Survey of the Black Bog Ant *Formica picea* on Cors Goch, Llanllwch SSSI in 2024

NRW Evidence Report No. 816

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Cors Goch, Llanllwch © Ali Baird

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Mae'r morgrugyn *Formica picea* yn nodwedd gymhwysol yn SoDdGA Cors Goch, Llan-llwch. Mae'r holl gofnodion o'r morgrugyn yn dod o'r gors i'r de o'r rheilffordd, sy'n eiddo i Ymddiriedolaeth Bywyd Gwyllt De a Gorllewin Cymru ac yn cael ei rheoli fel Gwarchodfa Natur Genedlaethol. Sefydlwyd cwadrat/llain parhaol, sy'n mesur 30 x 15m, yng nghanol y gytref ym 1996 ac mae cyfrifiadau rheolaidd o nifer y nythod/solaria gweithredol o fewn y llain wedi cael eu cynnal wedi hynny.

Ar 20 Awst 2024, treuliodd dau syrfëwr un diwrnod yn cyfrif solaria morgrug *Formica picea* ar y safle. Yn hytrach na chanolbwyntio ar y llain barhaol a'r cwadratau hanesyddol, roedd yr arolwg yn cwmpasu cymaint â phosibl o'r GNG i asesu maint y boblogaeth, ei dosbarthiad a'i phresenoldeb ar draws y gors. Archwiliwyd yr holl solaria i sicrhau eu bod mewn defnydd gweithredol ac nad oeddent yn nythod a oedd yn perthyn i rywogaethau morgrug eraill.

Cofnodwyd cyfanswm o 173 o solaria morgrug *Formica picea*, gyda 161 o solaria ym Mloc 1 (gan gynnwys 9 yn y llain barhaol) a 12 ym Mloc 6. Gwelwyd 33 o nythod a oedd yn perthyn i rywogaethau morgrug eraill (rhywogaethau *Myrmica* a *Lasius*) hefyd. Mae arolygon blaenorol yn dangos bod Cors Goch, Llan-llwch yn cefnogi poblogaeth o tua 150 o nythod morgrug *Formica picea* sydd yn fwy mynych ym Mloc 1 ond hefyd i'w gweld ym Mloc 6. Mae'r arolwg presennol yn awgrymu bod maint y boblogaeth o forgrug *Formica picea* a gofnodwyd yn 2024 o fewn yr amrediad a ddisgwylir ar gyfer y safle. Fodd bynnag, nid yw'r niferoedd yn bodloni'r Amcan Cadwraeth presennol oherwydd y nifer isel o solaria yn y llain barhaol a chyflwr gwael y cynefin ym Mlociau 2 i 5. Er gwaethaf hyn, ymddengys bod y boblogaeth yn cael ei chynnal ar lefel dderbyniol.

Yn ystod yr arolwg presennol, cofnodwyd presenoldeb y Fursen Fach Goch *Ceriagrion tenellum* a Chriciedyn Hirgorn y Gors *Metrioptera brachyptera* hefyd gan fod y ddau yn nodweddion cymhwysol ar SoDdGA Cors Goch, Llan-llwch. Cofnodwyd cyfanswm o wyth Criciedyn Hirgorn y Gors ym Mloc 1 a 6 ond ni welwyd unrhyw Fursennod Bach Coch ac efallai bod hyn oherwydd diffyg dŵr agored ar y safle.

Executive summary

The Black Bog Ant *Formica picea* is a qualifying feature of Cors Goch, Llanllwch SSSI. All records of the ant are from the bog south of the railway line, owned and managed as a National Nature Reserve by the Wildlife Trust of South & West Wales (WTSWW). A permanent quadrat/plot, measuring 30 x 15m, was established in the core of the colony in 1996 and regular counts of the number of occupied nests/solaria within the plot have been undertaken subsequently.

On 20th August 2024, two surveyors spent one day counting Black Bog Ant solaria on the site. Rather than focussing on the permanent plot and historic quadrats, the survey covered as much of the NNR as possible to assess the population size, distribution and extent across the bog. All solaria were checked to ensure they were in active use and that they were not the nests of other ant species.

