

**MONITORING INVERTEBRATE FEATURES ON
SSSI'S: *Singa hamata* ON CORS CARON,
CEREDIGION**

**D.C. Boyce
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MONITORING INVERTEBRATE FEATURES ON SSSI'S

THE ORB SPIDER *Singa hamata* ON CORS CARON SSSI, CEREDIGION

D.C. BOYCE

CCW CONTRACT SCIENCE REPORT No. 784

Countryside Council for Wales

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Summary

A population of the spider *Singa hamata* occurring on the Cors Caron SSSI, Ceredigion was monitored in 2006. This work aimed to develop techniques that could be used by CCW to help meet its commitments under the Common Standards Monitoring Programme.

The spider was found in a number of wetland habitats on the Reserve, but was most abundant on the three raised mires. A draft Conservation Objective for the species at Cors Caron has been developed. This involves the recording of simple data on the spider and its habitat. A sample station was established on each of the raised mires. One-hour timed searches were carried out on each of these for *Singa*, which was most easily found by searching for the silken retreats it spins on heather and other plants. Favourable Condition would be achieved where at least ten spiders were found during one-hour searches of two of the raised mires, with at least five recorded from the third. Transects were also established across each raised bog, with the frequency of suitable habitat being recorded along these. Suitable *Singa* habitat was defined as bog vegetation with no more than 75% cover of purple moor-grass and at least 5% cover of heather of 30cm. or more in height. Overall, Cors Caron would be considered favourable for the feature where suitable habitat was present in at least 50% of the quadrats across two of the raised mires, with at least 40% suitable habitat in the third. The various decisions made during development of the draft Conservation Objective are discussed, with justification for the methodology adopted being provided.

The monitoring programme showed that, by the criteria set out in the draft Objective, the *Singa hamata* feature on Cors Caron SSSI is currently in Favourable Condition. This is thought to be a fair assessment of the current state of the feature, as large sub-populations of the spider occur on all three raised mires, with smaller numbers also present in other wetland habitats on the Reserve.

Crynodeb

Cafodd poblogaeth o'r pryf copyn *Singa hamata*, sy'n bodoli yn SoDdGA Cors Caron yng Ngheredigion, ei monitro yn 2006. Nod y gwaith hwn oedd datblygu technegau y gallai'r Cyngor Cefn Gwlad eu defnyddio i'w helpu i fodloni ei ymrwymadau dan y Rhaglen Monitro Safonau Cyffredin.

Cafodd y pryf copyn ei weld mewn nifer o gynefinoedd gwlyptir yn y Warchodfa, ond gwelwyd y nifer fwyaf ohonynt ar y tair cyforgors. Mae Amcan Cadwraeth drafft wedi'i ddatblygu ar gyfer y rhywogaeth yng Nghors Caron. Mae'n golygu cofnodi data syml am y pryf copyn a'i gynefin. Cafodd gorsaf samplu ei sefydlu ar bob un o'r cyforgorsydd. Cynhaliwyd sesiynau awr o hyd a amserwyd ar bob un o'r cyforgorsydd er mwyn chwilio am *Singa*. Y ffordd hawsaf o ddod o hyd i'r rhywogaeth oedd chwilio am y llochesau sidan y mae'n eu gweu ar rug a phlanhigion eraill. Byddai Cyflwr Ffafirol yn cael ei nodi pe bai o leiaf deg pryf copyn yn cael eu gweld yn ystod sesiynau chwilio awr o hyd ar ddwy o'r cyforgorsydd, a phe bai o leiaf pum pryf copyn yn cael eu cofnodi ar y drydedd. Sefydlwyd trawsluniau ar draws pob cyforgors hefyd, a chofnodwyd amllder cynefin addas ar hyd y rheiny. Nodwyd mai cynefin addas ar gyfer *Singa* yw llystyfiant cors y mae llai na 75% ohono yn laswellt y bwla ac y mae o leiaf 5% ohono yn rug 30cm neu fwy o ran taldra. At ei gilydd, byddai Cors Caron yn cael ei hystyried mewn cyflwr ffafirol ar gyfer y nodwedd pe bai cynefin addas yn bresennol yn o leiaf 50% o'r cwadratau ar draws dwy o'r cyforgorsydd, a phe bai o leiaf 40% o gynefin y drydedd gyforgors yn gynefin addas. Caiff yr amrywiol benderfyniadau a wnaed yn ystod y gwaith o ddatblygu'r Amcan Cadwraeth drafft eu trafod, a chyfiawnheir y fethodoleg a fabwysiadwyd.

