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West Penwith Moors, Cornwall: Invertebrate sample survey for Broad and Specific Assemblage Type identification. (2015)

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Foreword

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Background - An invertebrate sample survey of sites across the West Penwith Moors was commissioned by Natural England in order to provide evidence in support of the potential notification of key areas of semi-natural habitat and features as a Site of Special Scientific Interest (SSSI). Targeted sampling was undertaken within selected survey areas (see Appendix 2) and analysed in terms of ISIS assemblages – Natural England's developing Invertebrate Species and habitats Information System. The fieldwork was carried out in two phases - September 2013 and July 2014 – in order to increase the range of species detectable by broadening the seasonal coverage.

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Further information
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West Penwith Moors, Cornwall

Invertebrate sample survey for Broad and Specific Assemblage Type identification

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Rove beetle *Syntomium aeneum* © *F. Köhler*

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SUMMARY

An invertebrate sample survey of sites across the West Penwith Moors was commissioned by Natural England in order to provide evidence in support of the potential notification of key areas of semi-natural habitat and features as a Site of Special Scientific Interest (SSSI). Targeted sampling was undertaken within selected survey areas (see Appendix 2) and analysed in terms of ISIS assemblages – Natural England's developing Invertebrate Species and habitats Information System. The fieldwork was carried out in two phases - September 2013 and July 2014 – in order to increase the range of species detectable by broadening the seasonal coverage.

The ISIS analysis has demonstrated that the West Penwith Moors are of SSSI quality for three invertebrate assemblage types:

- F003 scrub-heath and moorland
- W312 Sphagnum bog
- F001 scrub edge

The fauna overall is most notable for the wide representation of species which are characteristic of heath and moor situations, and which have become increasingly scarce and localised due to habitat loss throughout England.

A total of 602 invertebrate species were recorded, with the most species-rich groups being beetles, flies and spiders; harvestmen and millipedes were also very significant features, with a notably high proportion of the entire British fauna represented. Seven species found are additions to the county list, but assumed to be long overlooked natives.

One species found, Pond Mud Snail *Omphiscola glabra*, is listed under Section 41 of the 2006 Natural Environment & Rural Communities (NERC) Act as a **Species of Principal Importance** for the conservation of biodiversity. This makes it a statutory duty on planning authorities and other decision makers to consider these species when carrying out their duty to further the conservation of biodiversity. Populations were discovered during pond-netting at Boswens Common (site 20.1) and Woon Gumpus Common (site 21).

One beetle recorded currently has **British Red Data Book** status: the rove beetle *Stenus kiesenwetteri*, associated with low-lying areas of wet heath and bog on Woon Gumpus Common (site 21); this is the only known Cornish population of this rarity.

Nine other beetle species found currently have '**Nationally Scarce'** status – see Glossary for an explanation of this expression:

- The water scavenger beetle *Helochares punctatus*, asssociated with moist peat in wet heath, in bogs and in acid pools;
- the weevil *Acalles ptinoides*, associated with old heather;
- the stonecrop weevil *Aizobius sedi*, Sheep's-bit pollen beetle *Meligethes subrugosus* and a ground weevil *Orthochaetes insignis*, all found on and around the main areas of granite carn sampled:
- Heather flea beetle *Altica longicollis*, confined to Chapel Carn Brea (site 2);
- a dung beetle *Cercyon obsoletus*, from cattle-grazed grass heath;

- a wetland rove beetle *Tachyporus formosus* associated with old tussocks of purple moor grass *Molinia caerulea*; and
- an ant-associated rove beetle *Zyras haworthi*.

Using the Community Conservation Index for aquatic invertebrates, most sites were overall of 'high' conservation importance [site 21b was 'very high' and site 37 'fairly high']. Although the aquatic invertebrate assemblages were not particularly diverse they contained a relatively high proportion of nationally uncommon species, reflecting the scarcity and importance of lowland heath habitats across most of southern England. Whilst certainly of significant value, the aquatic invertebrate assemblages were good examples of - but not exceptional for - the type of habitat investigated; the exception to this are the sites at which Pond mud snail *Omphiscola glabra* occurred which are likely to be of at least regional importance.

The West Penwith Moors invertebrate assemblages have been shown to not be fully consistent with the ISIS assemblage types, due to many species behaving differently locally to their national codings within the current version of ISIS. It is very much the mineral soil assemblages which distinguish the West Penwith Moors fauna from that of the Lizard heathlands but even the peat assemblages appear to be significantly different in character to those found on the Lizard. A West Penwith Moors SSSI is clearly well justified on moorland invertebrate grounds.

The order of conservation importance of the sample sites for invertebrates has been demonstrated to be as follows (**SSSI quality in their own right; *SSSI quality as part of a larger network of sites), with the most interesting ecologically at the top:
Site 21 Woon Gumpus Common**
Site 20 Dry Carn and Boswens Common West**
Site 32 Carn Galva*
Site 31 Watch Croft, Trevean, White Downs & Bosullow Common*
Site 18 Carnyorth Common to Bostraze Bog*
Site 43 Zennor Hill and Rosemorran*
Site 37 Mulfra Hill to Treen Common*
Site 2 Chapel Carn Brea*
Site 4 Bartinney Downs, Tredinney Common and Numphra Common*
Site 40 North of Higher Kerrowe*
Site 53 Rosewall Hill *
Site 44 Foage Farm to Sperris Croft and Boscubben Croft*
Site 36 Nine Maidens Common*
Site 51 Noon Digery, Trenowin Downs, Tonkins Downs and Gulval
The last site (Site 51) proved to be of only moderate value for moorland invertebrates, with notably few uncommon species detected.

Suction sampling and pitfall-trapping were both found to be very effective at detecting the range of terrestrial species present. While sweep-netting was difficult to apply – particularly during the autumnal gales experienced - this is an effective tool under calmer conditions. Beating was however found to be a more robust method, as it was possible to beat taller vegetation over a net at times when the wind made sweep-netting impractical. It is therefore recommended that beating becomes a standard approach for the ISIS methodology alongside the other sampling tools.

ACKNOWLEDGEMENTS

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CONTENTS

1 INTRODUCTION

1.1 Aims and Objectives

Natural England is gathering evidence to support the potential notification of key areas of semi-natural habitat and associated features in the West Penwith Moors area of west Cornwall as a Site of Special Scientific Interest (SSSI).

The moorland – known locally as roughland – was sampled for invertebrates in order to provide substantive information to underpin Natural England's biodiversity evidence base for the area. Key semi-natural habitats occurring in the survey area include lowland heathland and associated acid grassland, mires and flushes, scrub and bracken. For the purposes of survey work the area has been divided into 57 separate numbered survey areas, some of which are contiguous, with individual survey areas ranging in size from about 3 to 157ha. Some survey areas are currently under positive management while others are unmanaged.

The objective of the invertebrate sample survey was to undertake targeted sampling within selected survey areas across the West Penwith Moors. The survey explored the principal habitat types found on the Moors to determine the invertebrate assemblages present and their quality. The data is analysed in terms of ISIS (Invertebrate Species and habitats Information System) assemblages. The data generated will identify the Broad Assemblage Types (BATs) and Specific Assemblage Types (SATs) present and enable Natural England to determine whether these features of interest qualify for selection under the SSSI selection guidelines. It was not envisaged that a per unit survey was necessary, only a true reflection of the assemblages typically occurring in the main habitat types. The data may also, potentially, be used to form a baseline for drafting favourable condition tables and carrying out condition assessments.

The specification was developed from the methods for site selection described in **NERR005** *Surveying terrestrial and freshwater invertebrates for conservation evaluation* (Drake et al 2007). The terrestrial invertebrates were to be sampled during the 2013 field season and again in 2014. Freshwater invertebrates associated with the various ponds would be sampled only in 2014.

1.2 Background information

The area under investigation lies mainly within the West Penwith part of the Cornwall Area of Outstanding Natural Beauty (AONB). It is also mainly within the former West Penwith Environmentally Sensitive Area (ESA) boundary and is focused on areas of semi-natural habitat associated with the ESA roughland tier.

Until the 19th century rough ground was an important part of the farming landscape and played a key role in the rural economy (Dudley, 2008; Kirkham et al, 2011): rough grazing for sheep, cattle, ponies and goats, and cutting of furze (gorse and heather used as domestic fuel), turf (peat was a major domestic fuel) and ferns (bracken used as bedding for livestock, etc). The extent of rough ground has been greatly diminished in the past 200 years through enclosure and agricultural improvement. Through the 20th century, due to agricultural specialisation and

principally in dairy farming, farmers lost the economic stimulus and livestock to graze the rough ground, its vegetation not being capable of supporting high milk yields. The roughland was largely abandoned, although a practice of spring burning continues in many areas with the aim of keeping the coarse vegetation in check. Such wildfires are believed to be very damaging to the biodiversity of the moors. The present vegetation structures on the Moors reflect this history of burning.

The area has an outstanding archaeological heritage, particularly from the Bronze Age and Iron Age periods. The international importance of the industrial heritage associated with metalliferous mining is recognised through inclusion in the St Just Mining District part of the Cornwall and West Devon Mining Landscape World Heritage Site.

A currently informal partnership of key organisations and stakeholders is working to establish a consensus for a vision for the future sustainable management of the area.

No directly comparable invertebrate survey dataset is available but the invertebrate survey of the Lizard heathland NNRs (Sheppard, 1986) provides the closest in terms of the vegetation types surveyed. That survey covered the full field season and used a somewhat different array of sampling methodologies, but nonetheless does provide a good basis for comparing and contrasting the results.

2 METHODOLOGY

2.1 Field survey – targeted sampling of invertebrates

2.1.1 Target groups

Target groups for this work include Coleoptera, larger Diptera, Heteroptera, Aculeate Hymenoptera and Araneae, as outlined in Drake et al (2007). Species which have not yet been coded in ISIS were mostly not identified from the samples except where they could be reliably identified under field conditions.

2.1.2 Target key features (BATs and SATs)

The habitats to be sampled were those likely to support the key features or BATs/SATs, as follows:

Broad Assemblage Type	**Specific Assemblage Type**
F0 cross-cutting assemblage type (scrub edge/ scrub heath and moorland)	F001 scrub edge F003 scrub heath and moorland
F1 unshaded and early successional mosaic	F112 open short sward
W1 flowing water	W126 seepage
W2 mineral marsh and open water	W211 open water on disturbed sediments (disused china clay workings only?)
W3 permanent wet mire	W311 open water in acid mire W312 Sphagnum bog

Broad Assemblage Type	Specific Assemblage Type
	W313 moss and tussock fen

Other:
granite outcrops on hill tops (carns)
ponds

This list was derived from the ISIS Development Report (Lott 2008).

2.1.3 Indicative sampling locations

Just 14 of the 57 survey areas were selected by Natural England for specialist invertebrate survey, each with between one and five sampling locations, making 42 sampling locations in total. These had been selected using the following criteria:

- The range of habitats/ features present are typical of the overall area,
- A consideration of accessibility and survey logistics, and
- Where land ownership and access were unlikely to be problematical.

Pre-survey reconnaissance of the indicative sampling locations was a requirement of the project brief. This was considered essential in order to determine the nature and extent of the habitats to be sampled and to confirm suitable locations for sampling using the full range of sampling methods identified in the Methodology (below) and, in particular, placement of pitfall traps. It also provided opportunity for the contractor to recommend a variation of sampling location based on their experience of surveys and the habitats to be sampled. Two days were allocated for this preliminary walk-over assessment of all the proposed sampling locations.

2.1.4 Principal habitats to be sampled

The following habitats had been proposed for sampling. The brief descriptions were intended to give an indication of the vegetation structure and species composition rather than provide a precise botanical interpretation.

- Short humid heath with bare ground and where *Erica tetralix* and/or *Molinia caerulea* are prominent components of the vegetation;
- Mires, associated with humid heath and/or ponds;
- Ponds;
- Short acid grassland swards forming ‘glades’ within patchy mature dry heath and/or gorse;
- Acid grassland more open than above, may be associated with archaeological features such as drove roads within moorland areas;
- Thin ‘plateau’ communities, usually occurring on hill tops associated with carns and granite outcrops;
- Carns on hill summits – sampling around bases, in and around hollows.

2.1.5 Methodology

The following methods were employed:

- Pitfall trapping
- Suction (vacuum) sampling

- Spot-sweeping
- Sweep-netting (if circumstances allowed, eg not too windy)
- Pond-netting

Sampling protocols and standards for all of the above methods followed those given in Drake et al (2007). The sampling methods were deployed appropriately and consistently across the overall survey area – insofar as this was feasible in relation to the extant weather conditions - and included the full range of habitats supporting the SATs likely to be present. The data to be generated is required for comparative purposes, by habitat/feature across the overall survey area.

2.1.5.1 Pitfall trapping

Although not typically part of a standard ISIS assessment, pitfall trapping is a standardised method and overcomes the effects of both weather and time of day on sample size and composition. Nine traps were used for each sampling location, set either as a 3x3 grid or linear, according to the local conditions. In large expanses of relatively uniform vegetation a 3x3 grid is preferable as it makes re-location easier. Linear sites clearly lend themselves best to linear trap runs. However, vegetation mosaics may require greater creativity if the vegetation edges are to be sampled consistently, eg blocks of heath within a grassland matrix.

With the exception of only one (site 20.1), the survey areas selected by Natural England are on Access land, and are likely to be visited by local people at any time of year with some being well used, including for dog walking. Some locations are popular tourist destinations during the summer. Siting and location marking of trap grids needed to be discrete to minimise the risk of inadvertent trampling, interference and possible vandalism. Clear plastic traps of 300ml capacity were accordingly used in order to reduce visibility, and the locations 'marked' only through a combination of recording local landmarks – where available – and GPS recording.

Traps were operated for seven days, after which the contents were collected for identification, the traps were removed, and the pits reinstated by plugging with soil and turf. The seven day run required the traps to be charged with a preservative, in order to reduce predation within the individual traps and avoid escapes. Approximately 100ml of liquid was placed in each trap, the formulation being 50:50 ethylene glycol (commercially available antifreeze) and water, with a small quantity of washing-up liquid to reduce surface tension. The contents of each run of 9 traps were pooled by emptying each into a 1000ml container for storage while awaiting sorting and identification.

2.1.5.2 Suction sampling

A domestic leaf blower/sucker machine powered by a petrol-driven two-stroke engine was used in selected sample locations. A net was installed into the suction tube and attached around the mouth using rubber bands. The suction tube was then applied to take samples by pressing the mouth over the ground/vegetation in a series of points across the sampling location, targeting suitable features such as patches of low vegetation, edges to rock outcrops, and edges to taller vegetation. The net was periodically emptied into a tray for sorting of invertebrates into a container with

preservative for subsequent sorting and identification. The process was repeated for a total time period of 20 minutes per sampling location.

2.1.5.3 Sweep-netting and Spot-sweeping

Where winds permitted, standard sweeps of a sweep-net of 20 minute duration were deployed to achieve a standard effort across the overall survey area. Samples were immediately transferred to a container of preservative for storage, ready for subsequent sorting and identification. Similarly 20 minutes were spent spot-sweeping at each sampling location.

Where strong winds made the use of a sweep-net impractical, standard beating was employed as a substitute method – although Drake et al (2007) dismiss beating as 'rather primitive and of limited application' it is in effect directly comparable to sweep-netting as a technique in being difficult to quantify scientifically other than through timed sampling. For beating, the sweep-net was pushed beneath any heath and/or low scrub and the bushes beaten with a wooden stick, causing any invertebrates hidden within to drop into the net, from where they were quickly transferred to a container of preservative. 20 minutes were allocated to the method at each sampling location.

2.1.5.4 Pond-netting

Numerous small seasonal pools and wet mires exist across the West Penwith Moors, along with various larger more permanent ponds, often associated with former clay workings. The following were identified as being of potential interest by the initial scoping survey and targeted for sampling to assess their aquatic invertebrate assemblages during the current investigation: Tredinney Common (part of site 4): 'pond in former china clay working with willow scrub, mature heather and gorse' (SW 3943 2877); Boswens Common West (part of site 20): 'pond' (SW 4015 3265); Woon Gumpus Common (part of site 21): 21a 'mire with *Molinia caerulea'* (SW 3967 3353); 21b 'mire with tussocky *Molinia caerulea* and willow scrub' (SW 3981 3333); 21c 'pond with tussocky *Molinia caerulea* around (SW 4001 3339); 21d: 'pond' (SW 3986 3361); Mulfra Common (part of site 37): 'pond with area of mire to north east' (SW 4482 3612).

The aquatic invertebrate assemblages of the six habitats were sampled using the recommended 'pond netting' method (Drake *et al*., 2007). This method involves three timed periods of net sampling of one minute duration each at a site, accompanied by a timed period (30 minutes) of sorting in the field.

The netting was carried out using a FBA pattern pond net, fitted with a 1mm mesh collecting bag and involved a combination of mostly sweeping of the net through submerged and marginal vegetation, accompanied by 'kick' sampling of coarse substrate (areas of exposed gravel) and 'puddling' of areas of finer substrate such as silt. Some of the pools sampled in the mires contained very shallow water overlying deep carpets of moss (predominately *Sphagnum* species); these were sampled using a fine mesh tea strainer, as the net was generally too large to skim the shallow water. Where no surface water was evident, compression of the water-logged *Sphagnum* resulted in small pools being produced as water flowed into the resultant hollow from

the surrounding compressed moss; these hollows were then netted with the strainer to capture any invertebrates washed out of the moss by the water flow.

After each one minute session of net (or strainer) sampling, the contents of the net were emptied into a white tray and sorted in the field for ten minutes, a process that was repeated two more times. Thus in total, sampling at each site involved three minutes of net sampling and 30 minutes of field sorting. With each one minute sampling session carried out at different locations around the margins of the pond or within the mire.

Conductivity and pH readings were collected in the field using a Hanna Instruments HI9812-5 portable meter.

During the field sorting, representative specimens of each of the aquatic taxa were picked out with entomological forceps and placed in a vial containing 90% Industrial Methylated Spirits (IMS or Denatured Ethanol B), 5% water and 5% glycerol. Those taxa not easily identifiable in the field were later identified using a stereo microscope. Taxa were identified to the lowest possible level, with the exception of the taxonomically difficult groups Oligochaeta (segmented worms), Hydrachnidae (water mites), and Chironomidae (non-biting midge larvae).

2.1.6 GPS data formats

A requirement of the project was to enable geo-location of the sampling areas so that geospatial cross-referencing with National Vegetation Classification (NVC) mapping would be feasible. As such the following rules were applied:

- For all pitfall trap grids, the central point was taken as the location;
- Sweeping and suction sampling were recorded in the same way – in reality the pitfall trapping grid was used as the central point;
- For pond netting the grid reference of the pool was noted;
- A handheld GPS unit was used to record the grid references as a 10 figure reference – the full 12 figure reference provided by a handheld unit is not meaningful owing to the limited abilities of such machines.

2.2 Timing of fieldwork

The requirement was for the project to begin in early September 2013 and to repeat the fieldwork in June-July 2014, subject to confirmation of funding availability.

2.2.1 September 2013

The work programme in September was split into distinct phases:

- Reconnaissance of the selected sites;
- Placing and subsequent removal of pitfall trap grid lines;
- Suction sampling, targeted at periods of drier and calmer weather conditions;
- Sweep-netting, also targeted at drier and calmer periods.

Phasing of the work in this way was also advisable due to the burden of the field sampling equipment – it was not practical or sensible to attempt to carry all of the necessary equipment from the closest vehicle parking point to the sampling locations.

From a logistical point of view it was easier to focus on applying one sampling technique across a series of sampling locations when weather conditions were most suitable.

The two days of the reconnaissance (2nd and 3rd September) took place under typical high summer weather conditions of clear skies and warm sunshine, with temperatures in the low to middle twenties Centigrade, and little or no wind. These conditions continued into the pitfall trap setting phase but deteriorated from mid afternoon on day 4, when the moorlands were engulfed in a bank of low cloud with intense drizzly rain. Day 5 started fine but heavy rain showers dominated the afternoon. Low temperatures and heavy showers continued across the following weekend, when the majority of the pitfall traps were operating – total rainfall during this weekend was around 4-5cm, resulting in the pitfall traps becoming water-logged but not flooded – they may have functioned as water-traps to some extent towards the end of the seven day sampling period.

Week 2 was the start of the suction sampling and sweep-netting work and experienced generally dry and fine conditions for the first half, but with much more cloud cover and temperatures substantially lower, in the range of 12-15 degrees C. Strong gusting winds also made sweep-netting virtually impossible and kept insect flight activity well down - only the lower-lying *Molinia* mire areas, e.g. at sample site 21 (Woon Gumpus Common), could be sampled adequately and were therefore specifically targeted. The week became wetter from late Wednesday afternoon (11th) and no suction sampling or sweep-netting could be undertaken on Thursday 12th, when cloud levels were at ground level on the moors and rainfall was mostly heavy. Emptying of pitfall traps was however possible with the aid of the GPS location records and previous experience of the landscape. The unsettled weather made it sensible to give priority to the suction sampling during any dry period and to leave the sweep-netting work temporarily in the hope of calmer conditions returning later in the survey period. The very unsettled conditions continued throughout the field survey period.

2.2.2 July 2014

The phasing of the work programme remained much the same for the mid summer survey, with the exception only of the reconnaissance survey which was not necessary at this stage. The pitfall trap lines were laid out over July 1st to 3rd and emptied and removed over July 8th to 10th. The laying out period was during a very hot – upper 20s Centigrade - and more or less windless period. Suction sampling started on July 7th and continued for part of the 8th, 9th, 10th and 11th. While largely warm and sunny, the 8th and 9th both had prolonged periods of torrential rainfall around midday, and this was followed by very strong gusting north-westerly winds which made any net work – including suction sampling – difficult unless good shelter could be found at the study locations.

Aquatic invertebrate sampling was carried out on July 1st (sites 4, 20 and 21) and 2nd (sites 20 and 37). At this time the 'pond' at site 21c was found to be dry, leaving six sites at which sampling could be undertaken.

3 OVERVIEW OF RESULTS

3.1 Species total for main taxa

The sampling resulted in a species list of 602 invertebrates. These are broken down by the main taxonomic groups in Table 1. As will be seen, the main groups found were Coleoptera, Diptera, Araneae and Heteroptera, which are four of the five target groups. Species in the fifth target group named in the contract brief - Aculeate Hymenoptera - were very scarce during the field survey period and only a few species were detected.

Table 1 Species totals for major invertebrate groups arising from sampling in September 2013 and July 2014

Taxa	**Vernacular**	**Species Totals**
Coleoptera	Beetles	226
Diptera	Two-winged Flies	134
Araneae	Spiders	95
Hemiptera • Heteroptera • Auchenorhyncha • Sternorhyncha	True bugs	 47 9 1
Opiliones	Harvestmen	14
Hymenoptera Aculeata	Ants, bees & wasps	14
Diplopoda	Millipedes	11
Mollusca	Snails	10
Odonata	Dragonflies	9
Lepidoptera	Moths & butterflies	8
Chilopoda	Centipedes	5
Oniscidea	Woodlice	5
Orthoptera	Grasshoppers	4
Hirudinea	Leeches	2
Pseudoscorpiones	False scorpions	1
Psocoptera	Barkflies	1
Trichoptera	Caddisflies	1
Thysanura	Bristletails	1
Dermaptera	Earwigs	1
Amphipoda	Land hopper	1
Cladocera	Daphnia	1

3.2 Species with conservation status

Only ten of the 602 species currently have conservation status – this is a relatively low ratio (about 1.7%) for such a large complex of semi-natural vegetation. Although not directly comparable, it may be useful to compare this with published data for one particular area of ancient woodland where 20 of 218 species (9%) in a sample survey had conservation status (Darby, 2014) and a chalk downland where 52 out of 455

species (11%) had conservation status (Darby, in press). Unfortunatly no comparable data for an area of moorland is readily available, but the difference in scale with the two other habitat types is striking. It seems clear that the West Penwith Moors area is characterised more by the characteristic species of the semi-natural vegetation present than by representation of particular rarities.

The most notable find was Pond mud snail *Omphiscola glabra* - this is listed under Section 41 of the 2006 Natural Environment & Rural Communities (NERC) Act as a Species of Principal Importance for the conservation of biodiversity.

The most notable of the other species – all beetles - is the rove beetle *Stenus kieswenwetteri* (Staphylinidae) which currently has Red Data Book Vulnerable status (Hyman, 1994). Two further rove beetles identified have Nationally Scarce status: *Tachyporus formosus* and *Zyras haworthii*. Other Nationally Scarce species found are the water scavenger beetle *Helochares punctatus* and the dung beetle *Cercyon obsoletus* (both Hydrophilidae), the pollen beetle *Meligethes subrugosus* (Nitidulidae), Heather flea beetle *Altica longicollis* (Chrysomelidae) and the three weevil species *Acalles ptinoides* and *Orthochaetes insignis* (Curculionidae) and *Aizobius sedi* (Apionidae); the status of *Altica longicollis* has recently been re-affirmed (Hubble, 2014). All of the Nationally Scarce species are listed in the *Red Data Book for Cornwall and the Isles of Scilly* (Bennallick et al, 2009).

3.2.1 Pond mud snail Omphiscola glabra

The outstanding discovery is the presence on the moors of Pond mud snail *Omphiscola glabra*. This is listed under Section 41 of the 2006 Natural Environment & Rural Communities (NERC) Act as Species of Principal Importance for the conservation of biodiversity. This provision makes it a statutory duty on planning authorities and other decision makers to consider these species when carrying out their duty to further the conservation of biodiversity. Populations were discovered during pond-netting at sites 20.1 (Boswens Common) and 21 (Woon Gumpus Common).

The species is dependent on the availability of ponds with low calcium, nutrient poor water on acidic sandy or gravelly soils, especially within unimproved pasture and heathland. A large draw-down zone is important, leaving large expanses of bare ground during drought conditions. The number of occupied sites has declined significantly in the last 25 years due to the loss or degradation of suitable temporary ponds through infilling, agricultural pollution, overgrazing, scrub encroachment and convertion of small seasonally flooded ponds to larger permanent water bodies (Buglife, 2013). Not surprisingly, Cornwall is a national stronghold for the species; it is well-known on Goss Moor and Red Moor. It has been known at Woon Gumpus Common since 2007, but Boswens Common is a new locality.

3.2.2 Stenus kiesenwetteri

Stenus kiesenwetteri is a large and relatively distinctive example of the *Stenus* genus of rove beetles – it is the only species which combines a red dot on each wingcase with a smooth cylindrical abdomen. It is a speciality of lowland peat mires and has a strong southern distribution in both Britain (New Forest, East Dorset heaths, East Devon pebblebed commons, and the Wealden heaths of Surrey and Sussex) and Ireland (Kerry and West Cork) (Lott & Anderson, 2011). Two beetles were found by suction sampling the extensive area of diverse mire habitats on site 21 (Woon Gumpus Common). It has not previously been reported to occur in Cornwall and so is not included in the *Red Data Book for Cornwall and the Isles of Scilly* (Bennallick et al, 2009).

3.2.3 Orthochaetes insignis

Orthochaetes is a distinctive genus of flightless ground weevils. The larvae feed within the leaves of a wide variety of herbs, feeding on the more nutritious green cells within and using the tough outer skin of the leaves as protection from dehydration and from predators. Sites are typically on dry, freely-draining soils, with open or sparse vegetation of native plants. The species is best known in Britain from the southern coastal counties, and has a restricted global distribution of western Europe and NW Africa (Morris, 2002). As the species is flightless it has increasingly become confined to the less disturbed areas of native vegetation, as once lost from a site it is difficult to re-establish. In the West Penwith Moors it is particularly vulnerable to the more serious wildfires which scorch deep into the soil and so it is confined to the larger carns. One was found by suction sampling the rocky carn areas of the ridge of Carn Galva (site 32.3). There are just a few previous reports from Cornwall: seacliffs on the The Lizard, from Pantersbridge and Mawnan Glebe, and an old record from Gwithian. This is the first record from the West Penwith Moors.

3.2.4 Helochares punctatus

The water scavenger beetle *Helochares punctatus* lives on moist peat in wet heath, in bogs and in acid pools (Foster, et al 2014). The British distribution is notably lowland, a feature which restricts its range considerably as a result of land drainage and agricultural improvement. It is the larger expanses of lowland heath and moor which still retain populations. The West Penwith Moors are clearly an important area for the species regionally, as the species was found at site 4 (Tredinney Common) and all three sample areas at site 21 (Woon Gumpus Common). The species only been reported from Cornwall once before, from Carnkief Pool in 2011 (ERICA). Its absence from The Lizard heaths is surprising.