A total of 173 Black Bog Ant solaria was recorded, with 161 solaria in Block 1 (including 9 in the permanent plot) and 12 in Block 6. Thirty-three nests of other ant species (*Myrmica* and *Lasius* species) solaria were also seen. Previous surveys show that Cors Goch, Llanllwch supports a population of about 150 black bog ant nests which are more frequent in Block 1 but also occur in Block 6. The present survey suggests that the Black Bog Ant population size recorded in 2024 is within the range expected for the site. However, numbers do not meet the current Conservation Objective due to the low number of solaria in the permanent plot and to the poor condition of habitat in Blocks 2 to 5. Despite this, the population appears to be being maintained at an acceptable level.

During the current survey, the presence of Small Red Damselfly *Ceriagrion tenellum* and Bog Bush Cricket *Metrioptera brachyptera* was also recorded as both are qualifying features on Cors Goch, Llanllwch SSSI. A total of eight Bog Bush Crickets was recorded in both Blocks 1 and 6 but no Small Red Damselflies were seen and this may have been due to a lack of open water on the site.

1. Introduction

The Black Bog Ant *Formica picea* 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. 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. It is a polygynous species, with several queens in a nest, and rarely with more than a few hundred workers.

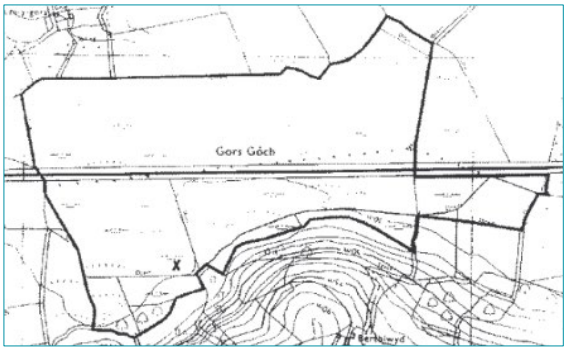
Figure 1. Solarium of Black Bog Ant. From: Fowles & Hurford (1996).

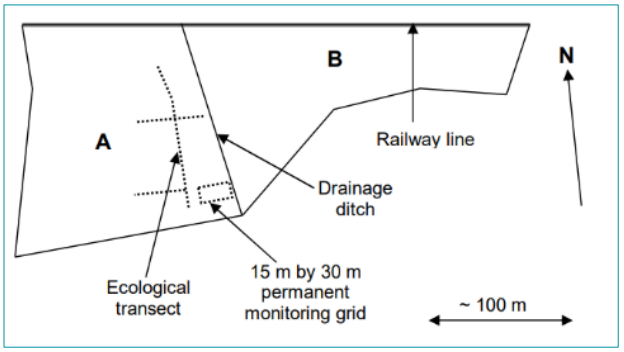
In the UK, Black Bog Ant is associated with bogs and wet heath at a small number of sites in southern England including the heaths of Dorset and Surrey and the valley bogs in the New Forest, with a single site in Yorkshire. It was first found in Wales on Rhossili Down in 1913 (Donisthorpe, 1927; Hallett, 1915) and was subsequently found on Cors Goch, Llanllwch SSSI in September 1991 in an area of wet heath on raised bog (Fowles, 1992; Gander, 1992). Subsequent investigations demonstrated that Cors Goch supports a large population of about 150 nests which are more frequent in areas of open wet heath on the degraded part of the bog but also occur on the intact dome (Bagley, 1992; Franks, 1993; Fowles, 1996; Fowles & Hurford, 1996; Howe, 2022).

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 (Boyce, 2023; Orledge *et al*., 1998). 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).

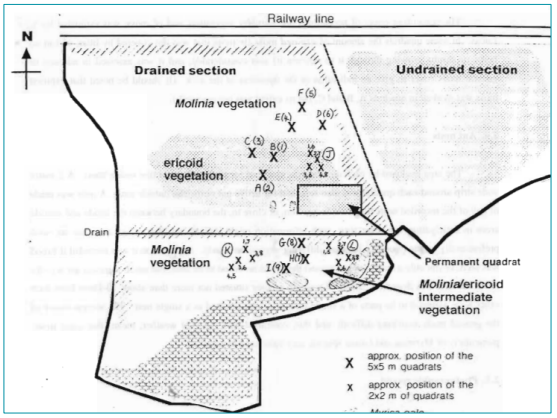
Black Bog Ant is a qualifying feature of Cors Goch, Llanllwch SSSI. All records of the ant at Cors Goch, Llanlwch SSSI are from the bog to the south of the railway line, owned and managed as a National Nature Reserve by the Wildlife Trust of South & West Wales (WTSWW). Small Red Damselfly *Ceriagrion tenellum* and Bog Bush Cricket *Metrioptera brachyptera* are also qualifying features of Cors Goch, Llanllwch SSSI.

