# Monitoring of the Black Bog Ant *Formica picea* on Rhossili Down SSSI in 2022

NRW Evidence Report No. 686

Author name: David Boyce

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# Crynodeb gweithredol

Mae morgrugyn du y gors *Formica picea* yn brin yn y DU, lle mae'n gysylltiedig â chorsydd a rhostir gwlyb mewn nifer fach o safleoedd yn ne Lloegr, gan gynnwys rhostiroedd Dorset a Surrey a chorsydd dyffrynnoedd y New Forest, gydag un safle yn Swydd Efrog. Yng Nghymru, mae wedi'i gyfyngu i Rhosili Down ar Benrhyn Gŵyr, Cors Goch Llanllwch yn Sir Gaerfyrddin, a Chors Llanerch yn Sir Benfro. Fe'i cofnodwyd gyntaf ar Rhosili Down yn 1913 a'i ailddarganfod wedyn yn 1996. Canfu arolwg ym mis Gorffennaf 1997 fod 49 o nythod gweithredol ar hyd pedwar trawslun o'r dwyrain i'r gorllewin ar draws y gors a chynefinoedd rhostir gwlyb a lifolchir i'r dwyrain o'r gefnen ganolog, gyda 23 o nythod gweithredol eraill mewn mannau eraill ar y safle. Amcangyfrifwyd bod rhwng 840 a 4,970 o nythod gweithredol yn bresennol ar draws y safle, sy'n cynrychioli'r boblogaeth fwyaf yn y DU.

Ailadroddodd yr arolwg presennol, ym mis Awst 2022 waith 1997, gyda chyfrif o nythod gweithredol ar hyd y pedwar trawslun. Cofnodwyd cyfanswm o 47 o nythod gweithredol, dau yn llai nag yn 1997, er bod y niferoedd ar hyd pob trawslun yn amrywio (1, 34, 4 a 10 yn 1997; 1, 21, 3 a 22 yn 2022). Er bod y canlyniadau hyn yn awgrymu bod poblogaeth morgrug du y gors wedi aros yn sefydlog dros y cyfnod o 25 mlynedd, cynhaliwyd yr arolwg presennol ar ôl llosgiad mawr iawn heb ei reoli ddiwedd mis Ebrill 2022. Roedd hyn wedi clirio'r holl lystyfiant a deiliach marw ac wedi deifio'r mawn ar yr wyneb, ac wedi llosgi'r rhan fwyaf o'r ardal fagu graidd, gan gynnwys y rhan fwyaf o'r tri thrawslun gogleddol. Hyd yn oed erbyn arolwg mis Awst, nid oedd y llystyfiant wedi adfywio'n sylweddol ac roedd ehangder mawr o swbstrad noeth, wedi'i losgi o hyd. Cafodd ailddyfiant y llystyfiant yma hefyd ei atal gan bwysau pori trwm iawn gan ddefaid, gwartheg a merlod a chan yr amodau eithriadol o gynnes a sych dros gyfnod gwanwyn a haf 2022.

Mae'n debygol bod y llosgi wedi'i gwneud hi'n haws dod o hyd i nythod gweithredol yn ystod yr arolwg presennol nag yn 1997, gan ei gwneud hi'n anodd cymharu canlyniadau'n uniongyrchol. Mae'n rhaid bod y llosgi wedi cael effaith negyddol sylweddol ar allu'r morgrugyn i chwilota am ysglyfaeth di-asgwrn-cefn byw a neithdar, er y gallai fod wedi cael llai o effaith ar ei allu i gynaeafu melwlith o gytrefi llyslau tanddaearol neu led-danddaearol. O'r herwydd, mae'n anodd gweld y bydd effeithiau'r llosgi hwn yn cael unrhyw beth ond effaith negyddol, gref ar y boblogaeth o forgrug du y gors ar Rhosili Down, sydd o bwysigrwydd cenedlaethol.

# Executive summary

The Black Bog Ant *Formica picea* is rare in the UK where it is associated with bogs and wet heath at a small number of sites in southern England including the heaths of Dorset and Surrey and the valley bogs in the New Forest, with a single site in Yorkshire. In Wales, it is restricted to Rhossili Down on Gower, Cors Goch Llanllwch in Carmarthenshire and Cors Llanerch in Pembrokeshire. It was first recorded on Rhossili Down in 1913 and subsequently refound in 1996. A survey in July 1997 found 49 active nests along four east to west-oriented transects across the bog and flushed wet heath habitats to the east of the central ridge, with a further 23 active nests elsewhere on the site. It was estimated that between 840 and 4970 active nests were present across the site, representing the largest population in the UK.

