot orbweaver (*Araneus quadratus*) is one of our heaviest weighing up to 2.5 grams. The proportion of the extant native British spider fauna assigned to one of the three main threat categories (Critically Endangered (including Possibly Extinct species), Endangered, and Vulnerable) is almost 16% - including Near Threatened, this rises to 20%, or one fifth of species (Harvey et al. 2017).

Focal Species

Surveys in 2021 focused on 7 species of spider, each with an elevated conservation status and an association with Caledonian Pine Forest habitat which has suffered historical decline resulting in habitat loss and range restriction. These 7 species are listed below:

Species name	GB IUCN Status	GB Rarity Status
<i>Clubiona subsultans</i>	Near Threatened	Nationally Rare
<i>Dipoena torva</i>	Near Threatened	Nationally Rare
<i>Haplodrassus soerenseni</i>	Endangered	Nationally Rare
<i>Philodromus emarginatus</i>	Vulnerable	Nationally Rare
<i>Philodromus margaritatus</i>	Near Threatened	Nationally Rare
<i>Robertus scoticus</i>	Critically Endangered	Nationally Rare
<i>Xytiscus luctuosus</i>	Endangered	Nationally Rare

Surveys included areas with known records and those without, as well as providing some temporal and spatial spread. Areas chosen were located on sites where there was conservation focus and would likely lead to further provision of conservation effort for these species.

Methods

A total of 96 bark traps and 31 nest traps were installed in 4 locations around Scotland. Bugvac samples were also taken for each trap location (except Gallin) equating to 45 location samples. Trap selection was based on an accepted and tested method for passively surveying the target species. The opportunity was taken to research the effectiveness of manipulating the bark trap design, the hypothesis being that this may affect both diversity and abundance of catch composition. Traps were placed approximately 100 metres apart; this varied depending on tree site suitability. Traps were all placed 1.5 to 2 metres high on the tree.

Locations

Site locations were selected based on habitat suitability, historical records as well as providing reasonable spatial distribution across Scotland. Consideration was also given to the level of protection that is currently provided, or potentially provided resulting from any important findings from these surveys. All sample locations were dominated by or had remnants of Caledonian pine forest, important habitat for the focal species. Caledonian, or native pinewoods, are characterised by an open woodland canopy and dispersed trees. Species include Scots pine (*Pinus sylvestris*), Juniper (*Juniperus communis*), birch (*Betula* spp.), willow (*Salix* spp.), Rowan (*Sorbus aucuparia*) and Aspen (*Populus tremula*). They grow on infertile soils and are a link to the huge boreal forests of Scandinavia and Northern Russia, supporting a range of rare, specialist species.

Abernethy National Nature Reserve (Forest Lodge, Loch Garten and Dell Woods)

Abernethy National Nature Reserve (NJ 0019817508) is located on the southern edge of the village of Nethy Bridge, 14 kilometres (9 miles) northeast of Aviemore in Badenoch and Strathspey and forms part of the Cairngorms complex which consists of six individually large Caledonian forest areas. It represents the more 'continental' East Central biochemical region, typically with W18b *Pinus sylvestris* - *Hylocomium splendens* woodland, *Vaccinium* spp. sub-community. This complex of woodlands is the most extensive area of native pinewood in the UK and comprises almost half the total area of ancient Caledonian forest in Scotland. In common with the rest of Scotland, the upper limits of the pine woodland are mostly artificially depressed by grazing, but a more natural tree-line occurs at 640 metres on Creag Fhiachlach. This is the highest altitudinal limit of woodland in the UK and consists of bushy stunted growth of Scots pine admixed with Juniper of a similar stature. The pine woodland shows transitions to a wide range of other vegetation, including bog woodland on the forest mires. The forest contains nationally important populations of Capercaillie (*Tetrao urogallus*), Scottish crossbill (*Loxia scotica*) and the Osprey (*Pandion haliaetus*).

Abernethy Reserve is owned and managed by the Royal Society for the Protection of Birds (RSPB). Forest Lodge, Loch Garten and Nethy Bridge sampling areas fall under this management.

Dell Woods, located at the north-eastern tip of the Abernethy NNR and covering 267 hectares, is owned, and managed by NatureScot so could be subject to different management regimes from the other sites surveyed in Abernethy Forest.

Abernethy NNR has national and international importance, designated as a Special Protection Area (SPA) under the Birds Directive, and Special Area of Conservation (SAC) under the Habitats Directive as well as a Site of Special Scientific Interest (SSSI). Parts of the Reserve also form part of the River Spey SAC because of the tributaries which feed the Spey. Permissions were obtained to survey and lethal sample in the reserve by both RSPB and NatureScot.

Black Wood of Rannoch

Black Wood of Rannoch (NN 57434 55762) is the most extensive area of relict Caledonian forest remaining in Perthshire. It is representative of the South-Central biochemical region and is the most southerly pinewood selected. The wood contains important communities of species characteristic of old pinewoods, particularly lichens and fungi, and supports a number of rare species, such as Coralroot (*Corallorhiza trifida*) and Serrated wintergreen (*Orthilia secunda*). It also supports populations of Scottish crossbill and Capercaillie.

Black Wood of Rannoch is owned and managed by Forestry and Land Scotland.

Black Wood of Rannoch has national and international importance, designated as a Special Protection Area (SPA) under the Birds Directive, and Special Area of Conservation (SAC)

under the Habitats Directive as well as a Special Site of Scientific Interest (SSSI). Permissions were obtained to survey and lethal sample in the reserve areas.

