Hymettus

Hymettus Ltd
Research Report for 2011

Compiled by Paul Lee

Lea-Side, Carron Lane, MIDHURST, West Sussex GU29 9LB
Registered in England No. 5761114
Registered Charity No. 1124636

Cover photograph:
Bombus ruderarius queen by Steven Falk

CONTENTS

Hymettus Research Report for 2011

1. Background to 2011 research

1.1 This report deals with the research programme originating in discussions of the Steering Group at the 2010 Hymettus Annual Review meeting and finalised by the coordinator with advice from the Hymettus Board of Trustees. The reported work was made possible by grants from Defra, from Natural England, from the Redwing Trust and from Scottish Natural Heritage. Much of the work is only summarised here but further details can be obtained from Paul Lee and reports of many individual projects can be downloaded from the Hymettus website.

1.2 The UK Biodiversity Action Plan (UK BAP) is the UK Government's response to the international Convention on Biodiversity signed in 1992. It should provide a detailed set of plans for conservation of the 1150 Priority Species and 65 Priority Habitats listed therein but gaps in knowledge, particularly for the less well known species groups, have proved a barrier to the completion and delivery of these plans. Most of the Hymettus research in 2011 was Defra funded and aimed to address some of the knowledge gaps that have been independently identified as priority areas of investigation for BAP Priority Species of lesser known terrestrial invertebrates. In addition to aculeate hymenoptera, these BAP Priority Species included three millipedes, a centipede, four flies, ten ground beetles and a leaf hopper.

1.3 Alongside the Defra project on UK BAP species, work continued in partnership with the statutory agencies, Bumblebee Conservation Trust and RSPB on the reintroduction of *Bombus subterraneus* in England and the Species Action Framework project on *Bombus distinguendus* in Scotland.

1.4 The research is reported mainly as autecological studies within seven ecological / geographical groupings.

2. Shingle & sand dune invertebrates

2.1 Ants at Dungeness

Brian Banks, assisted by Dr Nikki Gammans, has been attempting to determine whether there are significant differences in the abundance of nests of *Tetramorium caespitum* (important as the host of *Anergates atratulus)* and *Temnothorax interruptus* in different vegetation communities on Dungeness. Hanging tiles placed on the ground have proved to be a useful way of surveying for *T. caespitum.* The tiles become warm under sunlight and are attractive to ants rearing larvae and pupae. The degree of colonisation of tiles was variable. This might indicate differing densities of ant nests; however, other factors could be influencing the results. There was increased occupancy of the tiles by *T. caespitum* and *Myrmica scabrinodis* in 2011 compared with previous years but no evidence of *A. atratulus* was found. An

additional technique was tested in 2011 i.e. using cheese baits to assess the distribution of ant species across a range of vegetation communities.

T. caespitum was very scarce in areas of unconsolidated shingle with sparse (mainly grassy) vegetation. As the coastal grassland becomes more established and the shingle more fixed, with finer material filling the voids between the pebbles, so *T. caespitum* starts to establish nests. The hanging tiles did not provide clear evidence of differences in species distribution between the types of acid grassland / lichen heath found on the shingle. However, data from the use of cheese baits showed a strong association between vegetation type and the presence of *T. caespitum* (X^2= 45.502, p<0.001, df=2). Although the ant is frequently found on stable, long-established *Arrhenatherum* grassland it is more strongly associated with lichen-rich areas in shingle margin acid grassland and especially in mature lichen-rich acid heath. Broom scrub was not sampled in 2011, although previous surveys had not found dense broom to be used for nesting. Thus the distribution of *T. caespitum* across the shingle is relatively predictable, with this ant occurring in stable coastal grassland and lichen heath, although each patch of shingle vegetation does not have a uniform density of the ant, presumably due to chance effects in colonisation.

Areas of lichen-rich acid grassland on young shingle were used by densities of ants approaching those found in stable *Arrhenatherum* grassland, with the highest densities found on more mature, ungrazed lichen heath near the coast. There appears to be no association between nest size and vegetation type but large nests (>1000 workers) were more frequent than expected in areas with light winter grazing. The opposite was true in ungrazed areas where individual foragers, small (<100 workers) and medium nests (>100, <1000 workers) were more frequent than expected (X^2= 17.533, p<0.001, df=3).

Insufficient data were collected for robust statements to be made regarding the status of *Temnothorax interruptus* in the different shingle communities. However, some general observations can be made. *T. interruptus* was found far less frequently on the shingle than *T. albipennis*, the latter species being found more readily in dead plant stems. Over the years *T. interruptus* has been found under tiles on coastal *Arrhenatherum* grassland, which has abundant areas of exposed pebbles, and on areas of lichen heath with exposed flints. It can be found also by turning over pebbles to look for nests and was attracted to the cheese baits in very small numbers but only on stable *Arrhenatherum* grassland. On areas of lichen heath *T. interruptus* is likely to benefit from grazing if this exposes flint pebbles in amongst the vegetation.

The network of tiles remains available for monitoring for *Anergates atratulus* in future years.

2.2 *Doratura impudica*

Dr Alan Stewart has completed a study to characterise more precisely the micro-habitat of the bug *Doratura impudica*. All historical records for this species have been collated. Prior to this project, this species was known from six sites on the coast between Kent and Norfolk. Specimens associated with records outside this zone have been checked and found to be mis-

identifications (attributable to the closely-related but widespread and common species *Doratura stylata*).

Twelve coastal sand dune sites were visited in 2010-11 along the coasts of SE England and East Anglia between West Sussex and north Norfolk with detailed sampling carried out at 21 sub-sites within these. All sub-sites were sampled by standardized sweep-netting (vacuum sampling was used initially but found not to be any more productive for this species). The number and sex of all adult *D. impudica* were recorded (no nymphs were found). The presence of *Doratura impudica* was confirmed at all sites for which historical records existed, except two: Scolt Head Island, which was difficult to access; and Titchwell, where extensive searching failed to find it. The species is now known from a total of eight hectads in Britain (Kent: 1; Essex: 3; Norfolk: 4).

The relative cover of all plant species and bare ground at each sub-site was recorded on the DAFOR scale with the data being used to allocate each sub-site to an NVC community. The height of the vegetation and the density of *Elytrigia juncea* stems in 50x50 cm sample quadrats were also recorded. The total area of potentially suitable habitat was estimated. A number of environmental variables were recorded at each site in order to characterize the abiotic micro-habitat, including aspect, slope, soil pH and the presence of obvious disturbance (in the form of trampling). Soil samples were taken to analyse for sand particle size. Site locations were recorded using a GPS to an accuracy of +/- 10m. Photos of the habitat were taken at each site.

It is clear that the preferred habitat for this species is the extreme seaward edge of coastal sand dunes. It was found only in areas where sand couch, *Elytrigia juncea* (=*Elymus farctus*), formed mono-specific stands or dominated the plant community. This species is therefore assumed to be the bug's host plant. Closely related plant species, such as sea couch, *Elytrigia atherica,* did not support the bug. However, extensive searching of some apparently suitable sites (e.g. Winterton Dunes) failed to detect the bug, suggesting that factors other than the presence of the host plant may be critical. It was most frequently encountered, and in greatest numbers, where its host plant grew in large, sparsely-stemmed, monocultural stands. Such stands usually occur in a narrow zone (maximum 10m.) between uncolonized sand at the top of the beach and stabilized dune dominated by marram grass, *Ammophila arenaria.* As such, the preferred habitat is very vulnerable to erosion and fragmentation by wave action and to disturbance by human trampling.

An extension of this project in 2012 will use knowledge of its preferred habitat to survey for *D. impudica* in two large sand dune systems in the south-west (Studland and Braunton Burrows) and three in south Wales (Kenfig, Merthyr Mawr and Whitford Burrows).

3. Invertebrates of the North Sea and English Channel coasts

3.1 *Trachysphaera lobata*

Paul Lee and Dr Helen Read are attempting to establish the distribution of the pill millipede *Trachysphaera lobata* on the Isle of Wight and, in collaboration with Dr Thomas Wesner of the Research Museum Alexander Koenig in Bonn, have completed an investigation of the taxonomic status of the known British populations.

Pill millipedes of the genus *Trachysphaera* are very small millipedes with a body length of less than 4 mm and a heavily sculptured surface, giving them a very unusual appearance. *Trachysphaera* species are generally difficult to identify because numerous morphological characters are known to vary greatly both within and between populations and many species descriptions are based on a very small number of specimens. A population of *Trachysphaera* was first discovered on the Isle of Wight in 1984 where it still appears to be restricted to a small area of undercliff near Bembridge. The identity of the English specimens was unclear for a long period as only females were collected. Later, males were collected and determined as *Trachysphaera lobata*, a species known from western France. Recently, two further British *Trachysphaera* populations were discovered in South Wales. Field work was undertaken in February 2011 to collect specimens from the Isle of Wight population and specimens were collected from near Swansea in March 2011. Scanning electron microscopy images of various morphological structures were taken from five specimens from the Isle of Wight population and eight specimens from the Welsh population as well as individuals from different European populations. Morphological characters on the last tergite before the anal shield confirm the identity of both British *Trachysphaera* populations as *T. lobata*. However, multi-layer images taken of twelve specimens from the Isle of Wight and of nine specimens from the Welsh population revealed large differences in colour and encrustration within each population that could not be correlated to differences in other morphological structures or to genetic differences.