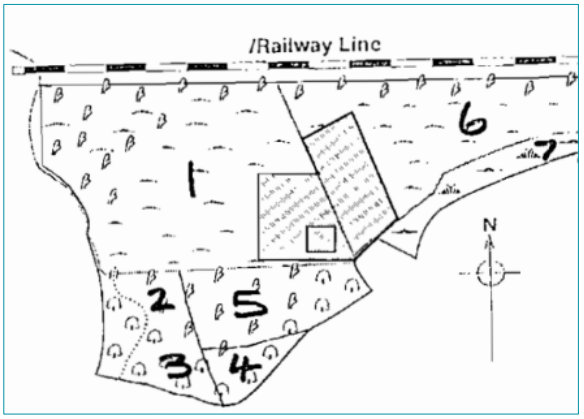
A permanent quadrat/monitoring plot, measuring 30 x 15m, was established in the core of the colony at Cors Goch, Llanllwch in 1996 (Figures 2 to 5) to count the number of occupied nests. Counts here have ranged from 6 to 110 (summarised in Howe, 2022). A Conservation Objective for the population at Cors Goch Llanllwch has been established (Howe, 2005; Table 1). Recent reported declines in the number of occupied nests within the monitoring plot on Cors Goch, Llanllwch (Howe, 2022) may have been due to the increasing rankness of the vegetation. However, recent scrub control and mowing have been undertaken and this appears to have been successful in providing more suitable habitat (particularly along the southern fence line) where solaria were very abundant during the present survey.





Figures 2 & 3. Position of permanent monitoring grid on Cors Goch, Llanllwch. From: Fowles & Hurford (1996) and Rees (2006).





Figures 4 & 5. Location of permanent quadrat, historic quadrats and blocks used to determine Black Bog Ant population condition.

Table 1. Conservation Objective for Black Bog Ant on Cors Goch Llanllwch SSSI. From: Howe (2005).

Conservation objective (for when the feature is in favourable condition)	To maintain the black bog ant *Formica picea* at Cors Goch Llanllwch NNR in favourable condition where:
Lower limit	The number of active nests on Cors Goch Llanllwch should exceed: 100
Lower limit	Where: there should be at least 60 active nests within the permanent grid; there should be at least 40 active nests within block 1 (outside the permanent grid), blocks 2 to 5 and on the raised mire, with a minimum of 5 nests in each block and 1 nest on the raised mire.
Habitat quality	**AND** Objectives for the condition of habitat on the wet heath and the raised mire are Favourable.
Definition of suitable black bog ant habitat	A mosaic of wet heath and purple moor-grass associated with a high water table, where the ericoids are not over-mature and there is little or no invading birch scrub.

Cors Goch, Llanllwch has been largely unmanaged since WTSWW took over ownership in 1980s except for the blocking of ditches in the western part of the bog (Block 1) soon after acquisition. The site was also fenced around this time but no grazing was introduced. Some scrub clearance was undertaken around 2010. Over the winter of 2022-23, extensive scrub clearance was carried out and approximately 3.5 ha of Purple Moor-grass was cut in Block 1 and the site was re-fenced. Grazing with four cows and calves was introduced in May 2023 with the stock removed in September of the same year.

This survey was commissioned to determine the current status and distribution of Black Bog Ant on Cors Goch Llanllwch south of the railway line in August 2024 by undertaking a count of solaria.

2. Methods

To assess the number of solaria present, the site was walked over by two surveyors on 20th August 2024 working from east to west and back in “transects” running parallel to the old drainage ditches. The surveyors worked in parallel but kept apart and covered transects roughly 4m wide (2m on each side of the surveyor) to cover as much habitat as

possible whilst ensuring there was no double counting of solaria. Areas of mown, grazed (or naturally shorter, more open vegetation) were used as the main “transect” routes. Areas of taller, more rank vegetation between these were also searched by walking “W walks” through them.