The current survey in August 2022 repeated the 1997 work, with a count of active nests along the four transects. A total of 47 active nests was recorded, two less than in 1997, although numbers along each transect varied (1, 34, 4 & 10 in 1997; 1, 21, 3 & 22 in 2022). Whilst these results suggest that the Black Bog Ant population has remained stable over the 25 year period, the current survey took place after a very large, uncontrolled burn in late April 2022. This had cleared all vegetation and litter and scorched the surface peat, and had burnt the majority of the core breeding area, including most of the three northern-most transects. Even by the time of the August survey, the vegetation had not regenerated appreciably and there were still large expanses of bare, burnt substrate. The regeneration of vegetation here was also checked by very heavy grazing pressure from sheep, cattle and ponies and by the exceptionally warm and dry conditions over the spring-summer of 2022.

It is likely that the burn made it easier to find active nests during the current survey than in 1997, making it difficult to directly compare results. The burn must have had a significant negative impact on the ability of the ant to forage for live invertebrate prey and nectar, though it may have had less impact on its ability to harvest honeydew from subterranean or semi-subterranean aphid colonies. As such, it is hard to see that the impacts of this burn will have anything but a strong, negative impact on the nationally important population of Black Bog Ant on Rhossili Down.

# 1. Introduction

The Black Bog Ant *Formica picea* Nylander, 1846 is widespread in central and northern Europe but absent from the Iberian peninsula, Ireland, Italy, the Mediterranean and much of France other than Brittany and the Pyrenees (Lebas *et al*., 2019). It is associated with open, wet and generally cool habitats including peat bogs, damp meadows and heather moorland (Collingwood, 1979). Nests are usually found in the wettest parts of a site, with the above-ground structure comprising grass and moss fragments built around a supportive grass tussock (often Purple Moor-grass *Molinia caerulea*) or amongst clumps of moss, forming a flattish cone or solarium a little less than 10cm in diameter, although the bulk of the nest is underground to a depth of 30cm. The solarium is used to incubate the brood in the spring and summer. Black Bog Ant is a polygynous species, with several queens in a nest, and rarely with more than a few hundred workers. In the UK, it is associated with bogs and wet heath at a small number of sites in southern England including the heaths of Dorset and Surrey and the valley bogs in the New Forest, with a single site in Yorkshire (Howe, 2022). The ant is listed as a Red Data Book 2 (Vulnerable) species in the last review of British Aculeate Hymenoptera (Falk, 1991) and is included on Section 7 of the Environment (Wales) Act 2016 as a Species of Principal Importance for the conservation of biodiversity in Wales.

The Black Bog Ant was first found in Wales by J.W. Allen on Rhossili Down in 1913 (Donisthorpe, 1927; Hallett, 1915, 1928, 1936, 1947, 1956) although the record was long thought to be an error (Blacker, 1989; Falk, 1991; Yarrow, 1954). It was subsequently found on Cors Goch Llanllwch SSSI in Carmarthenshire in September 1991 in an area of wet heath on raised bog (Fowles, 1992, 1996; Gander, 1992). Survey work by the Countryside Council for Wales refound Black Bog Ant on Rhossili Down in August 1996 and more intensive surveys indicated that there may be several thousand nests in flushed wet heath on the east-facing slopes of the site, representing the largest population in the UK (Orledge *et al*., 1998). Wider searches for additional populations on Gower in 1999 failed to find the ant on Cefn Bryn Common, Clyne Common, Fairwood Common, Frog Moor, Llanmadoc Hill, Pengwern Common and Welsh Moor in 1999 (Orledge & Smith, 1999). It has since been found on Cors Llanerch in the Gwaun Valley in Pembrokeshire on a heavily-ditched valley bog planted with conifers (Hudson, 2007, 2008a&b).

Rhossili Down (central Grid Reference approximates to SS423895) is owned and managed by the National Trust. It is sited at the western extremity of the Gower Peninsula in the county of Glamorgan (Watsonian vice-county 41), between the villages of Llangennith to the north and Rhossili to the south and approximately 20 kilometres to the west of Swansea (Figure 1). It is underlain by Old Red Sandstone which gives rise to nutrient-poor podsols suitable for the development of acidophilous heath, bog and grassland vegetation. The central ridge rises to a height of 193 metres towards its southern end, on The Beacon. It has dry heathland dominated by Ling *Calluna vulgaris* with frequent Western Gorse *Ulex gallii* and Bell Heather *Erica cinerea* and rock outcrops that host a diverse assemblage of saxicolous lichens. The dry heath is mostly referable to the H8 community of the National Vegetation Classification (NVC; Rodwell, 1991), with some stands of more upland-type H12 heath on the highest ground (see Figure 2).