DNA was extracted from thirteen specimens of *T. lobata* from the Isle of Wight population, fifteen from the Welsh population, ten from a French mainland population, and two each from two distinct Italian *Trachysphaera* populations. Amplification of the COI gene and subsequent sequencing was only successful for two Italian specimens, all thirteen specimens from the Isle of Wight, and twelve specimens from Wales. Due to a contamination not detected before the sequencing was undertaken, no COI sequences could be obtained from the French *T. lobata* population. The results show that the two British populations of *T. lobata*, while related to each other, consist of separate units, with a different evolutionary history. The question of whether (1) the two disjunct populations are the last remaining relict populations of a *Trachysphaera* distribution spanning southern England and South Wales, with all intermediate populations either undiscovered or extinct, or (2) if the Welsh and Isle of Wight populations are the result of two separate dispersal or introduction events from distant European mainland populations, cannot be answered at present because of the lack of samples from the European continent.

A further survey on the Isle of Wight is planned for May 2012 to complete this project. Work on the taxonomic status of the species in Britain and Europe will continue.

3.2 *Nothogeophilus turki*

Steve Gregory, Paul Lee and Dr Helen Read are attempting to determine the current English distribution of the centipede *Nothogeophilus turki*. This centipede was first described as new to science in 1988 on the basis of specimens collected from the Isles of Scilly. It was then reported from Freshwater Bay on the Isle of Wight. It is difficult to identify in the field appearing very similar to several other small, pale geophilomorph centipedes, especially the common species *Schendyla nemorensis*. Most of the few records of this species are from coastal locations and all have a strong maritime influence.

Field work to search for specimens on the Isle of Wight was undertaken over three days in February 2011 alongside work on the millipede *Trachysphaera lobata*. The location of Freshwater led to several coastal sites being visited as a long stretch of coast could conceivably be described as being part of the town and its environs. Even so time did not allow for all possible sites to be surveyed. Specimens initially thought to belong to *N. turkii* were collected from Compton Chine to the east of Freshwater Bay. However, under the microscope these proved to be *S. nemorensis.* None of the other sites visited produced any small, pale geophilomorph centipedes.

The surveys may have been organised too early in the year in order to ensure successful collection of *N. turki.* A further survey on the Isle of Wight is planned for May 2012 to complete this project. However, a re-survey of sites on the Isles of Scilly is required at some time in the near future.

3.3 *Colletes halophilus*

Adrian Knowles has been investigating the environmental conditions necessary for nest establishment by the Saltmarsh Mining Bee *Colletes halophilus*. In 2010 nest site data were collected from Colne Point, Walton Hall Marshes, Mersea Stone and Alresford Creek in Essex. At Middle Beach Dovercourt, no nesting activity was found but *C. halophilus* was present on the adjacent saltmarsh. Walton Hall Marshes, Alresford Creek and Middle Beach Dovercourt were revisited in 2011. A number of more speculative survey walks were undertaken in south Suffolk in both years. Nest site details from Lincolnshire were supplied by Alan Phillips based on his observations in 2009 and 2011 and Tim Strudwick confirmed the location of a large nesting aggregation near Breydon Water, Great Yarmouth and supplied some details.

Although there is a risk of over-generalising on the basis of relatively few observations, nesting aggregations of *C. halophilus* appear to exploit a variety of natural and artificial locations. In coastal sand spits and hinterland saltmarsh two distinct niches are known to be exploited: low-lying and essentially level transition zones between sand dune and saltmarsh habitat; and also dry Marram Grass dune vegetation, including steep, eroding faces. The

substrates at most sites are sand dominated although some of the artificial sites have more silty substrates. Anecdotal evidence suggests that the sides of a clay embankment seawall have been utilised in south Suffolk, although this colony could not be re-discovered in 2010 or 2011. This appears to be a similar situation to the Breydon Water colony discovered by Tim Strudwick in Norfolk. At some sites the substrate remains dry but at most sites it is exposed to significant levels of moisture at some times of the year. Slope seems to be a less important consideration. All of the substrates would be capable of holding a stable tunnel, so that bare, loose soil is unlikely to be favoured. Even in sand dune habitats, it is postulated that the fibrous root stock of Marram Grass and other vegetation present is playing a role in helping to support the tunnel walls.

The apparent situation at Alresford Creek, where the bees are deliberately nesting close to the high water mark when seemingly similar substrate higher up the embankment face is relatively under-utilised, suggests that there is some ecological advantage in doing so. Possibly this may reduce competition for nesting substrate from other aculeates. The polymerised inner lining of the natal cell is likely to confer some degree of waterproofing for that cell, thereby permitting such activity.

Another aspect of the work on *C. halophilus* was to use Environment Agency (EA) coastal erosion and sea defence models to map areas of high potential risk within the range of the bee. In October 2009 the EA reported that this study looking at saltmarsh loss and sea level rise would be completed within 'a few months'. The data from this study was to form the basis of the planned appraisal of *Colletes halophilus* in East Anglia, identifying where it is most vulnerable and where coastal realignment projects are likely to be of value to the conservation of this species. A prototype spreadsheet tool and draft data for the north Norfolk coast was finally made available early in 2011. The spreadsheet tool is applicable to any area but the user needs to input data specific to their area of interest and then plot the resulting sea level change using GIS. So far it has not been possible to obtain the data for the other coastal areas within the range of *C. halophilus*.

3.4 *Pogonus luridipennis*

John Walters has collated existing biological records to determine the current English distribution of the carabid beetle *Pogonus luridipennis*. The beetle seems to have declined significantly in recent years and there are no sites where the beetle can now be found reliably. Visits to Salthouse, Norfolk and to Ferrybridge, Dorset in 2010 failed to locate the beetle at two of its previously known sites. Following these unsuccessful attempts to locate the beetle an identification guide was produced and a copy sent to Gibralter Point Nature Reserve, Lincolnshire as there were fairly recent records for this area. This strategy proved successful as a local naturalist found two individuals on a saltpan at Seacroft Marsh in May 2011. Two visits to the site by experienced coleopterists in September 2011 produced six specimens on each occasion. Light trapping in late summer may prove to be an effective way of locating this species and further information guides should be targeted at moth recorders on the Dorset, Norfolk and Lincolnshire coasts.

3.5 *Philorhizus vectensis*

John Walters has collated existing biological records to determine the current English distribution of the carabid beetle *Philorhizus vectensis.* It seems to occur at a low density throughout its range. The cliffs at Torcross, Devon form the only British locality where the beetle usually can be found but it could not be found on visits in May or September 2010. Six individuals were found in similar habitat, grass tussocks on cliff faces, further south along the cliffs at Dun Point (SX823416) in May 2010 and one individual was found at Torcross in 2011. A further individual was found walking over bare, chalky ground at Southwell landslip, Isle of Portland in September 2010. Shingle at Ferrybridge; Chesil Beach; Gribbin Head, Fowey; the cliffs from Rame Head to Queener Point, Cornwall and Bolberry Down, Devon were searched in 2010 without success. Clive Turner did find an individual at Bolberry Down in 2011. The other vice-counties with records in the last twenty years are East and West Cornwall, North Devon, South Somerset, Dorset, Isle of Wight and East Kent.

Few records of *Philorhizus vectensis* were made during the course of this project so there is little other than anecdote that can be used to characterise its micro-habitat. At known locations it appears to need a warm micro-climate, often on sparsely vegetated, south facing maritime slopes. The beetle has also been recorded from shingle at Dungeness and, less recently, from breckland at Cavenham Heath, Suffolk. Information guides targeted at general naturalists in southern coastal counties may be an effective way of gaining further information beyond the end of this project.

4. Invertebrates of early successional stages of vegetation colonisation including arable field margins

4.1 *Harpalus froelichii*

John Walters has investigated the viability of habitat creation by soil disturbance in areas of the Brecks close to existing colonies of the Brush-thighed Seedeater *H. froelichii*. Recently, Butterfly Conservation has established about 60 bare ground plots in the Brecks by turf-stripping and rotavation. This work has been targeted at the conservation of Grey Carpet Moth *Lithostege griseata* and other insects and plants typical of early successional habitats in the Brecks. The plots vary in size from a few square metres to narrow strips of over 200 metres long. Butterfly Conservation advised which plots had Fat Hen *Chenopodium album* established on them and therefore may provide potential habitat for *H. froelichii*.