Ar sail y meini prawf a restrir yn yr Amcan drafft, roedd y rhaglen fonitro yn dangos bod nodwedd *Singa hamata* yn SoDdGA Cors Caron mewn Cyflwr Ffafirol ar hyn o bryd. Credir bod hwn yn asesiad teg o gyflwr presennol y nodwedd, oherwydd ceir is-boblogaethau mawr o'r pryf copyn ar bob un o'r tair cyforgors a cheir niferoedd llai mewn cynefinoedd gwlyptir eraill yn y Warchodfa hefyd.

1. Introduction

This report describes monitoring of a population of the orb spider *Singa hamata* occurring on the Cors Caron National Nature Reserve (NNR) and Site of Special Scientific Interest (SSSI) in 2006. This project was carried out as part of a programme of invertebrate monitoring initiated by the Countryside Council for Wales (CCW). Four days fieldwork were undertaken on the site, on the 9th 10th and 11th September 2006, with a final visit to complete habitat monitoring undertaken on the 6th November. A further day was spent preparing the final report.

The aim of the contract was to develop and trial a Conservation Objective for *Singa hamata* on the Cors Caron SSSI by identifying relevant habitat and species attributes. Once the Objective was established, trial monitoring of the *S. hamata* population was undertaken using a methodology that aimed to assess its condition against thresholds that form part of the Conservation Objective for this species. The work aims to contribute to CCW's commitments under the Common Standards Monitoring (CSM) initiative for statutorily protected sites. It is hoped that the work described here will be applicable to other populations of *S. hamata* in Wales, and may also be a model for the development of Objectives for other related features. An important element of the CSM process is that monitoring programmes allow for rapid assessment of features against targets that describe succinctly the desired state of appropriate attributes. It is important that, wherever possible, monitoring of these attributes can be undertaken by non-specialists.

Cors Caron NNR is situated in the county of Ceredigion in mid-Wales. A central grid reference for the site approximates to SN685635. It is an internationally important site, notified both as a SSSI and SAC. The primary interest is in the excellent examples of relatively undamaged lowland raised mire. These have developed as three discrete raised domes in the floodplain of the Afon Teifi. The tops of the raised mires are referable to the M18 *Erica tetralix-Sphagnum papillosum* raised mire of the National Vegetation Classification (NVC). In the lagg zone that fringes the raised domes there is purple moor-grass vegetation belonging to the M25 *Molinia caerulea-Potentilla erecta* community. In addition, the central floodplain, and cut-over mire areas around the periphery of the site have developed a range of other fen and mire communities. There are also stands of wet woodland, especially towards the north of the Reserve.

Singa hamata was first discovered on Cors Caron by Kefyn Catley, who found it to be plentiful on all three raised mires in 1985 (Catley, 1986). The Welsh Peatland Invertebrate Survey (WPIS) studied Cors Caron in 1997. They found it again on the north-east raised bog and also in an area of tufted hair-grass *Deschampsia cespitosa* and soft rush *Juncus effusus* -dominated floodplain fen adjacent to the Afon Teifi (Holmes, Boyce & Reed, 1991). In the 1990s there have been further sightings of the spider from the raised mires, and there is also a 1998 record from cut-over raised bog in compartment 10 (P. Culyer pers. comm.).

2. Methods

This is a large site, and the first couple of days were spent walking as much of the area as possible, attempting to get a picture of the distribution of the spider on the SSSI and making notes on its habitat preferences. The management compartments used by CCW have been the basis for recording information on *Singa*. The location of these can be found on Map 1. Because of the concentration of past records, most time was spent investigating the tops of the raised bogs, which have produced the vast majority of earlier records. However, areas of floodplain fen and cut-over mire were also investigated, with particular emphasis on the eastern fringe of compartment 13 and compartment 10, where there are previous records of the spider. This information was used to develop the Conservation Objective and monitoring programme set out in sections 3 and 4 of this report.