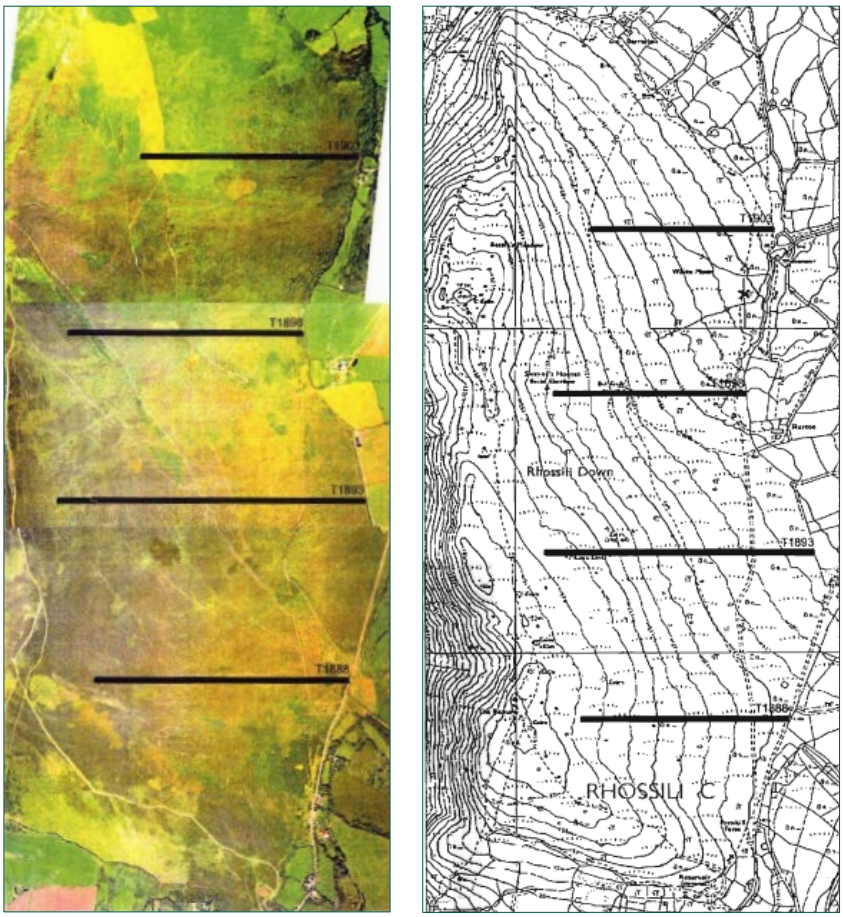
Figure 1. Location of Rhossili Down.


Figure 2. Ling-dominated dry heath looking south towards Rhossili Bay and Worm's Head.

The key area of the site for Black Bog Ant is the lower slopes to the east of the central ridge. These are less steep than those to the west and a series of springs arising along them gives rise to soligenous flushes that support a range of wet heath and mire NVC communities (Rodwell, 1992). Around flush lines, the commonest type is the M6 mire, which is characterised by bog-mosses *Sphagnum* spp., Common Cottongrass *Eriophorum angustoifolium* and a range of small sedges, including Star Sedge *Carex echinata*, Carnation Sedge *C. panicea* and Common Yellow Sedge *C. demissa*. In places where the groundwater is less acidic, there are M29 runnels with abundant Bog Pondweed *Potamogeton polygonifolius* and Marsh St. John's-wort *Hypericum elodes* (Figure 3). The latter are the main breeding habitat for a colony of the internationally threatened Southern Damselfly *Coenagrion mercuriale*, which is known from Rhossili Down. On the wettest ground around flushes and seepages, there are some stands of M21 acid bog characterised by abundant Bog Asphodel *Narthecium ossifragum*, Round-leaved Sundew *Drosera rotundifolia* and hummock-forming bog-mosses such as *Sphagnum papillosum*. The most extensive communities on the eastern slopes are stands of wet or humid heath referable to the H4, M15 and M16 types. These have Ling, Cross-leaved Heath *Erica tetralix*, Western Gorse and abundant Purple Moor-grass *Molinia caerulea*. A feature of the H4 type is the presence of frequent Bristle Bent *Agrostis curtisii*, especially in the earlier stages after burning.