3.2.5 Meligethes subrugosus

Meligethes subrugosus is the Sheep's-bit pollen beetle; the adults feed on the pollen of Sheep's-bit *Jasione montana*, laying their eggs in the flowerhead and the larvae feed in the developing seeds. The species occurs wherever the hostplant grows in reasonable profusion, typically on light sandy soils and limestone, with open heathy or grassy vegetation (Kirk-Spriggs, 1996). It is best known in Britain from southern and western coasts, but especially along the coasts of The Lizard. It has not previously been found inland. Two examples were taken in the pitfall traps set in the brambly grass heath of site 43 (Zennor Hill). *Meligethes* do tend to be under-recorded however and it may prove to be more widespread in the county.

3.2.6 Acalles ptinoides

The biology of the weevil *Acalles ptinoides* is unknown but the larvae are thought to develop in dead twigs of broad-leaved trees and shrubs, including heather. The adult weevil is ground-living, found amongst moss and leaf-litter. Sites tend to be on acid or leached soils, and are generally either oak woodland or old heathland. Wildfires can be very damaging as they both kill the weevils and destroy the habitat of dead heather stems. It is a western European species, widely distributed throughout England, Wales and southern Scotland (Morris, 2002). It is known from just a few records in Cornwall. A single specimen was found by suction sampling at sample site 18.3 (Carn Kenidjack, part of Carnyorth Common to Bostraze Bog) in September and another in July from the brambly grass heath of site 43 (Zennor Hill and Rosemorran).

3.2.7 Aizobius sedi

The larvae of *Aizobius sedi* weevils develop as leaf- and stem-miners on Crassulaceae, principally the stonecrops *Sedum acre* and *S. anglicum* in Britain. It is very localised in Britain, but well-scattered in England from west Cornwall to west Norfolk, chiefly in coastal situations (Morris, 1990). Cornish records are very few and confined to rocky coasts. It was found in small numbers by suction sampling of *Sedum anglicum* plants on and around the main areas of granite outcrop sampled: sampling sites 18.3 Carn Kenidjack (part of Carnyorth Common to Bostraze Bog), 31 (Watch Croft), 32 (Carn Galva), 43 (Zennor Hill and Rosemorran). These are the first inland records for the county.

3.2.8 Altica longicollis

Heather flea beetle *Altica longicollis* feeds on both heather *Calluna vulgaris* and heaths *Erica* species, feeding on shoots, leaves and stems (Cox, 2007). The beetle may favour the more nutritious short young growth recovering from burns or browsing and/or the stressed plants subject to wind-pruning by regular strong winds (K.N.A. Alexander, pers. obs.). The species has a very scattered distribution across Britain with distinct concentrations. In Cornwall it is best known from the Lizard and West Penwith; it was found in numbers in 2013 by suction sampling at site 2 (Chapel Carn Brea) but nowhere else.

3.2.9 Cercyon obsoletus

Cercyon obsoletus is a specialist dung feeder associated with large herbivores and rabbits, but has also been found feeding in carrion, decaying fungi and decaying vegetable matter generally; an association with semi-natural conditions is suspected but has not been demonstrated. It is probably an opportunistic and mobile species which requires continuity of rotting vegetable matter, dung and carrion availability (Hyman, 1994). The West Penwith Moors offer ideal habitat throughout their landscape scale availability of semi-natural vegetation. It has a widespread distribution across Britain but records are very sparse. In Cornwall there are only four widely scattered previous records, none from the West Penwith Moors. One was taken by the pitfall traps amongst the cattle-grazed grass heath at site 31.1 Trevean Farm (part of Watch Croft, Trevean, White Downs and Bosulow Common).

3.2.10 Tachyporus formosus

The rove beetle *Tachyporus formosus* is a particularly scarce species occurring amongst wet vegetation and damp moss in lowland marshy situations across southern Britain. There are notably few historic records in the county with old records from the Sennen and Land's End area, and from Kynance on the Lizard, and only two relatively recent records, from Ruan Lanihorne Marshes in 1971 and Nanterrow Marsh, Gwithian in 2004. One was taken by pitfall-trapping around the large old *Molinia* tussocks within the bracken area below Carn Galva (site 32.2).

3.2.11 Zyras haworthi

The identification of this rove beetle from pitfall trap samples in the acidic grass heath of Boswens Common (site 20.1 south) is surprising as this is typically associated with tree-nesting ants. The specimen may merit checking by someone more familiar with the species. Although primarily reported from the runs of Jet Ant *Lasius fuliginosus*, it has also been found away from ants in leaf litter and marshland. The species has been reported across the southern counties of England and there is just one previous report from Cornwall, in the far east of the county.

3.3 Other species of conservation interest

In addition to the Nationally Scarce beetle species described in section 3.2 above, a wide range of other invertebrates found during the smapling are also of interest in being uncommon or very localised nationally or very rare in Cornwall.

3.3.1 Coleoptera (beetles)

The previous section provides details of the RDB and NS beetles found during the sampling. A few other beetle species also merit comment: the rove beetle *Syntomium aeneum*, the weevil *Rhynchites aeneovirens*, and the flea beetle *Longitarsus holsaticus.*

Syntomium aeneum is a ground-living species, associated with moss-covered surfaces on freely-draining, mainly nutrient-poor substrates. It is listed in the *Victoria County History of Cornwall* (Page, 1906) but there appear to have been no reports from the county since then. A single specimen was taken by suction sampling on and around the main area of granite outcrop at site 32.3 (Carn Galva).

Rhynchites aeneovirens (now known as *Neocoenorrhinus minutus*) is best known in Britain from oak trees, where the larvae feed in partially severed buds. However, Morris (1990) draws attention to an association with herbaceous *Potentilla* and *Geum* noted by a French author. It is a rare species in Cornwall but has been reported from Gweek Wood and a few other sites. Of particular interest is an old record from the Penzance area, where oaks are very uncommon. In 2014, one was taken by suction sampling the ungrazed grass heath on Tredinney Common (site 4), an area with abundant growth of tormentil *Potentilla erecta*, and it seems likely that there is a small Cornish population associated with this hostplant rather than the more typical oak.

Longitarsus holsaticus is the Lousewort Flea Beetle, a nationally uncommon and very localised species. The adults are typically found on Marsh Lousewort *Pedicularis palustris* in mire and wet heath situations, the larvae are thought to be root-feeders on the plants. There appear to be notably few Cornish records, mostly old, from Bodmin Moor, West Penwith and The Lizard. Small numbers were taken by the pitfall traps set in the diverse mire area of site 21 (Woon Gumpus Common), and also at sites 43 (Zennor Hill) and 53 (Rosewall Hill).

3.3.2 Diptera (two-winged flies)

Site quality Diptera proved to be notably disappointing, the 134 species identified including no Nationally Scarce species at all. A good range of species typical of the habitats sampled were found however, and some of these are worthy of further discussion.

The peatlands, in particular, of the sampling sites have been found to support many typical wet moorland Diptera. The dolichopodid *Campsicnemus alpinus* was present in abundance across most of the humid heath areas. The ERICA database contains no records at all but the Dipterists Forum knows the species from Retire Common in 2001. The Lizard heathland invertebrates survey (Sheppard, 1986) refers to *Campsicnemus ? alpinus* being present on 'short' and 'tall' heath sites but not 'wet' heath. The draft report does not explain the uncertainty of the identification, but this does suggest that *C. alpinus* is widespread across sthe humid heaths of West Cornwall. It is a characteristic species of wet heath vegetation on peat and is regarded as a common species of this habitat across much of the north and west of Britain as well as the New Forest and east Dorset. An associated species is the crane fly *Euphylidorea meigenii* which is very typical of wet peat habitats. It was found at sites 18.2 (Carnyorth Common to Bostraze Bog) and 21 (Woon Gumpus Common), but not listed in the Lizard report (Sheppard, 1986). The large crane fly *Tipula melanoceros* is another characteristic species of mire and wet heath, and is best known in Cornwall from the Lizard heaths (Sheppard, 1986; Stubbs, 1992) – it was found at six of the sampling locations; it was one of the most abundant species in a study of the crane flies of a boreal mire in Finland (Autio et al, 2013).

The richest site for wet peatland Diptera overall proved to be the area of diverse mire habitats on Woon Gumpus Common (site 21) added to the sampling sites for July 2014. This produced by far the greatest variety of mire specialsits, additionally including the doli-flies *Diaphorus nigricans, Dolichopus atratus, D. brevipennis* and *D. vitripennis*, as well as the cranefly *Molophilus occultus.*

The cranefly initially thought to be a notable find and reported as such in the 2013 draft of this report has proved to be *Limonia dilutior*, the confusion caused by the fading of a diagnostic marking on the legs due to immersion in the antifreeze mixture used in the pitfall traps. Although not an exciting find, this species is characteristic of heathland and moorland. It was first discovered in Cornwall during the Lizard heathland survey (Sheppard, 1986), from the Mullion sampling site, and has since been found at Chapel Porth by Alan Stubbs in 1990. Its discovery on the West Penwith Moors is therefore not surprising but constitutes only the third area of the county known to support the species. It was found by pitfall trapping at sites 2 (Chapel Carn Brea), 37.1 (in Mulfra Hill to Treen Common) and 44 (Foage Farm to Sperris Croft and Boscubben Croft, near Zennor Quoit).

Site 32 (Carn Galva) proved the most interesting for tephritid flies, associated with abundant flowering of the key herb foodplants. *Campiglossa loewiana* is the more interesting of the two species found here; its larvae develop in the flowers of Goldenrod *Solidago virgaurea*. The species appears to be an overlooked one in the county, with no previous reports. It had only been reported from 28 hectads up to 2003 (Clemons, 2003) and so will become Nationally Scarce when the Species Status

Review for the family is next updated. The British records are very widely dispersed across the country but this is the first record west of Dorset. The same site also produced the only capture of the more widespread *Tephritis vespertina*, which develops in Cat's-ear *Hypochaeris spp.* flowers – this species has unfortunately been overgraded within ISIS.

3.3.3 Heteroptera (true bugs)

The plant bug *Mecomma dispar* is the most notable bug find from the September 2013 sampling. This is a boreo-montane species across most of its European range, with a distinctly patchy distribution in Britain, occurring most widely across the northern and western hill country (Southwood & Leston, 1959). It appears to have a requirement for unshaded but permanently humid situations, such as coastal grasslands or more rank vegetation inland. It was first found in Cornwall in the Millook Valley, in 2001, and then again on Bodmin Moor in 2005 (Alexander, 2008). One was taken in a pitfall trap in the dense tussocky grassland amongst heath and bramble at sampling site 43.1 (Zennor Hill and Rosemorran).

Another important discovery is the plant bug *Deraeocoris scutellaris*, a species listed in the *Victoria County History* (Page, 1906) but not reported in the county since. Its rediscovery over 100 years later suggests that it can be very elusive to sampling. One was taken by suction sampling at Trevean (site 31.1) during the July 2014 survey. It has been associated with heather and heaths, but also other foodplants in other situations. It appears to be genuinely rare and very localised across England, and must be approaching a conservation status of Nationally Scarce.

The grass bug *Trigonotylus caelestialium* breeds on various grasses in both moist and dry habitats nationally, as well as on cereal crops. It requires its host plants to be tall and flowering with seed-set. It was overlooked in the past amongst the more widespread *T. ruficornis* but has been distinguished in Britain since 1992. Its discovery on a humid heath site 31.3 (Watch Croft, Trevean, etc) and from the old *Molinia* amongst bracken at site 32.2 (Carn Galva) represent the first county records of this long overlooked species. The localities are both on moist peat and the species may prove to be a peat fen and mire specialist in the county.

As with the water beetle fauna, the water bugs were found to very much comprise the characteristic species of moorland pools. Two of the species found are rare in the county (Alexander, 2008). *Arctocorisa germari* (site 37.2 Mulfra Hill to Treen Common) has previously been reported from Dozmary Pool, Loe Pool and Abbey Pool, Tresco (Alexander, 2008). Its habitat is still water bodies with little or no live vegetation, ie a bare mineral substrate as in recently dug quarry ponds (Huxley, 2003). *Sigara scotti* - as its name suggests - is best known from heath and moorland pools across Scotland and has a much more localised distribution within England. It was first reported in the county from Chynhalls in 1924 and has only been reported from two sites since then: Porkellis Moor in 1978 and Dozmary Pool in the 1980s. Its discovery on Mulfra Common (site 37 Mulfra Hill to Treen Common) is therefore very significant; it prefers sparsely vegetated peat pools. *S. distincta* is similarly known from very few sites, again including Dozmary and Loe Pools.

3.3.4 Araneae (spiders)

Although no Nationally Scarce spiders were found during the sampling, a notably wide range of species typical of semi-natural grassland, heathland and moorland situations were shown to be present, including a large number of nationally uncommon species. Most of the latter are known from very few other sites in Cornwall and three appear to have been completely overlooked in the past (Hopkins, 2006): the money spiders *Walckenaeria unicornis* and *Agyneta cauta* (Linyphiidae) and the crab spider *Ozyptila simplex* (Thomisidae). The first is a widespread species nationally and lack of records presumably just reflects lack of recording – it was found on sites 4 (Tredinney Common) and 31.2 (the green lane at Trevean Farm) - but the other two are nationally uncommon species:

- *Agyneta cauta* is a speciality of heathland and moorland in Britain but hardly known from the SW at all – a single old record from Dartmoor; it tends to occur amongst damp litter and mosses on moist peaty soils; single females were pitfall-trapped on the humid heath of site 44 (Foage Farm to Sperris Croft and Boscubben Croft) and on the open rocky heath with peaty soils at site 53 (Rosewall Hill).
- *Ozyptila simplex* is associated with tall grassy, generally coastal vegetation, and is known in the SW from a small number of coastal localities in Devon, Somerset and Dorset; a female was pitfall-trapped on the recently grazed humid heath of site 40 (North of Higher Kerrowe).

Amongst the other uncommon species the following are the most significant finds:

- The money spider *Ceratinella scabrosa* lives amongst detritus in relatively undisturbed semi-natural situations, including ancient woodland, limestone grassland and marsh; a female was taken by suction sampling on and around the granite outcrops of sample site 32.3 (Carn Galva); it was first found in Cornwall in Redrice Wood in 1997 and has subsequently been found at a single site in the Isles of Scilly in 1998;
- The money spider *Walckenaeria alticeps* is a species of wet moss and leaf litter in *Sphagnum* bogs that have become overgrown with *Molinia* which provides some shade; it is mainly known across the north and west of Britain and has only once been found previously in Cornwall, on Bodmin Moor in 1997; a male was found by suction sampling the humid heath area of sample site 36 (Nine Maidens Common);
- The money spider *Walckenaeria atrotibialis* has only been found in Cornwall on the moors of Bodmin Moor and West Penwith; a male was pitfall-trapped on the grassy humid heath at site 2 (Chapel Carn Brea) and two males and a female on the humid heath of site 44 (Foage Farm to Sperris Croft and Boscubben Croft); it is known from a wide variety of semi-natural vegetation types nationally and so its confinement in Cornwall to moorlands is unusual;
- The money spider *Walckenaeria vigilax* is another damp moorland species confined in Cornwall to Bodmin Moor and the West Penwith Moors; it appears to be widespread in the latter area and was found at sites 31, 32, 40, 44 and 51;
- The money spider *Metopobactrus prominulus* is a damp grassland species known in Cornwall from Bodmin Moor, West Penwith and the Lizard; single males were pitfall-trapped in the humid heath areas at sites 4 (Tredinney Common) and 21 (Woon Gumpus Common);

- The money spider *Pelecopsis nemoralis* is best known across the upland regions of northern and western Britain where it is associated with mossy ground; Cornish records are mostly very old, from Bodmin Moor, West Penwith and The Lizard; two males were captured by suction sampling around site 18.3 (Carn Kenidjack);
- The orb-web spider *Agalenatea redii* (Aranaeidae) which constructs its web amongst bushy heather and gorse, and has previously only been known in Cornwall from The Lizard; juvenile spiders were found widely by sweep-netting on site 21 (Woon Gumpus Common) and 51.2 (Baker's Pit Reserve);
- The orb-web spider *Cercidia prominens* spins its web amonst sparse heathy or grassy vegetation; there is one old Cornish record from The Lizard; a male was pitfall-trapped in the brambly grass-heath at site 43 (Zennor Hill and Rosemorran);
- The liocranid *Scotina gracilipes*, which lives amongst the root bases of heather in dry and exposed heathlands; a male was found by pitfall trapping the humid heath of site 32.1 (Carn Galva) and another on site 44 (Foage Farm to Sperris Croft and Boscubben Croft); it otherwise only known in Cornwall from a series of dry heath sites in 1968

3.3.5 Opiliones (Harvestmen)

Two species were found which feature in the *Red Data Book for Cornwall and the Isles of Scilly* (Bennallick et al, 2009) – referred to hereafter as the RDBCIS:

- *Nelima gothica*, a species of permanently moist situations, living amongst rank vegetation and amongst dead vegetation debris generally; there are only two other records post 1980; a juvenile was taken in a pitfall trap set amongst bracken and rank grasses on site 53 (Rosewall Hill); only two other post 1980 records are known in the county.
- *Anelasmocephalus cambridgei* is another species requiring permanently moist situations and is most often found in woodland leaf litter; there is just a single other post-1980 record; one was taken in a pitfall trap amongst the grass heath of site 20.1 (Dry Carn and Boswens Common West); only one other post 1980 record is known in the county.

A third species found has not been reported from the county previously and appears to be a long-overlooked native: *Lophopilio palpinalis*. This is a widespread species across much of lowland Britain and is associated with permantly humid but not wet conditions; further east it is best known from the litter layer in broad-leaved woodlands and beneath old hedges, although it is associated with dry open places covered with lichen in the Netherlands. Two females were beaten from heather and gorse in grazed pasture at site 31.1 (Watchcroft, Trevean, etc) and two males and a sub-adult from humid heath at Baker's Pit Nature Reserve (sites 51.1 and 51.2).

Odiellus spinosus is another rare species in the county. Its British range is distinctly southern and eastern, but it is known to be expanding northwards. The young live among grass and plant litter, but the adults ascend bushes and trees. It has a preference for warm sheltered situations. It was first reported in Cornwall in 1974 and may be a newcomer to the county; its range is known to be expanding out from its core distribution in SE England. It has been reported at Skimmel Bridge, west of

Penzance in 2013 (ERICA). A female was taken in a pitfall trap in the cut bracken area at Carn Galva (site 32.2).

3.3.6 Pseudoscorpiones (False scorpions)

Just one false scorpion was found despite the extensive sampling and this was another RDBCIS species: *Chthonius orthodactylus*. This basically lives amongst dead vegetation litter but little more is understood about its ecology. It is best known in Britain from SE England but has also been found more sparingly in the west. In Cornwall it has been found previously just once, in the Camborne area many years ago. A male was taken by suction sampling on the granite outcrop area at site 31.2 (Watch Croft).

3.3.7 Diplopoda (millipedes)

In contrast to the other taxa, the key interest amongst the millipedes is a species which is largely confined in Britain to the far South West, *Leptoiulus belgicus*. It features in the RDBCIS as it is a speciality of the area. It appears to favour warm microclimates and sites tend to be on light, well-drained soils. It is clearly widespread across the West Penwith Moors, occurring amongst taller vegetation - generally with western gorse, heaths and bracken – on mineral soils, and was taken by pitfall trapping, sweep-netting and beating at sites 4.1 Tredinney Common (part of Bartinney Downs, Tredinney Common and Numphra Common), 20.1 (Dry Carn and Boswens Common West), 31.1 Trevean Farm (part of Watch Croft, Trevean, White Downs and Bosullow Common), 32.3 (Carn Galva), 43.1 the Logan Stone area (part of Zennor Hill and Rosemorran) and 51 Baker's Pit Reserve (part of Noon Digery, Trenowin Downs, Tonkins Down and Gulval Downs). Globally it has an extended Atlantic distribution and is found throughout Western Europe. There is a pronounced peak in activity in late summer and autumn when they mature, ready for overwintering in the adult stage (Lee, 2006).

3.3.8 Lepidoptera (butterflies and moths)

Grayling butterfly *Hipparchia selene* was the only notable lepidopteran encountered on the Moors. Single adults were only seen at site 31 (Watch Croft, Trevean, White Downs and Bosullow Common) and 40 (North of Higher Kerrowe). Wall Brown *Lasiommata megera* was also seen. Both are Priority Species under the England BAP due to reported national declines. Both remain widespread in Cornwall however.

Caterpillars of Vapourer moth *Orgyia antiqua* were a very visible feature of the Moors during September.

3.3.9 Hymenoptera (ants, bees and wasps)

Solitary bees were surprisingly elusive across the sample sites, suggesting that targeted exploration of suitable situations may be the best way to find these species, rather than the structured sampling regime adopted for the current project. Very few had much by way of blossom and this explains the lack of flower-visiting insects generally.

Just one species of note was found, *Panurgus calcaratus* which was found by sweep-netting along the green lane at site 31.2 (Trevean Farm). The species is best known across the lowland heaths of southern and south-eastern England, but with sporadic occurrence elsewhere, especially in coastal situations. It is associated with short, heathy grasslands over sand or sandy-clay soils, and so the mineral soil areas of the West Penwith Moors provides ideal habitat, especially where yellow-flowered Asteraceae occur in profusion – this bee specialises in this pollen. It has been reported as present along the West Penwith coastline, at Pendeen and Sennen, but not previously inland.

The only mining wasp noted was the very widespread spider-hunting *Anoplius nigerrimus* (Pompilidae), which was found in the pitfall traps at sites 18 (Carnyorth Common) and 31.1 (Trevean Farm). It is associated with dry grassland and scrub.

Two nationally rare and threatened bumble bee species are likely to occur on the West Penwith Moors – *Bombus cryptarum* and *B. magnus* – but are morphologically indistinguishable from the common and widespread *B. lucorum* (J. Scriven, Stirling University, pers. comm.). Bumble bees of the *B. lucorum* group were widely seen across the sample sites during September 2013 and July 2014. Both are associated in Britain with the relatively cooler climate of the west and *B. magnus* is particularly associated with *Calluna* and *Erica* blossom on heathland. Both are known to occur in Cornwall and have been found on comparable moorland on Dartmoor. Investigation of DNA markers is required to ascertain which of the three species is present, and this was not part of the present study.

One ant was found which features in the RDBCIS: *Leptothorax acervorum*. This is a widespread species across Cornwall and Britain and it seems unclear why it was featured – the author admits that it is probably under-recorded. Nest sites are in bare laminated structures in full sun, and include deadwood of various trees and shrubs as well as exposed rock and even air-dried peat (Skinner & Allen, 1996). It was found on sites 18 (Carnyorth Common to Bostraze Bog), 31.2 (Watch Croft), 43 (the Logan Stone area (part of Zennor Hill and Rosemorran), 44 (Foage to Sperris Croft and Boscubben Croft), 51 Baker's Pit Reserve (part of Noon Digery, Trenowin Downs, Tonkins Downs and Gulval Downs) and 53 (Rosewall Hill).

Small black ants found amongst the peat samples were carefully checked for the bog-living *Lasius platythorax* but all appear to be the common and widespread dry ground species *Lasius niger*. These were presumably workers foraging out from nest sites amongst the acid grassland areas close by.

3.3.10 Psocoptera (barkflies)

Barkflies were more noticeable by their unaccountable absence from the samples – as epiphyte browsers they should have been plentiful amongst bushy heather and gorse. But the recent history of uncontrolled wildfires may be expected to have had a dramatic impact on abundance and species richness.

A single species *Enderleinella obsoleta* was found in the pitfall traps on two of the areas of humid heath – Carnyorth Common (site 18.2) and Trevean (site 31.2). This species has been found previously in the area by the author, associated with old

heather on Carn Galva (site 32.3), and clearly still persists across the area. These are the only modern records from the county (Alexander, 2011) and the species is included in the RDBCIS

3.4 Constraints on the totals found

3.4.1 Conditions experienced in September 2013

Although the September 2013 survey work initially experienced late high summer conditions (see section 2.2 above), the weather rapidly deteriorated and the sampling was largely carried out under relatively low temperatures, strong winds and persistent showers. This meant that insect flight activity was severely curtailed and little could be found at blossom for instance. While the pitfall trapping and suction sampling methods were to some extent independent of the weather, sweep-netting was severely curtailed – beating provided some additional samples to supplement the failed sweep-net samples where feasible.

While species which are most readily found late in the year were relatively well-represented in the catches, the important high summer fauna was poorly represented. Aculeate Hymenoptera were the group most noticeably affected, but a high proportion of the Araneae found were immature and unidentifiable as a result. Diptera were also poorly represented due to the season.

Another factor which may have reduced catch sizes is that many wetland species move into ranker vegetation on drier freely-draining soils for overwintering. They should still have been detectable to some extent, but anything retreating deep into tussocky grassland might have been missed. The flea beetle *Chaetocnema confusa* appears to come into this category as it is associated with wet habitats where it is believed to feed on *Carex* species, but was mainly found amongst rank vegetation types on mineral soils during September 2013 - Cox (2007) notes that the adults hibernate in moss and grass tussocks. Some of the rove beetles (Staphylinidae) normally associated with wetland situations were similarly also found on the mineral soils. The autumn is a time when many species also disperse outside of their normal habitat associations to some extent.

3.4.2 Conditions experienced in July 2014

The July sampling periods were generally much more favourable to invertebrate activity and hence productive sampling. While largely warm and sunny, the 8th and 9th both had prolonged periods of torrential rainfall around midday, and this was followed by very strong gusting north-westerly winds which made any net work – including suction sampling – difficult unless good shelter could be found at the study locations. At sites where the use of nets was not feasible on the first visit, a second visit under calmer conditions was carried out. Temperatures varied from the upper 20s on the 2nd down to 15 degrees Centigrade on the 8th.

3.4.3 Other points

The fauna is essentially very similar in composition to that which is known from the coastal slopes of West Penwith – not surprisingly – but lacks the majority of the

warmth-loving specialists which contribute so much to the species-richness of the area. Comparable studies have not however been made and so direct comparison of conservation significance is not feasible. It may be that the West Penwith moors are richer in the acid mire fauna, for instance. No true upland species were found but typical heath and moorland invertebrates are clearly very well represented.

3.5 Overview of ISIS assemblage types

3.5.1 Summary of data

The full species list covering both sampling periods was entered into the ISIS 2010 spreadsheet in order to identify the main assemblage types represented:

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W311	open water in acid mire matrix	2		11	157
F003	scrub-heath & moorland	30	fav	9	
W312	Sphagnum bog	9	fav	8	157
F001	scrub edge	12	fav	7	
W221	litter-rich fluctuating marsh	1		3	139
W211	open water on disturbed mineral sediments	1		3	139
F112	open short sward	5		3	151
F002	rich flower resource	5		2	
F111	bare sand & chalk	8		2	151
W314	reedfen and pools	1		1	157
A212	bark & sapwood decay	3		1	
A211	heartwood decay	1		1	

All SATs scoring more than zero are listed

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	38	126		201	
W3	permanent wet mire	13	157		69	
W2	mineral marsh & open water	12	139		61	
F1	unshaded early successional mosaic	7	151		39	
F3	shaded field & ground layer	5	112		26	
A2	wood decay	2			9	0
A1	arboreal canopy	2			8	
W1	flowing water	0			1	

Rarity scores are shown only for BATS represented by more than 15 species in the assemblage / fauna being analysed

The sampling therefore indicates that the West Penwith Moors are collectively of SSSI quality for the following assemblages:

- **F003 scrub-heath & moorland**
- **F001 scrub edge**
- **W312 Sphagnum bog**

Significantly, these Specific Assemblage Types (SATs) also provide the largest species counts of all of the SATs which have species present on the Moors and which have been coded to particular SATs. The implication is that the whole moorland complex sampled is in favourable conservation condition for invertebrates. The individual moorland parcels are analysed separarely below (section 4) and this demonstrates that Site 21 Woon Gumpus Common is the key area for W312. The F001 and F003 species representation is scattered across the whole network, with no single parcel being of SSSI quality alone. The presence of Pond mud snail has meant that both Sites 20 (Boswens Common) and 21 (Woon Gumpus Common) are individually of SSSI quality for the **W2 mineral marsh and open water BAT**.

3.5.2 Coding issues

The prominence of the **F3 shaded field and ground layer** Broad Assemblage Type (BAT) assemblage is clearly an indication of poor coding within ISIS. Assessors based in the drier east of England often assume that species confined to shade there actually require shade but in reality many of these species merely require a combination of semi-natural conditions and more or less permanently high humidity, conditions which - in the east - are largely confined to woodlands but which – in the generally more humid conditions of western Britain – are more widespread in semi-natural vegetation types generally and especially including open moorland vegetation.