Dundreggan

Dundreggan Forest (NH 32410 14820) is Trees for Life's flagship forest restoration project. The site in Glen Moriston, is near Loch Ness. In the 1950s, only 1% of Caledonian Forest survived but Trees for Life has been working to bring back Caledonian forests to Scotland. The charity bought Dundreggan, a 4,000-hectare estate with plantation woods in. Since then, it has become a model conservation estate to demonstrate native forest restoration.

Gallin, Glen Lyon

Gallin (NN5303945637) site belongs to a private landowner and consists of mainly medium sized Scots Pine, largely open canopy with low lying shrub.

Figure 1 Site Locations.

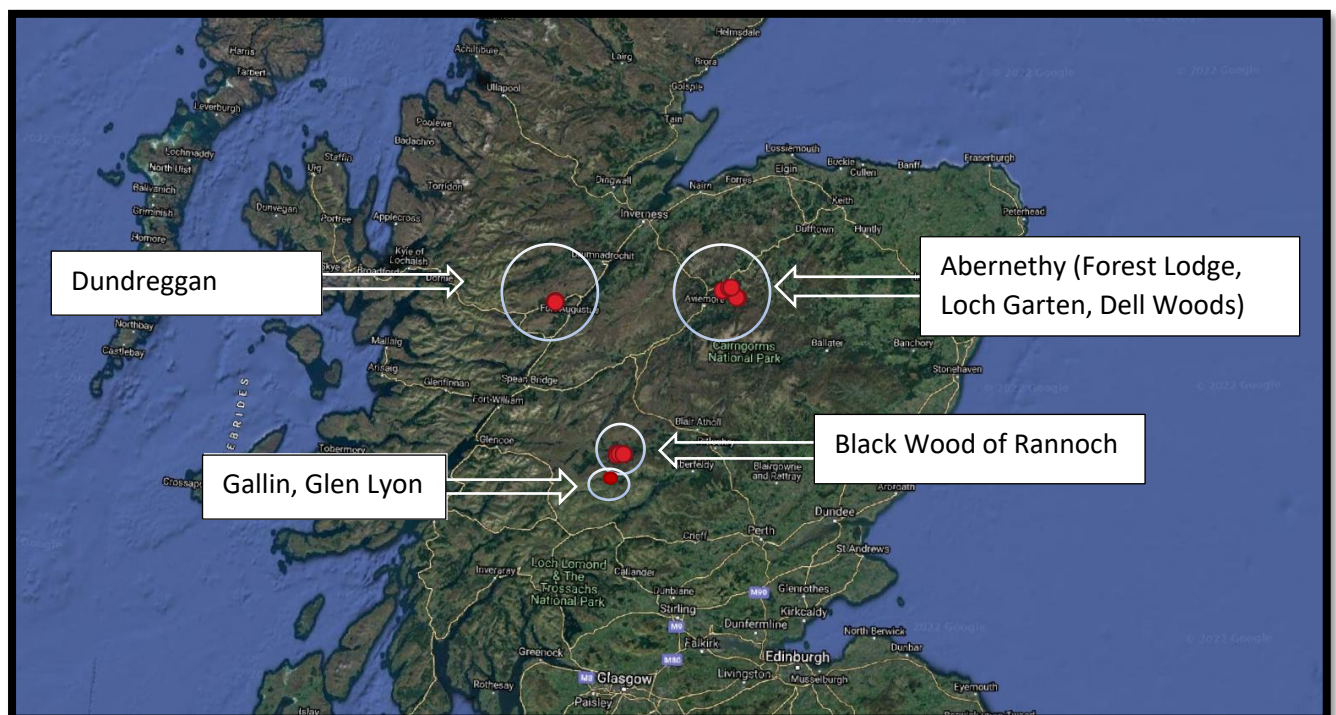


Figure 2 Abernethy – Forest Lodge 5 trap locations.



Figure 3 Abernethy – Nethy Bridge (3 traps) and Dell Woods (2 traps) trap locations