Figure 3. M29 flush on Rhossili Down SSSI.

In July 1997, the Countryside Council for Wales (CCW) commissioned a detailed survey of the Black Bog Ant on Rhossili Down (Orledge *et al.*, 1998). This established four east to west-oriented transects across the bog and wet heath habitats to the east of the central ridge from which the earlier records of *F. picea* had come (Figures 4 & 5). In all, they found 49 active nests along these four transects and a further 23 active nests elsewhere on the site.




Figures 4 & 5. Location and extent of transects on Rhossili Down. From: Orledge *et al*. (1998).

The 1997 study undertook detailed investigations of the ecology of the Black Bog Ant at Rhossili Down. It was clear from this that *F. picea* nests were associated with the mire and humid/wet heath communities (H4, M21, M15, M16) described in the preceding paragraphs. The nest is largely subterranean but there is usually a dome (solarium) of vegetation fragments built up around living plant stems and containing tunnels and chambers. As its name suggests the solarium provides a warm, sheltered environment into which the workers are able to move eggs, larvae and pupae over the spring-summer in order to accelerate brood development (Orledge *et al.*, 2018; Seifert, 2018).

Foraging workers are thought to primarily gather honedew from ‘farmed’ colonies of aphids. For example, at Cors Goch, Llanllwch, workers build 'collars' of vegetation fragments around shoots of Common Cottongrass in order to protect colonies of the aphid, *Paraschizaphis eriophori* (Orledge *et al.,* 2018). They will also predate small invertebrates and gather nectar from the flowers of ericaceous dwarf-shrubs such Ling and Bell Heather and are known to be skillful at removing invertebrates from the sticky leaves of

insectivorous sundews (Seifert, 1998). Mature nests generally contain between 500 and 800 workers and between 1 and 27 queens, though large polygynous nests may have over 10,000 workers (Seifert, 1998).

Extrapolating from the NVC map of the site and the observed distribution and density of nests along the transects, Orledge *et al*. (1998) estimated that 1.26 km² of the site had suitable bog and wet heath habitat for the Black Bog Ant and that the estimated size of the colony was 2420 active nests, with lower and upper 95% confidence intervals of 840 and 4790 active nests respectively.

Figure 6. Humid heath on Rhossili Down SSSI, T1903.

This report decribes the results of monitoring work undertaken in August 2022 on the population of the Black Bog Ant on Rhossili Down SSSI. This work was commissioned by Natural Resources Wales (NRW) and aimed to establish the current status of the ant on Rhossili Down and to elucidate its habitat requirements and management needs.

# 2. Methods

The four transects established in 1997 are located 500m apart and run east-west along the 1888, 1893, 1898 and 1903 eastings of the National Grid. These are referred to as T1888, T1893, T1898 and T1903 in this report. The location of the four transects is shown on Figure 9 and the bounding grid references and a short description of their characteristics is provided in Table 1.

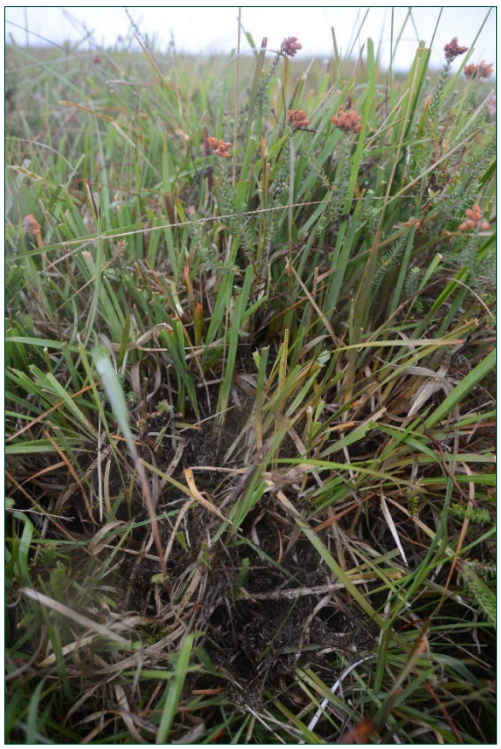
Table 1. Details of Black Bog Ant transects on Rhossili Down SSSI in 2022.