In contrast, the arboreal **A1, A2 and A212** coded species involve species which are associated with trees and shrubs, and therefore may be expected - to some extent – on moorland with scattered scrub. However, even some of these provide difficulties. Gorse and even dwarf shrubs may provide suitable habitat for arboreal canopy species, and this explains the presence here of the money spider *Lepthyphantes obscurus*, for example. Similarly, the weevil *Acalles ptinoides* develops in small dead twigs of either oak or heather. The doli-fly *Medetera saxatilis* has been placed in the A2 wood decay assemblage as it is generally found on tree trunks but it does also occur on rock surfaces – a special category is needed within ISIS for species such as this which are associated with the bare surfaces of bark and rocks. The rove beetle *Zyras haworthi* has been included in the A211 heartwood decay assemblage due to its association with ants, especially the tree-nesting *Lasius fuliginosus*, but it clearly also occurs with ants living in open grasslands. The real oddity found is the weevil *Rhynchites aeneovirens* which is most typically found on oak foliage, but - as Morris (1990) mentions – has been reported elsewhere in Europe from herbaceous *Potentilla* and *Geum*. Its discovery amongst the ungrazed grassland of site 4, rich in *Potentilla erecta*, appears to be the first report from this hostplant in Britain.

3.5.3 Land management influences

One particular influence from the recent past has been management by burning which has made the invertebrate fauna more dynamic, with open ground species being

obliged to exploit early successional vegetation on peat soils when open ground is not available on mineral soils. The humid heath areas sampled were mostly within a few years recovery from fires and provide some of the most extensive open ground habitat available for active hunters – e.g. the spiders *Clubiona diversa* (Clubionidae) and *Cnephalocotes obscurus* (Linyphiidae), the ground beetles (Carabidae) *Olisthopus rotundatus* and *Nebria salina*, and many rove beetles (Staphylinidae) - as the relatively thin vegetation cover allows the exposed surface peat to dry out in the summer. It was very clear that open ground species currently rely heavily on the humid heath areas; it is the open structure that is important rather than soil type. The pattern of burning influences the presence/absence of particular species at any one time, with open-ground species following the burn cycles, and moving on as the vegetation re-thickens. Similarly, coarse vegetation species become later successional species but may equally be only temporarily present on a particular site at a particular time. Burning has turned the fauna of the Moors into a very dynamic fauna, whereas the historic land-uses would have provided more stable conditions. The switch presumably has resulted in the local extinction of many less mobile species. Some less mobile species have become confined to the granite tor areas, where vegetation is more protected from fire, and where old heather, for example, may persist.

While burning continued as grazing was being abandoned, extensive re-establishment of grazing has taken place under HLS agreements which are now in place across much of the West Penwith Moors area. Although burning still takes place it is becoming better targeted and controlled (the fire on Mulfra Hill in 2012 was an exception) and integrated with grazing (A. McDouall, pers. comm.).

3.5.4 West Penwith Moors assemblage types

With one of the impacts of burning replacing grazing being a shift in invertebrate habitat associations, a result has also been that the invertebrate assemblage classification used for ISIS is unreliable. This indicates that the ISIS assemblage classification system needs to be modified to better reflect structural and hydrological factors. The habitat associations for the more interesting species listed in sections 3.2 and 3.3 above are detailed in Appendix 2 and summarised as follows:

MINERAL SOILS
Open granite and bare sandy soils amongst the vegetation
Araneae (Spiders)
Ceratinella scabrosa
Pelecopsis nemoralis
Coleoptera (Beetles)
Aizobius sedi
Meligethes subrugosus
Orthochaetes insignis
Syntomium aeneum
Diptera (Flies)
Campiglossa loewiana

PEAT SOILS
Open structured vegetation, with much bare peat
Araneae (Spiders)
Agyneta cauta
Metopobactrus prominulus
Scotina gracilipes
Walckenaeria alticeps
W atrotibialis
W. vigilax
Coleoptera (Beetles)
Longitarsus holsaticus
Stenus kiesenwetteri
Diptera (Flies)
Campsicnemus alpinus
Euphylidorea meigenii

Limonia dilutior
Tipula melanoceros

Ranker grassland, with heath, gorse, bramble, bracken

Araneae (Spiders)
Cercidia prominens
Ozyptila simplex
Walckenaeria unicornis
Coleoptera (Beetles)
Altica longicollis – wind-pruned heather
Rhynchites aeneovirens
Zyras haworthi
Heteroptera (Bugs)
Deraeocoris scutellaris
Mecomma dispar
Opiliones (Harvestmen)
Nelima gothica
Diplopoda (Millipedes)
Leptoiulus belgicus

Old heather stands around carns, etc

Coleoptera (Beetle)
*Acalles ptinoides***
Psocoptera (Barkflies)
Enderleinella obsoleta

Ranker mire vegetation, with Molinia, etc

Araneae (Spiders)
Agalenatea redii

Open water & marsh

Molluscs (Snails)
Omphiscola glabra
Coleoptera (Beetles)
Tachyporus formosus
Hemiptera (Bugs)
Arctocorisa germari
Coleoptera (Beetles)
Helochares punctatus
Hemiptera (Bugs)
Sigara scotti

This breakdown probably provides the most useful guide to the key species present in the assemblages of the West Penwith Moors. The species are listed by category in parallel to provide a visual comparison of comparative species-richness.

It is instructive to compare the above breakdown with the results from the Lizard heathland survey (Sheppard, 1986). The peat list contains many species also found on the Lizard, but not all. Notable exceptions are the limoniid crane flies *Limonia cf flavipes* and *Euphylidorea meigenii*, but the draft Lizard report indicates that '*Limonia'* species were not fully identified – nomenclatural changes in the intervening period complicate the interpretation of some of the species names. It is also striking that the two more interesting spider species were not detected on the Lizard heaths. In contrast, the mineral soil assemblages are notable for their complete absence from the Lizard samples. It is the presence of these species which particularly characterises the West Penwith Moors and which makes the designation of a West Penwith Moors SSSI so important - from an invertebrate point of view.

3.6 Community Conservation Index (aquatic invertebrates)

In addition to ISIS analysis carried out for the invertebrate assemblages within each survey area across the West Penwith Moors, the Community Conservation Index (CCI) was also used to provide an assessment of the conservation value of the aquatic invertebrate communities. This index is explained in more detail in the Appendix.

A total of 63 aquatic invertebrate taxa were recorded during the survey, many of which were representative of low-nutrient, soft water habitats and included several species described by Boyce (2004) as having affinities with acid mires. The most diverse sites were the three larger ponds present at sites 4, 20 and 21d (see 4.5). Unsurprisingly given the nature of the habitats surveyed, the aquatic Hemiptera and Coleoptera were the two largest groups represented.

The conservation value of the invertebrate assemblages ranged from 'fairly high' (site 37) to 'very high' (site 21b) interest, with the remaining four sites being of 'high' interest. Although several nationally uncommon species were recorded from 21b, it was thought that the value of the site was over-represented by the CCI score and that 'high' interest was a more accurate indication of the conservation value of the invertebrate assemblage present. Although the number of taxa at each of the sites was generally low - a common occurrence in such nutrient-poor habitats - they each contained a relatively high proportion of uncommon species, possibly a reflection of the relative rarity of the acid mire habitat across much of lowland Britain. Of particular note were: the Nationally Scarce water scavenger beetle *Helochares punctatus*, recorded at sites 4, 21a, 21b and 21d; the Nationally Scarce pond mud snail *Omphiscola glabra*, present at sites 20 and 21d; and the County Rare corixid bugs *Sigara scotti* and *Arctocorisa germari*, both recorded at site 37. With the exception of the two sites at which *Omphiscola glabra* occurred, which are of at least regional importance, the assemblages were overall good examples of but not exceptional for the type of habitat represented.

4 SITE BY SITE RESULTS

4.1 Site 2 Chapel Carn Brea

This is a National Trust owned public open space. The site is a low conical hill, rising from 168m to 198m, and facing out into the Atlantic – it is the most exposed of the West Penwith Moors, lying at the south-west end of the sequence.

At the time of the survey the site was under a Higher Level Stewardship (HLS) agreement with management options targeted to specific semi-natural habitats. It has recently had grazing restored, using a small number of Dartmoor ponies; these were present throughout the survey period. The period when the last previous grazing regime was operated here is not known. There has been a recent history of uncontrolled heath fires.

Three sampling locations were identified by Natural England:

- A distinct area of short humid heath on the northern flanks of the hill, east of the main route up to the summit (hand-held GPS map reference of centre of sampling area SW 3873 2819):
    - Identified for pitfall trapping and sweeping/ spot-sweeping
- Gorse, heather and bramble in a matrix of acid grassland on the eastern flanks of the hill (hand-held GPS map reference of centre of sampling area SW 3876 2811):
    - Identified for pitfall trapping, suction sampling and sweeping/ spot-sweeping
- The granite outcrop/carn of the summit area, with a mosaic of acid grassland, mature heather and gorse (hand-held GPS map reference of centre of sampling area SW 3860 2810):
    - Identified for suction sampling and sweeping/ spot-sweeping

The humid heath (see Figure 1) has *Erica tetralix*, *E. cinerea* and *Ulex gallii* co-dominant, with some *Calluna vulgaris* in a matrix of *Molinia* and *Carex*. The vegetation cover was assessed at 95% and digging-in the pitfall traps revealed a stratification of a shallow surface peat over gritty soil.

Figure 1. Humid heath sampling location at site 02.1 Chapel Carn Brea – one pitfall trap visible near centre of image

The coarser area has blocks of *Erica cinerea*, *Ulex gallii* and *Rubus fruticosus* agg in a short grassy mosaic with low tussocky *Holcus lanatus* and patches of *Agrostis curtisi* with frequent *Potentilla erecta* and *Galium saxatile*. The vegetation cover was also about 95% and the soil beneath very gritty. The vegetation was clearly recovering from relatively recent cutting and/or burning.

Figure 2. Grass heath sampling location at site 02.1 Chapel Carn Brea – one pitfall trap visible near centre of image

The summit area has had a long history of disturbance and contains the ruined foundations of an ancient chapel as well as heaped carns, providing rubble habitat rather than granite outcrops. There are areas of *Sedum anglicum* and lichen cover amongst the rubble and a large expanse of close-cropped and trampled grass around the base of the rubble heaps.

Figure 3. Granite carn sampling location at site 02.1 Chapel Carn Brea

The sampling programme was:

Action	First sampling (2013)	Second sampling (2014)
Reconnaissance	3rd September	
Pitfall traps placed	4th September	1st July
Pitfall traps removed	11th September	8th July
Suction sampling	18th September	8th July
Sweep-netting	27th September*	22nd July

*sweep-netting attempted but abandoned due to a very strong gusting easterly gale; beating was also not feasible.

The combined data from the three sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	53	121		66	
F3	shaded field & ground layer	8			10	
F1	unshaded early successional mosaic	7			9	
W2	mineral marsh & open water	2			3	
W3	permanent wet mire	2			3	
A2	wood decay	1			1	0

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W221	litter-rich fluctuating marsh	1		3	
W312	Sphagnum bog	1		1	
F003	scrub-heath & moorland	2		1	
F112	open short sward	1		1	
F002	rich flower resource	1		0	
F111	bare sand & chalk	1		0	

The key feature of Chapel Carn Brea arising from the sampling programme is the unique presence here of a population of the Nationally Scarce Heather flea beetle *Altica longicollis* - two males and two females were found by suction sampling the open grassy heath area during September and more were found by sweep-netting and pitfall-trapping in July; it was also pitfall-trapped in the humid heath area in July. The species was found nowhere else during the sampling. The author believes that this species has a strong association with low heather, stressed either by exposure or browsing – and possibly burns - and this exposed western hill is therefore likely to be a key area of the moors for it. The presence of the uncommon moorland money spider *Walckenaeria atrotibialis* is also notable – a male in the grassy heath pitfalls - as this

was only detected at one other site, 44 Foage Farm to Sperris Croft and Boscubben Croft.

The area of humid heath typically supports a population of the doli fly *Campsicnemus alpinus* and two further mire flies were taken in the grassy heath area: the moorland craneflies *Limonia dilutior* and *Tipula melanoceros.* Chapel Carn Brea is clearly an interesting area for its invertebrates.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Amphipoda		*Architalitroides dorrieni*		
Araneae	Linyphiidae	*Walckenaeria atrotibialis*	2	U
		Gonatium rubens		
		Maso sundevalli		
		Pocadicnemis pumilla		
		Oedothorax fuscus		
		Pelecopsis sp.		
		Monocephalus fuscipes		
		Erigone dentipalpis		
		Erigone atra		
		Agyneta subtilis		
		Stemonyphantes lineatus		
		Lepthyphantes tenuis		
		Lepthyphantes zimmermanni		
	Tetragnathidae	*Pachygnatha degeeri*		
	Aranaeidae	*Araneus diadematus*		
	Lycosidae	*Pardosa palustris*		
		Pardosa nigriceps		
		Trochosa terricola		
	Agelenidae	*Agelena labyrinthica*		
	Liocranidae	*Agroeca proxima*		
	Clubioniidae	*Clubiona neglecta*	2	F11
	Gnaphosidae	*Drassodes cupreus*	2	F21
	Thomisidae	*Xysticus cristatus*		
		Ozyptila trux		
	Salticidae	*Euophrys sp.*		
Auchenorhyncha	Cicadellidae	*Ulopa reticulate*		
Chilopoda	Lithobiidae	*Lithobius forficatus*		
		Lithobius melanopus		
		Lithobius variegatus		
Coleoptera	Apionidae	*Apion atratulum*		
		Apion curtirostre		
		Apion dichroum		
		Apion scutellare	2	F22
	Carabidae	*Abax parallelepipedus*		
		Amara lunicollis	2	F2000

Order	Family	Species Identification	Score	SAT
		Amara ovata		
		Amara similata		
		Bembidion lampros		
		Bradycellus harpalinus		
Coleoptera ctd	Carabidae ctd	*Carabus nemoralis*	2	F21
		Carabus problematicus		
		Carabus violaceus		
		Dyschirius globosus	2	W31
		Leistus rufomarginatus	2	F21
		Loricera pilicornis		
		Nebria salina		
		Notiophilus biguttatus		
		Poecilus versicolor	2	F2000
		Pterostichus melanarius		
		Pterostichus niger		
		Trechus obtusus		
	Chrysomelidae	*Altica longicollis*	2	F22
		Lochmaea suturalis		
		Longitarsus succineus		
		Neocrepidodera ferruginea		
	Curculionidae	*Hypera venusta*		
		Micrelus ericae		
		Sitona lineatus		
		Sitona suturalis		
	Elateridae	*Athous haemorrhoidalis*		
		Dalopius marginatus		
	Geotrupidae	*Anoplotrupes stercorosus*	2	F2200
	Helophoridae	*Cercyon melanocephalus*		
	Hydrophilidae	*Megasternum concinnum*		
	Leiodidae	*Catops chrysomeloides*		
	Scolytinae	*Hylastinus obscurus*	2	F2000
	Staphylinidae	*Othius laeviusculus*	2	F2100
		Othius punctulatus		
		Philonthus albipes	2	F2000
		Philonthus carbonarius		
		Philonthus cognatus		
		Quedius levicollis		
		Quedius molochinus		
		Quedius nigriceps	2	F2100
		Sepedophilus nigripennis		
		Stenus brunnipes		
		Stenus clavicornis		
		Stenus pallipes	4	W2212
		Stenus pusillus		
		Tachinus pallipes		

Order	Family	Species Identification	Score	SAT
		Tachyporus atriceps	2	F21
		Tachyporus chrysomelinus		
		Tachyporus pusillus		
Coleoptera ctd	Staphylinidae ctd	*Tasgius morsitans*	2	F1100
	Tenebrionidae	*Lagria hirta*		
Dermaptera	Forficulidae	*Forficula auricularia*		
Diplopoda	Julidae	*Julus scandinavius*		
	Polydesmidae	*Polydesmus denticulatus*		
Diptera	Anthomyiidae	*Anthomyia liturata*		
		Delia florilega		
		Delia platura		
		Hylemya nigrimana		
		Pegoplata infirma		
	Bibionidae	*Dilophus febrilis*		
	Calliphoridae	*Calliphora vicina*		
	Chloropidae	*Oscinella hortensis*		
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Dolichopus plumipes		
		Medetera saxatilis	2	A2100
	Fanniidae	*Fannia fuscula*		
	Limoniidae	*Limonia dilutior*	2	F2221
	Lonchopteridae	*Lonchoptera lutea*		
	Muscidae	*Coenosia distinguens*	2	I
		Coenosia femoralis		
		Helina reversion		
		Phaonia errans		
	Mycetophilidae	*Mycetophila fungorum/perpallida*		
		Tetragoneura sylvatica		
	Sarcophagidae	*Sarcophaga carnaria*		
		Sarcophaga subvicina		
		Sarcophaga variegata		
	Scathophagidae	*Scathophaga stercoraria*		
	Sciaridae	*Ctenosciara hyalipennis*		
	Sphaeroceridae	*Copromyza nigrina*		
		Copromyza stercoraria		
	Syrphidae	*Eumerus funeralis*		
		Melanostoma mellinum		
	Tipulidae	*Tipula confusa*		
		Tipula melanoceros	2	W31
		Tipula paludosa		
Heteroptera	Lygaeidae	*Drymus sylvaticus*		
		Scolopostethus decoratus		
		Stygnocoris sabulosus		
	Miridae	*Pithanus maerkeli*		

Order	Family	Species Identification	Score	SAT
Hymenoptera	Apidae	*Bombus pascuorum*		
	Formicidae	*Lasius flavus*		
		Lasius niger		
		Myrmica ruginodis		
Hymenoptera ctd	Formicidae ctd	*Myrmica scabrinodis*		
Mollusca		*Cepaea nemoralis*		
Oniscidea	Oniscidae	*Oniscus asellus*		
	Philosciidae	*Philoscia muscorum*		
Opiliones	Nemastomatidae	*Nemastoma bimaculatum*		
	Phalangidae	*Lacinius ephippiatus*		
		Mitopus morio *Mitopus morio var. ericaeus*		
		Oligolophus tridens		
		Paroligolophus agrestis		
		Phalangium opilio		
		Platybunus triangularis		
Orthoptera	Acrididae	*Chorthippus parallelus*		

4.2 Site 4 Bartinney Downs, Tredinney Common and Numphra Common

Tredinney Common (site 4.1) was the focus of the sampling effort within this large site. This is an area of open heath with a mostly south-easterly aspect and sheltered to some extent by higher ground to the north. The central area contains a substantial pit of former china clay workings – this contains small deep hollows and a large shallow depression which were largely water-filled at the time of the survey visits. At the time of the survey the site was not under a management agreement that includes management options targeted to specific semi-natural habitats. The area has clearly not been grazed for many years.

Three sampling locations were identified by Natural England:

- Grassy sward with patchy heather, gorse & bramble
    - Identified for suction sampling and sweeping/ spot-sweeping
- Short humid heath with *Erica tetralix*
    - Identified for pitfall trapping and sweeping/ spot-sweeping
- Pond area in former china clay working with willow scrub, mature heather and gorse
    - Identified for pond netting, sweeping/ spot-sweeping, and suction sampling of scrub/heath.

The grassy heath and scrub (SW 39106 28515) is very rank from lack of management, the vegetation being very dense at ground level.

Figure 4. Grass heath sampling location at site 4.1 Tredinney Common

The humid heath at SW 39260 28686 has 100% vegetation cover, with a tangle of *Erica tetralix, E. cinerea* and *Ulex gallii* in a matrix of *Molinia* and *Eriophorum*, and a very fibrous moist peaty soil with grit beneath.

Figure 5. Humid heath sampling location at site 4.1 Tredinney Common – one pitfall trap visible near centre of image

The water level in the pond was very low at the time of the September visit, following a particularly warm and dry high summer period. The clay banks hold tall and dense stands of *Molinia* tussocks, with tall bushy *Calluna*, *Erica cinerea* and *Ulex gallii*. A few *Salix* bushes are also present. Royal Fern *Osmunda regalis* is a notable feature and there are also patches of *Sphagnum* moss among the *Molinia* tussocks. The clay

workings have created an interesting area that is sheltered from the normal westerly winds.

Figure 6. Pondside vegetation sampling location at site 4.1 Tredinney Common – *Osmunda regalis* clumps on edge with heath

It was evident from marks around the basin that it holds more water in wetter weather but by the beginning of July the water had drawn down considerably such that there were three distinct wetted areas. At the southern end of the basin was the largest body of water, a large, relatively shallow pool (centred at grid ref. SW 3944 2874) with densely vegetated margins that sloped away to deeper, un-vegetated water in the middle of the basin. The substrate was silt overlying a gravel base and a pH of 5.9 and a conductivity of 90µScm were recorded. Marginal vegetation consisted of dense beds of submerged bulbous rush *Juncus bulbosus*, with lesser amounts of shoreweed *Littorella uniflora*, common spike-rush *Eleocharis palustris*, bog pondweed *Potamogeton polygonifolius*, marsh pennywort *Hydrocotyle vulgaris* and a few stands of intermixed *Sphagnum* moss. The southern end of the basin was shaded by an overhanging grey willow *Salix cinerea*. The invertebrate community in the main pool was dominated by large numbers of water boatmen *Notonecta* and Corixinae nymphs, nymphs of the common darter dragonfly *Sympetrum striolatum*, *Hesperocorixa castanea* water bugs and *Hydroporus* beetles (mostly *Hydroporus pubescens*), with large numbers of the common beetle *Agabus bipustulatus* in the margins. Substantial numbers of palmate newts *Lissotriton helveticus* and common frog *Rana temporaria* tadpoles were also present.

Just north of the main pool and separated from it by a low ridge is a smaller hollow filled with dense *Juncus bulbosus*, with occasional, marginal patches of *Hydrocotyle vulgaris*, *Sphagnum* and sharp-flowered rush *Juncus acutiflorus*. The invertebrate community here was dominated by large numbers of *Hydroporus* and *Helophorus* beetles, *Agabus bipustulatus* and *Sympetrum striolatum* nymphs; with palmate newts also present in high densities. Three nymphs of the broad-bodied chaser *Libellula depressa* were found from this area.

Further north of this second pool, an area of currently dry mire extended up the basin, with a small water-filled hollow in its north-west corner. This hollow contained a dense mat of *Sphagnum* with occasional intermixed *J. bulbosus*. As well as large numbers of palmate newts, *Agabus bipustulatus*, *Hesperocorixa castanea*, *Hydroporus* and the pond skater *Gerris gibbifer* were all present in significant numbers. Single specimens of the diving beetle *Agabus nebulosus* and the Nationally Scarce water scavenger beetle *Helochares punctatus* were also found from this hollow.

Site 4, Tredinney Common: top: main pond; centre: small hollow;
bottom: smaller pond

The sampling programme was:

Action	First sampling (2013)	Second sampling (2014)
Reconnaissance	3rd September	
Pitfall traps placed	4th September	1st July
Pond-netting		1st July
Pitfall traps removed	11th September	8th July
Suction sampling	18th September	8th July
Sweep-netting	27th September*	22nd July

*sweep-netting attempted but not possible in the strong easterly gale blowing through the site, even in the clay workings where the wind was being channelled through the valley.

The combined data from the three sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	32	107		42	
W2	mineral marsh & open water	20	119		27	
W3	permanent wet mire	12	156		16	
F1	unshaded early successional mosaic	5			7	
F3	shaded field & ground layer	5			6	
A1	arboreal canopy	3			4	
W1	flowing water	1			1	

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W311	open water in acid mire matrix	1		5	156
W221	litter-rich fluctuating marsh	1		3	119
W312	Sphagnum bog	2		2	156
F112	open short sward	2		1	
W314	reedfen and pools	1		1	156
F003	scrub-heath & moorland	2		1	
F001	scrub edge	1		1	
F111	bare sand & chalk	2		0	
F002	rich flower resource	1		0	

A few of the species found merit comment. The uncommon snake millipede *Leptoiulus belgicus* was found amongst the taller and ranker vegetation of the grassy heath and pondside sampling locations. The grassy heath also contained the uncommon weevils *Caenopsis waltoni* and *Rhynchites aeneovirens*, as well as the rove beetle *Tachyporus pallidus*. As mentioned in 3.3.1, the *Rhynchites aeneovirens*

(now known as *Neocoenorrhinus minutus*) is best known in Britain from oak trees, but an association with herbaceous *Potentilla* and *Geum* has been noted by a French author; this the first time that it has been found on its alternative foodplant *Potentilla erecta* anywhere in Britain. The pools were not found to be of any special interest for aquatic invertebrates. The mire doli fly *Campsicnemus alpinus* was typically abundant in the area of humid heath. This appears to be an area of moderate interest.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Araneae	Theridiidae	*Theridion sp.*		
		Neottiura bimaculata		
		Enoplognatha ovata		
	Linyphiidae	*Walckenaeria unicornis*		
		Walckenaeria cuspidata		
		Gongylidium rufipes		F3100
		Metopobactrus prominulus	2	F2100
		Gonatium rubens		
		Maso sundevalli		
		Oedothorax fuscus		
		Erigone dentipalpis		
		Erigone atra		
		Stemonyphantes lineatus		
		Lepthyphantes obscurus	2	A1100
		Lepthyphantes tenuis		
Araneae ctd	Linyphiidae ctd	*Lepthyphantes zimmermanni*		
		Lepthyphantes mengei		
		Neriene sp.		
	Tetragnathidae	*Tetragnatha extensa*		
		Metellina segmentata		
	Aranaeidae	*Araneus diadematus*		
		Araniella opistographa	2	A1100
		Hypsosinga sp.		
	Lycosidae	*Pardosa nigriceps*		
		Trochosa terricola		
	Mimetidae	*Ero furcata*		
	Liocranidae	*Agroeca proxima*		
	Clubioniidae	*Clubiona trivialis*		
	Gnaphosidae	*Drasyllus/Zelotes sp.*		
	Thomisidae	*Xysticus cristatus*		
		Ozyptila trux		
		Ozyptila atomaria		
Auchenorhyncha	Cicadellidae	*Ulopa reticulata*		
Butterflies	Pieridae	*Colias croceus*		
Chilopoda	Lithobiidae	*Lithobius forficatus*		
		Lithobius variegatus		

Order	Family	Species Identification	Score	SAT
Coleoptera	Apionidae	*Apion atratulum*		
		Apion dichroum		
		Apion scutellare	2	F22
	Attelabidae	*Rhynchites aeneovirens*	2	A11
	Carabidae	*Bembidion quadrimaculatum*		
		Dromius linearis		
		Dromius melanocephalus		
		Dyschirius globosus	2	W31
	Chrysomelidae	*Crepidodera aurea*		
		Lochmaea suturalis		
	Coccinellidae	*Rhyzobius litura*		
		Caenopsis waltoni	2	F0000
		Micrelus ericae		
		Nedyus quadrimaculatus		
		Neliocarus nebulosus	2	F1121
		Rhinoncus pericarpius		
		Sitona striatellus		
	Dryopidae	Dryops luridus		
	Dytiscidae	Acilius sulcatus		
		Agabus bipustulatus		
		Agabus nebulosus		
		Hydroporus erythrocephalus		
		Hydroporus gyllenhalii		
Coleoptera ctd	Dytiscidae ctd	*Hydroporus palustris*		
		Hydroporus pubescens		
		Hygrotus inaequalis		
	Elateridae	*Dalopius marginatus*		
	Gyrinidae	*Gyrinus substriatus*		
	Haliplidae	*Haliplus ruficollis*		
	Helophoridae	*Helochares punctatus*	2	W3121
		Helophorus brevipalpis		
		Helophorus flavipes		
		Helophorus obscurus		
	Hygrobiidae	*Hygrobia hermanni*	2	W21
	Leiodidae	*Agathidium marginatum*		
		Catops fuscus		
	Pselaphinae	*Bryaxis bulbifer*		
	Scirtidae	*Cyphon ochraceus*		
		Cyphon padi	2	W31
	Staphylinidae	*Lesteva punctata*	2	W12
		Platydracus stercorarius	2	F2000
		Sepedophilus nigripennis		
		Stenus aceris		
		Stenus brunnipes		

Order	Family	Species Identification	Score	SAT
		Stenus cicindeloides		
		Stenus flavipes		
		Stenus impressus		
		Stenus ossium		
		Stenus pallipes	4	W2212
		Stenus pusillus		
		Stenus similis		
		Stenus solutus	2	W3141
		Stenus tarsalis		
		Tachyporus pallidus	2	W21
Diplopoda	Julidae	*Cylindroiulus latestriatus*		
		Leptoiulus belgicus	2	F31
	Polydesmidae	*Polydesmus angustus*		
Diptera	Culicidae	*Culex pipiens*		
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Dolichopus brevipennis	2	W31
		Dolichopus plumipes		
		Dolichopus vitripennis	2	W31
	Heleomyzidae	*Heteromyza sp*		
	Hybotidae	*Platypalpus pallidiventris*		
	Muscidae	*Coenosia distinguens*	2	I
		Coenosia tigrina		
		Neomyia cornicina		
	Psychodidae	*Boreoclytocerus ocellaris*		
Diptera ctd	Scathophagidae	*Scathophaga stercoraria*		
	Sepsidae	*Sepsis cynipsea*		
	Sphaeroceridae	*Copromyza stercoraria*		
		Crumomyia fimetaria		
	Tabanidae	*Haematopota pluvialis*		
	Tipulidae	*Tipula paludosa*		
Heteroptera	Anthocoridae	*Anthocoris nemorum*		
		Orius niger		
	Corixidae	*Corixa punctata*		
	Corixidae	*Hesperocorixa castanea*		
	Gerridae	*Gerris gibbifer*	2	W31
	Lygaeidae	*Scolopostethus decoratus*		
		Stygnocoris rusticus	2	F1121
		Stygnocoris sabulosus		
	Miridae	*Stenodema calcarata*		
		Stenodema holsata		
	Nabidae	*Anaptus major*		
		Aptus mirmicoides		
		Nabis ericetorum		
		Nabis rugosus		
	Notonectidae	*Notonecta obliqua*	2	W31

Order	Family	Species Identification	Score	SAT
	Saldidae	Saldula saltatoria		
Hymenoptera	Apidae	*Bombus pascuorum*		
	Formicidae	*Formica fusca*		
		Leptothorax acervorum		
		Myrmica ruginodis		
		Myrmica scabrinodis		
Odonata	Coenagrionidae	*Enallagma cyathigerum*		
		Ischnura elegans		
	Libellulidae	*Libellula depressa*		
		Sympetrum striolatum		
Oniscidea	Oniscidae	*Oniscus asellus*		
	Philosciidae	*Philoscia muscorum*		
Opiliones	Phalangidae	*Lacinius ephippiatus*		
		Mitopus morio		
		Oligolophus tridens		
		Paroligolophus agrestis		
		Platybunus triangularis		
Trichoptera	Limnephilidae	*Limnephilus vittatus*		

4.3 Site 18 Carnyorth Common to Bostraze Bog

The sampling was focused on Carnyorth Common itself. The area is effectively two summit areas with a saddle in between and slopes below on all sides. The western summit of Carn Bean reaches 203m while the eastern Carn Kenidjack reaches 202m.