2.1. Species attribute

During the current survey, *Singa* was found to occur over most of the raised mires. During initial surveys, fourteen 20m square quadrats were recorded to assess the population density across these habitats. 15 minutes were spent looking for *Singa* in each of these quadrats. Initially, it had been envisaged that *Singa* should be counted at these specific sites, but the wide variation in density of the spider on the raised mires, which was only partly explained by density of old heather was thought to make a more general walk-over of each of the domes a more reliable means of carrying out a rapid assessment of the spider population. For this reason, it was decided that one-hour counts should be undertaken that would cover much larger areas of each raised bog. These counts were made by taking a number of breaks along the habitat transect (see sub-section 2.2 below). Three twenty-minute searches were undertaken along transects 1 and 3 and four on transect 2.

Searches involved slowly walking across the bog, looking for the silken retreats of *Singa*. The retreat is spun with dense white silk and is usually of a somewhat elongate to triangular form (see photos 1 and 2). The pinkish colour mentioned by both Catley (1986) and Roberts (1995) was not apparent. It is suggested that counts of spiders should be carried out in August-September, as this study has shown good numbers to be present on Cors Caron at this time. However, Harvey, Nellist & Telfer. (2002) suggest peak counts of *Singa* occur in June and July, and further work may allow the sampling window to be widened to also include these months. Weather conditions are not critical for finding the spider, as location of the retreats is the means by which the spider is detected.

The raised mires have much the largest numbers of *Singa* and other secondary habitats will not need to be looked at in order to establish the condition of its population at Cors Caron.

2.2 Habitat attribute:

The primary habitat of the spider at Cors Caron was on the three raised bogs. The vast majority of records were for retreats spun up on mature, degenerate or dead ling *Calluna vulgaris*. As can be seen from the photos, the retreat was usually spun on dead ling twigs, though occasionally living branches might be used. A few retreats were also found on old plants of cross-leaved heath *Erica tetralix*. Towards the edge of the raised domes, M18 vegetation begins to grade into lagg habitats that are

dominated by dense M25 *Molinia* bog. In the transition zone, open patches of mire with ling and other raised mire species are interspersed with dense tussocks of purple moor-grass. *Singa* occurs in these lagg transitions, provided that there are still some open patches with old ling plants. Occasionally, retreats were also found on the inflorescences of low-growing *Molinia* plants, where these occurred in relatively open vegetation. Moving further into the lagg zone, where purple moor-grass becomes overwhelmingly dominant, *Singa* could not be found.

The habitat quality attribute is to be assessed by recording very simple quadrat information within the main areas of suitable habitat. Transects were established across all three raised mires. Transects involved walking a set distance along a four-figure northing or easting. Position and bearing were fixed using a hand-held GPS unit. This seemed the optimum technique by which a simple sampling methodology could be combined with coverage that aimed to include a representative range of vegetation structures across the dome and its margins. Standing at the start point, a 2m square quadrat was recorded immediately in front of this point, then 25 paces were taken along the set bearing using the GPS unit regularly to maintain position. At the 25th pace another quadrat was recorded as before, continuing until the end point stipulated was reached. The location of the transects is shown on Map1, and the various bearings and grid references for start and end points are given in section 4. The figure of 5% cover of ling within each quadrat was considered to approximate to one good-sized ling bush, or two smaller clumps.

3. Results of survey

This section details the findings of the initial survey exercise carried out on the site. The results of the trial monitoring exercise can be found in section 5.