| Transect no. | Grid Ref. (west end) | Grid Ref. (east end) | Length (m) | Description |
|---|---|---|---|---|
| T1888 | SS42158880 | SS42838880 | 672 | Mostly rather dry, unburnt heathland. |
| T1893 | SS42048930 | SS42918930 | 866 | Mostly burnt heath, dry in western half, humid to wet in east. |
| T1898 | SS42138980 | SS42698980 | 553 | Dry heath in western half, wet heath and bog to east, partly burnt. |
| T1903 | SS42259030 | SS42789030 | 529 | Humid to wet heath, mostly burnt. |

The technique used to record Black Bog Ant along the transects was a modified form of that employed in the 1997 survey. For each of the four transects, a strip approximately 10 metres wide centred on the appropriate grid line, was searched intensively following the method used on Cors Goch Llanllwch by Fowles & Hurford (1996). To facilitate recording, the transect was divided into ten-metre sample sections, each of which was assigned a unique sample number, starting at the western end of the transect. For example, sample point T1888-01 constituted a notional 10 metre² box centred on SS42158880 and the final sample on this transect (T1888-67) was located around point SS42838880. Within each sample section, the whole 10 metre² plot was walked with an entomological net pole used to tap likely-looking nest sites (e.g. accumulations of plant and soil debris on *Molinia* tussocks, *Sphagnum* mounds etc.).

Where slight disturbance revealed the presence of ant brood, or produced vigorous ant activity (i.e. many workers immediately rushing out), an active Black Bog Ant nest was recorded. A number of unoccupied structures that appeared likely to be abandoned *F. picea* nests were also found but were not recorded as active nests. Where only one or a few ants were present, or where they were beaten into a tray from flowering heathers or Western Gorse, these were recorded as foraging workers. Nests and workers of other species of ants were also recorded in the same way.

The main difference in methodology between the 1997 survey and the current monitoring was that in 1997, three surveyors walked in a line along each transect, whereas in 2022, over the same number of days, there was just the one surveyor. It would therefore be expected, given the cryptic nature of Black Bog Ant nests, that the earlier study would have produced more records than the latter.



Figures 7 & 8. Nests in *Molinia* tussock and *Molinia-Sphagnum papillosum* tussock, T1893.

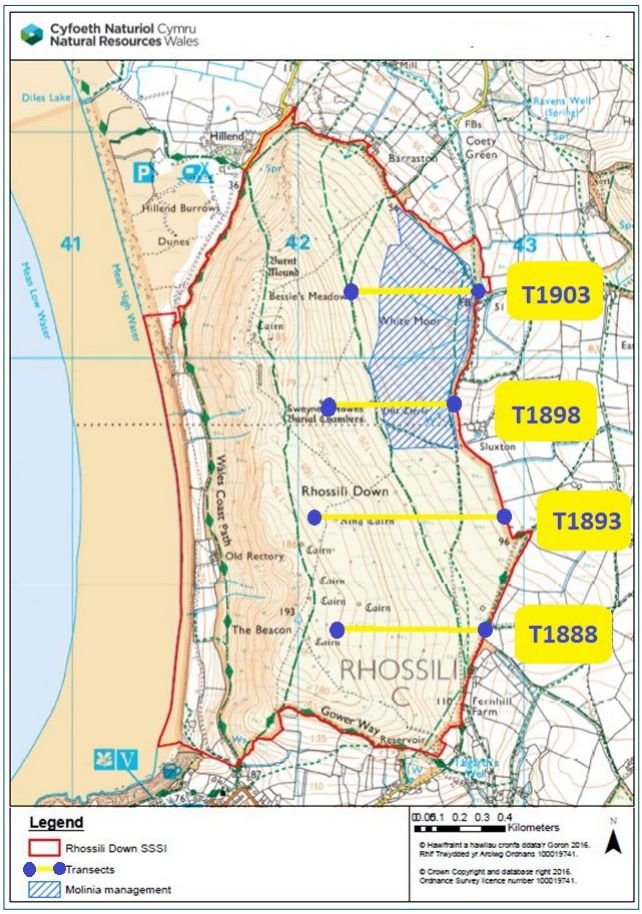



Figure 9. Location of Black Bog Ant transects on Rhossili Down SSSI in 2022.

# 3. Results

## 3.1. Black Bog Ant

A summary of the data collected along the four transects in 2022 is given in Table 2 below. It also provides the corresponding figures for the 1997 counts. Table 3 gives the location of all records of Black Bog Ant on Rhossili Down in 2022, including the sample number, Grid Reference, number of nests/workers recorded and a brief habitat description.