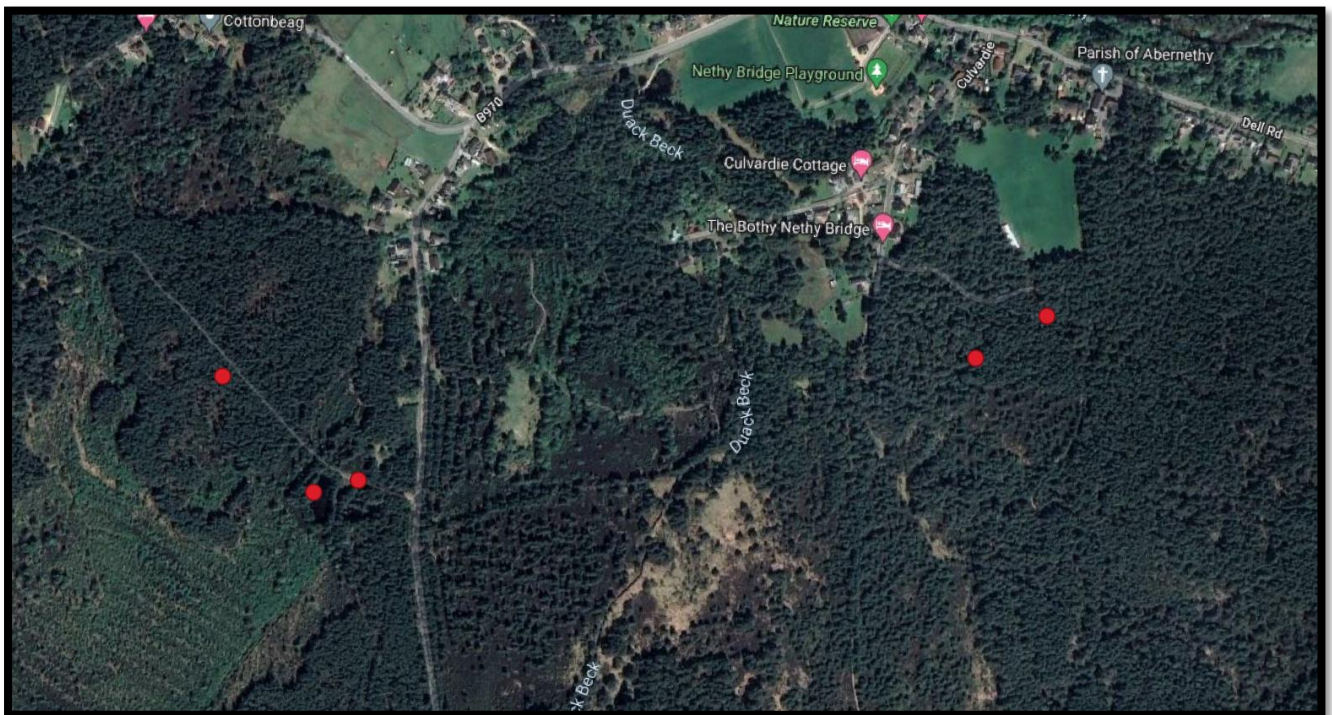


Figure 4 Abernethy - Loch Garten 5 trap locations



Figure 5 Dundreggan 15 trap locations

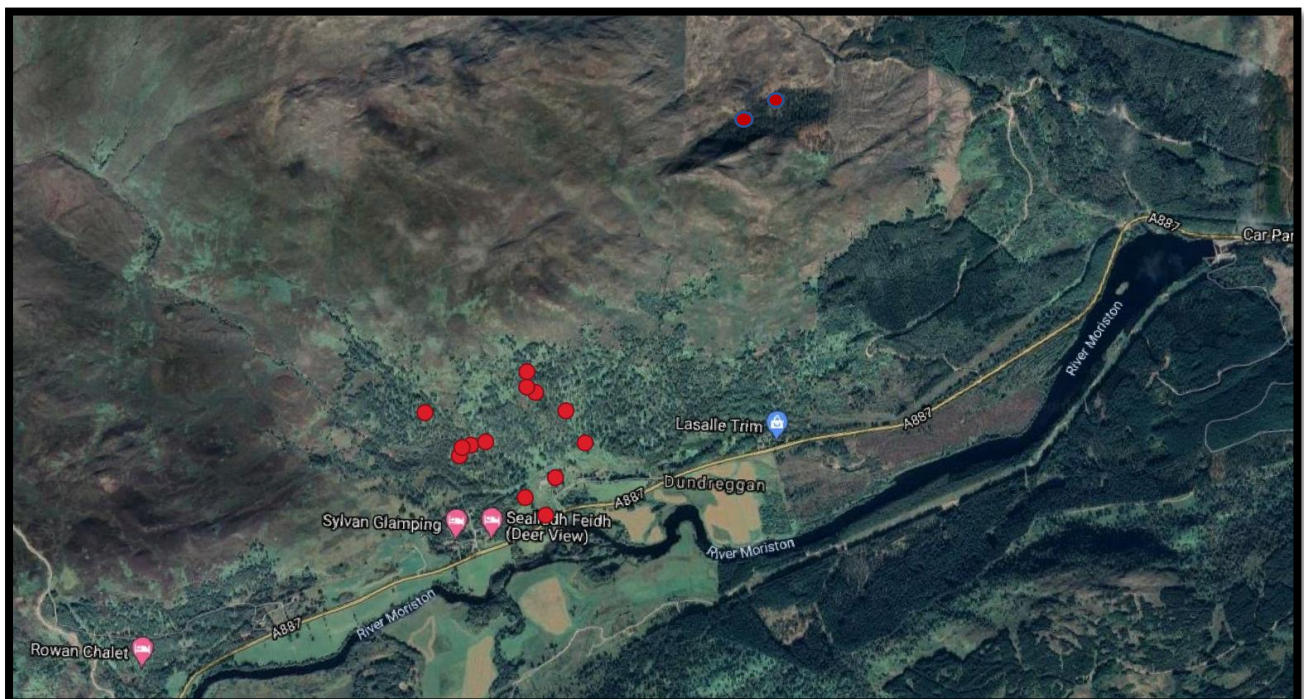
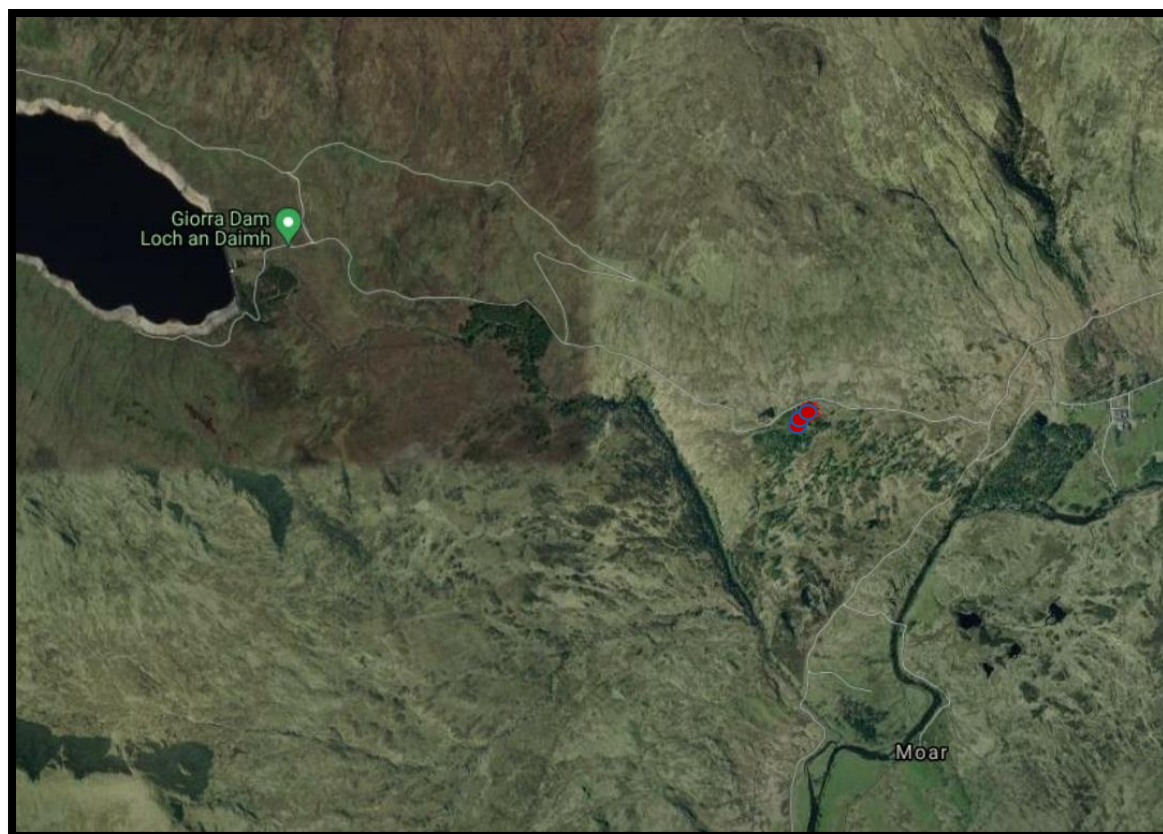