Where solaria were found, they were gently disturbed (usually by poking a finger into the solarium or by pulling on the culms of *Molinia*) to check that ants and/or a brood were present and that it was being actively used. Any solaria that appeared unusually dark (composed more of soil than of fragments of vegetation) were checked more closely and these were found to be nests of *Myrmica* or *Lasius* species. Non-target ants were not identified to species.

Whilst undertaking the survey, the presence of Small Red Damselfly and Bog Bush Cricket was also recorded.

3. Results

A total of 173 Black Bog Ant solaria were recorded during the present survey (Figure 6). The areas of mown, grazed (or naturally shorter, more open) vegetation used as the main “transect” routes were found to have the most solaria. These were areas where the vegetation was not excessively rank and tussocky but had a reasonably varied open structure that was either dominated by *Molinia caerulea* or where *Molinia* was co-dominant with *Calluna vulgaris*. Areas of taller, more rank vegetation (usually very tall, tussocky *Molinia*) between the more open areas were initially searched intensively. However, it soon became clear that such areas supported few solaria.

161 solaria were recorded from Block 1 (the western part of the site, in both NVC M25 and M15 mire communities), nine of which were in the permanent quadrat/ monitoring plot. A further 12 solaria were recorded from Block 6, (the eastern, undrained part of the raised mire, in both NVC M15 and M18 mire communities). Blocks 2-5 were not surveyed as the habitat was in such poor condition being very rank and scrubby.

Thirty-three nests of other ant species (*Myrmica* and *Lasius* species) which could be initially mistaken for Black Bog Ant solaria were counted. This rather high count emphasises that it is important to identify the nests of other ant species and ensure they are not mistakenly counted as Black Bog Ant solaria. It may also indicate that at least parts of the bog are drier than they should ideally be, and this might mean that Black Bog Ant is competing with higher densities of other ant species. The highest density of other ants appeared to be in the same area of the highest Black Bog Ant density (Figure 7).

Eight Bog Bush Crickets were recorded from both Blocks 1 and 6 (Figure 8). No Small Red Damselflies were found although several pools, rutted areas and sections of ditch appeared to provide suitable habitat. However, very little open water was present and most suitable-looking areas had a dense and more or less complete cover of vegetation over their surfaces.