At the time of the survey the site was under a Higher Level Stewardship (HLS) agreement with management options targeted to specific semi-natural habitats. The area is actively grazed with cattle, although this was only apparent from the relatively fresh dung during the September sampling period.

Four sampling locations were identified by Natural England:

- Sampling location 18.1, west-facing slopes below Carn Bean, with regenerating vegetation after a burn – the burn edge is a 0.5m deep thicket of *Ulex gallii* with heaths
    - Grassy sward, with regenerating gorse and bramble - identified for suction sampling and sweeping/ spot-sweeping
    - Short grassy sward with regenerating gorse - identified for pitfall trapping and sweeping/ spot-sweeping
- Sampling location 18.2, short humid heath with *Erica tetralix* & wet areas with seasonally flooded hollows on the saddle between the two carns
    - Identified for pitfall trapping and sweeping/ spot-sweeping
- Sampling location 18.3, Carn Kenidjack, granite outcrop/carn with grassy areas, mature heather and gorse
    - Identified for suction sampling and sweeping/ spot-sweeping

The short grassy sward of Location 1 (SW 3815 3324) has tussocky fine grasses with re-growing *Ulex gallii, Erica cinerea* and *Rubus fruticosus* agg. The slope is very rocky and the mineral soils are very rocky and mostly shallow as a result. The area suction sampled (SW 3819 3330) is similar but more open and with large clumps of *Potentilla erecta* frequent.

Figure 7. Short grassy sward sampling location at site 18.1 Carnyorth Common – one pitfall trap visible in foreground

Figure 8. Grassy sward suction sampling location at site 18.1 Carnyorth Common

Location 2 (SW3845 3315) has short *Erica tetralix, E. cinerea, Calluna vulgaris* and *Ulex gallii* in a matrix of *Molinia, Carex* and mosses; vegetation cover is 100%. The vegetation lies over deep moist peat.

Figure 9. Humid heath sampling location at site 18.2 Carnyorth Common – one pitfall trap visible in foreground

Location 3 (SW3880 3295) is a large granite carn – Carn Kenidjack - with crevice vegetation of *Sedum anglicum, Galium saxatile* and fine grasses. The carn faces are partly covered by ivy and there is some *Ulex gallii* and *Erica cinerea* around the rock bases.

Figure 10. Granite carn sampling location at site 18.3 Carn Kenidjack. Suction sampling machine and white tray for sorting catch.

The sampling programme was:

Action	First sampling (2013)	Second sampling (2014)
Reconnaissance	3rd September	
Pitfall traps placed	4th September	1st July
Pitfall traps removed	11th September*	8th July
Suction sampling	20th September	11th July
Sweep-netting	27th September*	22nd July

* one trap had been pulled out of the ground by a cow and trampled; sweep-netting attempted but not possible in the strong easterly gale blowing through the site, some beating was possible at the pitfall trap site and in more sheltered areas around the carn.

The combined data from the four sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	37	116		37	
F1	unshaded early successional mosaic	12			12	
W3	permanent wet mire	7			7	
F3	shaded field & ground layer	5			5	
W2	mineral marsh & open water	4			4	
A1	arboreal canopy	2			2	
A2	wood decay	2			2	0

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W221	litter-rich fluctuating marsh	1		3	
W312	Sphagnum bog	2		2	
F112	open short sward	2		1	
F111	bare sand & chalk	2		0	
A212	bark & sapwood decay	2		0	
F003	scrub-heath & moorland	1		0	

This Common was one of the more interesting of the sites, with a large array of the species which characterise the assemblage types as well as two Nationally Scarce weevil species *Acalles ptinoides* and *Aizobius sedi*. Carn Kenidjack produced both of these weevils as well as the bare sandy ground spider *Pelecopsis nemoralis*, the uncommon weevil *Caenopsis waltoni* and the humid heath flea beetle *Chaetocnema confusa* which is presumed to be overwintering here. The humid heath was notable for its mire crane flies *Euphyllidorea meigenii* and *Tipula melanoceros* as well as its

ground beetles *Carabus granulatus* and *Olisthopus rotundatus*. The money spider *Cnephalocotes obscurus* was present on the grassy heath slopes.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Araneae	Linyphiidae	*Gonatium rubens*		
Araneae ctd	Linyphiidae ctd	*Maso sundevalli*		
		Oedothorax fuscus		
		Pelecopsis nemoralis	2	F3100
		Cnephalocotes obscurus	2	F2100
		Gongylidiellum vivum		
		Erigone atra		
		Lepthyphantes obscurus	2	A1100
		Lepthyphantes tenuis		
		Lepthyphantes zimmermanni		
		Lepthyphantes ericaeus		
	Tetragnathidae	*Pachygnatha degeeri*		
	Aranaeidae	*Araneus diadematus*		
		Hypsosinga sp.		
	Lycosidae	*Pardosa pullata*		
		Pardosa nigriceps		
	Clubioniidae	*Clubiona neglecta*	2	F11
	Gnaphosidae	*Drassodes cupreus*	2	F21
	Thomisidae	*Xysticus cristatus*		
		Ozyptila trux		
	Salticidae	*Heliophanus flavipes*		
		Neon reticulatus		
Auchenorhyncha	Cicadellidae	*Ulopa reticulata*		
Coleoptera	Apionidae	*Aizobius sedi*	4	F1111
		Apion atratulum		
		Apion dichroum		
	Byrrhidae	*Byrrhus pilula*		
	Cantharidae	*Rhagonycha fulva*		
	Carabidae	*Bembidion lampros*		
		Bradycellus verbasci		
		Calathus fuscipes		
		Carabus granulatus	2	W21
		Carabus problematicus		
		Dromius melanocephalus		
		Olisthopus rotundatus	2	F11
		Poecilus versicolor	2	F2000
		Pterostichus madidus		
		Trechus obtusus		
	Chrysomelidae	*Apteropeda orbiculata*	2	F2000
		Chaetocnema confusa	2	W31

Order	Family	Species Identification	Score	SAT
		Lochmaea suturalis		
	Coccinellidae	*Coccinella septempunctata*		
	Cryptophagidae	*Ephistemus globulus*		
	Curculionidae	*Acalles ptinoides*	4	A2121
		Caenopsis waltoni	2	F0000
		Hypera venusta		
		Micrelus ericae		
Coleoptera	Curculionidae	*Neliocarus nebulosus*	2	F1121
	Elateridae	*Agriotes pallidulus*		
	Nitidulidae	*Epuraea biguttata*	2	A2121
	Scirtidae	*Cyphon padi*	2	W31
	Staphylinidae	*Euaesthetus bipunctatus*	2	I
		Mycetoporus rufescens	2	F2200
		Philonthus carbonarius		
		Philonthus cognatus		
		Sepedophilus nigripennis		
		Staphylinus erythropterus	2	F2200
		Stenus nitidiusculus		
		Stenus pallipes	4	W2212
		Tachyporus chrysomelinus		
		Tasgius morsitans	2	F1100
	Tenebrionidae	*Lagria hirta*		
Diplopoda	Polydesmidae	*Polydesmus denticulatus*		
Diptera	Agromyzidae	*Cerodontha denticornis*		
	Anthomyiidae	*Anthomyia liturata*		
	Chloropidae	*Cetema simile*		
	Culicidae	*Culex pipiens*		
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Dolichopus plumipes		
		Dolichopus vitripennis	2	W31
	Limoniidae	*Euphylidorea meigenii*	2	W3121
	Lonchopteridae	*Lonchoptera lutea*		
	Muscidae	*Coenosia distinguens*	2	I
		Coenosia femoralis		
		Helina reversio		
	Opomyzidae	*Opomyza germinationis*		
	Sarcophagidae	*Sarcophaga carnaria*		
	Scathophagidae	*Scathophaga stercoraria*		
	Sepsidae	*Sepsis cynipsea*		
	Sphaeroceridae	*Lotophila atra*		
	Syrphidae	*Eumerus funeralis*		
		Melanostoma mellinum		
	Tipulidae	*Tipula melanoceros*	2	W31
		Tipula paludosa		

Order	Family	Species Identification	Score	SAT
Heteroptera	Lygaeidae	*Scolopostethus decoratus*		
		Stygnocoris sabulosus		
	Miridae	*Amblytylus nasutus*		
		Liocoris tripustulatus		
	Nabidae	*Nabis rugosus*		
	Tingidae	*Acalypta parvula*		
		Derephysia foliacea	2	U
Hymenoptera	Formicidae	*Lasius niger*		
		Leptothorax acervorum		
		Myrmica ruginodis		
	Pompilidae	*Anoplius nigerrimus*		
Mollusca		*Oxychilus alliarius*		
Oniscidea	Oniscidae	*Oniscus asellus*		
	Philosciidae	*Philoscia muscorum*		
	Porcellionidae	*Porcellio scaber*		
	Trichoniscidae	*Trichoniscus pusillus*		
Opiliones	Leiobunidae	*Leiobunum blackwalli*		
	Phalangidae	*Lacinius ephippiatus*		
		Mitopus morio *Mitopus morio var. ericaeus*		
		Paroligolophus agrestis		
		Phalangium opilio		
		Platybunus triangularis		
Orthoptera	Acrididae	*Chorthippus parallelus*		
Psocoptera	Caeciliusidae	*Enderleinella obsoleta*		
Psylloidea	Aphalaridae	*Strophingia ericae*		
Thysanura		*Dilta littoralis*		

4.4 Site 20 Dry Carn and Boswens Common West

Sampling site 20 comprises two adjoining enclosures of Boswens Common West. The enclosures are dominated by dwarf shrub heath; aspect is north and north-west, the southern enclosure rising to 224m. At the time of the survey the site was under a Higher Level Stewardship (HLS) agreement with management options targeted to specific semi-natural habitats.

Three sampling locations were identified by Natural England:

- Sampling location 20.1 (southern enclosure), grazed by cattle (and rabbits):
    - Short grassy sward with patchy mature heather and gorse - identified for pitfall trapping, suction sampling and sweeping/ spot-sweeping
    - Pond - identified for pond netting
- Sampling location 20.2 (northern enclosure), grazed by ponies (and rabbits)
    - Short grassy sward with patchy mature heather and gorse - identified for pitfall trapping, suction sampling and sweeping/ spot-sweeping

The location in the southern enclosure (SW 4014 3268) has blocks of mature *Ulex gallii* with *Erica cinerea, Calluna vulgaris* and *Rubus* in a mosaic of relatively short and lightly grazed acid grassland with *Potentilla erecta* locally frequent and occasional *Succisa pratensis*. *Calluna* is also regenerating within the open grassland. Vegetation cover is 100% over a humid organic rich mineral soil.

Figure 11. Grass heath sampling location at site 20.1 Boswens Common West, (southern enclosure) – one pitfall trap visible in foreground

The sampling location within the northern enclosure (SW 3981 3308) has blocks of *Erica tetralix, E. cinerea, Ulex gallii* and *Calluna vulgaris* in a matrix of very close-cropped *Molinia* and *Carex* over a moist peaty soil.

Figure 12. Grass heath sampling location at site 20.2 Boswens Common West, (northern enclosure) – one pitfall trap visible in foreground

Site 20.1 has a small pond (SW 4019 3279) used as a drinking point by grazing cattle. The pond was in a shallow basin and is likely to dry out completely during hot summers. A dense carpet of plicate sweet-grass *Glyceria plicata* surrounded most of the pond's edge, with occasional intermixed bog pimpernel *Anagallis tenella* and round-leaved crowfoot *Ranunculus omiophyllus*. There were occasional stands of *G. plicata* and *Potamogeton polygonifolius*, along with a single plant of un-branched bur-reed *Sparganium emersum* in the central basin, although most of this was un-vegetated with a substrate of silt overlying gravel. A conductivity of 50µScm and a pH of 6.4 were recorded.

The aquatic invertebrate community was dominated by large numbers of water boatman (*Notonecta* and Corixinae) nymphs and *Helophorus* beetles, with substantial rafts of the whirligig beetle *Gyrinus substriatus* also present. The Nationally Scarce pond mud snail *Omphiscola glabra* was present in healthy numbers, a population not previously recorded at this location. The presence of other species such as the dwarf pond snail *Galba truncatula* and the limnephilid caddis *Limnephilus vittatus* reinforced the assumption that much of the pond basin is potentially ephemeral during prolonged dry periods of weather.

The sampling programme was:

Action	**First sampling (2013)**	**Second sampling (2014)**
Reconnaissance	3rd September	
Pond netting		1st & 2nd July
Pitfall traps placed	4th September	2nd July
Pitfall traps removed	11th September*	9th July**
Suction sampling	18th September (southern)	22nd July
Sweep-netting	27th September*	22nd July

* most of traps in the northern enclosure had been pulled out of the ground by the ponies and trampled, leaving just two in situ; in contrast just one had been damaged by the cattle in the southern enclosure; sweep-netting attempted but not possible in the strong easterly gale blowing across the site; some beating was possible in the southern enclosure.

** four traps destroyed by cattle

Location 2 proved to be the least productive of all of the sampling locations in September 2013 and was not continued in July 2014.

The combined data from the three sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	40	115		42	
W2	mineral marsh & open water	20	195	fav	21	
W3	permanent wet mire	8			8	
F3	shaded field & ground layer	5			5	
A1	arboreal canopy	3			3	
F1	unshaded early successional mosaic	1			1	
A2	wood decay	1			1	0

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W221	litter-rich fluctuating marsh	1		3	195
W312	Sphagnum bog	1		1	
F003	scrub-heath & moorland	3		1	
A211	heartwood decay	1		1	
F112	open short sward	1		1	

It should be noted that the bulk of the species were found in the southern enclosure (sample site 20.1) as the heavy pony grazing in 20.2 was both severely reducing the vegetation structure and the ponies vandalised the pitfall trapping.

The southern enclosure (20.1), with its light grazing regime maintaining a diverse vegetation structure, produced the main interest here. The ponds are of especial note for the presence of a population of Pond Mud Snail *Omphiscola glabra* – the presence of this species alone shifts the ISIS assessment into 'favourable conservation status'. The Nationally Scarce ant-associated rove beetle *Zyras haworthi* is a feature of interest in the grass heath.The snake millipede *Leptoiulus belgicus* and the rove beetle *Tachyporus pallidus* are both typical species of the mineral soil vegetation found on the West Penwith Moors and the light grazing regime has enabled the tormentil weevil *Anthonomus brunnipennis* to become established – it needs large clumps of flowering plants. Additionally this was the only site to produce the uncommon harvestman *Anelasmocephalus cambridgei.*

The only feature of the northern enclosure (20.2) worthy of any comment at all was the presence of the typical mire doli-fly *Campsicnemus alpinus*, although in low numbers compared to other sites. The larvae develop in the moist peat and so the species is less affected by the pony grazing.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Amphipoda		*Architalitroides dorrieni*		
Araneae	Linyphiidae	*Ceratinella brevipes*		
		Walckenaeria acuminata		
		Oedothorax fuscus		
		Erigone dentipalpis		
		Erigone atra		
		Bathyphantes gracilis		
		Lepthyphantes tenuis		
		Lepthyphantes zimmermanni		
		Lepthyphantes ericaeus		
	Tetragnathidae	*Pachygnatha degeeri*		
	Aranaeidae	*Araneus diadematus*		
		Hypsosinga sp.		
	Lycosidae	*Pardosa nigriceps*		
		Alopecosa pulverulenta		
		Trochosa terricola		
	Clubioniidae	*Clubiona recluse*		
	Thomisidae	*Ozyptila atomaria*		
Coleoptera	Apionidae	*Apion atratulum*		
		Apion haematodes		
		Apion scutellare	2	F22
	Carabidae	*Amara lunicollis*	2	F2000
		Carabus problematicus		
		Dyschirius globosus	2	W31
		Nebria salina		
		Pterostichus strenuus		
		Trechus obtusus		
	Chrysomelidae	*Lochmaea suturalis*		
Coleoptera ctd	Chrysomelidae	*Neocrepidodera ferruginea*		
	Cryptophagidae	*Ephistemus globulus*		
	Curculionidae	*Anthonomus brunnipennis*	2	F2000
		Hypera venusta		
		Micrelus ericae		
		Sitona lepidus		
		Sitona striatellus		
	Dytiscidae	*Agabus bipustulatus*		
		Agabus nebulosus		
		Dytiscus marginalis		
		Hydroporus pubescens		
		Hydroporus tessellatus		
		Hygrotus inaequalis		
		Hyphydrus ovatus		
		Laccophilus minutus		
	Gyrinidae	*Gyrinus substriatus*		

Order	Family	Species Identification	Score	SAT
	Haliplidae	*Haliplus ruficollis*		
	Helophoridae	*Helophorus aequalis*		
		Helophorus brevipalpis		
		Helophorus flavipes		
		Helophorus obscurus		
	Hydrophilidae	*Megasternum concinnum*		
	Hygrobiidae	*Hygrobia hermanni*	2	W21
	Nitidulidae	*Meligethes obscurus*		
	Staphylinidae	*Philonthus tenuicornis*	2	F2100
		Quedius levicollis		
		Quedius molochinus		
		Staphylinus erythropterus	2	F2200
		Stenus brunnipes		
		Stenus pallipes	4	W2212
		Tachyporus chrysomelinus		
		Tachyporus pallidus	2	W21
		Zyras haworthi	2	A2111
Diplopoda	Julidae	*Cylindroiulus punctatus*		
		Julus scandinavius		
		Leptoiulus belgicus	2	F31
		Ommatoiulus sabulosus		
Diptera	Anthomyiidae	*Delia echinata*		
		Hylemya variata		
	Anthomyzidae	*Anthomyza elbergi*		
	Bibionidae	*Dilophus febrilis*		
	Chloropidae	*Cetema simile*		
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Chrysotus gramineus		
Diptera ctd	Dolichopodidae	*Dolichopus vitripennis*	2	W31
		Hercostomus nigripennis	2	F2100
	Ephydridae	*Hydrellia sp. (maura group)*		
	Lonchopteridae	*Lonchoptera lutea*		
	Muscidae	*Coenosia femoralis*		
		Coenosia pedella	2	I
		Neomyia cornicina		
		Phaonia incana		
	Mycetophilidae	*Anatella sp*		
	Opomyzidae	*Opomyza germinationis*		
	Opomyzidae	*Opomyza petrei*		
	Sarcophagidae	*Sarcophaga carnaria*		
	Scathophagidae	*Scathophaga stercoraria*		
	Sciaridae	*Corynoptera uncata*		
	Sphaeroceridae	*Copromyza nigrina*		
		Lotophila atra		
	Syrphidae	*Eristalis horticola*		

Order	Family	Species Identification	Score	SAT
		Eumerus funeralis		
		Syritta pipiens		
	Tipulidae	*Tipula paludosa*		
	Anthocoridae	*Anthocoris nemorum*		
	Corixidae	*Corixa punctata*		
		Sigara nigrolineata		
	Hydrometridae	*Hydrometra stagnorum*		
	Lygaeidae	*Drymus sylvaticus*		
		Scolopostethus decoratus		
		Stygnocoris sabulosus		
	Miridae	*Adelphocoris lineolatus*		
		Orthotylus ericetorum		
		Pithanus maerkeli		
	Nabidae	*Nabis ericetorum*		
	Notonectidae	*Notonecta obliqua*	2	W31
	Tingidae	*Acalypta parvula*		
Hirudinea	Glossiphoniidae	*Helobdella stagnalis*		
Hymenoptera	Formicidae	*Myrmica ruginodis*		
		Myrmica scabrinodis		
Mollusca	Lymnaeidae	*Galba truncatula*	16	W2
		Omphiscola glabra		
Moths	Arctiidae	*Orgyia antiqua*		
Oniscidea	Oniscidae	*Oniscus asellus*		
	Philosciidae	*Philoscia muscorum*		
Opiliones	Leiobunidae	*Dicranopalpus ramosus*	2	A1100
		Leiobunum blackwalli		
	Phalangidae	*Lacinius ephippiatus*		
		Mitopus morio var. ericaeus		
Opiliones	Phalangidae	Paroligolophus agrestis		
Opiliones	Trogulidae	Anelasmocephalus cambridgei	2	F21
Thysanura		Dilta littoralis		
Trichoptera	Limnephilidae	Limnephilus vittatus		

4.5 Site 21 Woon Gumpus Common

Woon Gumpus Common is a relatively low lying area of moorland, forming a shallow bowl from about 165 – 184m, and draining northwards. At the time of the survey the site was not under a management agreement that includes management options targeted to specific semi-natural habitats. The area appears unmanaged.

Five sampling locations were identified by Natural England for September 2013:

- Mire with *Molinia*
    - Identified for pitfall trapping and sweeping/ spot-sweeping
- Pond

    - Identified for pond-netting
- Pond with tussocky *Molinia* surrounds
    - Identified for pond-netting
- Short humid heath with *Erica tetralix* and *Molinia*
    - Identified for pitfall trapping and sweeping/ spot-sweeping
- Mire with tussocky *Molinia* and willow scrub
    - Identified for sweeping/ spot-sweeping and possibly pond-netting

A sixth site was added for July 2014 as a replacement for site 20.2:

- Diverse area of seasonally flooded humid heath with *Sphagnum* hollows.

The mire with *Molinia* (SW3963 3352) forms part of a track-way which crosses the Common and appears to have resulted from compaction where the track crosses the main drainage line. The precise path of the track has tended to move north and south according to the condition of the crossing point, creating a strip of notably species-poor mire vegetation. Vegetation cover is 100% and includes a few *Sphagnum*-filled vehicle ruts amongst a mix of short and taller *Molinia*. There is also some patchy *Juncus effusus* and a thin scatter of *Erica tetralix*. The soils are deep wet peat. This sampling location lies within a very extensive area of humid heath.

Figure 13. Molinia mire sampling location at site 21.1 Woon Gumpus Common

The area of short humid heath (SW 3978 3359) is relatively low-lying and appears to have water runnels in some seasons. The cover is again 100%, with *Erica cinerea*, *E tetralix*, *Ulex gallii* and *Calluna* in a matrix of low *Molinia*. The soil is a moist deep peat with small rocks below.

Figure 14. Humid heath sampling location at site 21.1 Woon Gumpus Common – one pitfall trap visible lower left centre

The willow scrub mire (SW 3980 3334) lies along the upper section of the central drainage line and is much more diverse than the lower track mire. The vegetation forms a complex area of tall *Molinia* with *Eriophorum*, *Erica tetralix*, and *Juncus effusus*; *Succisa* is abundant amongst the tall tussocky *Molinia*. Shelter is also relatively good due to the landform, the taller vegetation, and the occasional *Salix* bushes along the main drainage line. The area would benefit from some opening up by cattle.

Figure 15. Molinia mire with Salix sampling location at site 21.1 Woon Gumpus Common

The diverse mire area was selected for its flower-rich humid heath and for the series of sunken pits filled by *Sphagnum* (SW39787 33311). It lies on the west side of the willow scrub mire. The open-structured humid heath was notable for the frequency of flowering bog asphodel *Narthecium ossifragum* amongst cotton-grass *Eriophorum*, *Molinia* and low dwarf shrubs. An orchid species – heath spotted *Dactylorhiza maculata*? – had flowered profusely earlier in the season. The wet hollows contained water-logged *Sphagnum* and marsh St.John's-wort *Hypericum elodes*, with sundew *Drosera rotundifolia* and a *Potamogeton* sp.

Figure 16. Diverse mire sampling location at site 21.1 Woon Gumpus Common

Site 21, Woon Gumpus Common: top to bottom: 21a mire; 21b mire, hollow 1; 21b, hollow 2; 21b hollow 3; 21c dry pond; 21d pond

Four areas of potential aquatic habitat were identified across Woon Gumpus Common. Area 21a consisted of 'mire with *Molinia caerulea*' centred at SW 3965 3353. This was an elongated hollow beside the track at this location in which grew soft rush *Juncus effusus*, creeping bent *Agrostis stolonifera* and bog pimpernel. Most of the hollow was damp in early July, with only a few small, very shallow puddles, containing *Dicranum* moss that were sampled with a strainer. Large numbers of *Helophorus* beetles were collected from this area, along with smaller numbers of other aquatic Coleoptera species, including *Dytiscus semisulcatus* and the Nationally Scarce *Helochares punctatus*.

Area 21b was an area of 'mire with tussocky *Molinia caerulea* and willow scrub' that had developed in a depression along which water drained from higher ground to the east westwards into a shallow basin containing several small channels and hollows. Most of these hollows were damp with no standing water in early July. Further to the south was a low-lying area containing several hollows filled with water-logged *Sphagnum* which were sampled using both the net and strainer. No open water was visible so sampling consisted of pushing down the moss and netting the water as it filled the resultant hole. Three of the largest hollows, containing the best diversity of flora were sampled, with one minute of sampling in each. The first was located at SW 39790 33307 and contained a dense carpet of *Sphagnum* with intermixed cotton-grass *Eriophorum sp*. and marsh St. John's-wort *Hypericum elodes*. Purple moor-grass *Molinia caerulea*, soft rush *Juncus effusus*, bog asphodel *Narthecium ossifragum* and star sedge *Carex echinata* grew around the edge of this hollow. A conductivity of 30µScm and a pH of 4.6 were recorded at this location. The second hollow was located at SW39783 33304 and also contained dense *Sphagnum*, with intermixed *Hypericum elodes, Juncus bulbosus, Potamogeton polygonifolius*, and occasional sundews *Drosera sp*.; a thin layer of water was present on top of the vegetation. *Juncus effusus, Molinia, Narthecium* and *Carex echinata* grew around the edges of the hollow. The final hollow was located at SW 34782 33294 and again consisted of dense *Sphagnum* with intermixed *H. elodes, J. bulbosus* and *Eriophorum*. Hollows 1 and 3 contained few invertebrates, mostly just the diving beetle *Agabus affinis*; most of the invertebrates were collected from the wetter hollow 2, where the community was dominated by large numbers of *Helophorus* and *Hydroporus* beetles and *Agabus affinis*, as well as a few specimens of the Nationally Scarce *Helochares punctatus*.

Area 21c was a 'pond with tussocky *Molinia caerulea* around,' a small basin fed by water draining off higher ground to the east located at SW 4000 3339. At the time of the survey visit the basin was dry with damp peat present at the lowest point, no aquatic invertebrates were present. A carpet of *J. bulbosus*, with occasional intermixed small sweet-grass *Glyceria declinata, J. effusus* and *Hydrocotyle* covered part of the basin, the remainder was bare peat.

Area 21d was a pond in a shallow basin on the eastern boundary of Woon Gumpus Common at SW 3987 3361. The pond was relatively large and significantly less oligotrophic in comparison to most of the other habitats surveyed, with a conductivity of 280µScm and a pH of 6.4 recorded. The substrate consisted of deep accumulations of peat and silt overlying a gravel and sand base with dark, turbid water, 40 to 50cm deep in the centre of the basin. The central basin of mostly un-vegetated water was surrounded by dense mats of floating sweet-grass *Glyceria fluitans*, with occasional patches of common duckweed *Lemna minor, Potamogeton polygonifolius* and

Sparganium emersum. The aquatic invertebrate community was the most diverse recorded during the survey and dominated by large populations of *Helophorus* and *Haliplus ruficollis* beetles, with slightly lesser numbers of *Hydroporus pubescens*. Species of note included the Nationally Scarce *Helochares punctatus* and pond mud snail *Omphiscola glabra*, the latter a population first discovered by Harmer in 2007 during a previous invertebrate survey of the same pond. Note the presence of an introduced physid snail species tentatively identified as *Physella heterostropha* using shell characteristics. This is not a reliable identification due to the degree of variation that can occur in the shell of members of this group and at least two other introduced species (*P. acuta* and *P. gyrina*) are believed to occur across Britain (Kerney, 1999). Palmate newts and common frog adults and tadpoles were present in large numbers.