Diurnal hand searching in August 2010 produced two specimens of *H. froelichii* at Aspall Close, Mildenhall (TL698777) and one at Ramparts Field (TL787716). A further specimen was found in an arable field margin (TL726828) close to the Maidscross Hill plots. No

beetles were found in four plots at Kings Forest (TL785725), three plots at Cranwich Heath (TL803935) and two plots at Maidscross Hill.

Although the beetle was recorded only from plots at Aspal Close LNR, Mildenhall in 2011, the visits over both years showed that the bare ground plots created by turf-stripping are an effective method for creating habitat for this beetle as long as they contain stands of *C. album*. The beetle appears to be well adapted to using small patches of ephemeral habitat. Where bare ground has been created and *C. album* has grown on the plot the beetle appears to have colonised the site very quickly. To maintain populations at these sites stripping or disturbing part or all of each plot during the winter every 2-3 years would be the most appropriate method for sustaining populations of the beetle and its food plant.

An extension of this work would investigate the extent to which Cross-compliance and Stewardship margins provide occupied habitat for *H. froelichii* and the potential to develop this as a delivery mechanism for the conservation of the species within actively farmed land. Deliberate creation of suitable feeding resources in active farmland within their range in East Anglia to test the ability of the beetle to find new resources is suggested as a Stewardship-related project.

The factors which limit the distribution of this beetle remain unknown. There are other areas in East Anglia with *C. album* growing in sandy field margins e.g. a record from near Holt, north Norfolk in August 2000. Targeting searches in these areas in August may lead to more sites being discovered. Information guides targeted at moth recorders in East Anglia may be another way of gaining further information beyond the end of this project.

4.3 *Ophonus laticollis* and *O. melletii*

John Walters has collated existing biological records to determine the current English distribution of the carabid beetles *Ophonus laticollis* and *O. melletii*.

Norfolk remains the stronghold for *O. laticollis* with Gallows Hill, Thetford the most reliable British site for studying the beetle. Paul Lee and Neil Marjoram had taken several specimens in 2010 from a number of arable fields to the south east of Gallows Hill. John Walters found specimens here again in 2011. The only other vice-counties with records in the last twenty years are North Somerset, East Sussex, Oxfordshire, East Suffolk, Buckinghamshire (where Mark Telfer also re-found the beetle in 2011) and Glamorganshire.

An extension of this work would investigate the extent to which Cross-compliance and Stewardship margins provide occupied habitat for *O. laticollis* and the potential to develop this as a delivery mechanism for the conservation of the species within actively farmed land.

The only sighting of *O. melletii* in 2010 beetle was from a single site in Kent. However, Howell Hill, Cheam, Surrey is now the only site where *O. melletii* can reliably be found. It is a small grassland and scrub nature reserve on chalk soils surrounded by urban areas and a golf course. Specimens were found here again in 2011by Mark Telfer. The only other vice-

counties with records in the last twenty years are East Sussex, East Kent, Buckinghamshire, Cambridgeshire and West Norfolk.

5. Invertebrates of heathland

5.1 *Formica exsecta*

Stephen Carroll continued the long term annual monitoring of nests of the Narrow-headed Ant *Formica exsecta* at Chudleigh Knighton Heath SSSI including monitoring the impact of management operations (grazing, swaling and scrub cutting) on both *F. fusca* and *F. exsecta* nests. The 2011 survey took place over weekends between 19th August and 5th September 2011. It was noted whether nests were active, inactive, or abandoned/destroyed/supplanted by another ant species. Diameters of nests were measured. Measuring of nests often triggered a defensive response, which was also noted in case this might give an indication of nest colony vigour. The location, number, diameter, and activity status of any apparent 'satellite nests' were also recorded. A satellite nest was inferred when a nest structure was found that was generally smaller than, and in close proximity (within 5m) to, an existing known nest. At least 34 nest structures are considered to be satellites of other nests; 26 other nest structures were inactive or showed only low activity. In total 156 nest structures were found in 2011, of which at least 96 have been interpreted as independent nest colonies. As in 2010, newly colonising nests in managed areas were generally near (within 10-15m) areas with known existing nests; re-colonisation of cleared and edge areas has occurred only where there was a source population of existing nests nearby.

From previous years it has been seen that swaling in areas where nests are present has the potential to damage or destroy nests. This is perhaps an inevitable risk where a change in wind direction or concealed accumulation of combustible litter causes fires to burn downwards rather than sweep quickly across surface vegetation. If nests survive swaling or mowing operations there may be indirect impacts, for example by removal of scrub which is needed to produce prey items. So far, over 2 years, results show mowing provides higher net gains of nests compared to swaling. However mowing as an alternative to swaling may be impractical and time consuming in areas which are currently heavily scrubbed over, or relatively inaccessible to machinery. Selective swaling of smaller areas (currently of ~1ha) may then be a cost effective way of balancing need for scrub control while reducing risks to the population of nests as a whole. There would be expected to be different successional vegetation recovery rates from swaling compared to mowing and the additive effects of multiple swaling events over a number of years is not apparent from the current monitoring timescale.

At Chudleigh Knighton Heath 21 artificial 'stumperies' were set up during 2009 and 22 further existing cut tree stumps were identified for monitoring. Five additional existing cut stumps were identified in 2010 for monitoring. In addition, during the winter works season winter 2009 to spring 2010, a line of over 20 stumps was set up on Highways Agency

managed land, on the A38 footpath verge. In August 2011 ten additional existing stumps were identified for monitoring. In case it might be possible to identify absent nest occupants from the chewed nest material, sawdust samples were taken from the active *Lasius* and *F. fusca* nests in May 2011. Samples were viewed under a dissecting microscope at x10 or greater magnification, though comparison was inconclusive at this stage.

Over the last 2 years, there is some evidence of *F. fusca* adopting old existing stumps, and some colonisation of the newly created stumperies by ant species. One stump found with an active *F. fusca* nest in 2011 was noticeably older (possibly >10 years) and more decayed than any of the existing or new stumps on the site. This suggests the newly created stumperies, although these were created from pre-cut and partly decayed wood 4-5 years old, are not yet sufficiently rotted. As there is not currently a significant dead wood resource of this type on the site creating stumperies from imported older cut timber might be a solution, though it is not anticipated that a source of timber in this state would be readily available. Promoting faster rate of rotting of stumps might be induced artificially by, for example, introducing fungus or drilling rot holes, though slower decay and persistence might be needed if timber structure is a significant factor. Some stumperies have apparently been adopted by *Lasius* species, which is known to out-compete *F. exsecta*. In 2011 colonisation of the stumperies appeared to be take place earlier in the year and there was little activity seen in August. Monitoring at other times of year may be beneficial. It is not possible at this stage to tell whether stumperies help facilitate *F. exsecta* colonisation, either directly through provision of host nests (though no *F. exsecta* nests have otherwise been found associated with tree stumps on the site), or indirectly through elevating background numbers of host *F. fusca* nests. If provision of stumperies is to be considered as a technique for preparing areas for *F. exsecta* re-colonisation, this suggests stumperies need to be established well in advance (probably more than five years) and would not be a technique where short or immediate term results are required.

5.2 *Formica rufibarbis*

Although not a Hymettus led project, Hymettus is represented directly on the steering group for the Red-barbed Ant *Formica rufibarbis.* Dealate queens collected from the Isles of Scilly were raised in captivity and screened for disease before being released at prepared sites at Chobham Common in 2010. Scott Dodd, the Surrey Wildlife Trust officer responsible for the project, reports that monitoring of the release sites in 2011 suggests that viable colonies did not establish following release. *F.sanguinea* nests were known to be a threat to the species and were monitored but *Lasius niger* also proved to be a problem. The possibility of translocating whole nests from Normandy is being considered.

Meanwhile habitat management including bare ground creation and bracken control at Chobham Common continues in support of the existing nests and is now funded by Higher Level Stewardship payments. A MSc dissertation on the foraging ecology of *F. rufibarbis* at Chobham Common was completed in 2011.

5.3 *Tapinoma ambiguum* and *T. erraticum*

Paddy Saunders has been attempting to determine the environmental and ecological factors characteristic of sites inhabited by the ants *Tapinoma ambiguum* and *T. erraticum*. Specifically he aimed to test the hypothesis that *T. ambiguum* favours vegetation communities on wetter peat and *T. erraticum* favours those on drier sand. Soil type, percentage cover of dominant vegetation type, percentage cover of bare ground, average sward height, soil temperature and soil moisture (measured using a PMS-714 meter) were measured around ten *Tapinoma* nests on Godlingston Heath. A grid reference was recorded for each site and a voucher sample of ants taken to check species identity. Measurements at each nest were taken from nine $1m^2$ quadrats arranged in a 3x3 grid with the central quadrat placed directly over the nest. The same range of measurements was taken from ten random 'control' sites lacking evidence of *Tapinoma* nests.