Table 2. Transect counts of Black Bog Ant nests on Rhossili Down in 1997 and 2022.

| Transect | 1997 nest count | 2022 estimated nest count |
|---|---|---|
| T1888 | 1 nest | 1 nest |
| T1893 | 34 nests | 21 nests |
| T1898 | 4 nests | 3 nests |
| T1903 | 10 nests | 22 nests |
| **Totals** | **49 nests** | **47 nests** |

As can be seen from Table 2, the overall counts for the two years (47 in 2022 compared to 49 in 1997) are very similar, though with fewer nests recorded along T1893 but more found on T1903. In addition to active nests, the 2022 figures also assume there to have been a nest in any 10m² in which one or more workers was/were recorded and where no nest was found in that square or in either of those adjacent to it. These proxy nest records, like the records of any active nests, are shown in red in column three of Table 3.

Tables 3-6. Black Bog Ant records on Rhossili Down in 2022

**Notes on Tables 3-6:** The red colour in column 3 indicates those sample sections that have been scored as having a Black Bog Ant colony, either because an active nest was found there or because there was a worker record that met the criteria to be considered likely to represent an unrecorded colony.

Table 3: T1888 – 1 nest

| Sample no. | Grid reference | *F. picea* nests (n) or workers (w) | Habitat description |
|---|---|---|---|
| T1888-30 | SS42458880 | **1w** | Worker tapped from *Calluna vulgaris*, unburnt humid heath. |
| T1893-62 | SS42678930 | **1n** | Nest in *Sphagnum papillosum* hummock, unburnt wet heath. |
| T1893-61 | SS42668930 | **1n** | Nest in *Sphagnum capillifolium* hummock, unburnt mire. |
| T1893-29 | SS42348930 | **1n** | Nest in peat mound, burnt dry heath. |
| T1893-24 | SS42298930 | **1n** | Nest in peat mound, burnt dry heath. |
| T1893-23 | SS42348930 | **1n** | Nest in peat mound, burnt dry heath. |

Table 4: T1893 – 21 nests

| Sample no. | Grid reference | *F. picea* nests (n) or workers (w) | Habitat description |
|---|---|---|---|
| T1893-87 | SS42918930 | **1w** | Worker tapped from *Ulex gallii*, unburnt humid heath. |
| T1893-81 | SS42868930 | **1n; 1w** | Nest in *Molinia* tussock, burnt humid heath. |
| T1893-80 | SS42858930 | **1n** | Nest in *Molinia* tussock, burnt *Molinia-Ulex gallii*, humid heath. |
| T1893-78 | SS42838930 | **1n** | Nest in tightly grazed *Molinia* tussock, burnt humid heath. |
| T1893-77 | SS42828930 | **2n** | Nests in *Molinia* tussocks, burnt humid heath. |
| T1893-76 | SS42818930 | **1n** | Nest in *Molinia* tussock, burnt wet heath. |
| T1893-75 | SS42808930 | **1n** | Nest in *Molinia* tussock, burnt humid heath. |
| T1893-73 | SS42788930 | **2n** | Nests in *Molinia* tussocks, burnt wet heath. |
| T1893-66 | SS42718930 | **1n; 1w** | Nest in *Molinia-Sphagnum papillosum* tussock, 1 worker in *S. papillosum* hummock; unburnt wet heath. |
| T1893-64 | SS42698930 | **4n; 2w** | Nests in *Molinia* tussocks and *S. papillosum - Aulacomnium palustre* hummocks, workers in *S. papillosum* hummock; unburnt wet heath. |
| T1893-63 | SS42688930 | **1n** | Nest in *Sphagnum papillosum* hummock at base of *Molinia* tussock, unburnt wet heath. |
| T1893-62 | SS42678930 | **1n** | Nest in *Sphagnum papillosum* hummock, unburnt wet heath. |
| T1893-61 | SS42668930 | **1n** | Nest in *Sphagnum capillifolium* hummock, unburnt mire. |
| T1893-29 | SS42348930 | **1n** | Nest in peat mound, burnt dry heath. |
| T1893-24 | SS42298930 | **1n** | Nest in peat mound, burnt dry heath. |
| T1893-23 | SS42348930 | **1n** | Nest in peat mound, burnt dry heath. |