Figure 6 Black Wood of Rannoch 15 trap locations



Figure 7 Gallin - 3 trap locations



Sampling

Bugvac

Samples were collected using a leave blower with a stocking attached to the end. Samples are captured by setting the blower in reverse and running it over the surface of the ground for a set period of time. Approximately 3 minutes were spent sampling using the Bugvac at each location during 14th – 16th July 2021. Forty-five samples were collected and preserved for identification.

Figure 8 Bugvac



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Bark Traps

Bark traps were constructed using bubble wrap, duct tape, plastic liner and thin plastic-coated wire (trap design credit to Chris Catherine). A 40 by 40cm section of bubble wrap was covered on one side with black plastic liner, bubbles side out. The liner was then secured to the bubble wrap using the duct tape round each edge. Traps were folded in half, bubble sides together with the fold horizontal and trap flat against the surface of the tree. The trap was secured in place using the wire

Figure 9 Bark Traps



© Rebecca Lewis

Two types of bark traps were made using the same procedure but with different sized bubbles – large (20 mm diameter) and small (10 mm diameter). Small bubble and large bubble traps were placed in pairs at each location.

Figure 10 Installing the Traps



© Doug Gilbertson

Nest Traps

Nest traps were constructed using short lengths of garden cane pushed inside a plastic tube (plastic drinking bottle with top and bottom removed). These were secured to the trees using thin plastic-coated wire threaded through the trap and tied to the tree in a suitable location 1.5-2 metres above the ground.

Figure 11 Nest Traps



Trapping Schedule

Table i Trapping Schedule

Location	Trapping Period
Abernethy	14 th July 2021 - 8 th August 2021
Dell Woods	14 th July 2021 – 8 th August 2021
Dundreggan	15 th July 2021 - 9 th August 2021
Black Wood of Rannoch	16 th July 2021 - 10 th August 2021
Glen Lyon Estate	2 nd August 2021 - 26 th October 2021

All trap locations were marked using a GPS. Traps were left out for a minimum of 4 weeks. Trap installation at Gallin was delayed due to waiting for permissions for the site and was left longer due to the availability of the volunteer.

Gallery

Figure 12 Gallery

a. Bark traps on mature pine, Abernethy



b. Bark traps on Pine, Black Wood of Rannoch



c. Wood ant spider (*Diplocephalus*)



d. Hairy wood ant (*Formica lugubris*) hanging from spider silk



All photos © Rebecca Lewis

Emptying the traps

Bark and nest traps were emptied by carefully removing them from the tree and capturing any spiders found between the tree and the trap. The trunk was carefully inspected for remaining spiders and the trunk lightly brushed into a tray. The trap was then opened and emptied onto a tray placed on a white sheet on the ground. Spiders were taken from the tray using a pooter and transferred to a pot with preservative (70% Isopropanol). Samples were labeled with the reserve name, tree location and trap type.

Figure 13 Traps

a. Emptying traps



b. Nest trap



© Rebecca Lewis

Results

A total of 475 individuals were identified. This consisted of 41 identifiable species, with the remaining immature specimens identified to 9 other families. Six pots containing 8 individuals were unlabelled and could not be identified to a location. Of these 8 specimens, all were identified to species level and comprised 4 species (numbers included in the total).

Notable Species

Of the 7 focal species surveyed for, 2 were found with 51 individuals recorded from all sites apart from Gallin.