All of the *Tapinoma* on Godlingston Heath were confirmed as *T. ambiguum* (=*T. suboreale*). The ants showed a significant preference for sandy and drier soils compared with the control sites. The hypothesis that *T. ambiguum* favours vegetation communities on wetter peat was not supported by this research on Godlingston or by observations on the species from continental Europe. Nests were also more likely to occur in areas of bare ground where soil temperature was higher. Nest sites appeared to occur in areas of higher habitat diversity between dry and wet heath features. *T. ambiguum* was not found associated with large areas of homogenous dry heath. The preference of *T. erraticum* for drier sand could not be tested using the Godlingston data. In various European studies *T. ambiguum* is strongly associated with wet and dry heathland type habitats whereas *T. erraticum* occurs in a wider range of habitats.

T. erraticum was found at two sites in South Devon. In 2010 it was collected at Bovey Heathfields within dry heath with abundant bare ground. In both 2010 and 2011 it occurred at Newbridge on south-facing, dry heath land with gorse scrub. A nest site was found within this area utilising large, solid rock features made black, probably by a coating of lichen. These formed very effective heat sinks, possibly an important feature due to the high altitude of the site.

Some research has promoted controlled burning as a technique for maintaining suitable habitat for ants but no *Tapinoma* species were found within burnt areas. Burning can encourage a response of lush *Molina* growth shading the soil surface and lowering soil temperatures. Two nest sites were found on what appeared to be spoil from pond creation. Scraping or turf stripping may be a better way of creating suitable habitat.

5.4 *Pseudepipona herrichii* and *Homonotus sanguinolentus*

Chris Dieck has been undertaking surveys to determine the current English distribution of the Purbeck Mason Wasp *Pseudepipona herichii* and the spider hunting wasp *Homonotus sanguinolentus*. All sites where *Pseudepipona herrichii* had been recorded in 2010 were revisited in 2011 to monitor the extant populations on these sites. All sites with historic

records of *Homonotus sanguinolentus* in Dorset were also surveyed. In addition, a number of sites with the potential to support either or both species were visited. At each site suitable nesting conditions, i.e. exposed clay seams, in the vicinity of the recorded grid references were investigated for adult activity and nest burrows of *P. herrichii*. Survey for *H. sanguinolentus* involved locating the egg-laying retreats of the host spider *Cheiracanthium erraticum* in the tops of grasses and other vegetation primarily in bogs and wet or humid heathland. A small hole was made in the retreat using fine forceps and the spider was investigated for the presence of larvae of *H. sanguinolentus*. The presence of *C. erraticum* eggs or young was recorded as *C. erraticum* lays no eggs once it has been parasitized.

Despite another season of sub-optimal weather conditions, a total of 365 burrows of *P. herrichii* were located, as were 69 adult wasps, 59 females and 10 males. 55 egg-laying retreats of *C. erraticum* were investigated for the presence of *H. sanguinolentus* larvae. Five larvae were discovered. It was encouraging that *P. herrichii* had re-colonised areas within its former range, as well as being found for the first time at Creech Heath. Equally it was encouraging to find that *H. sanguinolentus* is still present on at least three sites in Dorset after not being recorded at all in 2010. Also, *H. sanguinolentus* was rediscovered in 2011on the Surrey heaths.

In an attempt to identify a surrogate survey method for locating *P. herrichii*, frequency of nectar raiding on heather *Erica cinerea* and the type of flower damage observed were investigated. 37,549 flowers were checked for signs of raiding. Sites with breeding populations of the wasp showed a highly significantly difference ($t=4.6$, $p<0.001$) in the proportion of heather flowers damaged by raiding (28%) when compared with sites without *P. herrichii* nests (14%). Raiding frequencies were also found to decrease significantly with distance to the colony ($r(60)=-0.28$, p,0.05). However, there was no evidence that the shape of the incisions can be used to determine the presence of the species on a site.

In 2003, an area of heath at Godlingston Heath was burned to create a heterogenous vegetation structure to benefit *Acleris hyemana* and by extension *P. herrichii*. Exclusion plots were set up to monitor the effect of grazing on the population of *A. hyemana*. In addition to an unfenced control plot, four further plots were fenced, one to exclude all grazing animals, another excluding only stock, the third excluding stock and deer but allowing rabbits to enter and the last excluding rabbits and stock but deer can jump the fence. The regeneration of the vegetation of these plots was monitored annually between 2004 and 2008 and again in 2011. The results suggest that deer have a more negative impact on *A. hyemana* numbers than other grazers. Also, between 2008 and 2011 *A. hyemana* numbers declined in all five plots. This may indicate that the vegetation is now at an age where it has become less palatable to the larvae or the relatively cold winters in 2009/10 and 2010/11 may have caused lower adult survival rates in adult moths.

5.5 *Andrena tarsata*

Louise Hislop has been developing and testing a monitoring protocol for detecting the presence of *Andrena tarsata* and a method of recording habitat quality. The monitoring

protocol used involved walking the site and recording the presence of *Potentilla erecta* along with notes on its growth habit and habitat. *P. erecta* was observed for the presence of *A. tarsata,* as were other possible forage flowers. The length of each observation depended upon prevailing weather conditions, quality and quantity of *P. erecta* and whether other bee species were on the wing. Where the bee was present, details were recorded and the bee caught for confirmation of identification. Nesting sites were recorded and an attempt made to identify foraging areas associated with them, and vice versa.

The quality and quantity of the forage resource was assessed using quadrats. Two different quadrat sampling techniques were used, partly because the *P. erecta* habit varied so greatly between sites. Firstly, a 0.25m² quadrat was placed over the area of *P.erecta* the bees were foraging on. A photograph was taken, uploaded and an on-screen count made of the number of fully open flowers. Measurements were taken of the height of each plant from the ground and of the maximum width of the plant. The aim of this sampling was to quantify the amount of bloom available on the plants the bees chose to visit. Secondly, systematic belt transect surveys were conducted using a 0.50m² quadrat at 10m intervals along the centre line of each site. The aim of this sampling was to look at the general distribution of *P. erecta* within each chosen site, as well as to quantify the number of available flowers. The height of each plant was again measured. Where the plants grew into each other it was not possible to measure individual widths. Rob Paxton commented that the belt transect method of vegetation surveying may give data of sufficient resolution to allow conservation management for this species but maybe the percentage of 'all blossom' could be added as a second variable; it would give a general measure of floral resources (e.g. for males, for other flower visitors) of conservation importance.

5.6 *Cicindela sylvatica*

Scott Dodd has collated existing biological records to determine the current English distribution of the Heath Tiger Beetle *Cicindela sylvatica.* Also he has completed a desktop review of existing autecological information for the beetle.

Recent field work and a review of the available historic data suggests that *C. sylvatica* is now extinct from over 50% of its previously recorded vice counties and at over 60% of its previously recorded hectads. Populations of *C. sylvatica* are now restricted to suitable habitat patches on lowland heathland in a narrow strip from western Surrey to eastern Dorset, with a single known population extant on coastal sand dune heath at Studland, Dorset.

The perceived long-term decline of *C. sylvatica* is believed to be associated with the loss, fragmentation and degradation of lowland heathland habitats in southern England, a trend affecting heathland ground beetles across their European range. The narrowly defined habitat requirements listed by many authors suggest that *C. sylvatica* is a stenotopic species of patches of bare ground on drier, compact sandy soils within lowland heathland habitat. A paucity of suitable bare ground and early successional habitat patches may be a factor in the decline of the beetle and might go some way to explaining the trend towards populations extant on regularly disturbed military training areas. The species is capable of flight but this

has only been observed over short distances and poor dispersal ability may also be a factor in its decline.

Mark-release-recapture studies of both *C. sylvatica* and *C. campestris,* at Thursley Common during 2011 assessed population size, dispersal distance, sex ratio, influential environmental factors and evidence of metapopulation structure. The study showed that populations of *C. sylvatica* were smaller and more locally distributed on parched early successional heath than those of *C. campestris*. *C. sylvatica* emergence began in mid-April with a sharp increase in May, reaching a peak in late May. *C. campestris* emerged earlier (in March) and peaked in early May, after which there was a steady decline in detectable adults. Recapture data suggests that some *C. sylvatica* adults live for at least 67 days. No adults of *C. sylvatica* were recaptured at a distance exceeding 200 metres from the original capture point and no exchange was detected between populations, potentially supporting the theory that ability to disperse is a limiting factor for the species.