Singa counts carried out in 20m square quadrats on the raised mires varied from one to 16:15 minutes, with the density of the spider clearly correlating very strongly with the density of over-mature or dead ling bushes. During the initial survey exercise, the highest densities of spiders (13 and 16 spiders:15 minutes) was found in the centre of the western raised mire. Here the density of old heather was higher than in other samples taken on the raised bogs, with cover of over-mature and dead ling being estimated to be in the order of 25-30%. Two views of this area are provided in photos 3 and 4. The presence of such a high cover of ling in the raised mire vegetation is thought to indicate that the site is drier than it ought to be, possibly as a result of past burning, and/or modification to the hydrology of the area. The initial survey showed wetter mire with lower cover of ling had adult densities of between 1-10 spiders, with this again appearing to correlate strongly with percentage cover of over-mature and dead ling. In areas sampled with approximately 15% cover of ling, *Singa* occurred at densities of between 6 and 10 in 15 minutes, whilst in two areas with very low cover of ling, only 1 spider was found in the quadrat. The exception to this was on the NE raised bog, where a 15-minute sample carried out in quite 'heathy' raised mire yielded only one spider. Samples undertaken in the lagg transition showed *Singa* to still be present in open, heathy patches between the *Molinia* tussocks, but the densities were lower than on the raised mire proper.

Initial surveys showed the most frequent plant to be used other than ling was white beak-sedge *Rhynchospora alba*, with the retreat usually spun up just under the

inflorescence. White beak-sedge is locally frequent across the raised mire, usually in lower-lying hollows, where it occurs over a carpet of *Sphagnum cuspidatum*, *S. recurvum* and other bog-mosses. In the modified raised mire in compartment 10, the cut-over areas have extensive lawns of *Sphagnum* with abundant white beak-sedge, and a 15 minute sample carried out here produced good numbers of *Singa* (12:15 minutes). This demonstrates that where vegetation structure is right (relatively open, with rigid supports for web and retreat construction at moderate height) the spider can occur in good numbers regardless of vegetation type. However, occurrence of *Singa* retreats on stands of white beak-sedge was very localised, with the spider being absent from most stands of this plant that were investigated.

Floodplain fen lying in the corridor of the Afon Teifi was also surveyed to assess the importance of the habitat for *Singa*. This survey work focused on the area from which the spider had previously been recorded by the WPIS team, corresponding to compartments 13 and 14A. Despite two hours searching, only one specimen was found in the grazed floodplain fen on the underside of a soft rush inflorescence. An area of very wet cut-over bog in compartment 12 was the final area to yield records of *Singa*, four retreats being found on inflorescences of sharp-flowered rush *Juncus acutiflorus* in an area of poor fen in which scattered plants of this species occurred over carpets of bog-moss.

The vast majority of *Singa* retreats were on the sides of old *Calluna* bushes growing on the raised bogs at heights ranging from 25 to 30cm, though in some instances, especially where the spider occurred on rushes in poor fen habitats, it could be found at heights of up to 45cm. At the other end of the spectrum, some retreats built on white beak-sedge could be as low as 20cm above ground. Initial searches for *Singa* were hampered by its habit of dropping from the lower opening in the retreat when disturbed. With practice, it was possible to prevent the spider escaping, and in any event, the distinctive appearance of the retreat could be recognised with practice.

In conclusion, prime micro-habitats for *Singa* occur on the lowland raised bog where there are over-mature and senescent ling bushes with dead terminal twigs at heights of 25-30cm. *Singa* appears to require an open-structured vegetation, and is largely absent from *Molinia* lagg habitat where tussocky growth exceeds about 75% cover. Though highest densities occur in rather 'dry' raised mire, where percentage cover of ling reaches about 30%, they also occur in wetter bog at somewhat lower densities. Management at Cors Caron aims to raise the water table on some of the drier areas of raised bog, which should reduce cover of ling and hence also the high density of *Singa* these sites currently support. However, the very large area of raised mire here, allied to the proposed prevention of further burning on the raised bogs, and the occurrence of secondary populations of *Singa* in other habitats that meet its structural requirements, ensures the SSSI should continue to hold a very large and important population of the spider.