Table ii Focal Species

Taxon	Reserve Located
<i>Dipoenia torva</i>	Dundreggan Abernethy Black Wood of Rannoch
<i>Clubiona subsultans</i>	Dundreggan Abernethy Black Wood of Rannoch

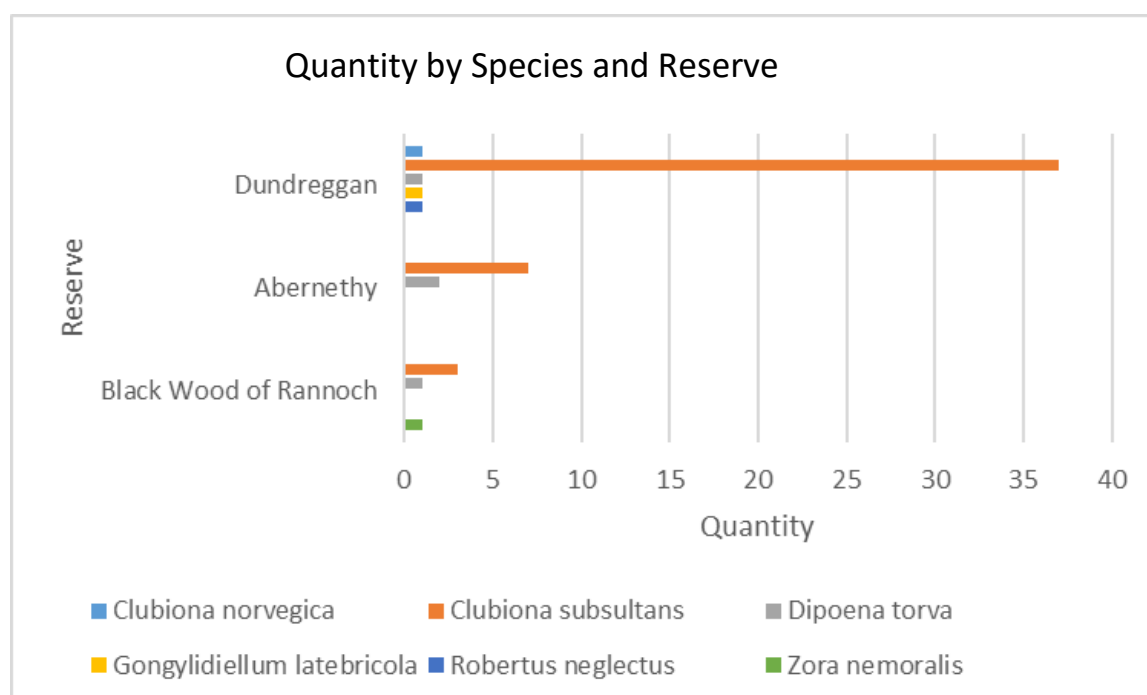
In addition, 4 species with elevated conservation status were recorded at Dundreggan and Black Wood of Rannoch.

Table iii Additional Species

Taxon	Conservation Status	Reserve Located
<i>Clubiona norvegica</i>	Nationally Scarce	Dundreggan
<i>Gongylidiellum latebricola</i>	Nationally Scarce	Dundreggan
<i>Robertus neglectus</i>	Nationally Scarce	Dundreggan
<i>Zora nemoralis</i>	Vulnerable Nationally Rare	Black Wood of Rannoch

Dundreggan had the largest diversity and abundance of notable (focal and additional) species, largely dominated by the presence of *Clubiona subsultans*. Gallin had no notable species (Fig.14).

Figure 14 Quantity of focal and additional notable species from each reserve



Overall, *Linyphiidae* dominated the samples with a large number of immature specimens. *Amaurobiidae* was the second largest group to dominate (Fig.15) with *Amarobious fenestralis* identified from most of the samples taken (Fig. 16).