Most published behavioural observations of *C. sylvatica* relate to aspects of adult behaviour. The larvae develop in vertical subterranean burrows from which they snatch passing prey. Larval feeding observations are poorly documented but prey has included various ant species, including *Formica sanguinea,* basking dipterans, including an *Eristalis* sp., hymenopterans and on one occasion a dragonfly. Therefore it seems clear that predation is opportunistic with a diverse range of invertebrate prey being taken.

5.7 *Poecilus kugelanni*

John Walters has been investigating the optimum habitat management techniques for Kugelann's Ground Beetle *Poecilus kugelanni* by studying the impact on beetle populations of grazing, burning, cutting and the creation of bare ground on heathlands. The beetle is currently known from 18 sites and all (except STANTA, Norfolk) have been visited and the key habitat features examined. The beetle was searched for using two methods: grubbing in roots of heather; and setting baited pitfall traps. The main investigation of habitat management techniques was based at Aish Tor and at Aylesbeare Common.

Aish Tor is managed by swaling (burning), cutting and livestock grazing. There is a large colony of *P. kugelanni* here that has been studied extensively over the last ten years. Six baited pitfall traps were set between 7th and 21st June 2010 and again between 3rd and 22nd May 2011 in areas which have been subject to different management techniques. The numbers of *P. kugelanni* caught were recorded.

Aylesbeare Common is managed by cutting firebreaks, regular scraping of several bare ground plots and grazing. The firebreaks are cut to within a few centimetres of the ground every few years and the cut vegetation removed. Several bare ground plots were first created in about 2000. The turf is removed from these areas providing areas of early successional vegetation. The plots are disturbed every few years to maintain this habitat. *P. kugelanni* is found within the firebreaks and bare ground plots. Eleven baited pitfall traps were set between 8th and 22nd June 2010 in areas which had been subject to different management

techniques. Five of these traps were set again between May and June 2011. The numbers of *P. kugelanni* caught were recorded.

From the results it was concluded that creation of bare ground and early successional heath land habitats are essential for this beetle (and also benefit many other specialist heath land invertebrates including bees, wasps and ants). Small-scale winter burning of heather and gorse between October and February is an excellent method of creating early successional habitats. Cutting firebreaks amongst heather and gorse on heath land is effective only if the cut vegetation is removed. The vegetation must be cut shorter than 10cm. On Dartmoor burning areas of habitat appears to be a more effective management technique than cutting, probably because of the difficulty of removing the vegetation. Turf-stripping small areas and disturbing the ground every four years to maintain early successional habitats has proved to be an effective method of creating good habitat on the east Devon pebble-bed heaths. Cutting rank gorse and heather and removing or burning cut material is an effective method for opening up habitats to allow access for grazing animals such as sheep, ponies, cattle and rabbits. It is essential that the cut vegetation is removed.

5.8 *Amara fusca*

John Walters has attempted to characterise the micro-habitat of the Wormwood Moonshiner *Amara fusca.* The presence of its main foodplant Field Wormwood *Artemisia campestris* seems to be the main limiting factor in the distribution of *A. fusca*. As this beetle has a short, late season of activity and is most effectively collected after dark, it may be overlooked by coleopterists. The beetle will use Mugwort *Artemisia vulgaris* but these populations do not appear to be as strong and it seems likely that if this foodplant were suitable then the beetle would be more widely distributed in Britain. Three Breckland localities, the only sites where the beetle has been reliably found in recent years, were visited on in August 2010. The sites were not searched after dark but *A. campestris* was found on only one site, Brandon *Artemisia* Reserve, and this was the only locality where a single specimen of *A. fusca* was collected. A, fusca was found here again in 2011. Crymlyn Burrows, Swansea was visited on in September 2010 and the very few patches of *Artemisia* found were searched both during the day and at night. No *A. fusca* were found and it seems unlikely that such a small population of the foodplant could support the beetle.

Deliberate creation of suitable feeding resources in active farmland within their range in East Anglia to test the ability of the beetle to find new resources is suggested as a Stewardship-related project.

5.9 *Anisodactylus nemorivagus*

John Walters has collated existing biological records to determine the current English distribution of the Heath Short-spur *Anisodactylus nemorivagus.* It is a difficult species to study as it seems to occur as thinly scattered populations in suitable pockets of habitat over large areas of heath land. The beetle is active early in the season from late March to May. The most reliable site to find it has been Peel Hill, New Forest but even here it is difficult to

locate. It could not be found on field visits in May and June 2010 and although three beetles were found here by grubbing in 2011 none were caught in pitfall traps. Two other New Forest sites at Stagbury Hill, Furzley Common and Parc Pale, Lyndhurst were similarly unproductive in 2010 but one beetle was located at Matley sandpit. The only other vice-counties with records in the last twenty years are Dorset, Surrey and East Sussex.

The habitat at sites where *A. nemorivagus* has been found appears to consist of low growing heather with areas of bare sandy ground and often a thin layer of peaty soil on south-facing slopes. The heather has been maintained in a suitable condition by grazing by cattle, ponies and rabbits, by cutting to form firebreaks or by turf-stripping to produce areas of regenerating heather.

6. Invertebrates of flower-rich grassland

6.1, *Cerceris quadricincta* and *C. quinquefasciata*

Adrian Knowles has completed an investigation of the geographical variations in prey items taken by the digger wasps *Cerceris quadricincta* and *C. quinquefasciata*. Five locations in Suffolk and one in Essex were visited to search for nests of *C. quinquefasciata* on eleven days between 8th July and 28th August 2010. Although all of the sites were known to support the wasp from previous surveys, it was not possible to locate any nests of *C. quinquefasciata* during 2010. Additionally the Mason Road Path (former Ozalid Works) site in Colchester was visited twice in 2010 and again in July 2011 to search for nesting *C. quadricincta*. No wasps were seen on the now overgrown nesting bank. On 22nd July 2011, fourteen prey items were collected from *C. quadricincta* nesting at Cliffs End, Ramsgate and two weevils were collected from *C. quadricincta* at Middlewick Ranges, Colchester (from the area outside the main rifle range) on 9th August 2011. All of these weevils were the very common *Sitona lineatus*.

Previous studies report a wide variety of quite common larval prey weevils can be utilised. Jeremy Early reported that in a three year study of a small colony of *C. quinquefasciata* he had noted the prey differed each year with Gorse Weevils *Exapion ulicis* dominating one year, pollen beetles *Meligethes* sp. another and Bean Weevils *Sitona lineatus* another. Mike Edwards noted lesser variations in the prey of *C. quadricincta* at Pegwell Bay, Kent in 2004 and 2005. *S. lineatus* dominated both years but small numbers of the weevil *Ceutorhynchus pallidactylus* were taken both years and *C. obstrictus* in 2005 also. *E. ulicis* has also been taken from *C. quadricincta* at the Mason Road Path site. These observations lead to the conclusion that prey distribution is not likely to be a limiting factor in the distribution of the wasps. What may be a limiting factor is the ability to find prey in sufficient quantity to support large colonies. Whilst data on nest characteristics are not available for *C. quadricincta*, it may be possible to draw some parallels from the closely related *C. quinquefasciata*. Nests comprise up to ten cells, each of which usually has about 50 prey items, although this can be as high as 82 in a single cell. Thus, a single finished nest may

hold approximately 500 weevils. Multiplying that up by the number of females in a viable colony, it is clear that these wasps are likely to need a weevil-rich resource relatively close to the nesting site. This food resource can only be provided by a botanically rich and/or very extensive site.

The small Mason Road Path nesting site for *C. quadricincta* is becoming engulfed by climbing vegetation growing through and along the overhanging chain link fence. Railtrack responded to a request to fulfil their biodiversity remit by clearing away most of the vegetation from the relevant stretch of fence. A follow up visit in spring would be useful to kill off any regrowth with herbicide, but it is encouraging that Railtrack are sufficiently motivated to undertake such small-scale specialised work for a biodiversity project. The long-term security of the adjacent brownfield foraging land remains uncertain.

6.2 *Colletes floralis*

Andy Jukes has collated the existing information from recent researches into the autecology of *Colletes floralis* in England, Ireland and Scotland. In summary, *C. floralis* can be regarded as polylectic though the proportions of pollen types and loads differ between populations. Apiaceae appear to play an important role but other families, including Asteraceae, are at least a co-dominant preference for some bees at one English site. Nesting occurs on short, patchy turf, bare ground and generally with a preference for southerly aspects. Coarse grass communities are negative attributes to sites. Varied topography appears to be a key attribute to nesting sites. Populations appear to be positively associated with the distance from the high tide mark to the start of sand dune vegetation and therefore vulnerable sites at risk of storm surges may require protection. Also, the conversion of suitable coastal breeding and connecting habitat to golf courses and for agriculture needs addressing through policy change at high level and more localised awareness of planning authority officers.