The sampling programme was:

Action	**First sampling (2013)**	**Second sampling (2014)**
Reconnaissance	3rd September	
Pitfall traps placed	4th September	1st July
Pond netting		1st July
Pitfall traps removed	11th September	8th July*
Suction sampling		10th July
Sweep-netting	11th September	22nd July

*The *Molinia* mire trap run had lost four traps from human interference

The combined data from the three sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
W3	permanent wet mire	27	160		50	
F2	grassland & scrub matrix	25	120		47	
W2	mineral marsh & open water	21	151	fav	39	
F3	shaded field & ground layer	3			6	
F1	unshaded early successional mosaic	1			2	
A1	arboreal canopy	1			2	
A2	wood decay	1			2	0

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W312	Sphagnum bog	9	fav	8	160
W311	open water in acid mire matrix	1		5	160
W221	litter-rich fluctuating marsh	1		3	151
F003	scrub-heath & moorland	3		1	
F002	rich flower resource	1		0	

The Woon Gumpus Common samples contain the richest of the peat soil faunas detected as well as the important population of the Pond Mud Snail *Omphiscola glabra* around the pond on the eastern edge of the Common.

The diverse mire was the outstanding feature of this site with its rich *Sphagnum* bog fauna, of 'favourable conservation status' in its own right. The only known Cornish locality for the nationally rare rove beetle *Stenus kiesenwetteri* is a notable feature, but the area also had many other uncommon mire species including the reed beetle *Plateumaris discolor*, the rove beetles *Gymnusa brevicollis* and *Stenus lustrator*, and the crane fly *Molophilus occultus*. The doli fly *Campsicnemus alpinus* was abundant at the humid heath location, while the *Molinia* mire locations contained the spiders *Agalenatea redii*, *Drassodes cupreus* and *Pirata piraticus* as well as the crane flies *Euphyllidorea meigenii* and *Tipula melanoceros*. It was also the only detected site for the rush bug *Cyrtorhinus caricis*.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Araneae	Theridiidae	*Robertus lividus*		
	Linyphiidae	*Metopobactrus prominulus*	2	F2100
		Maso sundevalli		
		Pocadicnemis pumilla		
		Oedothorax fuscus		
		Lophomma punctatum	2	W31
		Erigone dentipalpis		
		Erigone atra		
		Agyneta subtilis		
		Saaristoa abnormis		
		Bathyphantes gracilis		
		Lepthyphantes tenuis		
		Lepthyphantes zimmermanni		
		Neriene sp.		
	Tetragnathidae	*Tetragnatha extensa*		
		Pachygnatha clercki		
		Pachygnatha degeeri		
		Metellina merianae	2	A21
	Aranaeidae	*Araneus diadematus*		
Araneae ctd	Aranaeidae ctd	*Araneus quadratus*		
		Agalenatea redii	2	F22
		Hypsosinga sp.		
	Lycosidae	*Pardosa pullata*		
		Pardosa nigriceps		
		Trochosa terricola		
		Arctosa leopardus	2	W31
		Pirata piraticus	2	W31
	Agelenidae	*Agelena labyrinthica*		
	Clubioniidae	*Clubiona trivialis*		

Order	Family	Species Identification	Score	SAT
	Gnaphosidae	*Drassodes cupreus*	2	F21
	Zoridae	*Zora spinimana*		
	Thomisidae	*Xysticus cristatus*		
		Ozyptila trux		
Auchenorhyncha	Cercopidae	*Neophilaenus lineatus*		
	Delphacidae	*Conomelus anceps*		
Chilopoda	Lithobiidae	*Lithobius forficatus*		
		Lithobius microps		
Cladocera	Daphnidae	*Daphnia pulex*		
Coleoptera	Apionidae	*Apion scutellare*	2	F22
	Cantharidae	*Cantharis pallida*	2	F21
	Carabidae	*Agonum micans*	2	W21
		Bembidion lampros		
		Dyschirius globosus	2	W31
		Loricera pilicornis		
		Poecilus versicolor	2	F2000
		Pterostichus diligens		
		Pterostichus minor		
		Pterostichus niger		
		Pterostichus nigrita s lato		
		Pterostichus rhaeticus		
	Chrysomelidae	*Chaetocnema confusa*	2	W31
		Lochmaea suturalis		
		Longitarsus holsaticus	2	F2111
		Plateumaris discolor	2	W31
	Coccinellidae	*Coccinella septempunctata*		
	Curculionidae	*Graptus triguttatus*	2	F2100
		Micrelus ericae		
		Sitona lepidus		
	Dytiscidae	*Agabus affinis*	2	W3121
		Agabus bipustulatus		
		Colymbetes fuscus		
		Dytiscus semisulcatus	2	W31
		Hydroporus erythrocephalus		
Coleoptera ctd	Dytiscidae ctd	*Hydroporus gyllenhalii*		
		Hydroporus obscurus	2	W3121
		Hydroporus pubescens		
		Hydroporus tessellatus		
		Hygrotus inaequalis		
		Ilybius montanus		
		Noterus clavicornis		
	Elateridae	*Actenicerus sjaelandicus*	2	W31
	Gyrinidae	*Gyrinus substriatus*		
	Haliplidae	*Haliplus ruficollis*		

Order	Family	Species Identification	Score	SAT
	Helophoridae	*Anacaena globulus*		
		Anacaena limbata		
		Cercyon haemorrhoidalis		
		Coelostoma orbiculare	2	W31
		Enochrus fuscipennis	2	W3121
		Helochares punctatus	2	W3121
		Helophorus aequalis		
		Helophorus brevipalpis		
		Helophorus flavipes		
		Helophorus grandis		
		Helophorus obscurus		
	Hydrophilidae	*Chaetarthria simillima*		
	Hygrobiidae	*Hygrobia hermanni*	2	W21
	Scirtidae	*Cyphon ochraceus*		
	Staphylinidae	*Anotylus rugosus*		
		Gymnusa brevicollis	2	W3121
		Lathrobium terminatum		
		Philonthus cognatus		
		Staphylinus erythropterus	2	F2200
		Stenus flavipes		
		Stenus impressus		
		Stenus kiesenwetteri	4	W3121
		Stenus lustrator	4	W31
		Stenus pallipes	4	W2212
		Tachyporus chrysomelinus		
	Tenebrionidae	*Lagria hirta*		
Diplopoda	Julidae	*Cylindroiulus britannicus*		
		Julus scandinavius		
		Ommatoiulus sabulosus		
	Polydesmidae	*Polydesmus denticulatus*		
Diptera	Agromyzidae	*Cerodontha capitata*		
	Anthomyiidae	*Anthomyia liturata*		
		Delia florilega		
		Hylemya variata		
Diptera ctd	Anthomyiidae	*Pegoplata infirma*		
		Anthomyza elbergi		
		Anthomyza gracilis		
	Bibionidae	*Dilophus febrilis*		
	Chironomidae	*indet.*		
	Chloropidae	*Cetema sp*		
		Oscinella hortensis		
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Campsicnemus loripes		
		Campsicnemus scambus		

Order	Family	Species Identification	Score	SAT
		Chrysotus gramineus		
		Diaphorus nigricans	2	W31
		Dolichopus atratus	2	W3121
		Dolichopus brevipennis	2	W31
		Dolichopus plumipes		
		Dolichopus simplex		
		Dolichopus ungulatus		
		Dolichopus vitripennis	2	W31
		Poecilobothrus nobilitatus		
	Drosophilidae	*Scaptomyza pallida*		
	Ephydridae	*Hydrellia maura*		
		Notiphila riparia		
	Limoniidae	*Dicranophragma nemorale*		
		Euphylidorea meigenii	2	W3121
		Molophilus occultus	2	W31
		Phylidorea fulvonervosa		
		Pilaria discicollis		
	Muscidae	*Coenosia distinguens*	2	I
		Helina reversio		
		Neomyia cornicina		
	Mycetophilidae	*Exechia sp.*		
	Pipunculidae	*Verrallia aucta*		
	Psychodidae	*Boreoclytocerus ocellaris*		
	Scathophagidae	*Scathophaga stercoraria*		
	Sciaridae	*Corynoptera uncata*		
	Sciomyzidae	*Tetanocera elata*		
	Sphaeroceridae	*Copromyza nigrina*		
	Syrphidae	*Eristalis nemorum*		
		Eristalis pertinax		
		Helophilus pendulus		
		Melanogaster hirtella		
		Melanostoma mellinum		
		Platycheirus clypeatus		
		Platycheirus granditarsus		
		Sericomyia silentis		
		Syritta pipiens		
	Tabanidae	*Hybomitra distinguenda*		
	Tachinidae	*Campylocheta inepta*		
		Exorista larvarum		
	Tipulidae	*Prionocera turcica*	2	W31
		Tipula confusa		
		Tipula fulvipennis		
		Tipula melanoceros	2	W31
		Tipula oleracea		

Order	Family	Species Identification	Score	SAT
		Tipula paludosa		
Heteroptera	Corixidae	*Corixa punctata*		
		Hesperocorixa castanea		
		Sigara distincta		
		Sigara nigrolineata		
	Lygaeidae	*Drymus sylvaticus*		
		Kleidocerys truncatulus		
		Macrodema micropterum		
	Miridae	*Amblytylus nasutus*		
		Cyrtorhinus caricis		
		Leptopterna ferrugata		
		Pithanus maerkeli		
		Stenodema holsata		
		Stenodema laevigata		
		Trigonotylus ruficornis		
	Nabidae	*Nabis limbatus*		
	Notonectidae	*Notonecta obliqua*	2	W31
	Saldidae	*Saldula saltatoria*		
		Saldula saltatoria marginella		
Hirudinea	Glossiphoniidae	*Helobdella stagnalis*		
		Theromyzon tessulatum		
Hymenoptera	Apidae	*Bombus pascuorum*		
	Formicidae	*Lasius niger*		
Mollusca	Lymnaeidae	*Omphiscola glabra*	16	W2
		Radix baltica		
	Physidae	*Physella heterostropha?*		
	Sphaeriidae	*Pisidium casertanum*		
Moths	Arctiidae	*Orgyia antiqua*		
	Saturniidae	*Saturnia pavonia*		
Odonata	Aeshnidae	*Aeshna cyanea*		
		Anax imperator		
	Coenagrionidae	*Coenagrion puella*		
		Enallagma cyathigerum		
		Ischnura elegans		
Odonata ctd	Coenagrionidae	*Pyrrhosoma nymphula*		
	Libellulidae	*Libellula depressa*		
		Sympetrum striolatum		
Oniscidea	Oniscidae	*Oniscus asellus*		
	Trichonisciidae	*Trichoniscus pygmaeus*		
Opiliones	Leiobunidae	*Leiobunum blackwalli*		
	Phalangidae	*Lacinius ephippiatus*		
		Mitopus morio		
		Oligolophus tridens		
		Paroligolophus agrestis		

Order	Family	Species Identification	Score	SAT
		Phalangium opilio		
		Platybunus triangularis		
Orthoptera	Acrididae	*Chorthippus parallelus*		
	Tetrigidae	*Tetrix undulata*		
Trichoptera	Limnephilidae	*Limnephilus vittatus*		

4.6 Site 31 Watch Croft, Trevean, White Downs and Bosullow Common

The roughlands of this site form part of a much larger area spreading eastwards to site 32 (Carn Galva). The area is mostly rocky moorland rising to 252m at Watch Croft, but includes areas of humid heath along its southern flanks. Much is owned by the National Trust and sampling location 1 lies within an area of tenanted farmland that is actively managed as a nature reserve.

Five sampling locations were identified by Natural England:

- Sampling location 31.1
    - grassy sward 'glades' in patchy mature gorse - identified for pitfall trapping, sweeping/ spot sweeping & suction sampling
- Sampling location 31.2
    - Sheltered grassy 'ride' between vegetated stone hedges - identified for sweeping / spot sweeping and suction sampling
    - Short 'grey' humid heath with *Erica tetralix* - identified for pitfall trapping & sweeping/ spot sweeping
    - Granite outcrop/carn with grassy areas, mature heather and gorse - identified for sweeping/ spot sweeping & suction sampling
- Sampling location 31.3
    - short 'grey' humid heath with *Erica tetralix* - identified for pitfall trapping & sweeping/ spot sweeping

At the time of the survey sampling location 31.1 and a part of 31.2 were under a Higher Level Stewardship (HLS) agreement with management options targeted to specific semi-natural habitats. The rest of location 31.2 and 31.3 were not under a management agreement.

Sampling location 1 (SX 4167 3529) is within a large cattle-grazed enclosure and comprises blocks of *Ulex gallii, Erica cinerea*, and *Rubus fruticosus* agg within a matrix of relatively herb poor grassland. *Potentilla erecta* is present very sparsely. The soils are of the dry free-draining mineral type. Vegetation cover is 100%.

Figure 16. Grass heath sampling location at site 31.1 Trevean – one pitfall trap visible lower right centre

Sampling location 2 forms a cluster of very different features. The grassy 'ride' (SW 4188 3523) is actually an abandoned track or green lane lined by parallel Cornish hedges and leading up to the rocky summit of Watch Croft. It is dominated by rank grasses with large bushy heather and gorse. Finer grassy areas are maintained by trampling from walkers and the ground has hollows with *Juncus effusus* patches. Vegetation cover is 100%.

Figure 17. Abandoned green lane sampling location at site 31.2 White Downs

The humid heath (SW 4196 3529) is named as White Downs by the OS mapping and has 100% vegetation cover of low *Molinia*, *Erica cinerea*, *Erica tetralix* with occasional *Ulex gallii*. The soils are deep, moist and peaty.

Figure 18. Humid heath sampling location at site 31.2 White Downs

The granite outcrop area originally suggested by Natural England was found to be surrounded by thickets of gorse and bramble, and accordingly very difficult of access. Watch Croft (SW 4206 3571) was agreed to be a suitable alternative sampling location. This summit area has extensive granite outcropping with well-developed ledge vegetation of *Sedum anglicum* and fine grasses. It is surrounded by low gorse and heaths, and ivy is present over some of the exposed rock.

Figure 19. Granite carn sampling location at site 31.2 Watch Croft

Sampling location 3 (SW 4179 3505) forms part of a much more extensive area of humid heath on lower ground to the south and is continuous with Bosullow Common. There is 99% vegetation cover of low *Molinia, Erica cinerea, E. tetralix* and *Calluna vulgaris*, with bare peat visible throughout. The soil profile is shallow peat over mineral with loose gritty granite rocks below.

Figure 20. Humid heath sampling location at site 31.3 between White Downs and Bosullow Common

The sampling programme was:

Action	**First sampling (2013)**	**Second sampling (2014)**
Reconnaissance	3rd September	
Pitfall traps placed	5th September	2nd July
Pitfall traps removed	12th September	9th July**
Suction sampling	16th September	9th July
Sweep-netting	26th & 27th September*	22nd July

* 26th sweep-netting initially attempted but abandoned due to poor visibility and saturated vegetation; 27th sweep-netting again attempted but abandoned due to strong gale-force winds; some beating was carried out, especially in the more sheltered green lane.

** one pitfall trap was crushed by a cow

The combined data from the five sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	44	119		83	
F1	unshaded early successional mosaic	9	135		17	
F3	shaded field & ground layer	6			11	
W3	permanent wet mire	5			10	
W2	mineral marsh & open water	3			5	
A2	wood decay	2			3	0
A1	arboreal canopy	1			2	

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W221	litter-rich fluctuating marsh	1		3	
F112	open short sward	4		2	135
F003	scrub-heath & moorland	5		1	
F111	bare sand & chalk	5		1	135
F001	scrub edge	2		1	
W312	Sphagnum bog	1		1	
F002	rich flower resource	2		1	
A212	bark & sapwood decay	1		0	

The grass heath of Site 31.1 proved to be supporting a diverse assemblage of the typical West Penwith Moors species associated with ranker vegetation on mineral soils. The Nationally Scarce dung beetle *Cercyon obsoletus* was only found here, together with the spider *Dicymbium nigrum*, the flea beetle *Chaetocnema confusa*, the weevil *Caenopsis waltoni*, the rove beetle *Tachyporus pallidus*, the old heather snail *Columella aspera* and plenty of the snake millipede *Leptoiulus belgicus*. Additionally a single specimen of the heath bug *Deraeocoris scutellaris* was taken by suction sampling, the first Cornish record for more than 100 years. This is one of the richest assemblages of this type found during September 2013.

Watch Croft also held special interest, with the Nationally Scarce stonecrop weevil *Aizobius sedi* and the only false scorpion found during the sampling, *Chthonius orthodactylus* – a species with only one previous record from Cornwall and the only modern one. The uncommon spider *Clubiona diversa* was also found.

Typical humid heath species were also present, including the ground beetles *Carabus granulatus* (31.3) and *Olisthopus rotundatus* (31.2) and the doli fly *Campsicnemus alpinus* plentiful in both areas.

The green lane was notable as a corridor of flowers in July, and produced the only specimen of the uncommon mining bee *Panurgus calcaratus*.

Trevean was also one of only two sites with sightings of Grayling butterfly. Common blue and small copper were also present at 31.1.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Araneae	Theridiidae	*Enoplognatha latimana*	2	F2100
		Robertus lividus		
	Linyphiidae	*Ceratinella brevipes*		
		Walckenaeria antica		
		Walckenaeria unicornis		
		Dicymbium nigrum	2	U
Araneae ctd	Linyphiidae	*Walckenaeria vigilax*	2	F2100
		Dismodicus bifrons	2	U
		Gonatium rubens		
		Maso sundevalli		
		Pocadicnemis pumilla		
		Oedothorax fuscus		
		Erigone atra		
		Agyneta subtilis		
		Saaristoa abnormis		
		Stemonyphantes lineatus		
		Lepthyphantes alacris		F3100
		Lepthyphantes tenuis		
		Lepthyphantes zimmermanni		
		Lepthyphantes mengei		
		Lepthyphantes ericaeus		
		Neriene sp.		
	Tetragnathidae	*Pachygnatha degeeri*		
		Metellina segmentata		
		Metellina merianae	2	A21
	Aranaeidae	*Araneus diadematus*		
	Lycosidae	*Pardosa palustris*		
		Pardosa pullata		
		Pardosa nigriceps		
		Trochosa terricola		
	Agelenidae	*Agelena labyrinthica*		
	Liocranidae	*Agroeca proxima*		
	Clubioniidae	*Clubiona recluse*		
		Clubiona trivialis		
		Clubiona diversa	2	F21
	Zoridae	*Zora spinimana*		
	Thomisidae	*Xysticus cristatus*		
		Ozyptila trux		
	Salticidae	*Heliophanus flavipes*		
Auchenorhyncha	Cicadellidae	*Ulopa reticulate*		

Order	Family	Species Identification	Score	SAT
	Cixiidae	*Cixius cunicularius*	2	A11
	Cixiidae	*Cixius similis*	2	W31
Butterflies	Lycaenidae	*Lycaena phlaeas*		
		Polyommatus icarus		
	Satyridae	*Hipparchia semele*		
		Lasiommata megera		
Coleoptera	Apionidae	*Aizobius sedi*	4	F1111
		Apion atratulum		
		Apion haematodes		
		Apion onopordi		
		Apion scutellare	2	F22
Coleoptera ctd	Apionidae ctd	*Pirapion immune*	2	F22
	Cantharidae	*Rhagonycha fulva*		
	Carabidae	*Bembidion lampros*		
		Carabus granulatus	2	W21
		Dromius melanocephalus		
		Dyschirius globosus	2	W31
		Notiophilus palustris	2	F21
		Olisthopus rotundatus	2	F11
		Poecilus versicolor	2	F2000
		Trechus obtusus		
	Chrysomelidae	*Apteropeda orbiculata*	2	F2000
		Chaetocnema confusa	2	W31
		Lochmaea suturalis		
		Oulema obscura		
	Cryptophagidae	*Cryptophagus scanicus*		
	Curculionidae	*Caenopsis waltoni*	2	F0000
		Hypera venusta		
		Micrelus ericae		
		Neliocarus nebulosus	2	F1121
		Rhinoncus perpendicularis		
		Sitona lepidus		
		Sitona regensteinensis		
		Sitona striatellus		
	Dermestidae	*Anthrenus verbasci*		
	Elateridae	*Agriotes pallidulus*		
	Helophoridae	*Cercyon impressus*		
		Cercyon obsoletus	4	F000
	Hydrophilidae	*Megasternum concinnum*		
	Leiodidae	*Catops chrysomeloides*		
		Catops coracinus		
		Catops fuscus		
		Catops grandicollis		
	Nitidulidae	*Epuraea biguttata*	2	A2121
		Meligethes obscurus		

Order	Family	Species Identification	Score	SAT
	Pselaphinae	*Reichenbachia juncorum*	2	W31
	Ptiliidae	*not identified*		
	Silphidae	*Nicrophorus vespillo*		
		Nicrophorus vespilloides	2	F000
	Staphylinidae	*Anotylus complanatus*		
		Anotylus sculpturatus		
		Cordalia obscura		
		Drusilla canaliculata		
		Mycetoporus splendidus		
		Ocypus olens		
		Othius laeviusculus	2	F2100
Coleoptera ctd	Staphylinidae	*Othius punctulatus*		
		Philonthus carbonarius		
		Philonthus cognatus		
		Philonthus varians		
		Platydracus stercorarius	2	F2000
		Platystethus arenarius		
		Quedius molochinus		
		Sepedophilus marshami		
		Sepedophilus nigripennis		
		Staphylinus erythropterus	2	F2200
		Stenus brunnipes		
		Stenus clavicornis		
		Stenus flavipes		
		Stenus fulvicornis		
		Stenus impressus		
		Stenus pallipes	4	W2212
		Stenus similis		
		Stenus subaeneus	2	F2100
		Tachinus rufipes		
		Tachyporus pallidus	2	W21
	Tenebrionidae	*Lagria hirta*		
Dermaptera	Forficulidae	*Forficula auricularia*		
Diplopoda	Glomeridae	*Glomeris marginata*		
	Julidae	*Julus scandinavius*		
		Leptoiulus belgicus	2	F31
		Ommatoiulus sabulosus		
	Polydesmidae	*Polydesmus denticulatus*		
Diptera	Agromyzidae	*Cerodontha denticornis*		
	Anthomyiidae	*Anthomyia liturata*		
		Chirosia flavipennis		
		Delia platura		
		Hylemya variata		
	Anthomyzidae	*Anthomyza elbergi*		
	Bibionidae	*Dilophus febrilis*		

Order	Family	Species Identification	Score	SAT
	Calliphoridae	*Calliphora vicina*		
	Chloropidae	*Cetema simile*		
		Cetema sp		
	Diastatidae	*Diastata costata*		
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Chrysotus gramineus		
		Dolichopus plumipes		
		Dolichopus vitripennis	2	W31
		Hercostomus nigripennis	2	F2100
	Drosophilidae	*Lordiphosa andalusiaca*		
		Scaptomyza pallida		
Diptera ctd	Empididae	*Empis tessellata*		
	Ephydridae	*Hydrellia sp (maura/griseola)*		
	Lonchopteridae	*Lonchoptera lutea*		
	Muscidae	*Coenosia femoralis*		
		Coenosia pedella	2	I
		Coenosia tigrina		
		Helina reversion		
		Neomyia cornicina		
		Schoenomyza litorella		
	Opomyzidae	*Opomyza germinationis*		
	Rhagionidae	*Rhagio lineola*		
	Sarcophagidae	*Sarcophaga carnaria*		
	Scathophagidae	*Scathophaga stercoraria*		
	Sepsidae	*Sepsis cynipsea*		
		Sepsis orthocnemis		
	Sphaeroceridae	*Copromyza stercoraria*		
		Ischiolepta pusilla		
		Lotophila atra		
	Syrphidae	*Eristalis nemorum*		
		Helophilus pendulus		
		Sericomyia silentis		
	Tipulidae	*Tipula paludosa*		
Heteroptera	Lygaeidae	*Scolopostethus decoratus*		
		Stygnocoris sabulosus		
	Miridae	*Deraeocoris ruber*		
		Deraeocoris scutellaris	2	F22
		Dicyphus pallicornis		
		Leptopterna ferrugata		
		Orthotylus ericetorum		
		Pithanus maerkeli		
		Stenodema calcarata		
		Stenodema holsata		
		Trigonotylus caelestialium		

Order	Family	Species Identification	Score	SAT
		Trigonotylus ruficornis		
	Nabidae	*Aptus mirmicoides*		
		Himacerus major		
		Nabis limbatus		
		Nabis rugosus		
	Tingidae	*Acalypta parvula*		
		Derephysia foliacea	2	U
Hymenoptera	Apidae	*Bombus lucorum*		
		Panurgus calcaratus	2	F1112
	Formicidae	*Formica fusca*		
		Formica lemani		
Hymenoptera ctd	Formicidae ctd	*Lasius flavus*		
		Lasius niger		
		Leptothorax acervorum		
		Myrmica ruginodis		
		Myrmica scabrinodis		
	Pompilidae	*Anoplius nigerrimus*		
Mollusca		*Columella aspera*	2	F22
		Nesovitrea hammonis		
Oniscidea	Oniscidae	*Oniscus asellus*		
	Philosciidae	*Philoscia muscorum*		
	Porcellionidae	*Porcellio scaber*		
Opiliones	Leiobunidae	*Leiobunum blackwalli*		
	Nemastomatidae	*Nemastoma bimaculatum*		
	Phalangidae	*Lacinius ephippiatus*		
		Lophopilio palpinalis		
		Mitopus morio		
		Mitopus morio var. ericaeus		
		Oligolophus tridens		
		Opilio parietinus		
		Paroligolophus agrestis		
		Phalangium opilio		
		Platybunus triangularis		
Orthoptera	Tetrigidae	*Tetrix undulata*		
Pseudoscorpiones	Chthoniidae	*Chthonius orthodactylus*		
Psocoptera	Caeciliusidae	*Enderleinella obsoleta*		
Thysanura		*Dilta littoralis*		

4.7 Site 32 Carn Galva

The roughlands around the rocky ridge of Carn Galva form part of a much larger area spreading westwards to site 31 (Watch Croft, Trevean, White Downs and Bosullow Common). The area is dominated by the rocky ridge, with heathland and bracken

dominating the slopes and valley on the west side. Small areas of humid heath occur locally, the largest on the saddle above the valley.

At the time of the survey the site was under a Higher Level Stewardship (HLS) agreement with management options targeted to specific semi-natural habitats. It forms part of a large National Trust tenanted farm – Bosigran. The roughlands have been considerably affected by uncontrolled wild fires in recent decades, following abandonment of livestock grazing. The area has recently been subject to bracken and scrub control, with a small herd of Belted Galloway cattle recently introduced.

Three sampling locations were identified by Natural England:

- Sampling location 32.1, short 'grey' humid heath with *Erica tetralix* ('plateau' community)
    - Identified for pitfall trapping and sweeping / spot sweeping
- Sampling location 32.2, cut area with short grassy sward with bluebells adjacent to mature heather and gorse
    - Identified for pitfall trapping, sweeping / spot sweeping, and suction sampling
- Sampling location 32.3, granite outcrop / carn with grassy areas, mature heather and gorse ('plateau' community)
    - Identified for sweeping / spot sweeping, and suction sampling

The humid heath (SW 4272 3592) occupies the saddle above the valley, and has 99% vegetation cover of dense low *Molinia* with *Erica cinerea, E. tetralix, Ulex gallii* and *Calluna*. Low outcrops are occasional features but were not included in the sample area. The humid heath contains un-vegetated peat as a minor component.

Figure 21. Humid heath sampling location at site 32.1 (Carn Galva)

The cut area (SW 4230 3609) is dominated by bracken and forms a small stone-walled enclosure in the main valley bottom. Cattle have access through the broken walls and appear to favour the area for shelter. The vegetation cover is about 90% and

grassy with *Holcus lanatus* tussocks locally, *Oxalis* locally frequent and bluebell barely evident at this time of year. The bracken litter is very deep and open-structured, effectively forming the 'soil'. The lower stone wall has *Teucrium* and other herbs along its base.

Figure 22. Bracken-bluebell sampling location at site 32.2 (Carn Galva)

The granite area is a section of rocky tor (SW 4257 3637) with a relatively rich variety of herbs and the grassy ledges and outcrop bases – *Teucrium, Jasione, Potentilla erecta, Solidago, Galium saxatile, Sedum anglicum* and a yellow composite. The are also clumps of *Erica cinerea, Calluna* and *Rubus fruticosus* agg.