4. Conservation Objective for *Singa hamata* on Cors Caron SSSI

Conservation Objective (for when the feature is in favourable condition)	To maintain the orb spider <i>Singa hamata</i> at Cors Caron SSSI in favourable condition where
Lower limit	10 spiders are recorded during 1-hour searches on each of two of the raised mires and 5 spiders are recorded on the third.
	and
Habitat extent	The current extent of un-burnt M18 raised bog is maintained on all three domes.
Lower limit	
	and
Habitat quality	Two of the raised mires have suitable habitat recorded from 50% of sampling points and 40% of sampling points are classed as suitable habitat on the other mire (see definition of suitable habitat in box below).
Lower limit	
Definition of suitable <i>Singa hamata</i> habitat	Bog vegetation with no more than 75% cover of purple moor-grass and at least 5% cover of living or dead ling that is at least 30cm in height.

Notes on the Conservation Objective

Timed searches for spiders should, at least in part, be combined with recording the three vegetation transects. It is suggested that either four fifteen- or three twenty-minute breaks to carry out timed searches are taken at regular intervals along the transect route, with the former being preferable on the much longer transect 2, while the latter would probably suffice for the other two much shorter transects. For each of the raised mires, once 10 spiders have been noted timed searching can be stopped and attention focussed on the habitat transect.

The habitat extent attribute may be best assessed by the development of a protocol for interpretation of aerial photographs. The denser structure of *Molinia*, which is the dominant vegetation fringing the raised bogs is quite easily picked out on aerial photographs, especially in winter, when the pale colour of the dead leaves provides a strong contrast to the much darker colour of raised mire vegetation. Monitoring of the M18 community will be undertaken separately as part of the CSM for habitat features on Cors Caron and the results from that exercise can be used to inform this Objective.

Retreats of two other araneid spiders occurred frequently in areas holding populations of *Singa*, these being *Agalenatea redii* and *Larinioides cornutus*. Retreats of these could be confused with those of *Singa*, though with practice, many retreats of these two spiders could be confidently identified without recourse to extraction of the spider. The former occurred frequently in the same micro-sites as *Singa*, on the dead terminal branches of dead or over-mature ling bushes. However, the retreat was generally less elongate and more loosely woven and messy-looking in this species. *L. cornutus* had a similarly tightly-woven retreat to *Singa*, but this was usually located in a rolled-over flowerhead of purple moor-grass. *L. cornutus* retreats also tended to be sited higher than those of *Singa*. Although *L. cornutus* was present on the raised mires, it was generally scarce, being more frequent in the *Molinia*-dominated lagg zone where its favoured habitat was more frequent. Where there was any doubt as to

the species from examination of its retreat, extraction of the spider removed any doubt, as all these species are abundantly distinct. Two other araneids, *Araneus quadratus* and *Hypsosinga pygmaea* were also recorded in areas with populations of *Singa*, but were very scarce. Both of these species are very readily distinguished from *Singa*.

The general appearance of *Singa* is very characteristic. It is a small, spider with a dark carapace and bicoloured cream and sepia abdomen (see photos 5 and 6). The pale markings consist of well-marked central and lateral stripes, with a large patch widening from the central stripe to cover much of the middle of the abdomen. Dark abdominal markings occur on the anterior and posterior third of the abdomen, either side of the median line. Very often the central pale patch is divided by a series of dark, transverse bars, though the relative extent of pale and dark markings is quite variable, and some individuals may have a predominantly cream-coloured abdomen, with the sepia markings reduced, this being especially the case with the central transverse bars. With a little practice, *Singa* is readily distinguished from other related species.

Singa's small, and rather rudimentary orb-webs were usually constructed next to the retreat, using the dead ling stems as support. Very few spiders were seen in their webs, with those that were generally being found in the latter part of the afternoon constructing new webs. From this very limited data, it seems likely that most feeding activity takes place in the evening or at night.

5. Results of the trial monitoring of *Singa hamata* at Cors Caron SSSI

The results of the monitoring programme are set out in Table 1 above. They show that by the criteria set out in the draft objective, the site is in favourable condition for *Singa hamata*, though the SE bog fails on habitat quality and the SE bog fails to satisfy the species attribute. This is thought to be a fair assessment of the current condition of the site, which looks to be in generally good condition, and is likely to improve, in the shorter term at least, provided burning can be prevented.