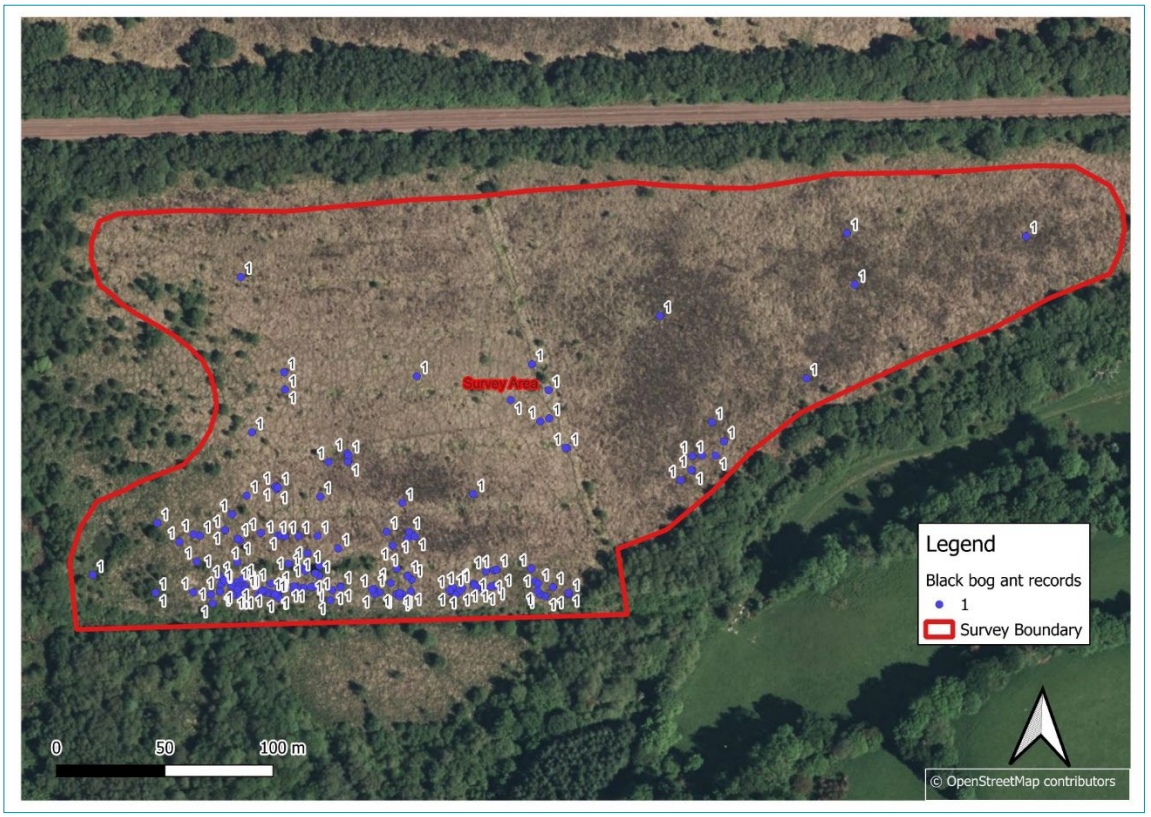


Figure 6. Location of the 161 Black Bog Ant solaria recorded in 2024.

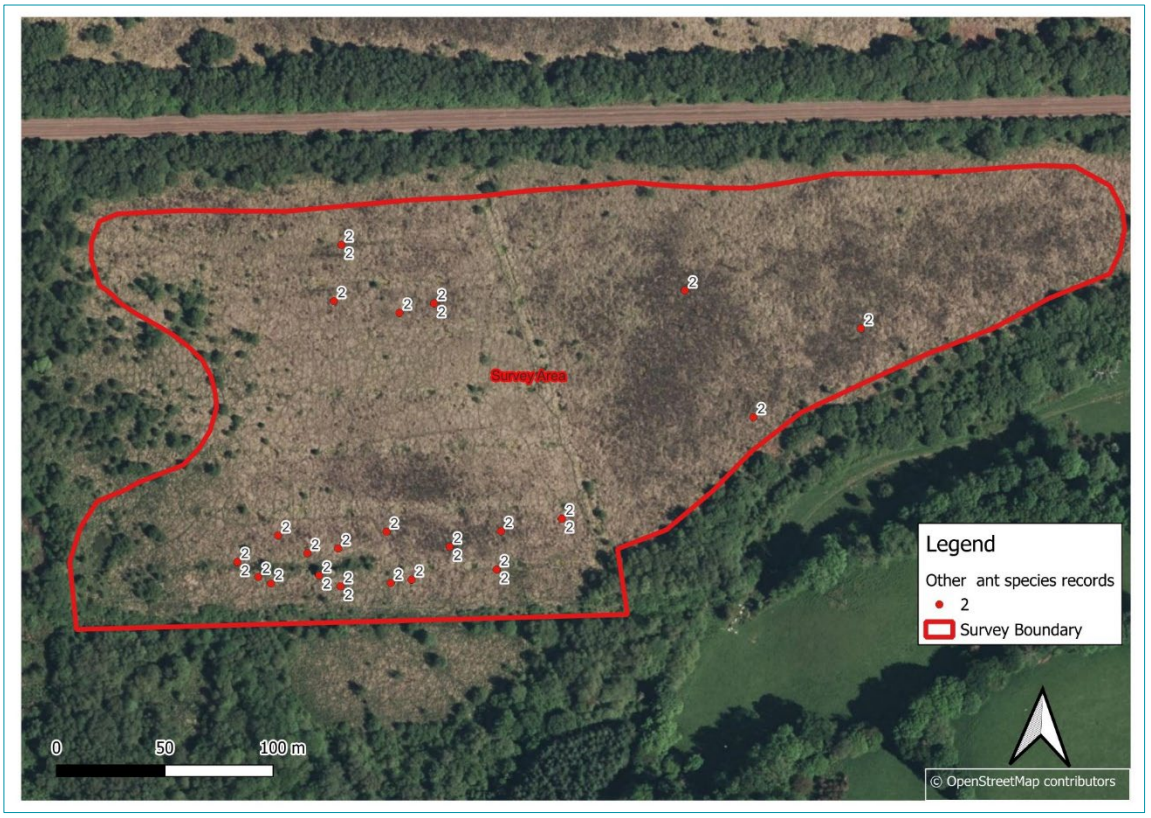


Figure 7. Location of solaria of other ant species in 2024.