Figure 23. Granite carn sampling location at site 32.3 (Carn Galva)

The sampling programme was:

Action	First sampling (2013)	Second sampling (2014)
Reconnaissance	3rd September	
Pitfall traps placed	5th September	2nd July
Pitfall traps removed	12th September*	9th July
Suction sampling	10th September	7th July
Sweep-netting	10th September	22nd July

* two of the traps in the cut bracken area (32.2) had been broken by cattle hooves.

The combined data from the three sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	48	124		60	
F1	unshaded early successional mosaic	7			9	
F3	shaded field & ground layer	6			8	
W3	permanent wet mire	6			7	
W2	mineral marsh & open water	3			4	
A2	wood decay	2			2	0
A1	arboreal canopy	1			1	

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W221	litter-rich fluctuating marsh	1		3	
W312	Sphagnum bog	1		1	
F003	scrub-heath & moorland	2		1	
F001	scrub edge	1		1	
F112	open short sward	1		1	
F002	rich flower resource	1		0	
F111	bare sand & chalk	1		0	
A212	bark & sapwood decay	1		0	

The granite carn area proved to be relatively rich in beetles, spiders and fruit flies in particular. The Nationally Scarce ground weevil *Orthochaetes insignis* is a typical species of open native vegetation on dry freely-draining soils but was only found here during the sampling programme. It may be expected on other carn areas. The flowery nature of the summit ridge is a valuable feature – the cattle appear to avoid this narrow strip of land, perhaps due to the frequency of visitors. Two species of fruit fly were taken during sampling, most notably the goldenrod-associated *Campiglossa loewiana* which hasn't previously been reported from the county. The other species was the more widespread *Tephritis vespertina*, associated with cat's-ear *Hypochaeris*. Amongst more typical West Penwith Moors species present were the Nationally

Scarce stonecrop weevil *Aizobius sedi*, the sorrel weevil *Apion marchicum*, the rove beetle *Stenus subaeneus* and the money spider *Ceratinella scabrosa*. The rove beetle *Syntomium aeneum* was another notable species found here, a species typical of upland Britain and the only Cornish record for over 100 years. The local ant-mimic spider *Micaria pulicaria* is also a feature of note as the only record from the September 2013 sampling.

The humid heath area was also notable for its typical West Penwith Moors species, with the uncommon spiders *Clubiona diversa, Scotina gracilipes* and *Walckenaeria vigilax*, the cranefly *Tipula melanoceros* and large numbers of the doli fly *Campsicnemus alpinus*.

The bracken area was not without interest. This was the only sampling location on the site which produced the uncommon snake millipede *Leptoiulus belgicus*, and the presence of the Nationally Scarce marshland rove beetle *Tachyporus formosus* was surprising. It is presumably associated with the relict areas of old tussocky *Molinia*.

Full species list (species registering 2 or more in ISIS are indicated):

Order	**Family**	**Species Identification**	**Score**	**SAT**
Amphipoda		*Architalitroides dorrieni*		
Araneae	Theridiidae	*Enoplognatha ovata*		
	Linyphiidae	*Ceratinella scabrosa*	2	F2100
		Walckenaeria acuminata		
		Walckenaeria vigilax	2	F2100
		Gonatium rubens		
		Pocadicnemis pumilla		
		Oedothorax fuscus		
		Erigone dentipalpis		
		Agyneta subtilis		
		Stemonyphantes lineatus		
		Lepthyphantes tenuis		
		Lepthyphantes zimmermanni		
		Lepthyphantes ericaeus		
	Tetragnathidae	*Pachygnatha degeeri*		
	Aranaeidae	*Araneus diadematus*		
		Araniella opistographa	2	A1100
		Hypsosinga sp.		
	Lycosidae	*Pardosa pullata*		
		Pardosa nigriceps		
		Trochosa terricola		
	Liocranidae	*Agroeca proxima*		
		Scotina gracilipes	2	F22
	Clubioniidae	*Clubiona trivialis*		
		Clubiona diversa	2	F21
	Gnaphosidae	*Micaria pulicaria*		
	Zoridae	*Zora spinimana*		
	Thomisidae	*Xysticus cristatus*		

Order	Family	Species Identification	Score	SAT
		Ozyptila trux		
		Ozyptila atomaria		
	Salticidae	*Heliophanus flavipes*		
Auchenorhyncha	Cicadellidae	*Ulopa reticulata*		
	Cixiidae	*Cixius similis*	2	W31
Chilopoda	Lithobiidae	*Lithobius crassipes*		
		Lithobius forficatus		
Coleoptera	Apionidae	*Aizobius sedi*	4	F1111
		Apion atratulum		
		Apion dichroum		
		Apion marchicum	2	F22
	Byrrhidae	*Byrrhus pustulatus*	2	F22
	Cantharidae	*Cantharis cryptica*		
	Carabidae	*Dromius linearis*		
	Carabidae	*Trechus obtusus*		
	Chrysomelidae	*Lochmaea suturalis*		
		Longitarsus succineus		
Coleoptera ctd	Chrysomelidae	*Phyllotreta undulata*		
	Curculionidae	*Hypera venusta*		
		Micrelus ericae		
		Neliocarus nebulosus	2	F1121
		Orthochaetes insignis	4	F1100
		Sitona striatellus		
	Elateridae	*Athous haemorrhoidalis*		
	Geotrupidae	*Geotrupes stercorarius*		
	Nitidulidae	*Meligethes obscurus*		
	Pselaphinae	*Bryaxis bulbifer*		
		Bryaxis puncticollis		
	Scraptiidae	*Anaspis pulicaria*		
	Scydmaeninae	*Neuraphes elongatulus*		
	Staphylinidae	*Lesteva heeri*		
		Philonthus cognatus		
		Platydracus stercorarius	2	F2000
		Sepedophilus nigripennis		
		Staphylinus erythropterus	2	F2200
		Stenus flavipes		
		Stenus impressus		
		Stenus latifrons		
		Stenus pallipes	4	W2212
		Stenus subaeneus	2	F2100
		Syntomium aeneum	2	F31
		Tachyporus formosus	4	F1100
	Tenebrionidae	*Lagria hirta*		
Dermaptera	Forficulidae	*Forficula auricularia*		
Diplopoda	Baniulidae	*Proteroiulus fuscus*		

Order	Family	Species Identification	Score	SAT
	Glomeridae	*Glomeris marginata*		
	Julidae	*Brachyiulus pusillus*		
		Julus scandinavius		
		Leptoiulus belgicus	2	F31
		Ommatoiulus sabulosus		
	Polydesmidae	*Polydesmus denticulatus*		
Diptera	Anthomyiidae	*Anthomyia liturata*		
		Delia platura		
	Calliphoridae	*Calliphora vicina*		
		Lucilia illustris		
	Chloropidae	*Cetema simile*		
		Cetema sp		
		Meromyza sp		
		Oscinella hortensis		
	Conopidae	*Sicus ferrugineus*	2	F11
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Dolichopus vitripennis	2	W31
Diptera ctd	Dolichopodidae	*Hercostomus nigripennis*	2	F2100
	Drosophilidae	*Scaptomyza pallida*		
	Ephydridae	*Hydrellia sp (maura/griseola)*		
	Lauxaniidae	*Minettia fasciata [= rivosa]*		
		Sapromyza halidayi		
	Lonchopteridae	*Lonchoptera lutea*		
	Muscidae	*Coenosia distinguens*	2	I
		Coenosia pedella	2	I
		Helina reversio		
		Hydrotaea irritans		
		Phaonia errans		
	Mycetophilidae	*Boletina gripha*		
	Opetiidae	*Opetia nigra*		
	Opomyzidae	*Geomyza balachowskyi*		
	Psychodidae	*Psychoda phalaenoides*		
	Scathophagidae	*Scathophaga stercoraria*		
	Sciaridae	*Bradysia pallipes*		
		Sciara hemerobioides		
	Sepsidae	*Sepsis cynipsea*		
	Sphaeroceridae	*Copromyza stercoraria*		
		Crumomyia pedestris		
	Syrphidae	*Sericomyia silentis*		
	Tabanidae	*Haematopota pluvialis*		
	Tephritidae	*Campiglossa loewiana*	2	F21
		Tephritis vespertina	4	F21
	Tipulidae	*Tipula melanoceros*	2	W31
		Tipula paludosa		

Order	Family	Species Identification	Score	SAT
Heteroptera	Lygaeidae	*Drymus sylvaticus*		
		Scolopostethus decoratus		
		Stygnocoris sabulosus		
	Miridae	*Leptopterna ferrugata*		
		Mecomma ambulans		
		Orthotylus ericetorum		
		Pithanus maerkeli		
		Stenodema holsata		
		Trigonotylus caelestialium		
		Trigonotylus ruficornis		
	Nabidae	*Nabis rugosus*		
	Tingidae	*Derephysia foliacea*	2	U
Hymenoptera	Apidae	*Bombus lucorum*		
	Formicidae	*Formica fusca*		
		Lasius niger		
		Myrmica ruginodis		
		Myrmica scabrinodis		
Mollusca	Discidae	*Discus rotundatus*		
Oniscidea	Oniscidae	*Oniscus asellus*		
	Philosciidae	*Philoscia muscorum*		
	Porcellionidae	*Porcellio scaber*		
Opiliones	Phalangidae	*Lacinius ephippiatus*		
		Mitopus morio		
		Mitopus morio var. ericaeus		
		Odiellus spinosus	2	S
		Paroligolophus agrestis		
		Phalangium opilio		
		Platybunus triangularis		
Orthoptera	Acrididae	*Chorthippus brunneus*		
		Chorthippus parallelus		
Thysanura		*Dilta littoralis*		

4.8 Site 36 Nine Maidens Common

Nine Maidens Common forms part of a large area of open moorland which links across through Site 32 Carn Galva to Site 31 Watch Croft, Trevean, White Downs and Bosullow Common. The area is renowned for its archaeological and historic mining interest and is well used by walkers. At the time of the survey the site was not under a management agreement that includes management options targeted to specific semi-natural habitats.

A single sampling location had been identified:

- Short 'grey' humid heath with *Erica tetralix*, mature heather and gorse adjacent

- Identified for pitfall trapping, sweeping / spot sweeping, and suction sampling

The area of humid heath forms a moderate sized basin within the common. The sampling location (SW 4354 3475) has low, densely-matted *Molinia*, *Erica cinerea*, *Erica tetralix*, and *Ulex gallii*, forming 100% vegetation cover. The soils are deep moist peat, although appeared somewhat drier than average for the sample sites. A few hollows were noted close by filled with *Sphagnum* as some low outcrops. Path margins close by were partly lined by *Succisa pratensis* in full bloom.

Figure 24. Humid heath sampling location at site 36.1 Nine Maidens Common

The sampling programme was:

Action	**First sampling (2013)**	**Second sampling (2014)**
Reconnaissance	3rd September	
Pitfall traps placed	5th September	2nd July
Pitfall traps removed	12th September	9th July
Suction sampling	20th September	9th July
Sweep-netting	27th September*	22nd July

* visited for sweep-netting but not possible due to strong winds – the site is very exposed.

The data from the sampling location produces the following BAT and SAT tables:

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	35	106		17	
W3	permanent wet mire	15			7	
F3	shaded field & ground layer	8			4	
F1	unshaded early successional mosaic	4			2	
A2	wood decay	2			1	0
W2	mineral marsh & open water	2			1	

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W221	litter-rich fluctuating marsh	1		3	
W312	Sphagnum bog	1		1	
A212	bark & sapwood decay	1		0	

The Nine Maidens site provides a good example of the typical West Penwith Moors humid heath assemblage, and was the only site for the very local money spider *Walckenaeria alticeps* during the sampling. The doli fly *Campsicnemus alpinus* was present in numbers and the crane fly *Tipula melanoceros* was also present. This was the only site with the uncommon rove beetle *Staphylinus dimidiaticornis*.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Amphipoda		*Architalitroides dorrieni*		
Araneae	Linyphiidae	*Walckenaeria alticeps*	2	W31
		Walckenaeria antica		
		Maso sundevalli		
		Pocadicnemis pumilla		
		Oedothorax fuscus		
		Erigone atra		
		Agyneta subtilis		
		Lepthyphantes tenuis		
		Lepthyphantes zimmermanni		
	Tetragnathidae	*Pachygnatha degeeri*		
	Aranaeidae	*Araneus diadematus*		
		Hypsosinga sp.		
	Lycosidae	*Pardosa pullata*		
		Pardosa nigriceps		
		Trochosa terricola		
		Arctosa leopardus	2	W31

Order	Family	Species Identification	Score	SAT
	Gnaphosidae	*Drasyllus/Zelotes sp.*		
	Zoridae	*Zora spinimana*		
	Thomisidae	*Ozyptila trux*		
	Salticidae	*Euophrys sp.*		
Butterflies	Pieridae	*Colias croceus*		
	Satyridae	*Pararge aegeria*		
Coleoptera	Carabidae	*Pterostichus minor*		
		Pterostichus strenuus		
Coleoptera ctd	Chrysomelidae	*Lochmaea suturalis*		
	Scraptiidae	*Anaspis pulicaria*		
	Staphylinidae	*Staphylinus dimidiaticornis*	2	F1100
		Staphylinus erythropterus	2	F2200
		Stenus pallipes	4	W2212
Diplopoda	Julidae	*Julus scandinavius*		
		Ommatoiulus sabulosus		
	Polydesmidae	*Polydesmus denticulatus*		
Diptera	Chloropidae	*Cetema sp*		
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Dolichopus vitripennis	2	W31
	Muscidae	*Coenosia distinguens*	2	I
	Pipunculidae	*Tomosvaryella palliditarsis*	2	I
	Syrphidae	*Helophilus pendulus*		
		Platycheirus clypeatus		
		Rhingia campestris		
		Volucella bombylans		
	Tipulidae	*Tipula melanoceros*	2	W31
Heteroptera	Miridae	*Leptopterna ferrugata*		
		Stenodema calcarata		
		Trigonotylus ruficornis		
Hymenoptera	Apidae	*Bombus pascuorum*		
		Bombus terrestris		
	Formicidae	*Myrmica ruginodis*		
Opiliones	Phalangidae	*Lacinius ephippiatus*		
		Mitopus morio		
		Platybunus triangularis		
Orthoptera	Acrididae	*Chorthippus parallelus*		
Thysanura	Machilidae	*Dilta littoralis*		

4.9 Site 37 Mulfra Hill to Treen Common

The terrain here is dominated by humid heath with a few small summit areas rising to 202m at The Beacon on Treen Common to the north and the higher Mulfra Hill to the south. The open common appears unmanaged and ungrazed.

Three sampling locations were identified by Natural England:

- Sampling location 37.1 an enclosed area of Bodrifty Farm
    - short grassy sward with patchy mature gorse - identified for pitfall trapping, sweeping / spot sweeping, and suction sampling
- Sampling location 37.2 unenclosed common
    - pond with area of mire to north-east - identified for pond netting, and sweeping / spot sweeping
    - short 'grey' humid heath with *Erica tetralix* and *Molinia caerulea* - identified for pitfall trapping, and sweeping / spot sweeping

At the time of the survey sampling location 1 was under a Higher Level Stewardship (HLS) agreement with management options targeted to specific semi-natural habitats. Location 2 was not under a management agreement.

The Bodrifty Farm (37.1) sampling location (SW 4465 3567) had been subject to a burn recently and had open mossy ground with gorse litter over a deep peat soil. Short *Molinia* is present locally as well as clumps of *Ulex gallii*. Vegetation cover was already about 95%.

Figure 25. Burnt humid heath sampling location at site 37.1 Bodrifty

The mire area (SW 4482 3611) – location 37.2 - is dominated by dense tall growth of *Eriophorum* and *Molinia* with some tufts of *Juncus effusus* and *Erica tetralix*. *Sphagnum* areas are also present.

Figure 26. Mire sampling location at site 37.2 (Mulfra Hill to Treen Common)

The humid heath (SW 4482 3605) had also been subject to recent burning but had 99% cover of *Molinia*, *Erica tetralix* and *Carex* spp with some low cover of mosses and lichens. The soil was a deep moist peat.

Figure 27. Humid heath sampling location at site 37.2 (Mulfra Hill to Treen Common)

The 'pond with area of mire to north east' in a shallow basin at the northern end of Mulfra Common at SW 4486 3613: on 2nd July much of the water had dried up leaving a basin of deep peat with only a very shallow layer of water over the top. Most of the basin was un-vegetated with some *Sphagnum*, *J. effusus* and *J. acutiflorus* around the edges and a small 'island' vegetated with *J. effusus* and young *Salix*. A clump of *Salix cinerea* and *Rhododendron* was present in the north-east corner of the

basin with two small areas of marginal mire at both the western and eastern sides of the pond. These consisted of dense carpets of damp *Sphagnum*, with no standing water present. Willow stakes have been planted around the circumference of the pond in the recent past, probably since spring 2014 with the aim of creating a wall of *Salix* around the pond.

Sampling was carried out by netting the thin layer of water in the basin and some sampling in the mires with a strainer after pushing down the moss in the damper areas. A conductivity of 160µScm and a pH of 4.8 were recorded during the sampling. The aquatic invertebrate assemblage was not particularly diverse and was dominated by large numbers of corixid lesser water boatmen (mostly *Hesperocorixa castanea* and *Sigara nigrolineata*) with lesser numbers of *Helophorus* beetles and other species present in small numbers.

Palmate newts were present along with single patrolling specimens of the emperor dragonfly *Anax imperator* and the black-tailed skimmer *Orthetrum cancellatum*. This latter species is regarded by Jones (1997) as being Locally Scarce and although a common insect throughout southern Britain it is still a rather infrequent sight in Cornwall. Strongholds for the species exist on the Lizard and in the St. Austell clay pits area (Jones, 1997), although there are records for the species across both eastern and western Cornwall in Merritt *et al*. (1997), which appear to conflict with the observations of Jones (1997). *Orthetrum cancellatum* breeds in ponds, lakes, slow-flowing rivers and dykes, often preferring sites with an open aspect and areas of bare ground (Merritt *et al*. 1997). If this species is later shown to use the Mulfra Common pond for breeding, the growth of a hedge of willow around the pond will certainly be detrimental to it. The shading offered by trees can provide some benefit to certain invertebrates in certain kinds of ponds (*e.g. Hydroporus incognitus* is known to be a specialist of shaded woodland ponds (Foster & Friday, 2011)) and can help to make a pond margin more diverse but generally the shading of ponds is detrimental to both their flora and fauna, and the new willow planting around the pond should ideally be removed if conservation is an objective here.

The sampling programme was:

Action	**First sampling (2013)**	**Second sampling (2014)**
Reconnaissance	2nd September	
Pitfall traps placed	6th September	2nd July

Action	First sampling (2013)	Second sampling (2014)
Pond netting		2nd July
Pitfall traps removed	13th September	9th July
Suction sampling	10th September	7th July
Sweep-netting	10th September*	21st July

* strong winds limited the amount of sweep-netting possible

The combined data from the three sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	31	124		34	
W2	mineral marsh & open water	18	130		20	
W3	permanent wet mire	17	147		19	
F1	unshaded early successional mosaic	5			5	
F3	shaded field & ground layer	5			5	
A1	arboreal canopy	1			1	

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W311	open water in acid mire matrix	2		11	147
W221	litter-rich fluctuating marsh	1		3	130
W211	open water on disturbed mineral sediments	1		3	130
W312	Sphagnum bog	2		2	147
F112	open short sward	2		1	
F003	scrub-heath & moorland	1		0	

The key feature found was typical West Penwith Moors humid heath species such as the crane fly *Limonia dilutior* and the doli fly *Campsicnemus alpinus*, the latter also on the burnt humid heath of Bodrifty. The recent fire had attracted the open ground rove beetle species *Stenus subaeneus*, more typically on the open granite summits. The tall mire vegetation provides an additional wetland habitat type and supports further characteristic wetland species such as the uncommon crane flies *Molophilus occultus* and *Tipula melanoceros*. The pool was largely dry at the time of the aquatic survey but was rich in lesser water boatmen and included *Arctocorisa gernari* which is rare in the county. Black-tailed Skimmer dragonfly *Orthetrum cancellatum* was noted over the pool; this is a highly mobile species which exploits open pools lacking vegetation – this was the only sighting of this species during the sampling.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Araneae	Linyphiidae	*Oedothorax fuscus*		
		Erigone atra		
		Agyneta subtilis		
		Bathyphantes gracilis		
		Tapinopa longidens		F3100
		Lepthyphantes tenuis		
		Lepthyphantes zimmermanni		
		Lepthyphantes mengei		
	Tetragnathidae	*Tetragnatha extensa*		
	Aranaeidae	*Araneus diadematus*		
		Araneus quadratus		
		Hypsosinga sp.		
	Lycosidae	*Pardosa pullata*		
		Pardosa nigriceps		
		Alopecosa pulverulenta		
		Trochosa terricola		
	Agelenidae	*Agelena labyrinthica*		
	Hahniidae	*Hahnia montana*		F3100
	Clubioniidae	*Clubiona reclusa*		
	Gnaphosidae	*Drassodes cupreus*	2	F21
	Philodromidae	*Tibellus oblongus*		F21
	Thomisidae	*Ozyptila trux*		
	Salticidae	*Neon reticulatus*		
Auchenorhyncha	Cercopidae	*Neophilaenus lineatus*		
Butterflies	Satyridae	*Lasiommata megera*		
Coleoptera	Apionidae	*Apion scutellare*	2	F22
Coleoptera ctd	Cantharidae	*Rhagonycha fulva*		
	Carabidae	*Amara lunicollis*	2	F2000
		Bembidion lampros		
		Carabus granulatus	2	W21
		Dyschirius globosus	2	W31
		Nebria salina		
		Olisthopus rotundatus	2	F11
		Trechus obtusus		
	Chrysomelidae	*Altica palustris*		
		Plateumaris discolor	2	W31
	Curculionidae	*Hypera venusta*		
		Neliocarus nebulosus	2	F1121
		Sitona striatellus		
	Dytiscidae	*Hydroporus erythrocephalus*		
		Hydroporus pubescens		
		Laccophilus minutus		
	Gyrinidae	*Gyrinus substriatus*		
	Haliplidae	*Haliplus ruficollis*		

Order	Family	Species Identification	Score	SAT
	Helophoridae	*Helophorus brevipalpis*		
		Helophorus flavipes		
		Helophorus grandis		
		Helophorus obscurus		
	Hydrophilidae	*Hydrobius fuscipes*		
		Sphaeridium bipustulatum		
	Hydrophilidae	*Sphaeridium lunatum*		
	Scarabaeidae	*Aphodius fossor*		
	Scirtidae	*Cyphon ochraceus*		
	Staphylinidae	*Othius laeviusculus*	2	F2100
		Oxypoda opaca		
		Platydracus stercorarius	2	F2000
		Quedius semiobscurus		
		Staphylinus erythropterus	2	F2200
		Stenus brunnipes		
		Stenus cicindeloides		
		Stenus flavipes		
		Stenus pallipes	4	W2212
		Stenus subaeneus	2	F2100
Diptera	Anthomyiidae	*Anthomyia liturata*		
	Chloropidae	*Cetema simile*		
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Chrysotus gramineus		
		Dolichopus atratus	2	W3121
Diptera	Dolichopodidae	*Dolichopus plumipes*		
Diptera	Dolichopodidae	*Dolichopus vitripennis*	2	W31
Diptera ctd	Ephydridae	*Hydrellia sp. (maura group)*		
	Limoniidae	*Limonia dilutior*	2	F2221
		Molophilus occultus	2	W31
	Lonchopteridae	*Lonchoptera lutea*		
	Muscidae	*Coenosia distinguens*	2	I
		Coenosia femoralis		
		Helina reversio		
		Schoenomyza litorella		
	Scathophagidae	*Scathophaga stercoraria*		
	Sciomyzidae	*Tetanocera elata*		
	Sepsidae	*Sepsis cynipsea*		
	Syrphidae	*Eristalis horticola*		
		Eristalis pertinax		
		Helophilus pendulus		
		Melanostoma mellinum		
		Neoascia tenur	2	W31
		Sericomyia silentis		
	Tipulidae	*Tipula melanoceros*	2	W31
		Tipula paludosa		

Order	Family	Species Identification	Score	SAT
Heteroptera	Corixidae	*Arctocorisa germari*	2	W2111
		Corixa punctata		
		Hesperocorixa castanea		
		Sigara nigrolineata		
		Sigara scotti		
	Gerridae	*Gerris thoracicus*		
	Lygaeidae	*Scolopostethus decoratus*		
	Miridae	*Leptopterna ferrugata*		
		Stenodema holsata		
		Trigonotylus ruficornis		
	Nabidae	*Nabis limbatus*		
	Notonectidae	*Notonecta obliqua*	2	W31
	Saldidae	*Saldula saltatoria*		
Hymenoptera	Formicidae	*Myrmica ruginodis*		
		Myrmica scabrinodis		
Odonata	Aeshnidae	*Anax imperator*		
	Libellulidae	*Orthetrum cancellatum*	2	W21
Oniscidea	Oniscidae	*Oniscus asellus*		
	Porcellionidae	*Porcellio scaber*		
Opiliones	Leiobunidae	*Leiobunum blackwalli*		
	Phalangidae	*Mitopus morio*		
		Phalangium opilio		
		Platybunus triangularis		
Orthoptera	Acrididae	*Chorthippus parallelus*		
Thysanura		*Dilta littoralis*		

4.10 Site 40 North of Higher Kerrowe

Sample site 40 is enclosed land to the north of Higher Kerrowe Farm but actually part of Trewey Farm, Zennor.

The sampling location identified by Natural England was:

- Short grassy sward with patchy mature heather and gorse
    - Identified for pitfall trapping, sweeping / spot sweeping, and suction sampling

At the time of the survey the site was under a Higher Level Stewardship (HLS) agreement with management options targeted to specific semi-natural habitats.

The sampling location (SW 4580 3673) was heavily poached by cattle at the time of the survey. The soils are a deep moist peat and are covered by very tussocky grasses and clumps of *Ulex gallii* and *Erica cinerea*. The area had presumably been left ungrazed for some time before cattle were recently put on.