Figure 15 Quantity of spiders by family

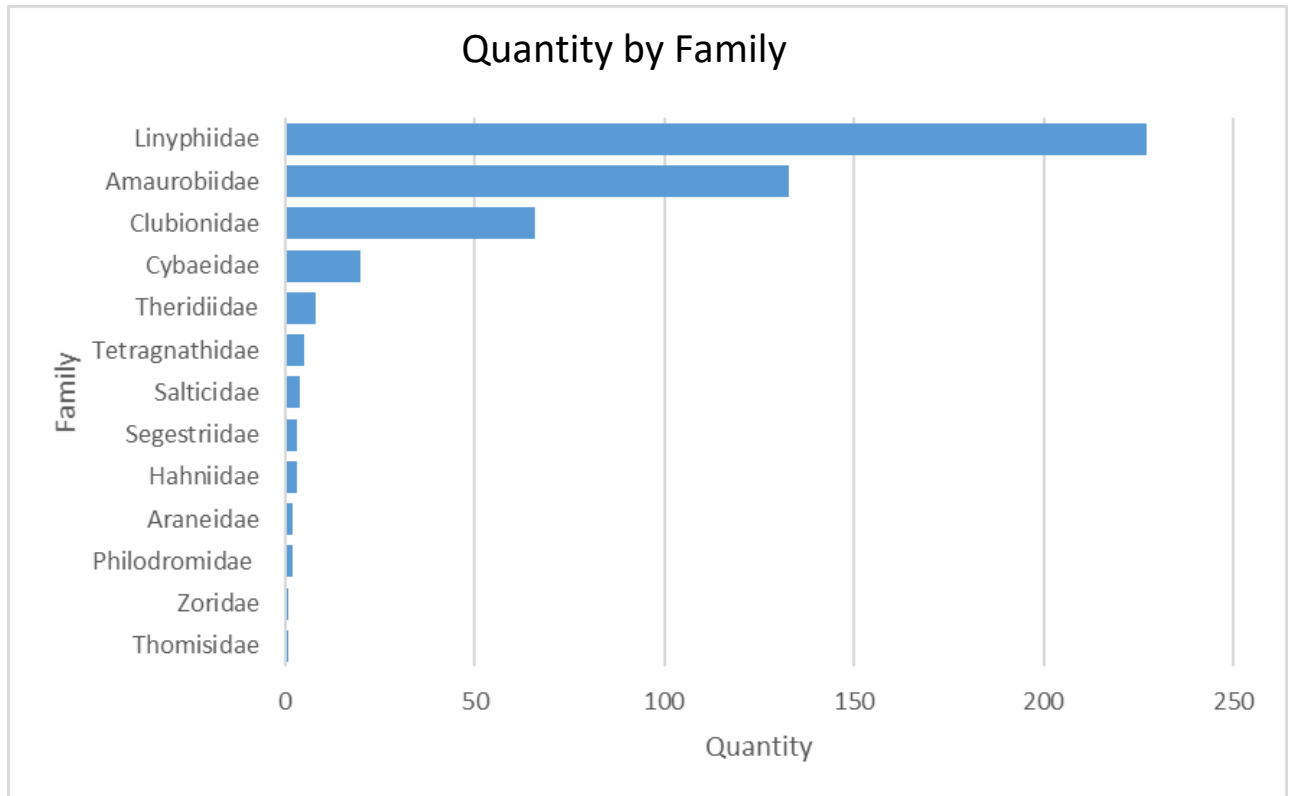
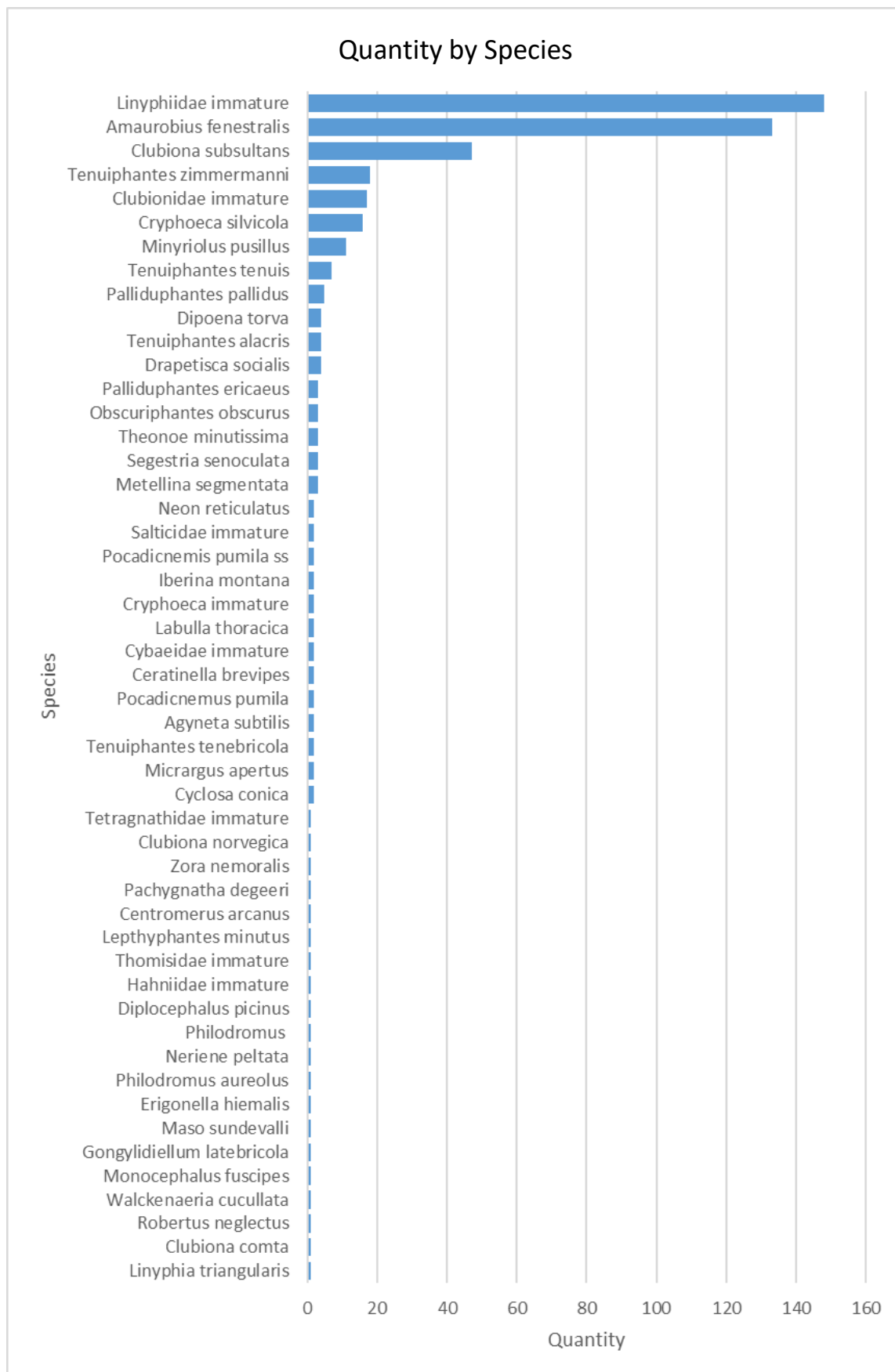
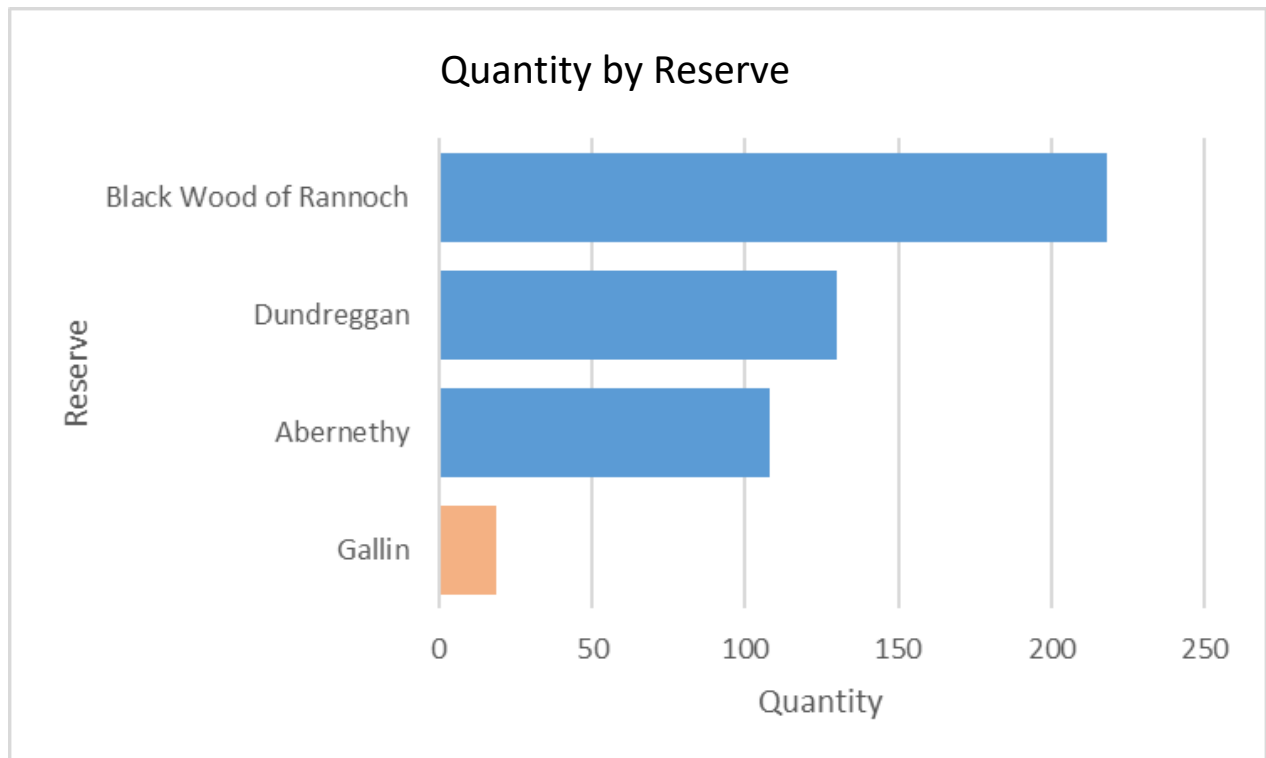