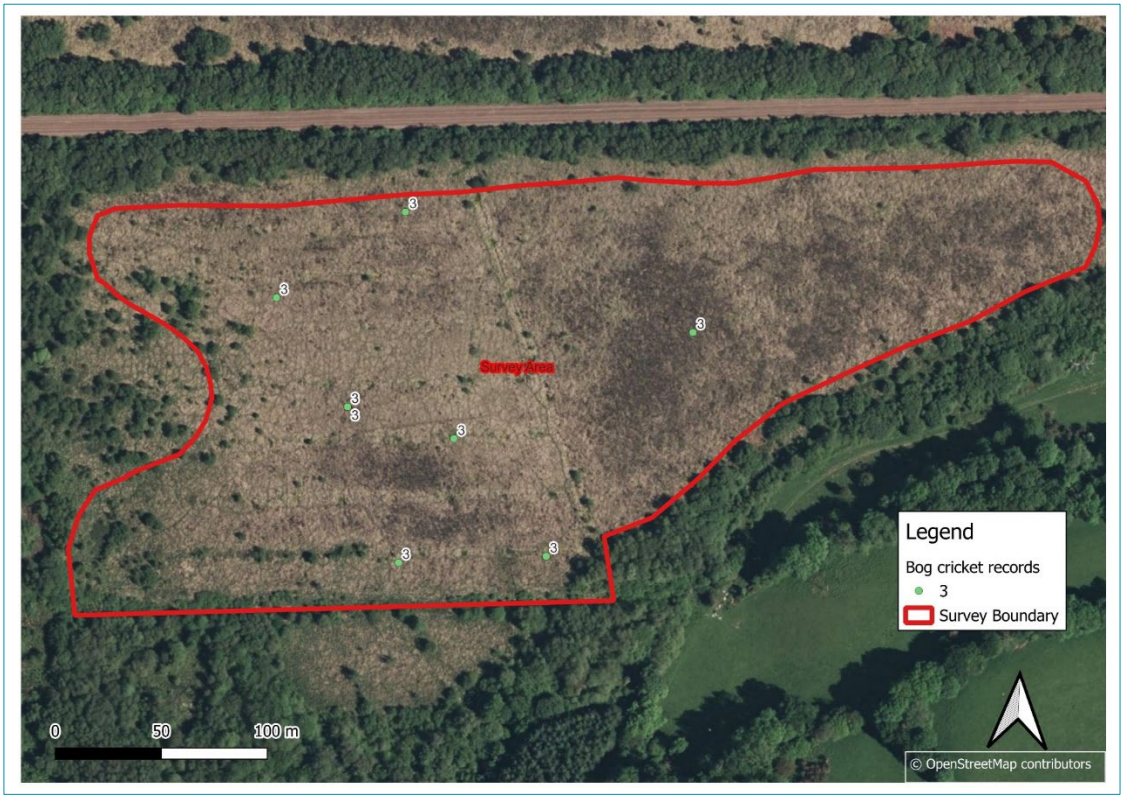


Figure 8. Location of Bog Bush Crickets in 2024.

4. Discussion

The highest count in the past was 81 “nests” in the permanent quadrat and 143 “nests” outside of the quadrat in 1999. Previous counts in the permanent quadrat have ranged from six to 110 (Howe, 2022). Past surveys have focused on the permanent quadrat and several quadrats in areas to the immediate north and south (Figure 4). In 1998, populations were said to be “located mainly in the sheltered southeast corner where the permanent quadrat has been placed. Further nests are found northwards on the heathland, and a few are present on the undrained side to the east” (North, 1998). The 2024 survey suggests that this distribution pattern remains largely unchanged, although the population seems now to have spread westwards along the mown areas close to the southern fence line (see Figure 6).

The present survey did not focus on the permanent plot and historic quadrats. Rather, it covered as much of the site as possible and included those areas to assess the population size, distribution and extent across the bog. In this way, it may be possible to assess the effects of recent management (scrub control, mowing and grazing) on Black Bog Ant. Furthermore, many of the historic quadrats to the south of the fence, in Blocks 2 to 5 are now in areas of unsuitable habitat. During the survey, several old bamboo canes were seen. It was assumed that these may have marked quadrat locations, but no solaria were seen immediately adjacent to them and the habitat was rather rank. It is difficult to

accurately compare the results of the present survey with historical surveys as it is not always clear how much of the site was covered, the level of survey effort involved and the fact that, in some surveys, groups of closely spaced solaria were counted as a single "nest."