Water and urban areas are significant barriers to the bees over the medium to long distances. 10km of open water is significant in reducing gene flow between populations, such as between the Hebridean islands. Sites isolated by unsuitable terrestrial habitat may be connected by stepping stones as differentiation in some grouped populations is not as great as exclusively isolated sites.

Landscape management should acknowledge the need for stepping-stones, corridors, and the wide ecological network required to link sites. Although the bees are likely to be able to disperse over larger tracts of unsuitable habitat, the provision of suitable foraging is important to enable individuals to reach new sites or interconnecting sites in the best possible fitness and reduce the levels of on-route mortality. Agri-environment schemes are a useful tool in creating ecological networks and additional foraging for the bees. However, current flower mixes require manipulation to provide a greater range of flower families and species to benefit *C. floralis* and also other solitary bee species. Any changes to the seed mix should be administered on a local scale given the degree of differentiation between populations.

In some areas of its range in the UK and Ireland, *C.floralis* is at a tipping point and is unlikely to be able to cope with further degradation of habitat, fragmentation and increased isolation brought about by development and other anthropogenic barriers to movement. The imperative site-specific management and landscape scale ecological networks require serious consideration to prevent losses of local populations leading to more severe regional and national extinctions.

6.3 *Osmia parietina*

Carl Clee has been attempting to determine the environmental and ecological factors characteristic of sites inhabited by the bee *Osmia parietina* and to determine the nature of the foraging resources utilized. Four locations in North Lancashire and Cumbria (Carnforth Ironworks Slag Banks, Yealand and Thrang End Allotments, Gait Barrows NNR and Hutton Roof Crags) where *Osmia parietina* had previously been recorded were each visited twice when weather conditions were suitable during the May to July flight period of the bee. Areas from which the bee had been recorded in the past were searched and patches of Bird's-foot Trefoil *Lotus corniculatus* were monitored by a system of random walks. Other species of plants in the vicinity were also recorded. No *O. parietina* were found but a single female was sighted on Warton Crag during a World Museum, Liverpool survey for Lancashire Wildlife Trust. The bee was foraging on *L. corniculatus*. This is the first record for this location.

In North West England *O. parietina* is found mainly at inland, sheltered, warm locations with areas of damaged limestone pavement or other base-rich bare rock surfaces and sparse patches of *L. corniculatus*. A wider variety of predominately coastal, natural and disturbed habitats are utilised in North Wales. In addition to limestone sites, colonies on the Llyn Peninsula are predominately on hard metamorphic rock where nests are confined to rock fissures and dry-stone walls. The population at Powis Castle near Welshpool, where the bee was recorded nesting in old beetle burrows in the trunk of a fallen veteran oak, conforms with observations from continental Europe, where *O. parietina* is described as nesting in pre-existing cavities in dead wood. The bee has also been recorded from conifer plantations in North Wales along the edges of fire - break roads and has been found nesting in borings made by a Piddock *Hiatella arctica* in coastal limestone rocks. The bee was photographed cutting pieces from a moss *Hypnum cuppressiforme* for nest cell construction.

Pollen samples were collected from twelve bees from three sites in North Wales. Pollen from four bees provided by the late Neil Robinson was examined also. Although the bee is described as polylectic in Europe, all of the British samples of pollen collected from this species were of *L. corniculatus*. Rob Paxton has commented that butterfly species typically have restricted larval diets at their northern range edge so it is not so surprising that this may also be the case for this bee species.

Males were recorded gathering nectar from a number of plant species such as Common Vetch (*Vicia sativa*), Mouse-ear Hawkweed (*Pilosella officinarum agg.*), Beaked Hawks-beard (*Crepis vesicaria*) and Ransoms (*Allium ursinum*). All of these observations were from the quarry site near Beaumaris, Anglesey.

6.4 *Eucera longicornis*

During the period mid-May to the end of July 2011 a team of Worcestershire recorders led by Geoff Trevis made several visits to Joan's Hole orchard, Old House Farm, Chapel Farm and Norchard Farm in order to identify the foraging and nesting areas of *E. longicornis*. In the event, there were no sightings in this area. The only record was of a single male in the village hall car park at Knighton-on-Teme some 13.5km from Joan's Hole. Further follow-up visits to Knighton-on-Teme (SO632700) failed to find further evidence of the species being present.

Pollen collected from bees at a site in north Wiltshire by Andy Foster and identified by Judith Webb probably came from meadow vetchling *Lathyrus pratensis* (on which the bees were seen to be foraging) or common vetch *Vicia sativa*. A further significant proportion of the pollen was small grained and probably from white clover *Trifolium repens*. All these species were available around Old House Farm, though not as profusely as in 2010, possibly as a result of drought, and the likely nesting sites remained available. The failure to find *E. longicornis* over two seasons suggests that this species is now extinct in the area although lack of suitable foraging plants is unlikely to be a cause of extinction. However, if, as has been suggested, *E. longicornis* can sustain a population over a wide area at low density a colony may still be around but very difficult to find. Rob Paxton suspects that many species commonly found in aggregations or 'colonies' also nest in isolation, particularly when at low density, and so it will be extremely difficult to detect them.

6.5 *Anthophora retusa*

Mike Edwards has been following up his autecological work on the bee *Anthophora retusa* by negotiating the creation of new forage habitat through changes in grazing regimes at Cuckmere Haven, adjacent to the Seaford population of the bees. The aim of this is to assess the usefulness of such approaches in encouraging the bee to expand its range from its current restricted strongholds.

Following a site visit with Richard James (South Downs National Park) to the High and Over area in 2010 which identified possible nesting and foraging areas at High and Over (2010 Hymettus Report) further searches were made of the area between the known colony by the Coastguard Cottages at the mouth of Cuckmere Haven and High and Over on 15/5/2011. Only three female and one male *Anthophora retusa* were seen during the visit but the weather was not ideal with intermittent sun and a stiff breeze. A number of potential nesting areas were identified but foraging areas were in short supply. There is also a very large rabbit problem throughout the whole area and progress on habitat improvement would require considered and effective rabbit control, by killing or fencing out.

A meeting was arranged under the auspices of the Sussex Wildlife Trust to explore the possibilities of habitat enhancement between Cuckmere Haven and High and Over with continued restoration of the High and Over site to encourage a more varied suitable flora,

especially on the lower areas. Louise Hutchby (Natural England), James Power (Sussex Wildlife Trust), Steve Tillman (Sussex Wildlife Trust), Richard James (South Downs Joint Committee), Stephanie Diment (East Sussex County Council), Dave Morgan (National Trust) and Mike Edwards were in attendance.

Agreement was reached to explore the potential to improve habitat quality primarily for *A. retusa,* but also potentially the bumblebees *Bombus humilis, B. muscorum, B. ruderarius* and the mining bee *Eucera longicornis.* The improvement in habitat quality would be targeted at both forage and nesting components through the ESL/HSL agreements operating, or soon to operate, in the target area. Of particular value would be if the farmer adjacent to High and Over were to be prepared to participate and if NE would support this under Stewardship. A map of the suggested areas for improvements within these agreements has been provided to Natural England. A costed plan for monitoring of the responses of the target bee species, forage and nesting habitat components has been drawn up and forwarded to Natural England and the National Park.

6.6 *Bombus distinguendus*

Work on the conservation of the Great Yellow Bumblebee *Bombus distinguendus* has been completed under the Species Action Framework partnership that Hymettus has with SNH, RSPB and BBCT. Murdo Macdonald reports that progress was made on all aspects of the project during the summer of 2011, despite the poor weather. Great Yellow Bumblebee seemed to be less seriously affected than most other bumblebees in Highland. Monitoring work continued in all the areas, and the results have been passed to BBCT for analysis. The single database of all verified records of *Bombus distinguendus* ('Great Yellow Bumblebee sightings data in the UK, 1990 onwards', managed by Will George of RSPB) was updated and on the NBN Gateway on 21 June 2011.

Work continued on existing demonstration plots, and plans are in place to put interpretation boards at Balnakeil and Achscrabster (Achvaster). Although not directly related to the SAF work, other sites being enhanced for bees, including Great Yellow Bumblebee, are under the management of RSPB or in the Caithness Biodiversity Group/BBCT 'Pollen and Nectar Rich' project. Long-term maintenance of the Balnakeil Craft Village site has been secured with the purchase of a strimming machine to be based locally and used to enhance the flora on the plot.

The general feeling amongst partners is that the SAF project was a great success, though not all objectives were met in full, and some of the original plans were altered in detail in the light of circumstances and experience. Three of the original Partners (SNH, Hymettus, RSPB) will no longer be directly involved, leaving BBCT to lead on follow-up work. Currently, the idea is to invite Plantlife and Buglife Scotland to become involved, thus expanding the habitat and taxonomic interest and expertise available to inform management activities. Exactly what form the work will take depends on whether these organisations agree to participate, and the decisions they make on priorities. Assuming success in establishing a new Partnership, an urgent task will be to put in place a funding package to

cover at least 3 and preferably 5 years. That will not happen in time to support work in 2012. Separately from anything that emerges from these discussions and to cover the funding gap in 2012, monitoring work will continue in Caithness under the banner of the Caithness Biodiversity Group, and prospects of local funding to continue in Orkney, Sutherland and the Western Isles are being explored.