Figure 16 Quantity of each spider species



In terms of overall quantity, Black Wood of Rannoch had the highest number of individuals, followed by Dundreggan then Abernethy. Gallin had fewer trap locations so cannot be directly compared (Fig.17).

Figure 17 Quantity of spiders in each reserve



Bark traps and nest traps were successful in trapping individual spiders. Forty of the 45 trap locations were populated by spiders, only 5 were empty. Bark traps were populated by a variety of species while nest traps were populated mainly by the *Clubionidae*. There was a clearly observable difference between the large and small bubble traps with the small bubble being more successful in trapping a larger diversity and abundance of spiders; the majority of large bubble traps were empty. Bugvac samples collected the largest number of spiders, the samples dominated by immature *Linyphiidae*.

Discussion & Recommendations

This was a large scale and thorough survey using a variety of trapping techniques. The scope of the survey also allowed for further testing of the traps, providing useful results applicable to future monitoring. The results revealed a large number and variety of spiders and included a number of species of conservation concern. These results will now be able to be used by the reserve managers to help direct their management plans.

Having experts able to identify the spiders from collected samples was critical to these surveys given the difficulty in identifying some of our vulnerable species. Conservation efforts should therefore include maintaining these skill sets through training and mentoring within our conservation communities.

It is also worth noting the constraints imposed by the survey methods. While setting up the traps at Dundreggan, spider expert Alastair Lavery sampled four of the sites using alternate methods (beating and brushing the trunks, refer to appendix for full report). He identified 11 species of spider using this method, 6 of which were not detected using the bark, nest or bugvac methods used in the main survey. While the survey methods chosen for this survey were suitable for the focal species, consideration should be given to its limitations when looking at other species present that may be of conservation concern. Increasing the sampling methods at each site would have increased the diversity of spiders found, however more time would need to be allowed for the survey and identification.

Ecological surveys and monitoring remain the cornerstone of any conservation strategy. Repeating these surveys would provide us with an indication of the continuing health of these populations through assessment of the recurrence of species identified in the samples.

Acknowledgements

Any large-scale survey of this nature not only benefits from the help of volunteers but can provide a learning experience to volunteers in the local area. Buglife as an organisation views volunteer participation as an important part of conservation efforts. We are hugely appreciative of the time and effort from local experts, sharing their knowledge and expertise in the location and identification of the spiders.