Table 5.1: Monitoring *Singa hamata* and its habitat on Cors Caron SSSI - 2006

	Station 1: SE raised bog		Station 2: W raised bog		Station 3: NE raised bog	
	Transect 1		Transect 2		Transect 3	
	SS68606210-SS68056210		SS68106265-SS68106400		SS69606330-69606395	
	Timed count	<i>Singa</i> habitat	Timed count	<i>Singa</i> habitat	Timed count	<i>Singa</i> habitat
No. spiders	15:60mins		25:60mins		9:60mins	
Q01		No		Yes		Yes
Q02		Yes		Yes		No
Q03		Yes		Yes		No
Q04		No		Yes		No
Q05		No		Yes		No
Q06		Yes		Yes		No
Q07		No		Yes		No
Q08		No		Yes		Yes
Q09		No		Yes		Yes
Q10		No		No		Yes
Q11		No		Yes		Yes

Q12	Yes	Yes	Yes
Q13	Yes	No	Yes
Q14	Yes	Yes	Yes
Q15	Yes	No	Yes
Q16	No	Yes	Yes
Q17	No	Yes	Yes
Q18	Yes	No	Yes
Q19	Yes	No	Yes
Q20	Yes	No	No
Q21	Yes	No	Yes
Q22	No	Yes	No
Q23	No	Yes	Yes
Q24	No	Yes	No
Q25	Yes	Yes	Yes
Q26	No	Yes	Yes
Q27	No	Yes	Yes
Q28		Yes	No
Q29		Yes	Yes
Q30		No	Yes
Q31		No	Yes
Q32		Yes	Yes
Q33		Yes	
Q34		Yes	
Q35		Yes	
Q36		Yes	
Q37		No	

Q38	No
Q39	Yes
Q40	No
Q41	No
Q42	Yes
Q43	Yes
Q44	No
Q45	No
Q46	Yes
Q47	Yes
Q48	Yes
Q49	No
Q50	No
Q51	Yes
Q52	Yes
Q53	Yes
Q54	Yes
Q55	Yes
Q56	Yes
Q57	Yes
Q58	Yes
Q59	Yes
Q60	Yes
Q61	Yes
Q62	Yes
Q63	Yes

Q64

Yes

Q65

Yes

Q66

Yes

Q67

Yes

% suitable habitat

44%

75%

69%

5. Management recommendations

A major aspiration of management at Cors Caron is to re-establish pristine raised mire vegetation across the three raised domes. If this is achieved, it seems likely that the abundance of *Singa* in such areas may diminish over the longer term. Set against this, the management plan for the NNR also aims to prevent any further burning of the raised mire. This will greatly benefit *Singa* in preserving the over-mature and dead lying bushes that constitute its primary niche.

6. Conclusion

As with many spiders, *Singa* is dependent on a very particular vegetation architecture, but it is not especially fussy about the species that compose that vegetation. In consequence, it may occur across a wide range of vegetation types, provided these structural conditions are met. This is certainly the case with *Singa*, which has a very scattered distribution across England and Wales in a range of damp habitats, and also in drier rough grasslands (Harvey et al, 2002). Though the Objective and monitoring strategy should be applicable to other mire sites, its relevance to grassland sites may be more limited. Elements of this study that relate to the requirements of *Singa* for particular vegetation structures should be applicable across all habitat types in which it occurs.

The results of the monitoring programme are set out in section 4 above. They show that, by the criteria set out in the draft objective, the *Singa hamata* feature on Cors Caron SSSI is currently in Favourable Condition. The presence of a very large population spread across much of the site clearly merits this status being conferred on the feature.