Figure 28. Humid heath sampling location at site 40.1 (North of Higher Kerrowe)

The sampling programme was:

Action	**First sampling (2013)**	**Second sampling (2014)**
Reconnaissance	2nd September	
Pitfall traps placed	5th September	2nd July
Pitfall traps removed	12th September	9th July
Suction sampling	10th September	7th July
Sweep-netting	10th September*	21st July

*the weather was very windy and the sweep-netting unproductive and so beating was also carried out

The data from the sampling location produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	47	124		38	
W3	permanent wet mire	11			9	
F1	unshaded early successional mosaic	8			6	
F3	shaded field & ground layer	4			3	
W2	mineral marsh & open water	2			2	

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W221	litter-rich fluctuating marsh	1		3	
W312	Sphagnum bog	1		1	
F111	bare sand & chalk	2		0	
F003	scrub-heath & moorland	1		0	

The fauna of this peatland site reflects an area with a history of light management but which perhaps has been brought into more intensive use only recently. The only typical West Penwith Moors peatland species detected were the doli fly *Camsicnemus alpinus,* the flea beetle *Chaetocnema confusus* and the money spider *Walckenaeria vigilax,* all currently in low numbers. The snail *Columella aspera* was present in the large clumps of mature heath and is typical of old woody growth. One nationally uncommon crab spider species present, *Oxyptila simplex*, is characteristic of tall grassy vegetation; it has not been reported from Cornwall previously. The presence of two rank vegetation spiders *Cnephalocotes obscurus* and *Dismodicus bifrons*, more typical of the ungrazed vegetation of mineral soils are also indicative of a site currently being brought into more intensive grazing management. This was one of only two areas where Grayling butterfly was seen.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Araneae	Linyphiidae	*Walckenaeria vigilax*	2	F2100
		Dismodicus bifrons	2	U
		Maso sundevalli		
		Peponocranium ludicrum		
		Pocadicnemis pumilla		
		Oedothorax fuscus		
Araneae ctd	Linyphiidae	*Cnephalocotes obscurus*	2	F2100
		Erigone dentipalpis		
		Erigone atra		
		Agyneta subtilis		
		Bathyphantes gracilis		
		Lepthyphantes zimmermanni		
		Lepthyphantes mengei		
		Lepthyphantes ericaeus		
	Tetragnathidae	*Tetragnatha extensa*		
		Metellina segmentata		
	Aranaeidae	*Araneus diadematus*		
	Lycosidae	*Pardosa pullata*		
		Pardosa nigriceps		
		Trochosa terricola		
	Clubioniidae	*Clubiona reclusa*		
	Thomisidae	*Xysticus audax*		

Order	Family	Species Identification	Score	SAT
		Ozyptila trux		
		Ozyptila simplex	2	F1111
Auchenorhyncha	Cicadellidae	*Eupelix cuspidata*		
		Ulopa reticulata		
Butterflies	Satyridae	*Hipparchia semele*		
Coleoptera	Apionidae	*Apion atratulum*		
		Apion scutellare	2	F22
	Carabidae	*Amara aenea*		
		Amara lunicollis	2	F2000
		Dyschirius globosus	2	W31
		Notiophilus biguttatus		
		Notiophilus palustris	2	F21
		Poecilus versicolor	2	F2000
		Pterostichus vernalis	2	F21
	Chrysomelidae	*Chaetocnema confusa*	2	W31
		Lochmaea suturalis		
	Curculionidae	*Hypera venusta*		
		Micrelus ericae		
		Sitona puncticollis	2	F1100
		Sitona striatellus		
	Pselaphinae	*Brachygluta fossulata*		
	Staphylinidae	*Drusilla canaliculata*		
		Philonthus carbonarius		
		Quedius semiobscurus		
		Staphylinus erythropterus	2	F2200
		Stenus brunnipes		
		Stenus fulvicornis		
		Stenus pallipes	4	W2212
		Tachyporus pusillus		
Diplopoda	Julidae	*Ommatoiulus sabulosus*		
	Polydesmidae	*Polydesmus denticulatus*		
Diptera	Anthomyiidae	*Hylemya variata*		
	Chloropidae	*Cetema simile*		
		Elachiptera diastema		
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Dolichopus plumipes		
		Dolichopus vitripennis	2	W31
	Lonchopteridae	*Lonchoptera lutea*		
	Muscidae	*Coenosia distinguens*	2	I
		Coenosia femoralis		
	Sepsidae	*Sepsis cynipsea*		
	Syrphidae	*Eristalis pertinax*		
		Helophilus pendulus		
		Platycheirus granditarsus		
	Tipulidae	*Tipula paludosa*		

Order	Family	Species Identification	Score	SAT
Heteroptera	Lygaeidae	*Drymus sylvaticus*		
		Scolopostethus decoratus		
	Miridae	*Leptopterna ferrugata*		
		Pithanus maerkeli		
		Stenodema holsata		
		Trigonotylus ruficornis		
Hymenoptera	Formicidae	*Myrmica rubra*		
		Myrmica ruginodis		
Mollusca		*Columella aspera*	2	F22
Oniscidea	Philosciidae	*Philoscia muscorum*		
Opiliones	Phalangidae	*Mitopus morio*		
		Paroligolophus agrestis		
		Platybunus triangularis		
Orthoptera	Acrididae	*Chorthippus parallelus*		
Thysanura		*Dilta littoralis*		

4.11 Site 43 Zennor Hill and Rosemorran

The roughlands of site 43 form part of a much larger area spreading northwards to site 44 (Foage Farm to Sperris Croft and Boscubben Croft, and south-eastwards to sites 45 Trendrine Hill and Beagletodn Downs, and 46 Amalveor Downs to Noon Billas. The identified sampling location is dominated by the rocky summit, with its well-known Logan Stone, and flanked by acid grasslands and heathland. At the time of the survey the site was not under a management agreement that includes management options targeted to specific semi-natural habitats. It forms part of a National Trust tenanted farm – Foage Farm – and the area is clearly cattle grazed as fresh dung was present although no livestock were seen during the survey visits. Grazing levels appear very light and much of the heath contains a high proportion of *Rubus fruticosus* agg and *Ulex* spp.

Three sampling locations were identified by Natural England:

- Granite outcrop / carn with grassy areas (‘plateau’ community)
    - Identified for suction sampling, sweeping / spot sweeping
- Grassy/ mossy sward with patchy heather
    - Identified for pitfall trapping, sweeping / spot sweeping
- Grassy/ mossy sward with patchy heather, gorse and bramble scrub
    - Identified for pitfall trapping, sweeping / spot sweeping, and suction sampling

The granite outcrop area sampled (SW 4637 3820) contained many rock ledges and crevices with moss and lichen cover, or *Calluna, Ulex gallii* and rank grasses.

Figure 29. Granite carn sampling location at site 43.1 Logan Stone area

The plateau area of grassy heather (SW 4640 3820) comprised dense tussocky grassland with some *Potentilla erecta*, mossy areas and clumps of *Calluna*. The soil was mineral in character although relatively peaty.

Figure 30. Grass heath sampling location at site 43.1 on east side of Logan Stone area

The brambly heath (SW 4637 3814) on the western flanks of the hill, below the granite exposures, also had a dense tussocky grassy matrix containing abundant mosses with luxuriant *Potentilla erecta* and *Carex* with some *Lotus pedunculatus*. Clumps of *Calluna/ Erica cinerea* feature as well as some *Vaccinium mytillus*, and

there is a variable cover of *Rubus fruticosus* agg. The soil is a typical deep mineral soil.

Figure 31. Brambly grass heath sampling location at site 43.1 below the Logan Stone area

The sampling programme was:

Action	**First sampling (2013)**	**Second sampling (2014)**
Reconnaissance	2nd September	
Pitfall traps placed	6th September	2nd July
Pitfall traps removed	13th September	9th July
Suction sampling	9th September	7th July
Sweep-netting	9th September*	21st July

*strong winds limited the amount of sweep-netting possible

The combined data from the three sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	44	117		47	
F1	unshaded early successional mosaic	8			8	
F3	shaded field & ground layer	8			8	
W3	permanent wet mire	5			5	
A1	arboreal canopy	3			3	
A2	wood decay	2			2	0
W2	mineral marsh & open water	1			1	

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W221	litter-rich fluctuating marsh	1		3	
F001	scrub edge	2		1	
F002	rich flower resource	2		1	
F111	bare sand & chalk	3		1	
F112	open short sward	1		1	
F003	scrub-heath & moorland	1		0	
A212	bark & sapwood decay	1		0	

The area of brambly grass heath proved to be relatively rich in uncommon invertebrates characteristic of coarse vegetation on mineral soils, and including species requiring relatively constant high humidity. Of particular note is the Nationally Scarce weevil *Acalles ptinoides* which breeds in old heather stems, uncommon plant bug *Mecomma dispar*, and the uncommon spider *Theonoe minutissima* which was only found here during the sampling programme. The uncommon millipede *Leptoiulus belgicus* was also found here, as well as in the open grassy heath sampling location. The granite tor is supporting the Nationally Scarce stonecrop weevil *Aizobius sedi*.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Amphipoda		*Architalitroides dorrieni*		
Araneae	Segestriidae	*Segestria senoculata*		
	Theridiidae	*Theonoe minutissima*	2	U
	Linyphiidae	*Ceratinella brevipes*		
		Gonatium rubens		
		Oedothorax fuscus		
Araneae ctd	Linyphiidae	*Oedothorax retusus*		
		Erigone dentipalpis		
		Meioneta saxatilis		
		Stemonyphantes lineatus		
		Lepthyphantes tenuis		
		Lepthyphantes zimmermanni		
		Lepthyphantes mengei		
		Lepthyphantes ericaeus		
	Tetragnathidae	*Pachygnatha degeeri*		
	Aranaeidae	*Araneus diadematus*		
		Cercidia prominens	2	F2100
	Lycosidae	*Pardosa pullata*		
		Pardosa nigriceps		
		Alopecosa pulverulenta		
		Trochosa terricola		
	Clubioniidae	*Clubiona diversa*	2	F21

Order	Family	Species Identification	Score	SAT
	Zoridae	*Zora spinimana*		
	Thomisidae	*Ozyptila atomaria*		
	Salticidae	*Heliophanus flavipes*		
		Euophrys sp.		
Auchenorhyncha	Cercopidae	*Philaenus spumarius*		
	Cixiidae	*Tachycixius pilosus*		
Coleoptera	Apionidae	*Aizobius sedi*	4	F1111
	Byrrhidae	*Byrrhus pilula*		
	Carabidae	*Harpalus latus*		
		Pterostichus strenuus		
		Trechus obtusus		
	Chrysomelidae	*Chaetocnema confusa*	2	W31
		Lochmaea suturalis		
		Longitarsus holsaticus	2	F2111
		Longitarsus luridus		
	Coccinellidae	*Coccinella septempunctata*		
	Curculionidae	*Acalles ptinoides*	4	A2121
		Micrelus ericae		
		Neliocarus nebulosus	2	F1121
	Elateridae	*Dalopius marginatus*		
	Hydrophilidae	*Megasternum concinnum*		
	Leiodidae	*Catops fuscus*		
		Catops grandicollis		
	Nitidulidae	*Meligethes carinulatus*		
		Meligethes subrugosus		
	Pselaphinae	*Pselaphus heisei*	2	W31
		Reichenbachia juncorum	2	W31
	Scydmaeninae	*Stenichnus scutellaris*		
	Silphidae	*Silpha atrata*		
Coleoptera ctd	Staphylinidae	*Drusilla canaliculata*		
		Philonthus carbonarius		
		Philonthus cognatus		
		Platydracus stercorarius	2	F2000
		Sepedophilus nigripennis		
		Staphylinus erythropterus	2	F2200
		Stenus brunnipes		
		Stenus fulvicornis		
		Stenus pallipes	4	W2212
		Tachyporus chrysomelinus		
	Tenebrionidae	*Lagria hirta*		
Diplopoda	Baniulidae	*Proteroiulus fuscus*		
		Julus scandinavius		
		Leptoiulus belgicus	2	F31
		Ommatoiulus sabulosus		

Order	Family	Species Identification	Score	SAT
	Polydesmidae	*Polydesmus angustus*		
		Polydesmus denticulatus		
Diptera	Anthomyiidae	*Anthomyia liturata*		
	Bibionidae	*Dilophus febrilis*		
	Dolichopodidae	*Dolichopus vitripennis*	2	W31
		Hercostomus nigripennis	2	F2100
	Hybotidae	*Tachydromia aemula*		
	Lonchopteridae	*Lonchoptera lutea*		
	Muscidae	*Coenosia distinguens*	2	I
	Muscidae	*Helina reversio*		
	Opomyzidae	*Opomyza germinationis*		
	Platystomatidae	*Rivellia syngenesiae*	2	F21
	Scathophagidae	*Scathophaga stercoraria*		
	Sepsidae	*Sepsis cynipsea*		
	Sphaeroceridae	*Copromyza stercoraria*		
	Syrphidae	*Eristalis horticola*		
		Syritta pipiens		
	Tipulidae	*Tipula paludosa*		
Heteroptera	Lygaeidae	*Drymus sylvaticus*		
		Scolopostethus decoratus		
		Stygnocoris sabulosus		
	Miridae	*Leptopterna ferrugata*		
		Mecomma dispar	2	F21
		Pithanus maerkeli		
		Stenodema holsata		
	Reduviidae	*Coranus subapterus*	2	F1112
	Rhopalidae	*Myrmus miriformis*		
Hymenoptera	Apidae	*Bombus lucorum*		
Hymenoptera	Apidae	*Hylaeus brevicornis*		
Hymenoptera	Formicidae	*Formica fusca*		
		Leptothorax acervorum		
		Myrmica rubra		
		Myrmica ruginodis		
		Myrmica scabrinodis		
Mollusca		*Cepaea nemoralis*		
		Oxychilus alliarius		
Moths	Arctiidae	*Orgyia antiqua*		
Oniscidea	Oniscidae	*Oniscus asellus*		
	Philosciidae	*Philoscia muscorum*		
	Porcellionidae	*Porcellio scaber*		
Opiliones	Leiobunidae	*Dicranopalpus ramosus*	2	A1100
	Leiobunidae	*Leiobunum blackwalli*		
	Nemastomatidae	*Nemastoma bimaculatum*		
	Phalangidae	*Lacinius ephippiatus*		
		Mitopus morio		

Order	Family	Species Identification	Score	SAT
		Oligolophus tridens		
		Paroligolophus agrestis		
		Platybunus triangularis		
Orthoptera	Acrididae	*Chorthippus parallelus*		
		Omocestus viridulus		
Thysanura		*Dilta littoralis*		

4.12 Site 44 Foage Farm to Sperris Croft and Boscubben Croft

Site 44 lies within a large expanse of roughland, between site 43 Zennor Hill and Rosemorran, and south-eastwards to sites 45 Trendrine Hill and Beagletodn Downs, and 46 Amalveor Downs to Noon Billas. The sampling location lies within an expanse of plateau peatland at about 230m. The area is well-visited by walkers due to its archaeological interest. At the time of the survey the site was not under a management agreement that includes management options targeted to specific semi-natural habitats. The area appears to be unmanaged and ungrazed.

Two sampling locations were identified by Natural England:

- Grassy sward with tussocky *Molinia caerulea*
    - Identified for suction sampling, sweeping / spot sweeping
- Short 'grey' humid heath with *Erica tetralix* and *Molinia caerulea*
    - Identified for pitfall trapping, sweeping / spot sweeping

The grassy *Molinia* location (SW 4688 3805) lies within a section of trampled grassy pathway lined by tussocky *Molinia*. This is an old drove road.

Figure 32. Molinia mire sampling location at site 44.1, old drove road near Sperris Croft

The humid heath sampling location (SW 4690 3781) comprises a mosaic of short *Molinia* with *Erica tetralix, Ulexgallii*, *Calluna* and *Erica cinerea*, with *Pedicularia* also present. The site has deep peat soils. Although very dry on the 6th September, the area was completely waterlogged by the 9th following heavy rainfall.

Figure 33. Humid heath sampling location at site 44.1 (near Sperris Croft)

The sampling programme was:

Action	**First sampling (2013)**	**Second sampling (2014)**
Reconnaissance	2nd September	
Pitfall traps placed	6th September	2nd July
Pitfall traps removed	13th September	9th July
Suction sampling	10th September	7th July
Sweep-netting	10th September*	21st July

*strong winds limited the amount of sweep-netting possible

The combined data from the three sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	46	126		27	
W3	permanent wet mire	12			7	
F1	unshaded early successional mosaic	5			3	
F3	shaded field & ground layer	5			3	
W2	mineral marsh & open water	2			1	

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W221	litter-rich fluctuating marsh	1		3	
F112	open short sward	2		1	
W312	Sphagnum bog	1		1	
F111	bare sand & chalk	1		0	

The area of humid heath was amongst the best areas of this habitat type sampled for specialist peatland invertebrates. Of particular interest is the first county record for the money spider *Agyneta cauta*, a species otherwise only known in the SW from Dartmoor. Other characteristic moorland species present include the money spiders *Walckenaeria atrotibialis* and *W. vigilax*, as well as the liocranid *Scotina gracilipes*. Diptera are also of interest with the largest catches of the cranefly *Limonia dilutior* and an abundance of the doli fly *Campsicnemus alpinus*.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Araneae	Linyphiidae	*Walckenaeria atrotibialis*	2	U
		Walckenaeria vigilax	2	F2100
		Erigone atra		
		Agyneta cauta	2	F22
		Lepthyphantes zimmermanni		
		Lepthyphantes ericaeus		
	Aranaeidae	*Araneus diadematus*		
	Lycosidae	*Pardosa pullata*		
		Pardosa amentata		
Araneae ctd	Lycosidae	*Pardosa nigriceps*		
		Trochosa terricola		
	Liocranidae	*Scotina gracilipes*	2	F22
Auchenorhyncha	Cercopidae	*Neophilaenus lineatus*		
Butterflies	Satyridae	*Lasiommata megera*		
Coleoptera	Cantharidae	*Cantharis cryptica*		
	Carabidae	*Dyschirius globosus*	2	W31
		Pterostichus diligens		
		Pterostichus strenuus		
	Chrysomelidae	*Apteropeda orbiculata*	2	F2000
		Lochmaea suturalis		
		Timarcha tenebricosa	2	F21
	Curculionidae	*Neliocarus nebulosus*	2	F1121
		Sitona striatellus		
	Leiodidae	*Catops coracinus*		
	Pselaphinae	*Reichenbachia juncorum*	2	W31
	Staphylinidae	*Drusilla canaliculata*		

Order	Family	Species Identification	Score	SAT
		Philonthus cognatus		
		Staphylinus erythropterus	2	F2200
		Stenus clavicornis		
		Stenus flavipes		
		Stenus fulvicornis		
		Stenus impressus		
		Stenus pallipes	4	W2212
		Tachyporus dispar		
Diplopoda	Julidae	*Ommatoiulus sabulosus*		
	Polydesmidae	*Polydesmus denticulatus*		
Diptera	Anthomyiidae	*Anthomyia liturata*		
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Dolichopus vitripennis	2	W31
	Limoniidae	*Limonia dilutior*	2	F2221
	Muscidae	*Coenosia distinguens*	2	I
		Coenosia femoralis		
		Schoenomyza litorella		
	Sarcophagidae	*Sarcophaga carnaria*		
	Scathophagidae	*Scathophaga stercoraria*		
	Sciaridae	*Corynoptera uncata*		
	Sciomyzidae	*Limnia paludicola*		
	Syrphidae	*Melanostoma mellinum*		
	Tipulidae	*Tipula confusa*		
		Tipula paludosa		
Heteroptera	Miridae	*Pithanus maerkeli*		
		Stenodema holsata		
		Trigonotylus ruficornis		
	Nabidae	*Aptus mirmicoides*		
Hymenoptera	Formicidae	*Formica lemani*		
		Leptothorax acervorum		
		Myrmica ruginodis		
Oniscidea	Philosciidae	*Philoscia muscorum*		
Opiliones	Phalangidae	*Lacinius ephippiatus*		
		Phalangium opilio		
		Platybunus triangularis		
Orthoptera	Acrididae	*Chorthippus parallelus*		
Thysanura		*Dilta littoralis*		

4.13 Site 51 Noon Digery, Trenowin Downs, Tonkins Downs and Gulval Downs

The area of site 51 identified for invertebrate sampling forms part of Baker's Pit Nature Reserve, owned and managed by the Cornwall Wildlife Trust. It lies immediately to the north of the Iron Age earthworks of Castle-an-Dinas and forms

part of the southern side of the easternmost extent of the West Penwith Moors; the highest point is about 200m. Humid heath vegetation dominates the area and slopes gently down to the north-east. At the time of the survey the site was under a Higher Level Stewardship (HLS) agreement with management options targeted to specific semi-natural habitats. The area is grazed by a tenant farmer.

Three sampling locations were identified by Natural England:

- Sampling location 51.1
    - Heath with *Erica tetralix* in growth phase with grassy sward in cut ride - identified for pitfall trapping, sweeping / spot sweeping, and suction sampling
    - Short grassy sward, regenerating heath - identified for pitfall trapping, sweeping / spot sweeping
- Sampling location 51.2
    - Grassy sward with regenerating heath (wetter than in 51.1) - identified for pitfall trapping, sweeping / spot sweeping

The short grassy sward of 51.1 (SW 4830 5545) is clearly recovering from a period of clearance of the vegetation, perhaps mechanically. Young growth of *Molinia* now forms a cover of 95% with some *Erica tetralix, E cinerea* and *Ulex gallii* sparingly. Open mossy ground forms the other 5% cover. Soil deep moist peat.

Figure 34. Short grassy sward sampling location at site 51.1 (Baker's Pit Nature Reserve)

The humid heath of 51.1 (SW 4851 3557) has a dense cover of *Erica tetralix, E cinerea* and *Ulex gallii* in a matrix of low *Molinia*. Deep moist peat soil. Old cow pats feature.

Figure 35. Humid heath sampling location at site 51.1 (Baker's Pit Nature Reserve)

Location 51.2 (SW 4826 3540) has dense growth of *Molinia, Erica cinerea, E tetralix* and *Ulex gallii* with more open mossy patches occupying less than 10% of the vegetation cover; the other 90% being the heathy vegetation. Deep moist peat soil. Signs of both rabbit and cattle were apparent.

Figure 36. Humid heath sampling location at site 51.2 (Baker's Pit Nature Reserve)

The sampling programme was:

Action	First sampling (2013)	Second sampling (2014)
Reconnaissance	2nd September	
Pitfall traps placed	6th September	3rd July
Pitfall traps removed	13th September	10th July
Suction sampling	10th September	10th July
Sweep-netting	10th September*	21st July

*strong winds limited the amount of sweep-netting possible

The combined data from the three sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	45	110		42	
F3	shaded field & ground layer	8			7	
F1	unshaded early successional mosaic	5			5	
W3	permanent wet mire	5			5	
W2	mineral marsh & open water	4			4	

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W221	litter-rich fluctuating marsh	1		3	
F112	open short sward	3		2	
W312	Sphagnum bog	1		1	
F003	scrub-heath & moorland	2		1	
F002	rich flower resource	1		0	
F111	bare sand & chalk	1		0	

This sampling location proved to be one of the poorest in invertebrates, perhaps reflecting the overall uniformity of the humid heath habitat present, itself perhaps a result of past management practices. The uncommon spider *Agalenatea redii* was present on 51.2 together with the uncommon snake millipede *Leptoiulus belgicus*. The typical humid heath doli fly *Campsicnemus alpinus* was abundant across the site, in all three sampling locations, although another typical associate, the money spider *Walckenaeria vigilax* was found at just one.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Araneae	Dysderidae	*Dysdera erythrina*		
	Linyphiidae	*Walckenaeria antica*		

Order	Family	Species Identification	Score	SAT
		Walckenaeria vigilax	2	F2100
		Gonatium rubens		
		Maso sundevalli		
		Pocadicnemis juncea		F2100
		Oedothorax fuscus		
		Erigone atra		
		Agyneta subtilis		
		Saaristoa abnormis		
		Stemonyphantes lineatus		
		Lepthyphantes tenuis		
		Neriene sp.		
	Tetragnathidae	*Pachygnatha degeeri*		
	Aranaeidae	*Araneus diadematus*		
		Araneus quadratus		
		Agalenatea redii	2	F22
		Hypsosinga sp.		
	Lycosidae	*Pardosa nigriceps*		
	Pisauridae	*Pisaura mirabilis*		
	Clubioniidae	*Clubiona trivialis*		
	Zoridae	*Zora spinimana*		
	Thomisidae	*Xysticus cristatus*		
	Thomisidae	*Ozyptila trux*		
Auchenorhyncha	Cercopidae	*Neophilaenus lineatus*		
		Philaenus spumarius		
Butterflies	Pieridae	*Colias croceus*		
	Satyridae	*Lasiommata megera*		
Chilopoda	Lithobiidae	*Lithobius forficatus*		
Coleoptera	Apionidae	*Apion atratulum*		
	Carabidae	*Nebria salina*		
		Pterostichus diligens		
Coleoptera ctd	Carabidae	*Pterostichus strenuus*		
		Trechus obtusus		
	Chrysomelidae	*Lochmaea suturalis*		
	Curculionidae	*Hypera venusta*		
		Micrelus ericae		
		Neliocarus nebulosus	2	F1121
		Sitona lineatus		
		Sitona striatellus		
	Elateridae	*Dalopius marginatus*		
	Helophoridae	*Anacaena globulus*		
	Staphylinidae	*Mycetoporus rufescens*	2	F2200
		Othius punctulatus		
		Philonthus carbonarius		
		Philonthus laminatus		
		Staphylinus erythropterus	2	F2200

Order	Family	Species Identification	Score	SAT
		Stenus flavipes		
		Stenus pallipes	4	W2212
		Stenus tarsalis		
Diplopoda	Julidae	*Julus scandinavius*		
		Leptoiulus belgicus	2	F31
		Ommatoiulus sabulosus		
	Polydesmidae	*Polydesmus denticulatus*		
Diptera	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Chrysotus gramineus		
		Dolichopus plumipes		
		Dolichopus vitripennis	2	W31
	Lonchopteridae	*Lonchoptera lutea*		
	Muscidae	*Coenosia distinguens*	2	I
		Coenosia femoralis		
		Coenosia tigrina		
		Helina reversio		
		Neomyia cornicina		
		Phaonia incana		
		Schoenomyza litorella		
	Mycetophilidae	*Acnemia nitidicollis*		
		Brevicornu sp		
	Opomyzidae	*Opomyza germinationis*		
	Sarcophagidae	*Sarcophaga carnaria*		
		Sarcophaga variegata		
	Scathophagidae	*Scathophaga stercoraria*		
	Sciaridae	*Corynoptera uncata*		
	Sciomyzidae	*Tetanocera elata*		
	Sphaeroceridae	*Copromyza stercoraria*		
	Syrphidae	*Eristalis pertinax*		
		Eumerus funeralis		
Diptera ctd	Syrphidae	*Melanostoma mellinum*		
		Syritta pipiens		
	Tabanidae	*Haematopota pluvialis*		
	Tipulidae	*Tipula confusa*		
		Tipula paludosa		
Heteroptera	Lygaeidae	*Scolopostethus decoratus*		
		Stygnocoris sabulosus		
	Miridae	*Leptopterna ferrugata*		
		Stenodema holsata		
		Trigonotylus ruficornis		
	Nabidae	*Nabis ericetorum*		
	Tingidae	*Acalypta parvula*		
Hymenoptera	Apidae	*Bombus lucorum*		
	Formicidae	*Leptothorax acervorum*		
		Myrmica ruginodis		

Order	Family	Species Identification	Score	SAT
Opiliones	Nemastomatidae	*Nemastoma bimaculatum*		
	Phalangidae	*Lacinius ephippiatus*		
		Lophopilio palpinalis		
		Mitopus morio		
		Oligolophus tridens		
		Opilio parietinus		
		Paroligolophus agrestis		
		Phalangium opilio		
		Platybunus triangularis		
Orthoptera	Acrididae	*Chorthippus parallelus*		
Thysanura		*Dilta littoralis*		

4.14 Site 53 Rosewall Hill

Rosewall Hill forms the last in the series of high moorland hilltops at the eastern end of the West Penwith Moors. It rises to about 230m. At the time of the survey the site east of the hedge from the road to the summit carn was under a Higher Level Stewardship (HLS) agreement with management options targeted to specific semi-natural habitats; this is owned by the National Trust and is grazed with cattle and/or ponies by a farm tenant. Rabbits are also numerous. The section west of the hedge is also in private ownership and was not under a management agreement.

Three sampling locations were identified by Natural England:

- Granite outcrop / carn with grassy areas ('plateau' community)
    - Identified for suction sampling, sweeping / spot sweeping
- Short grassy sward ('glades') with patchy mature heather and gorse
    - Identified for pitfall trapping, suction sampling, sweeping / spot sweeping
- Very short grassy sward with patchy gorse and bracken
    - Identified for pitfall trapping, suction sampling, sweeping / spot sweeping

The granite tor area (SW 4880 3915) is heavily trampled by visitors and has much bare mineral soil. Grassy edges to the outcrops are the main vegetation feature.

Figure 37. Granite carn sampling location at site 53.1 Rosewall Hill

The short grassy sward location (SW 4878 3928) has patchy mats of *Calluna* and scattered low *Ulex galli* within a matrix of short rabbit- and pony-grazed grassland. *Potentilla erecta* is frequent together with Carex sp. This is very rocky ground with only shallow mineral soils.

Figure 38. Short grassy heath sampling location at site 53.1 Rosewall Hill

The area of patchy bracken (SW 4875 3915) has 100% vegetation cover of grasses, bracken and bramble, with the occasional *Ulex gallii*. The soils are peaty but shallow in places.

Figure 38. Bracken sampling location at site 53.1 Rosewall Hill

The sampling programme was:

Action	**First sampling (2013)**	**Second sampling (2014)**
Reconnaissance	2nd September	
Pitfall traps placed	9th September	3rd July
Pitfall traps removed	16th September	10th July
Suction sampling	10th September	10th July
Sweep-netting	10th September*	21st July

*strong winds limited the amount of sweep-netting possible

The combined data from the three sampling locations produces the following BAT and SAT tables.

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	48	120		51	
F1	unshaded early successional mosaic	6			6	
F3	shaded field & ground layer	6			6	
W3	permanent wet mire	5			5	
W2	mineral marsh & open water	2			2	
A1	arboreal canopy	1			1	

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
W221	litter-rich fluctuating marsh	1		3	
W312	Sphagnum bog	1		1	
F001	scrub edge	1		1	
F112	open short sward	1		1	
F003	scrub-heath & moorland	1		0	
F111	bare sand & chalk	1		0	

This sampling location was amongst the poorest in invertebrates found. Nonetheless the bracken and grass area produced the only record for the uncommon harvestman *Nelima gothica* and also the very local spider *Pelecopsis parallela*. The uncommon money spider *Agyneta cauta* and the ant-mimic spider *Micaria pulicaria* were found on the open heath together with the doli fly *Campsicnemus alpinus*. The *Agyneta* had only previously been found in the SW on Dartmoor until the present survey added it to the Cornish list from here and site 44. Clearly the site does have some specific interest for uncommon moorland invertebrates even though the full assemblage may not be impressive.