6.7 *Bombus subterraneus*

The short-haired bumblebee partnership was formed in 2009 between Natural England, the Bumblebee Conservation Trust, RSPB and Hymettus. The project aims were firstly to reintroduce the short-haired bumblebee back to the UK from New Zealand (if feasible or from a suitable European Source). The project also set out to restore selected landscapes in the south of England (Dungeness/Romney Marsh area) using agri-environment schemes to recreate habitat for bumblebees by working with farmers, land-owners and conservation groups. Attempts were made in 2009 and 2010 to captive rear and export queens back from New Zealand to the UK but with limited success. After careful consideration, Natural England and the project partners agreed to change the reintroduction source location of *B. subterraneus* from New Zealand to a European source. It is intended to reintroduce the short-haired bumblebee from Sweden to the UK in early 2012.

6.8 *Bombus ruderarius*

Work in Suffolk by Paul Lee in 2010 attempted to obtain information on the pollen and nectar resources and habitat structure favoured by *Bombus ruderarius*. Steven Falk continued the project elsewhere in the country in 2011. More than a dozen sites in Warwickshire, all with records of *B. ruderarius* in earlier years, were visited on one or more occasions between March and August 2011. The species was recorded at three of these sites in 2011. Additional fieldwork in East Sussex and Hampshire failed to locate *B. ruderarius.*

No spring queens were observed in 2011 but historical observations note a very strong association with two species of Lamiaceae: Ground-ivy *Glechoma hederaceae* on the East Sussex Downs and White Dead-nettle *Lamium album* in Warwickshire. Pollen samples were obtained from eleven live workers and from a pinned specimen collected in 2010. The pollen samples were sent to Dr Judy Webb for microscopic analysis. The results indicated that kidney vetch *Anthyllis vulneraria* was a very important pollen source for the bee at both of the locations where the plant grew, forming at least 90% of the pollen collected by eight of the ten bees sampled and 15-20% of the pollen collected by the other two (*Lotus* sp. or rose / bramble formed 80% of these two samples). At two locations where *A. vulneraria* was not available, then the two bees had made heavy use of rose / bramble or Lamiaceae, probably marsh woundwort *Stachys sylvatica*, pollen. Other pollen types were found as much rarer components of the samples.

A single nest was found at one of the Warwickshire sites and was carefully examined and photographed on several occasions between 29th May and 10th August 2011. It was constructed of moss and located within sparse grass and kidney vetch and small hawthorn

saplings, fully exposed to the sun, with its roof seemingly acting as a solarium. The nest reached a maximum diameter of about five inches and seemed to support very few workers, very little coming or going was ever observed. When the moss was lifted to reveal honey pots and inhabitants, workers would adopt a defence posture on their backs with legs held up. No attempts were made to attack. In this regard, they are strikingly different in temperament to some other carder bees like *B. muscorum*, which is noted for its aggression. The nest was still occupied on 10th August, long after *A. vulneraria* had stopped flowering. No worker foraging was observed anywhere nearby at this point and workers in the nest were faded with tattered wing margins.

Although progress has been made in outlining the autecology of this bumblebee, there is still much to be discovered before effective conservation prescriptions can be produced.

7. Invertebrates of East Anglian wetlands

7.1 *Odynerus simillimus*

Tim Strudwick has continued to search for and monitor *Odynerus simillimus* colonies in Norfolk and Paul Lee has monitored the most recently discovered colony at Cattawade on the Suffolk/Essex border. Sutton Fen and Hickling Broad were chosen for study in 2011 as they had good aggregations of *O. simillimus* nests in 2010 and were both under sympathetic management, by RSPB and Norfolk Wildlife Trust respectively, thus freedom from disturbance could be expected. Weekly counts of adult wasps and active nests were made at Sutton Fen and at Hickling Broad in Norfolk and less frequently at Cattawade.

Data loggers measuring temperature were placed in the ground within the core 2010 nesting areas at all three sites in May 2011. The top of the data loggers were placed 10 cm below the ground surface. The Cattawade data loggers were removed by animals and/or humans but the Norfolk data loggers were collected in October 2011.

Adult wasps were active earlier than usual; males were observed from 10th May in Norfolk, 14th May at Cattawade with the last females seen on 11th July at Cattawade and 20th July in Norfolk. Active nests were first seen on 26th May, peaked on 16th June and the last were seen on 29th July. The population of *O. simillimus* at the monitored sites in the Broads has increased considerably between 2008 and 2011 but fell in 2011 from its 2010 peak at Cattawade, possibly due to re-vegetation of the main nesting area.

During fieldwork it was apparent that wasp activity was very sensitive to the weather, and it might be expected that local weather data for the spring and summer would account for both the early emergence and the fluctuations in nesting activity. However, there was no obvious correlation between activity and temperature. Sunshine and rainfall appear to be more important factors. Ground temperature is likely to be important pre-emergence for pupal development but temperature needs to be recorded over a number of years to gain sufficient

data to draw firm conclusions. It may also be important during the nesting period, as there may be a minimum temperature below which the female wasp, resting in the ground overnight, cannot start foraging regardless of the air temperature.

In mid-July a small number of *O. simillimus* nests were exposed when a section of bank collapsed due to rabbit activity. Some of the larvae appeared to be already fully grown, having turned an orange-brown colour. It seems likely that *O. simillimus* completes its larval growth during the summer, spending the autumn and winter as a pre-pupa, so it is unlikely that weather outside the periods of pupal development in the spring and the adult flight period is likely to be important to survival.

7.2 *Rhopalum gracile* and *Passaloecus clypealis*

Tara Marjoram and Paul Lee are attempting to determine the nature of the foraging resources utilized by the solitary wasps *Rhopalum gracile* and *Passaloecus clypealis*. In May 2010, eighty nest traps were constructed from common reed (*Phragmites australis*) stems packed into 15cm lengths of 5cm diameter plastic water pipe and mounted on bamboo canes. Forty traps were placed in a recently cut sedge bed and the rest in an area of mixed fen with taller vegetation at Woodbastwick Fen NNR, Norfolk. In March 2011 the reed stems were transferred into plastic ziplock bags and kept close to outside temperatures for a period of four months. They were monitored every two to three days for emergent aculeates. They were also opened to allow air to circulate and moisture to escape in order to dry contents as most bags were waterlogged. Random reeds were taken from the nests, cut and examined for pupae throughout the monitoring period.

A male *Anoplius caviventris* was the first aculeate to emerge in May followed by six more over a sixteen day period. In total, four males and three females emerged from four separate bundles of reed. Two bundles produced both male and female specimens, the females emerging two and three days after the males. All *A. caviventris* emerged whilst moisture levels were high within the bags. The last *A. caviventris* to emerge was a female on 7th June 2011. From one dry bag at least three *Rhopalum gracile* emerged, although body fragments found could suggest a higher number. The last specimens to emerge were a male and a female *Hylaeus pectoralis* discovered on 8th June from a single bag. At least five parasitic *Gasteruption assectator* (three males, two females) also emerged from various nests. Four of the bags had visible entry/exit marks and no emerged specimens were observed over the monitoring period even though the holes were taped up. One nest contained an ant colony and was discarded.

No *Passaloecus clypealis* were recorded and no pupae of *Rhopalum gracile*, or any other aculeate, were found in the 150 reed stems sampled. Therefore it was not possible to add to current information on the prey items collected by these two wasps.

The trap nests were replaced in March 2011 to enable a final season of sampling in 2012. The reeds will be examined as soon as possible after collection and any pupae found transferred to gelatin capsules for development.

7.3 *Asindulum nigrum*

David Gibbs reports that Woodbastwick Fen was surveyed for this fungus gnat in 2010 and again in 2011. Brief visits to Geldeston Meadows and Upton Broad and a speculative visit to Horse Fen, Ludham were made in 2011. *A. nigrum* was found at Woodbastwick Fen only, a single female in 2010 and thirteen to fourteen specimens in 2011. All observations were clustered in three groups, two of them in a single meadow, on slightly higher land which has not been summer-grazed but is either winter-grazed or managed by mowing. *A. nigrum* was most readily found in warm, sunny, still conditions in late morning, and could be found flying naturally among the sward in strong sunshine.