## Table 5: T1898 – 3 nests

| Sample no. | Grid reference | *F. picea* nests (n) or workers (w) | Habitat description |
|---|---|---|---|
| T1898-31 | SS42448980 | **2w** | Workers on wet peat, burnt wet bog with *Narthecium ossifragum, Eriophorum angustifolium, Juncus acutiflorus, Sphagnum* spp. |
| T1898-32 | SS42458980 | **1w** | Workers on wet peat, burnt wet bog with *Narthecium ossifragum, Eriophorum angustifolium, Juncus acutiflorus, Sphagnum* spp. |
| T1898-36 | SS42498980 | **1w** | Worker on burnt wet heath. |
| T1898-39 | SS42528980 | **1n** | Nest in *Sphagnum papillosum* hummock, unburnt wet *Molinia-Myrica* bog. |
| T1898-40 | SS42538980 | **1w** | Worker in *Sphagnum papillosum* hummock, unburnt wet *Molinia-Myrica* bog. |

## Table 6: T1903 – 22 nests

| Sample no. | Grid reference | *F. picea* nests (n) or workers (w) | Habitat description |
|---|---|---|---|
| T1903-27 | SS42529030 | **1n; 1w** | Nest in *Molinia* tussock, worker tapped from *Calluna vulgaris*; unburnt *Molinia-Calluna-Erica tetralix-Narthecium ossifragum-Sphagnum papillosum* mire. |
| T1903-28 | SS42539030 | **1n; 2w** | Nest in *Sphagnum papillosum* hummock, workers tapped from *Erica tetralix*; unburnt *Molinia-Eriophorum angustifolium-Calluna-Erica tetralix-Narthecium ossifragum* mire. |
| T1903-30 | SS42559030 | **1n** | Nest in well-grazed *Molinia-Eriophorum angustifolium-Sphagnum capillifolium* tussock, unburnt *Molinia-Calluna-Erica tetralix-Narthecium ossifragum-Sphagnum* mire. |
| T1903-31 | SS42569030 | **1w** | Worker running over bare peat, burnt wet heath. |
| T1903-36 | SS42619030 | **1n** | Nest in well-grazed *Molinia* tussock, burnt wet heath. |
| T1903-37 | SS42629030 | **2n** | Nests in well-grazed *Molinia* tussocks, burnt humid heath. |
| T1903-38 | SS42639030 | **2n** | Nests in well-grazed *Molinia* tussocks, burnt humid heath. |

| Sample no. | Grid reference | *F. picea* nests (n) or workers (w) | Habitat description |
|---|---|---|---|
| T1903-39 | SS42649030 | **3n** | 2 nests in well-grazed *Molinia* tussocks & 1 nest in *Trichophorum germanicum* tussock, burnt humid heath. |
| T1903-41 | SS42669030 | **1n** | 1 nest in *Molinia* tussock, burnt humid heath. |
| T1903-42 | SS42679030 | **2n** | 1 nest in *Molinia* tussock, burnt humid heath. |
| T1903-45 | SS42709030 | **1n** | 1 nest in peat hummock, burnt humid heath. |
| T1903-47 | SS42729030 | **2n** | 2 nests in *Molinia* tussocks, burnt humid heath. |
| T1903-48 | SS42739030 | **2n** | 2 nests in peat hummock, burnt humid heath. |
| T1903-50 | SS42759030 | **2n** | 1 nest in peat hummock, 1 in bleached *Sphagnum capillifolium* hummock. |
| T1903-52 | SS42779030 | **1n** | 1 nest in *Molinia* tussock, burnt humid heath. |

## 3.2. Other ants and invertebrates

Four other ant species were recorded along the transects on Rhossili Down in 2022, all of which are common and widely distributed species. The most frequently encountered species was the red ant *Myrmica ruginodis* and there were also occasional records of *M. rubra* and *M. scabrinodis*. Two nests of the Black Garden Ant *Lasius niger* were also noted.

A single male Southern Damselfly *Coenagrion mercuriale* was recorded flying over a M29 runnel between T1893 and T1903. Other notable records were of a single Hornet Robberfly *Asilus crabroniformis* close to the eastern end of T1888 and a Moss Carder Bumblebee *Bombus muscorum* foraging on heather flowers in dry heath close to the top of this transect.

A full list of casual invertebrate records collected on Rhossili Down during the course of the 2022 Black Bog Ant survey has been sent to NRW as an Excel spreadsheet.

# 4. Discussion

Given that the 2022 count was achieved with only a third of the manpower used to undertake the 1997 survey, it might be supposed that the Black Bog Ant has increased in numbers substantially since the earlier survey. However, the impact of burning on the survey needs to be taken into account when interpreting the 2022 data.