Full species list (species registering 2 or more in ISIS are indicated):

Order	Family	Species Identification	Score	SAT
Araneae	Segestriidae	*Segestria senoculata*		
	Mimetidae	*Ero cambridgei*		
	Linyphiidae	*Ceratinella brevis*		
		Walckenaeria acuminata		
		Walckenaeria antica		
		Oedothorax fuscus		
		Pelecopsis parallela	2	F2100
		Cnephalocotes obscurus	2	F2100
		Erigone atra		
		Agyneta cauta	2	F22
		Centromerita sp.		
		Saaristoa abnormis		
		Bathyphantes gracilis		
		Lepthyphantes tenuis		
		Lepthyphantes zimmermanni		
		Lepthyphantes mengei		
	Tetragnathidae	*Pachygnatha degeeri*		
		Metellina segmentata		
	Lycosidae	*Pardosa pullata*		
		Pardosa nigriceps		
		Alopecosa pulverulenta		
		Trochosa terricola		

Order	Family	Species Identification	Score	SAT
	Agelenidae	*Agelena labyrinthica*		
	Clubioniidae	*Clubiona recluse*		
		Clubiona neglecta	2	F11
	Gnaphosidae	*Micaria pulicaria*		
	Thomisidae	*Xysticus cristatus*		
		Ozyptila trux		
Auchenorhyncha	Cicadellidae	*Aphrodes albifrons*		
		Ulopa reticulate		
	Cixiidae	*Tachycixius pilosus*		
Chilopoda	Lithobiidae	*Lithobius forficatus*		
Coleoptera	Apionidae	*Apion atratulum*		
		Apion marchicum	2	F22
Coleoptera ctd	Carabidae	*Abax parallelepipedus*		
		Amara aenea		
		Cychrus caraboides	2	F2000
		Notiophilus biguttatus		
		Trechus obtusus		
	Chrysomelidae	*Lochmaea suturalis*		
		Longitarsus holsaticus	2	F2111
	Cryptophagidae	*Cryptophagus sp*		
	Curculionidae	*Hypera venusta*		
		Micrelus ericae		
		Neliocarus nebulosus	2	F1121
		Rhinoncus perpendicularis		
		Sitona striatellus		
	Elateridae	*Dalopius marginatus*		
	Geotrupidae	*Anoplotrupes stercorosus*	2	F2200
		Geotrupes spiniger		
	Silphidae	*Silpha atrata*		
	Staphylinidae	*Drusilla canaliculata*		
		Ocypus olens		
		Philonthus albipes	2	F2000
		Philonthus carbonarius		
		Philonthus cognatus		
		Quedius boops		
		Rugilus erichsonii	2	W31
		Sepedophilus nigripennis		
		Stenus brunnipes		
		Stenus pallipes	4	W2212
		Tachinus rufipes		
		Tachyporus chrysomelinus		
Diplopoda	Julidae	*Julus scandinavius*		
		Ommatoiulus sabulosus		
	Polydesmidae	*Polydesmus denticulatus*		

Order	Family	Species Identification	Score	SAT
Diptera	Agromyzidae	*Cerodontha denticornis*		
	Anthomyiidae	*Chirosia flavipennis*		
		Pegoplata aestiva		
	Chloropidae	*Cetema simile*		
		Oscinella hortensis		
	Dolichopodidae	*Campsicnemus alpinus*	2	W3121
		Chrysotus gramineus		
		Dolichopus vitripennis	2	W31
		Hercostomus germanus		
		Hercostomus nigripennis	2	F2100
	Drosophilidae	*Scaptomyza pallida*		
	Hybotidae	*Platypalpus nigritarsis*		
Diptera ctd	Lonchopteridae	*Lonchoptera lutea*		
	Muscidae	*Coenosia distinguens*	2	I
		Helina obscurata		
		Helina reversio		
		Musca autumnalis		
		Neomyia cornicina		
	Mycetophilidae	*Acnemia nitidicollis*		
		Brevicornu sp		
		Exechia parvula		
	Opomyzidae	*Geomyza balachowskyi*		
		Opomyza germinationis		
	Sarcophagidae	*Sarcophaga carnaria*		
		Sarcophaga variegata		
	Scathophagidae	*Scathophaga stercoraria*		
	Sciaridae	*Bradysia nitidicollis*		
	Sepsidae	*Sepsis cynipsea*		
	Sphaeroceridae	*Copromyza nigrina*		
		Crumomyia pedestris		
	Tachinidae	*Phryxe nemea*		
		Thelaira nigrina		
	Tipulidae	*Tipula paludosa*		
Heteroptera	Lygaeidae	*Drymus ryei*		
		Drymus sylvaticus		
		Scolopostethus decoratus		
		Stygnocoris sabulosus		
	Miridae	*Adelphocoris lineolatus*		
		Stenodema holsata		
	Nabidae	*Nabis limbatus*		
		Nabis rugosus		
Hymenoptera	Formicidae	*Formica lemani*		
		Leptothorax acervorum		
		Myrmica ruginodis		
		Myrmica scabrinodis		

Order	Family	Species Identification	Score	SAT
Mollusca		*Nesovitrea hammonis*		
		Oxychilus alliarius		
Moths	Arctiidae	*Orgyia antiqua*		
Oniscidea	Oniscidae	*Oniscus asellus*		
	Philosciidae	*Philoscia muscorum*		
	Porcellionidae	*Porcellio scaber*		
Opiliones	Leiobunidae	*Nelima gothica*	2	F21
	Nemastomatidae	*Nemastoma bimaculatum*		
	Phalangidae	*Lacinius ephippiatus*		
		Mitopus morio		
		Platybunus triangularis		
Orthoptera	Acrididae	*Chorthippus parallelus*		
Orthoptera	Acrididae	*Omocestus viridulus*		
Thysanura		*Dilta littoralis*		

4.15 Overview of the results from the sample sites

The sample sites are organised in the following table according to the total number of higher scoring species (from ISIS) and therefore with the level of conservation interest for invertebrate species greatest at the top of the listing.

Table 2. (N= number of sampling locations; 2, 4 and 16 are ISIS scores)

Site	N	2	4	16	RDB	NS
21 Woon Gumpus	6	37	3	1	*S. kies*	*O glabra, Helochares punctatus*
20 Boswens (South)	3	18	1	1		*O glabra, Zyras*
32 Carn Galva	3	25	5			*A sedi, O insignis, T formosus*
31 Watch Croft, Trevean	4	36	3			*A sedi , C obsoletus*
18 Carnyorth	4	24	3			*A sedi, Acalles*
43 Zennor Hill	3	18	3			*A sedi, Acalles, M subrug*
37 Treen Common	3	23	1			
2 Chapel Carn Brea	3	22	1			*A longicollis*
4 Tredinney Common	3	22	1			*Elochares punctatus*
40 Higher Kerrowe	1	17	1			
53 Rosewall Hill	3	16	1			
44 Foage to Sperris	2	15	1			
36 Nine Maidens	1	9	1			
51 Noon Digery, etc	3	9	1			

Sites 21, 20, 32, 31, 18 and 43 clearly stand out as having the greatest variety of more interesting species.

5 OVERVIEW OF SITE QUALITY

The ISIS analysis has demonstrated that the West Penwith Moors are of SSSI quality for three invertebrate assemblage types:

- F003 scrub-heath and moorland
- W312 Sphagnum bog
- F001 scrub edge

The fauna overall is most notable for the wide representation of species which are characteristic of heath and moor situations, and which have become increasingly scarce and localised due to habitat loss throughout England.

Taking the ISIS assemblage analysis into account, the highlights from the sampling programme are listed below, from the most significant sites - in terms of SSSI designation - to the sites of more moderate significance:

Site 21 Woon Gumpus Common

- A key site for the **W312 Sphagnum bog** invertebrate assemblage
- A key site for **W2 Mineral marsh and open water** invertebrate assemblage

Site 20 Dry Carn and Boswens Common West

- The southern enclosure a key site for **W2 Mineral marsh and open water** invertebrate assemblage

Site 32 Carn Galva

- High quality carn area, with Nationally Scarce weevils, etc
- Good example of humid heath habitat

Site 31 Watch Croft, Trevean, White Downs & Bosullow Common

- High quality grazed grass heath and carn areas
- Good example of humid heath habitat
- Interesting feature of old green lane

Site 18 Carnyorth Common to Bostraze Bog

- High quality carn area (Carn Kenidjack), with Nationally scarce beetles, etc
- Good example of humid heath habitat

Site 43 Zennor Hill and Rosemorran

- Moderate quality carn area
- Moderate quality areas of grass heath

Site 37 Mulfra Hill to Treen Common

- Good example of humid heath habitat
- Pool and mire with interesting invertebrate assemblage

Site 2 Chapel Carn Brea

- Good example of humid heath habitat
- The only identified West Penwith Moors population of the Nationally Scarce Heather flea beetle *Altica longicollis*

Site 4 Bartinney Downs, Tredinney Common and Numphra Common

- Good example of humid heath habitat on Tredinney Common
- Grass heath with species of significant interest
- Pool and mire areas of moderate interest

Site 40 North of Higher Kerrowe

- Good example of humid heath habitat, although old heath species under threat from increased grazing pressure

Site 53 Rosewall Hill

- Humid heath and grass heath aares of moderate interest for uncommon invertebrates

Site 44 Foage farm to Sperris Croft and Boscubben Croft

- A particularly good example of humid heath habitat

Site 36 Nine Maidens Common

- Good example of humid heath habitat

Site 51 Noon Digery, Trenowin Downs, Tonkins Downs and Gulval

- Very extensive area of humid heath but with relatively limited interest for moorland invertebrates

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GLOSSARY OF TECHNICAL TERMS

Invertebrate assemblage analysis framework:

ISIS Invertebrate Species and habitat Information System

- This is a computer application developed by Natural Engalnd in order to convert lists of scientific names into the key invertebrate habitat types represented within that list and to assess site quality for these invertebrates. It was primarily designed for Common Standards Monitoring, but is also useful for a wide range of other purposes.

BATs Broad Assemblage Types

- These are the basic invertebrate habitat types identified by ISIS. The classification reflects environmental factors such as hydrology and the dynamic influences that have an important effect on invertebrate assemblages. The categories distinguished include the different range of invertebrate species associated with mineral soils as opposed to peat soils, for example.

SATs Specific Assemblage Types

- These are characterised by very specialist invertebrate species which are considered to have an intrinsic conservation value; they are generally only found on sites with conservation value. Each SAT is linked to a particular BAT, eg the acid mire SAT lies within the permanent wet mire BAT.

BATs and SATs do not necessarily link closely with vegetation types as defined by plant ecologists, as vegetation *structure* is more important to invertebrates than the presence or absence of particular plant *species*. The proportion of bare ground within the vegetation may be more important than the plant species, for example, or the vegetation density and height, irrespective of the plant species.

Current invertebrate conservation status categories:

- The most notable species of invertebrate found on the West Penwith Moors have been given a conservation status termed **Nationally Scarce**. The basic criterion is that the species concerned are likely to occur in fewer than 100 of the 10km squares (**hectads**) which make up the Ordnance Survey mapping of Britain.
- These statuses are reviewed periodically in order to keep them as up-to-date as possible, reflecting changes in species' range and abundance that are occurring in relation to, for example, changing land use factors and climate change.
- Species are also subject to an assessment of threat to their survival in Britain and threatened species are featured in the **British Red List.**

Appendix 1 Community Conservation Index (CCI)

The Community Conservation Index (Chadd & Extence, 2004) was initially developed in 1995 by biologists in the NRA Anglian region and was reviewed in October 2004 after a ten year trial period. The CCI has advantages over other conservation assessment schemes, such as the species rarity score in that it takes into account the overall diversity of an invertebrate community and includes species that nationally might be uncommon but are not sufficiently scarce to warrant any conservation status. However, the scheme is already in need of up-dating as the conservation status of several species has changed in light of current knowledge.

Chadd and Extence (2004) state that the scores can be adapted to local circumstances and changing designations; however, with one notable exception the scores from the original paper have been used in this report in order to avoid discrepancies and confusion. The mud snail (*Omphiscola glabra*) was formerly considered to be a Red Data book category 2 (Vulnerable) species (Bratton, 1991) and thus would have scored 9 in the CCI calculation. However recent research, culminating in a more recent review of the statuses of non-marine Mollusca of Great Britain (Seddon *et al.* 2014) has concluded that a status of Nationally Scarce is more accurate and thus this species now scores 7 in the CCI calculation. This latter score has been used in this survey report in order to present a better assessment of the aquatic invertebrate communities at the two sites where this species was recorded.

Conservation Scores of between 1 and 10 have been assigned to each species of aquatic macro-invertebrate based on their rarity. Most of the individual species in a sample are allocated a score.

The Community Score is based on the BMWP-score or the species in the sample with the highest conservation score: the Community Score for a site is based on whichever indicates the highest score. The BMWP Scoring system is a metric widely used by the regulating authorities in the UK (Environment Agency, Scottish Environmental Protection Agency, Natural resources Wales and the Northern Ireland Environment Agency) to assess the impact of pollution on flowing waters and as such was not compliant with the methods used and the lentic habitats assessed in the current survey.

Conservation scores used for the CCI (CS)

Conservation Score	**Definition**
10	Red Data Book Category (RDB)1, endangered
9	RDB2, vulnerable
8	RDB3, rare
7	Notable (but not RDB status) or regionally very notable
6	Regionally notable
5	Local
4	Occasional (species not in categories 10 - 5, which occur in up to 10% of all samples from similar habitats)
3	Frequent (species not in categories 10 - 5, which occur in 10 - 25% of all samples from similar habitats)

Conservation Score	Definition
2	Common (species not in categories 10 - 5, which occur in 25 - 50% of all samples from similar habitats)
1	Very Common (species not in categories 10 - 5, which occur in 50 - 100% of all samples from similar habitats)

Categories 10 - 5 are recognised national designations developed by JNCC.

Community scores used with the CCI (CoS)

Community Score	BMWP	Highest Conservation Score
15	>301	10
12	251 - 350	9
10	201 - 250	8
7	151 - 200	7
5	101 - 150	5 or 6
3	51 - 100	3 or 4
1	1 - 50	1 or 2
0	0	scoring species absent

The CCI for a site is the product of the Community Score and the average Conservation Score. It is calculated by dividing the sum of the individual species scores (CS) by the number of species (n) then multiplying the resulting product by the community score (CoS) described above:

$CCI = (\sum CS \div n) \text{ X } CoS$

This gives a numerical index from which the conservation value of a site is derived (see numerical ranges below)
0.0 to 5.0 – sites supporting only common species and/or a community of low taxon richness. LOW CONSERVATION VALUE
5.0 to 10.0 – sites supporting at least one species of restricted distribution and/or a community of moderate species richness. MODERATE CONSERVATION VALUE
10.0 to 15.0 – sites supporting at least one uncommon species, or several species of restricted distribution and/or a community of high taxon richness. FAIRLY HIGH CONSERVATION VALUE
15.0 to 20.0 – sites supporting several uncommon species, at least one of which may be nationally rare and/or a community of high taxon richness. HIGH CONSERVATION VALUE
>20.0 – sites supporting several rarities, including species of national importance, or at least one extreme rarity (e.g. taxa included in the British RDBs) and/or a community of very high taxon richness. VERY HIGH CONSERVATION VALUE

APPENDIX 2 COMPARISON OF ISIS INVERTEBRATE ASSEMBLAGE TYPES WITH THE REALITY OF THE WEST PENWITH MOORS SAMPLING

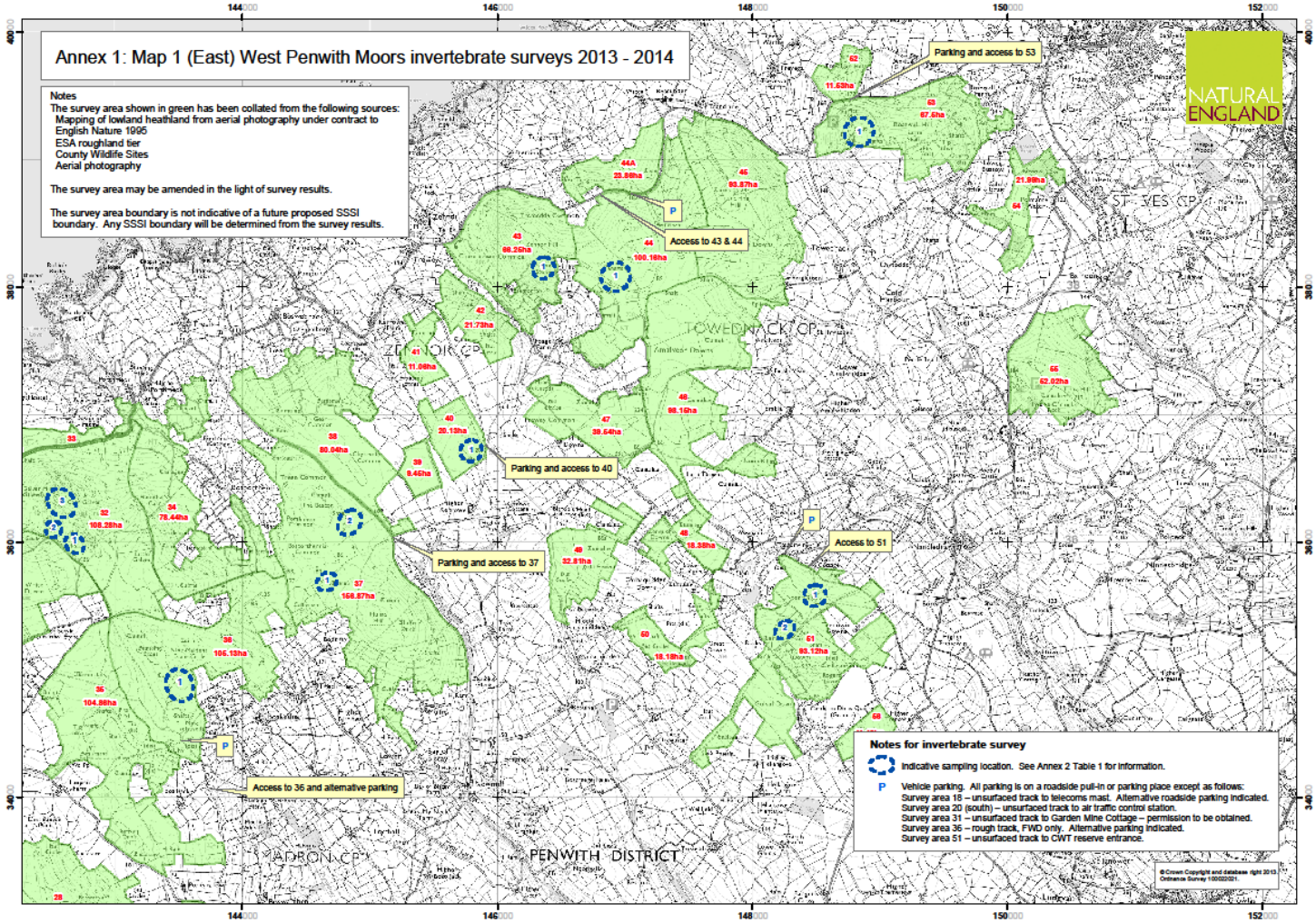
NCR additions to the county fauna; all assumed to be overlooked natives
ISIS assemblage type; WPM the suggested assemblage type as found on the West Penwith Moors

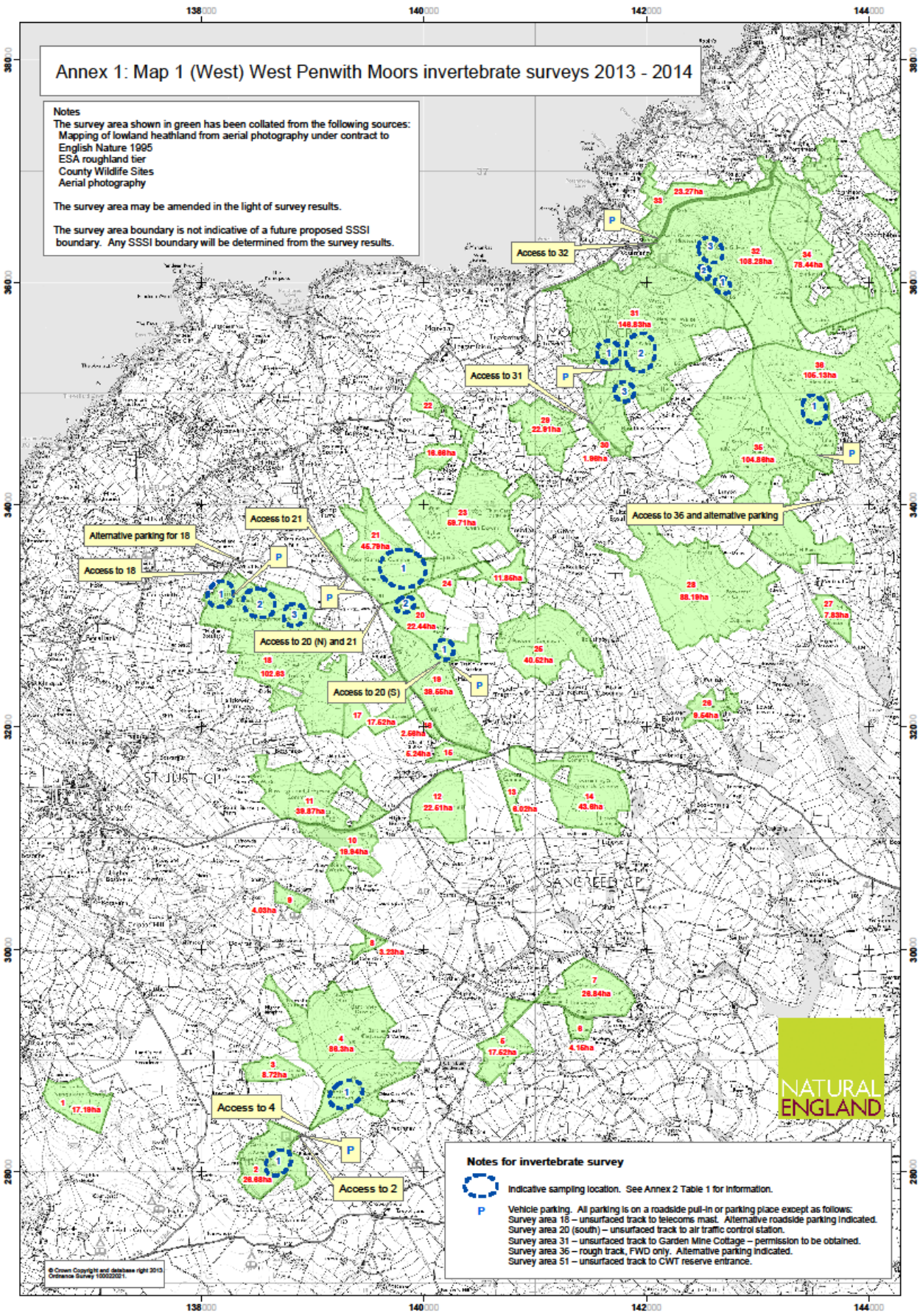
Species		NCR	ISIS	WPM	Soil type	Veg density	Veg height	Habitat
Omphiscola glabra	Mollusca		W2000	W221	mineral	open	short	seasonally flooded hollows in old semi-natural pastures
Stenus kiesenwetteri	Coleoptera	NCR	W3121	W3	peat	open	short	lowland peat mires
Orthochaetes insignis	Coleoptera		F1100	F112	mineral	open	short	mineral, sparse, herb-rich
Helochares punctatus	Coleoptera		W3121	W3	peat	open	short	moist peat
Meligethes subrugosus	Coleoptera		N/A	F111	mineral	open	tall	mineral, sparse, flowery
Acalles ptinoides	Coleoptera		A2121	F003	mineral	mixed	tall	dead heather stems
Aizobius sedi	Coleoptera		F1111	F111	mineral	open	short	mineral, sparse, herb-rich
Altica longicollis	Coleoptera		F2200	F003	mineral	mixed	short	stressed heather
Cercyon obsoletus	Coleoptera		F0000	F000	mineral	mixed	short	dung
Tachyporus formosus	Coleoptera		F1100	W221	mineral	open	mixed	wet Molinia marsh
Zyras haworthi	Coleoptera		A2111	F2	mineral	mixed	short	ants
Syntomium aeneum	Coleoptera		F3100	F111	mineral	open	mixed	mineral, sparse
Rhynchites aeneovirens	Coleoptera		A1100	F2	mineral	dense	tall	mineral, dense
Longitarsus holsaticus	Coleoptera		F2111	W3	peat	open	mixed	peat
Campsicnemus alpinus	Diptera		W3121	W3	peat	open	short	humid heath
Euphylidorea meigenii	Diptera		W3121	W3	peat	mixed	mixed	humid heath and Molinia mire
Tipula melanoceros	Diptera		W3100	W3	peat	mixed	mixed	humid heath and Molinia mire
Limonia dilutior	Diptera		F2221	W3	peat	open	short	humid heath

Species		NCR	ISIS	WPM	Soil type	Veg density	Veg height	Habitat
Campiglossa loewiana	Diptera	NCR	F2100	F111	mineral	open	tall	mineral, sparse, flowery
Mecomma dispar	Heteroptera		F2100	F2	mineral	dense	tall	rank
Deraeocoris scutellaris	Heteroptera		F2200	F003	mineral	dense	tall	heathers
Trigonotylus caelestialium	Heteroptera	NCR	n/a	F2	peat	mixed	tall	peat fen & mire
Arctocorisa germari	Heteroptera		W2111	W311	mineral	open		still water bodies with bare mineral substrate
Sigara scotti	Heteroptera		W3111	W311	peat	open		sparse peat pools
Walckenaeria unicornis	Araneae	NCR	F2100	F2	mineral	dense	tall	amongst detritus in tall often marshy vegetation
Agyneta cauta	Araneae	NCR	F2200	W3	peat	open	short	detritus in damp sites
Ozyptila simplex	Araneae	NCR	F1111	F2	mineral	dense	tall	grasslands
Ceratinella scabrosa	Araneae		F2100	F111	mineral	open	mixed	detritus in grasslans, etc
Walckenaeria alticeps	Araneae		W3100	W3	peat	open	short	mire with Molinia & Sphagnum
Walckenaeria atrotibialis	Araneae		U	W3	peat	open	short	humid semi-natural vegetation
Walckenaeria vigilax	Araneae		F2100	W3	peat	open	short	amongst moss & grass, damp sites
Metopobactrus prominulus	Araneae		F2100	W3	peat	open	short	grasslands, etc
Pelecopsis nemoralis	Araneae		F3100	F003	mineral	open	mixed	detritus & moss
Agalenatea redii	Araneae		F2200	W3	peat	dense	tall	tall, well-structured vegetation
Cercidia prominens	Araneae		F2100	F003	mineral	dense	tall	heathland & grassland
Scotina gracilipes	Araneae		F2200	W3	peat	open	short	dry exposed heathland
Nelima gothica	Opiliones		F2100	F2	mineral	dense	tall	tangled vegetation
Anelasmocephalus cambridgei	Opiliones		F2100	W3	peat	dense	short	detritus & moss, humid
Lophopilio palpinalis	Opiliones	NCR	F2121	F2	mineral	dense	tall	well-structured vegetation
Chthonius orthodactylus	Pseudoscorpion		N/A	F111	mineral	open		detritus, humid
Leptoiulus belgicus	Diplopoda		F3100	F2	mineral	dense	tall	well-structured vegetation

Species		NCR	ISIS	WPM	Soil type	Veg density	Veg height	Habitat
Panurgus calcaratus	Hymenoptera		F1112	F002	mineral	open	tall	short dry heath with yellow composites
Enderleinella obsoleta	Psocoptera		n/a	F2	mineral	mixed	tall	old heather, etc

APPENDIX 3 MAPS SHOWING SAMPLING LOCATIONS




Annex 1: Map 1 (West) West Penwith Moors invertebrate surveys 2013 - 2014
Notes
The survey area shown in green has been collated from the following sources:
Mapping of lowland heathland from aerial photography under contract to English Nature 1995
ESA roughland tier
County Wildlife Sites
Aerial photography
The survey area may be amended in the light of survey results.
The survey area boundary is not indicative of a future proposed SSSI boundary. Any SSSI boundary will be determined from the survey results.
Access to 32
Access to 31
Access to 36 and alternative parking
Access to 21
Alternative parking for 18
Access to 18
Access to 20 (N) and 21
Access to 20 (S)
Access to 4
Access to 2
NATURAL ENGLAND
Notes for invertebrate survey
Indicative sampling location. See Annex 2 Table 1 for information.
P
Vehicle parking. All parking is on a roadside pull-in or parking place except as follows:
Survey area 18 – unsurfaced track to telecoms mast. Alternative roadside parking indicated.
Survey area 20 (south) – unsurfaced track to air traffic control station.
Survey area 31 – unsurfaced track to Garden Mine Cottage – permission to be obtained.
Survey area 36 – rough track, FWD only. Alternative parking indicated.
Survey area 51 – unsurfaced track to CWT reserve entrance.
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