The present survey mapped all solaria, as requested in the project specification and did not attempt to assess how many "nests" (separate colonies) were present.

Black Bog Ant nests are mostly underground, to a depth of around 30cm, with one or more above-ground structures (referred to as solaria) built of grass and moss fragments constructed around a supportive tussock of vegetation (often Purple Moor-grass *Molinia caerulea*) or amongst clumps of moss. The words "nest" and "solaria" appear to have been used somewhat interchangeably in the past and to not always have been applied consistently. For example, Orledge & Lucas (2001) state that "*Nests* of a single species situated not more than about 10-15cm from each other were assumed to be parts of a single *unit* and were counted as a single *nest*."

Furthermore, changes in the distribution of Black Bog Ant are to be expected. As noted in Orledge (1998), nests "are not evenly distributed across the colonised area of Cors Goch. Also, they are highly mobile, with as many as 43% of nests moving during the course of a year". This probably accounts for the large difference between the counts in the permanent quadrat between June 2024 (40 "nests") and the present survey in August 2024 where just nine solaria were recorded.

Typically, Cors Goch Llanllwch supports a population of about 150 black bog ant "nests" which are more frequent in Block 1 but also occur in Block 6. (Bagley, 1992; Franks, 1993; Fowles, 1996; Fowles & Hurford, 1996; Howe, 2022). **The present survey suggests that the Black Bog Ant population size recorded in 2024 is within the expected range for the site.**

The survey shows, however, that the Black Bog Ant does not meet the targets set out in the current Conservation Objective (Table 1) due to the low number of solaria in the permanent quadrat/plot and the poor condition of the habitat in Blocks 2 to -5. It seems likely though that the population is in fact maintained at an acceptable level and that, until Blocks 2 to 5 are restored to a shorter, more open structure with less scrub, the Conservation Objective should be amended with higher targets set for Blocks 1 and 6 and a restoration target set for Blocks 2 to 5. Old Ordnance Survey maps contained in the various reports referred to earlier and a comparison of aerial imagery from 2006 to the present day suggest that Blocks 3 and 4 have always been dominated by scrub/woodland and that a small area of Block 2 and most of Block 5 were open, *Molinia*-dominated vegetation. It may be practical to restore Blocks 2 and 5 but, for the time being, it will perhaps be more important to ensure a suitable management regime is established and maintained in Blocks 1 and 6. The Conservation Objective refers to "nests" and this could also be clarified to ensure there is no confusion in the future between nests and solaria.

Mowing appears to have improved the habitat for Black Bog Ant along the southern fence line, where nearly half of all solaria were found. The wide, mown strips further north on the

bog supported fewer solaria and appeared to be shorter and more uniformly mown than the fence line strip but are likely to develop into suitable habitat in time as the vegetation grows back. Livestock may, however, focus on these areas and keep the vegetation short. In the future, mowing should aim to be less uniform and instead create a more diverse sward with some taller, tussocky patches left. Areas where trees and scrub have been removed were looked at but did not provide much suitable habitat as the vegetation remains very rank in these areas. Follow-up grazing or mowing may improve these in time. These areas were generally excluded from the survey.

Both Bosanquet (2011) and Lowe (2022) note an extensive lowering of the water table across the bog, and the latter provides a number of hydrological management recommendations that may help address this. This drying out may result in increased competition from *Lasius* and *Myrmica* ants which prefer less waterlogged conditions. It is certainly a concern that the highest concentration of other ant species coincides with that of Black Bog Ant along the southern fence line.

5. Conclusions

The count of 173 solaria suggests that the Black Bog Ant population on Cors Goch Llanllwch is relatively stable. However, its distribution is much more restricted than previously and is now found only in Blocks 1 and 6 with the majority (161 solaria) in Block 1. As such, the population is considered to be in unfavourable condition under the current Conservation Objective (CO), although this may need revising.

The majority of solaria are found along the southern fence line and this suggests that Black Bog Ant has responded to recent mowing management which has produced suitable habitat (defined in the CO as a wet heath and purple moor-grass mosaic associated with a high water table, where the ericoids are not over-mature and with little or no invading scrub).