Figure 10. Burnt wet heath close to T1898 showing badly bleached *Sphagnum* hummocks.

There was a very large, uncontrolled burn on Rhossili Down this spring which is thought to have taken place in late April (Iona Graham, pers. comm.), outside the legal burning season (that ends on 15th April). This had burnt the majority of the core breeding area, including most of transects T1893, T1898 and T1903. This was clearly a hot burn that had cleared all vegetation and litter and scorched the surface peat. Even by the time of the survey in August, the vegetation had not regenerated appreciably and there were still large expanses of bare, burnt substrate. This must have had a significant negative impact on the ability of the ant to forage for live invertebrate prey and nectar, though it may have had less impact on its ability to harvest honeydew from subterranean or semi-subterranean aphid colonies. The regeneration of vegetation here was also checked by the very heavy grazing pressure from sheep, cattle and ponies and by the exceptionally warm and dry conditions over the spring-summer of 2022. The latter factor also exacerbated the impacts of the illegal fire. It is hard to see that the impacts of this burn will have anything but a strong, negative impact on the nationally important population of Black Bog Ant on Rhossili Down.

Figure 11. Conspicuous nest mound in burnt humid heath, T1903.

It therefore seems surprising that the numbers of nests recorded in 2022 are comparable with those from the 1997 study, especially given that this was achieved with a third of the person-days survey effort. I believe that this is likely to have been because the nests were much easier to spot in the burnt areas. In unburnt vegetation, they can be extremely cryptic, with the solarium of chopped vegetation fragments often being very inconspicuous. By contrast, active nests located in the burnt areas were often detectable from some distance, as low peaty mounds. Having said this, the greatest number of active nests found in a single survey section (four nests) was in species-rich, unburnt wet heath at T1893-64.

Of the other ants recorded here in 2022, *M. ruginodis* and *M. scabrinodis* are both characteristic species of mires and wet heaths, though they are also found widely in a range of other open and, in the case of *M. ruginodis*, wooded habitats. The presence of *M. rubra* here is of concern, as this is a eurytopic species characteristic of a wide range of open habitats with high levels of disturbance. Where it occurs on mires and wet heaths in Wales, this is usually in situations where the hydrology has been substantially altered by drainage and/or excessive burning, resulting in drying and oxidation of the peat column. No other *Formica* species were recorded on Rhossili Down this year, though on some of the drier, western transect sections, the habitat appeared eminently suitable for the Northern Silky Ant *Formica lemani*, which is much the most frequently encountered *Formica* species on heathland and other moorland habitats in northern and western Britain. Indeed, one of the most surprising aspects of the 2022 study was the presence of some *F. picea* colonies on quite dry, H8 and H12 heath, where I would normally expect *F. lemani* to be the resident *Formica* species.

Figure 12. Nest mound in relatively dry, severely burnt heath, upper section of T1893.

Elsewhere in Britain, Black Bog Ant is restricted to mire and wet heath habitats, often where the ground is permanently saturated. Its occurrence in humid to relatively dry heathland is unique within a British context, though Seifert (2018) does record its presence in much drier grasslands on the continent, in sites where the climate is much colder over the winter months (e.g. montane habitats and steppe grasslands). He also considers competition from other *Formica* species to be a very important factor in restricting *F. picea* to bog habitats. Given the unusually dry nature of the heathland occupied by *F. picea* on Rhossili Down, it is to be hoped that the April 2022 burning does not result in excessive competition from other, more aggressive ants and dry-adapted ants such as *F. lemani* and *M. rubra*.

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# Data Archive Appendix

The data archive contains:

[A] The final report in Microsoft Word and Adobe PDF formats.

~~[B] A full set of maps produced in JPEG format.~~

~~[C] A series of GIS layers on which the maps in the report are based with a series of word documents detailing the data processing and structure of the GIS layers.~~

~~[D] A set of raster files in ESRI and ASCII grid formats.~~

~~[E] A database named [name] in Microsoft Access 2000 format with metadata described in a Microsoft Word document [name.doc].~~

~~[F] A full set of images produced in [jpg/tiff] format.~~

[G] Species records held in the Welsh Invertebrate Database (WID).

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue https://libcat.naturalresources.wales (English Version) and https://catllyfr.cyfoethnaturiol.cymru (Welsh Version) by searching 'Dataset Titles'. The metadata is held as record no 125511.