Thank you to Alasdair Lavery for his support in the field, identification of samples, ongoing support and expert advice. Chris Cathrine of Caledonian Conservation for his support and expert advice, explanation of trapping techniques, loaning of bark traps and identification of samples. Genevieve Tompkins of the Rare Invertebrates in the Cairngorms Project for help in the field and support with volunteers. Mike Davidson for his help in the field and onsite identification. Doug and Joyce Gilbertson (Trees for Life, Dundreggan Reserve) for their help in the field and setting up some remote traps. Anthony McCluskey of Butterfly Conservation for his help securing the fifth site (Gallin), setting and clearing the traps. Alice Melon and Kelly Powell for volunteering to help in the field. Gareth Ventress (Forestry and Land Scotland), Richard Mason (RSPB), Peter Kelly (NatureScot) and Ian Sargent (NatureScot) for site permissions and access information. Thanks, are also due to NatureScot, RSPB and Forest and Land Scotland for granting permissions to work on their land.

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Appendices

Copy of Report by Alasdair Lavery

Arachnida at Dundreggan, 15 July 2021.

Alastair Lavery 19 July 2021.

This report covers a limited sampling of spiders and other arachnids at Dundreggan, concentrating on species on tree bark and branches. The aim was to establish the presence and range of two key species, *Dipoena torva* and *Philodromus margaritatus* as part of a Buglife project.

Two sample methods were used – bark brushing on to a beating tray and low branch shaking or beating, again on to a canvas beating tray.

When immature specimens could be reliably identified to species level they are included in the tables, otherwise they are listed as total immatures in the detailed tables.

Summary.

Species/Site	DP1	DP2	DP3	DP4
	Pine	Birch	Birch	Pine
<i>Segestria senoculata</i>		Imm.	Adult	
<i>Amaurobius sp.</i>	Imm.		Imm.	
<i>Dipoena torva</i>				Adult
<i>Moebelia penicillata</i> (Linyphiidae) NS LC	Adult			
<i>Agyneta</i> (Meioneta) <i>innotabilis</i> (Linyphiidae) LC	Adult			Adult
<i>Pityohyphantes phrygianus</i> (Linyphiidae) NS				Imm.
<i>Metellina sp.</i>	Imm.	Imm.		
<i>Araneus diadematus</i> (Araneidae) LC	Adult			
<i>Nuctenea umbratica</i> (Araneidae) LC				Imm.
<i>Cryphoeca silvicola</i>		Imm.		Imm.
<i>Megabunus diadema</i> (Opiliones – Phalangidae)	Adult			

Site details

DP1. Mature Scots Pine (*Pinus sylvestris*) by Caochan na Sgochrich; NH 3225 1473

Species/Site	DP1 i	DP1 ii
	Pine	Pine
	Brushing	Beating
<i>Amaurobius sp.</i>	3 immature	
<i>Moebelia penicillata</i>	1 adult female	
<i>Agyneta (Meioneta) innotabilis</i>	1 adult female	
<i>Metellina sp.</i>	1 immature	2 immature
<i>Araneus diadematus</i>		1 adult male
<i>Megabunus diadema</i>	1 adult	

DP2. Mature Birch (*Betula pubescens*) by Caochan na Sgochrich; NH 3229 1472

Species/Site	DP2
	Beating
<i>Metellina sp.</i>	1 immature
<i>Nuctenea umbraticola</i>	1 immature
<i>Cryphoeca silvicola</i>	1 immature
<i>Linyphiidae</i>	2 immature

Araneus alsine was found near this site.

DP3. Mature Birch (*Betula pubescens*) by Caochan na Sgochrich; NH 3211 1493

Species/Site	DP3
	Beating
<i>Segestria senoculata</i>	3 immature
<i>Amaurobius sp.</i>	2 immature

DP1. Group of mature Scots Pine (*Pinus sylvestris*) along main track; NH 3265 1500.

The site includes Site W2 (NH 32658 14936 from the 2009 Dundreggan survey).

Species/Site	DP4
	Pine
	Brushing
<i>Diploana torva</i>	1 adult female, 1 immature male
<i>Agyneta (Meioneta) innotabilis</i>	Adult female
<i>Pityohyphantes phrygianus</i>	1 immature female
<i>Nuctenea umbraticola</i>	1 immature
<i>Cryphoeca silvicola</i>	1 immature
<i>Linyphiidae</i>	1 immature

The tree with *D. torva* had wood ants hanging from web lines (Figure 1).

Notes

***Amaurobius* sp.** The specimens are likely to be *Amaurobius fenestralis*, but the species cannot be determined definitively from immature specimens.

Moebelia penicillata* and *Agyneta (Meioneta) innotabilis are Linyphiidae characteristic of deeply fissured tree bark. *Agyneta innotabilis* was transferred from *Meioneta* recently and is listed as *Meioneta innotabilis* in most UK literature.

Dipoena torva is recorded here from the site it was found at in 2009. It is likely that it has a very restricted distribution at Dundreggan, but the sampling of wider areas in the Buglife survey may reveal a wider distribution.

Megabunus diadema, a harvestman, is recorded at Dundreggan for the first time.



Figure 1. Wood ants (*Formica* sp.) caught in webs at Site DP4.

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Email: info@buglife.org.uk



@buzz_dont_tweet

This project was supported by NatureScot

Photo credits L-R; Ladybird spider (*Eresus sandaliatus*) © S. Dalton, Jellyfish © D. Huffman, Tansy beetle (*Chrysolina graminis*) © S. Falk and Large garden bumblebee (*Bombus ruderatus*) © S. Falk



Saving the small things that run the planet

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