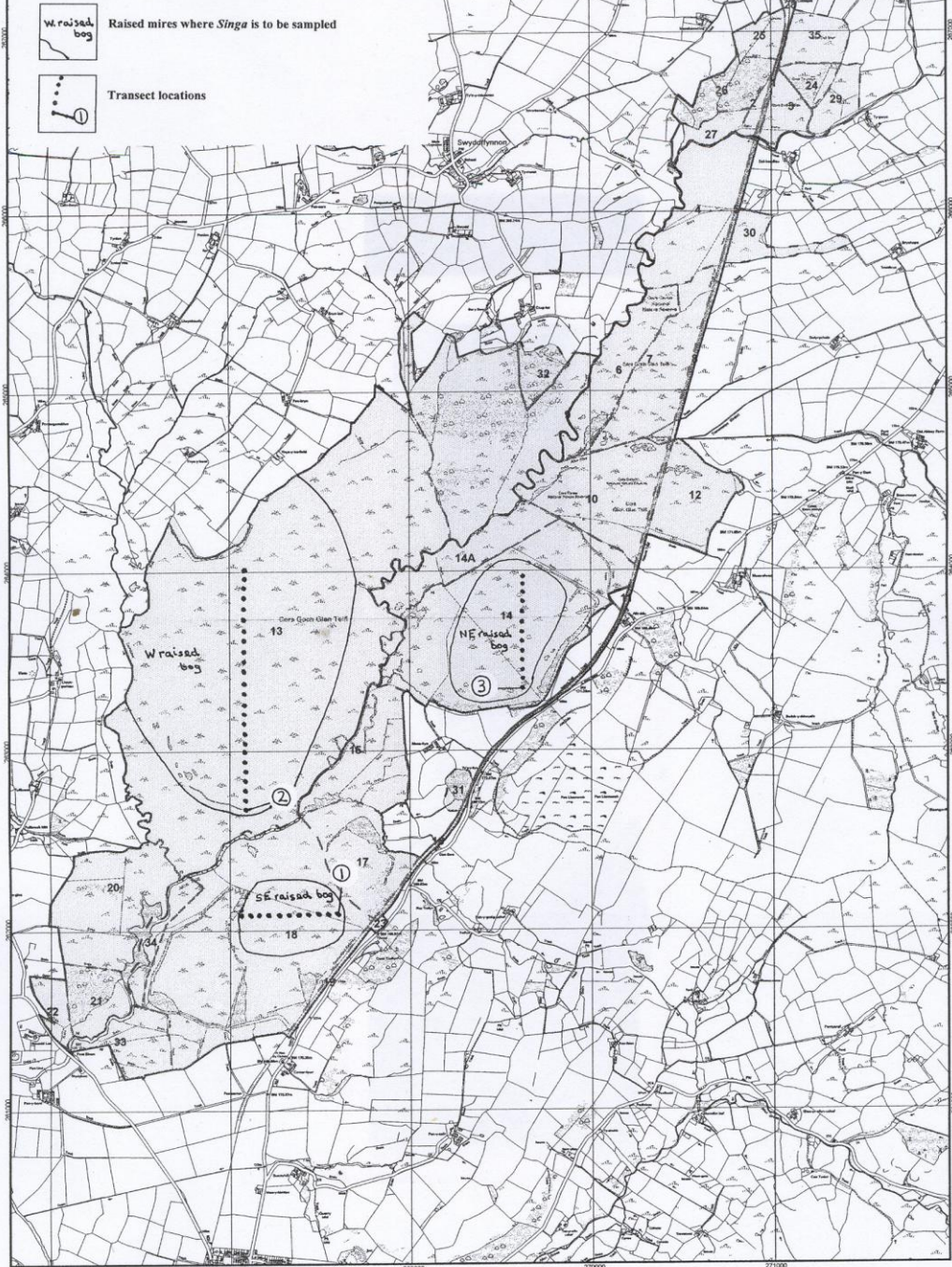
7. Acknowledgements

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Map 1: Cors Caron SSSI – *Singa hamata* monitoring 2007



Produced by CCW on: 30 July 2003

Scale 1:20000

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Cyngor Cefn Gwlad Cymru
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Appendix 1: Photographs of *Singa hamata* and its habitat at Cors Caron SSSI



Photo 1: *Singa hamata* retreat on terminal twigs of dead ling bush.



Photo 2: *Singa hamata* adult, retreat and web on dead ling.



Photo 3: *Singa hamata* retreat on side of dead ling bush.



Photo 4: Optimum habitat of *Singa hamata* on the western raised bog.



Photo 5: Western raised bog, optimum *Singa* habitat showing high cover of ling.



Photo 6: Western raised bog, a number of *Singa* retreats are visible in this photo.



Photo 7: Adult male *Singa hamata*.