Blocks 2 to 5 are currently in very unsuitable condition, with rank vegetation under a scrub canopy. Whilst this may have been a long term issue in Blocks 3 and 4, aerial images suggest that scrub invasion in Blocks 2 and 5 is more recent. Management should aim to restore these to more open conditions.

The highest densities of competing *Lasius* and *Myrmica* ants are along the southern fence line, coinciding with the highest density of Black Bog Ant. The extensive lowering water table across the bog is likely to be favouring these other species and attempts should be made to rewet the site.

In the short term, maximising the Black Bog Ant population in Block 1 is the most achievable goal by additional mowing to promote a shorter but diverse sward.

Further surveys to determine the current status of Small Red Damselfly are required, coupled with sympathetic management to increase areas of open water for breeding.

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Appendix 1. Grid references for Black Bog Ant Solaria on Cors Goch, Llanllwch on 20th August 2024

SN3643518587	SN3623618528	SN3633918527	SN3621118534	SN3636418604
SN3633018527	SN3625818532	SN3633818526	SN3621218531	SN3636018603
SN3633018528	SN3625818532	SN3633518525	SN3620918519	SN3634718612
SN3633018528	SN3625818532	SN3633118526	SN3620818523	SN3624318617
SN3632018526	SN3625818532	SN3633118526	SN3620218538	SN3624318617
SN3629718523	SN3629118528	SN3633018527	SN3621318528	SN3624218625
SN3629418523	SN3630118530	SN3632418526	SN3621518529	SN3648318622
SN3629418523	SN3636618526	SN3632318524	SN3622118538	SN3643018580
SN3629518522	SN3636318522	SN3632118523	SN3625518526	SN3643018580
SN3628618524	SN3636018523	SN3631918524	SN3625418527	SN3643018587
SN3628418523	SN3635918525	SN3631918525	SN3625718533	SN3644518593
SN3625118526	SN3635818529	SN3630118524	SN3625818536	SN3644118587
SN3624818526	SN3635618535	SN3629518524	SN3626818527	SN3642518575
SN3624618525	SN3625918568	SN3628418525	SN3626818526	SN3644018602
SN3623918523	SN3629218545	SN3628318525	SN3624418537	SN3637318590
SN3624018523	SN3625818550	SN3625218535	SN3626718544	SN3637218590
SN3623618524	SN3624918550	SN3626418525	SN3629418535	SN3636418617
SN3623618524	SN3624918550	SN3626418520	SN3629918531	SN3627118588
SN3623618524	SN3624918550	SN3625218534	SN3629918531	SN3627218587
SN3623618524	SN3623918550	SN3625618526	SN3637318523	SN3627218584
SN3623418524	SN3623118551	SN3624718527	SN3637418523	SN3629718565
SN3623318524	SN3621518552	SN3625318542	SN3637318524	SN3630018552
SN3622418527	SN3621518552	SN3623318525	SN3635918528	SN3630218550
SN3622118523	SN3620318550	SN3623918523	SN3624118550	SN3629918549
SN3621918523	SN3620018551	SN3624018521	SN3624318550	SN3633518534
SN3621918523	SN3618418556	SN3623818523	SN3624318550	SN3633918534
SN3621318524	SN3621818560	SN3623018523	SN3622218548	SN3634018534
SN3621318524	SN3623818573	SN3623218524	SN3622118549	SN3634018534
SN3621318524	SN3623818573	SN3623218524	SN3622118549	SN3633018569
SN3620518524	SN3622718598	SN3622418525	SN3622218669	SN3641618651
SN3620518524	SN3630318623	SN3622118529	SN3619418547	SN3650218689
SN3620018524	SN3635718629	SN3622318530	SN3623918571	SN3650518666
SN3618318524	SN3628918552	SN3622118526	SN3623918572	SN3658518688
SN3618318524	SN3628918552	SN3622118525	SN3622518568	SN3634018534
SN3615418532	SN3634218525	SN3621818527	SN3626318584	n/a

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 Welsh Invertebrate Database (WID).

Metadata for this project is publicly accessible through Natural Resources Wales' Data Discovery Service https://metadata.naturalresources.wales/geonetwork/srv (English version) and https://metadata.cyfoethnaturiol.cymru/geonetwork/cym/ (Welsh Version). The metadata is held as record no. **NRW_DS161305**.

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