A. nigrum seems to be strongly associated with grassy habitats with tall, dense sward and tussocks untrampled by grazing animals. Nearly all the observations at Woodbastwick are from areas usually dominated by, or at least with substantial amounts of *Calamagrostis* or *Holcus*, in a few instances *Juncus* dominated. These are highly botanically diverse meadows so at nearly all places where *A. nigrum* was noted there was also *Juncus*, *Carex*, *Phragmites*, *Gallium*, *Equisetum* and many other species. These associations indicate the general habitat these flies were seen in, and should not be treated as being very precise. Often an individual fly was watched flying though the habitat, rapidly moving from *Juncus* to *Calamagrostis* or *Holcus* dominated areas, although they were not observed flying into dense *Phragmites* or *Eupatorium*.

It is assumed that *A. nigrum* pass their larval development feeding on fungal hyphae and or fruiting bodies. This survey found no association with lignicolous fungi, although there are dead *Betula* and *Alnus* scattered across the site, *A. nigrum* displayed no clustering around these features. Terrestrial fungi were very scarce, and most present are very small species or associated with cattle dung. At one of the colonies a few very delicate cap-fungi were found with nematocera larvae and could indicate the larval development site for *A. nigrum*, but it will be necessary to rear the larvae found to confirm this. The greatest likelihood is that *A. nigrum* larvae develop by feeding on fungal hyphae amongst rotting grass litter at the bases of dense grass tussocks, perhaps of a species of fungi that produce fruiting bodies only rarely or that are ephemeral.

The findings suggest that cattle and other grazing animals should be kept away from populations of *A. nigrum* during the summer months. It is also recommended that cattle grazing not be introduced to any known or potential *A. nigrum* sites without prior survey to look for populations of this fly.

7.4 *Dolichopus laticola* and *D. nigripes*

Martin Drake has been investigating the habitat preferences of *Dolichopus laticola* and *D. nigripes*. 179 samples of Dolichopodidae were collected using ten minute sweep-net samples at six fens in Norfolk between 20th and 29th June 2010. The same technique was used to collect 124 samples from sixteen Norfolk fens between 16th and 23rd June 2011. Soil wetness, management and habitat type were recorded at each sampling point.

In 2011 *D. laticola* was recorded at six fens, five of which were new sites for the species. These records slightly increased the known range which extends along the Ant valley from Broad Fen in the north to Hulver Ground near its confluence with the Bure, and along the Bure from Ebb & Flow to Woodbastwick Fen. Outlying populations were found at Burgh Common in the south and Ormesby Broad in the east. *D. nigripes* was recorded only at Reedham Fen in the Ant valley, and this represents the first good population in this valley; it was previously known only from a single specimen from Catfield Great Fen in 2010. This species is otherwise restricted to the Bure valley fens. *D. laticola* was more frequent than expected in samples taken at 'old cut' fen vegetation and next to ditches. It was under-represented in grazed fen and apparently absent in fen next to ponds or swampy areas. It was scarce in sedge beds (*Cladium*) and scrub or carr. Samples with *D. laticola* were from land that was slightly drier than where it was absent. There was only a weak correlation between the occurrence of *D. laticola* and the value of fens measured using an index of vegetation quality. It was more likely to be present at fens of exceptional quality and absent from those of particularly poor quality, but there was no consistent pattern for areas of intermediate quality. *D. laticola* occurred more often at sites with high numbers of other species of dolichopodids. Ordination using DCA of 36 species of dolichopodids in 94 samples showed that *D. laticola* was associated with other mire species, some of which were fen specialists. *D. nigripes* was also associated with other fenland specialists.

The relationship of each *Dolichopus* species with environmental variables was examined in finer detail using tree models. These show the relationship of the response variable (*Dolichopus*) with all explanatory variables and give an indication of the relative importance of the variables. They are unaffected by lack of normality or linearity in the data, and are easy to interpret so have advantages over other types of modelling. Although the evidence for which factor controlled the local distribution of the two *Dolichopus* species was weak, the following conclusions were drawn. *D. laticola* preferred vegetation that suggested that it was 'old cut' fen, characterised by a larger proportion of tall herb vegetation and moderate amounts leaf litter. It appeared to avoid places dominated by tall dense reed to the exclusion of tall herb vegetation. This may be more characteristic of frequently cut and wetter commercial reedbed. Higher densities of flies were found in wetter areas, but this result conflicted with an apparent increased frequency of occurrence in slightly drier places (although still damp). *D. nigripes* preferred more open vegetation, in which highest densities were reached, and strongly avoided vegetation dominated by tall reed and sedge. The lack of a relationship with soil wetness may have been due to the similarly damp conditions in all the Bure sites.

It seems possible that both target species are more associated with intermittently cut fen, high in plant diversity and with low dominance by tall reed. Such areas are often considered to belong to a fen-meadow habitat type, which has been rather neglected in terms of ecological investigation. It is suggested that an extension to this work would involve these two species forming part of an assemblage to be investigated for its ecological associations with intermittently cut/grazed old fen-meadow. *Asindulum nigrum* could form part of this

assemblage also. Highlighting the potential of this rather neglected component of fen vegetation systems would be an important outcome of the project.

7.5 *Lipara similis*

Dr John and Barbara Ismay have been attempting to determine the environmental and ecological factors characteristic of sites inhabited by the cigar gall causing fly *Lipara similis.* It was hoped that their investigations would help to elucidate the taxonomy of the *Lipara* species occurring in Britain and enable the preparation of keys to the adults of these species and the galls they cause.

Between February and April 2011 ten sites were surveyed and samples taken from them. The sites were Wicken Fen NNR, Redgrave and Lopham Fen NNR, Chippenham Fen NNR, Holme Dunes NNR, Titchwell SSSI, Woodwalton Fen NNR, Cothill SSSI (Parsonage Moor only), Holkham Dunes NNR, New Forest NNR (Strodgemoor Bottom, east of Burley Street) and North Solent NNR (Beaulieu). At each site galls were located and provisional identifications to species made on the basis of the appearance of the galls. It is necessary to rear the adults and identify these to confirm the characters of the galls. The thickness of each gall was measured at base and middle at time of collection. The samples were stored individually in sealable bags and moistened twice per week, a system which has worked well in the past when rearing adults. After emergence the adults were then frozen or stored in denatured alcohol. Adults stopped emerging from the samples in early June 2011. The emerging flies included *Lipara* species, other Chloropidae, Scathophagidae, Anthomyzidae and there was a rather large percentage of parasitic Hymenoptera.

Ecological data gathered in spring included estimated distance from scrub or degree of shading, water levels, density of reed stems and notes on management, if available. Sites were revisited at the end of the growing period (August to October) to take the same measurements again, except that reed stem density was measured as low on the stem as possible (ca. 40 cm above ground). Degree of shading and percentage of tree cover, scrub etc in a 10 square metre quadrat around each site was measured also.

It is now clear that only two of the *Lipara* species are likely to show a consistent difference in the form and structure of their gall. Hence producing a key to separate these flies on the basis of gall form is not going to be possible. Gathering further material would not change the key findings and once the results are published no further extension is recommended for this project.

8. Invertebrates of open woodland

8.1 *Polyzonium germanicum*

Paul Lee coordinated a study undertaken by the British Myriapod and Isopod Group to establish the current distribution of the millipede *Polyzonium germanicum* and to determine the environmental and ecological factors characteristic of the sites it inhabits. *P. germanicum* is a south-eastern species in Britain with all verified records in East Kent. These records suggested it was a woodland species favouring older coppice (>15 years). Data submitted to the national recording scheme also suggested there had been a significant population decline over the last 25 years.

During the British Myriapod & Isopod Group Easter field meeting in 2011 a standardised survey was undertaken to ascertain the true status of the millipede and to gather data to assist in determining the environmental and ecological factors characteristic of sites inhabited by the millipede. Kent Wildlife Trust assisted in gaining permission to survey sites in as many hectads as possible. These were mainly woodlands but included all sites where the species had previously been recorded. Most hectads in the east of the county were covered and across to Tunbridge Wells to the west. Each site was visited by a team of two or three surveyors.

A standardized sample comprised six separate 5-minute sessions of hand searching in moss, litter etc. at six locations within a 20x30m quadrat. The number of *P. germanicum* collected was recorded along with information on litter type, vegetation structure and estimates of soil moisture, litter depth, and bare ground. 92 samples were recorded from 51 different woodlands / sites over the course of three days. *P. germanicum* was recorded from 22 of these samples and from 16 different hectads. The millipede is now known to survive throughout its previous range and the records have extended its known range both eastwards and westwards. There are few suitable sites further east but it may still occur unnoticed in areas to the west.

Initial analysis of the environmental data suggests there may be a link between occurrence of the millipede and soil moisture levels (or possibly humidity) but more statistical analysis is being undertaken.

8.2 *Metaiulus pratensis*

Paul Lee and Dr Helen Read coordinated a study undertaken by the British Myriapod and Isopod Group to establish the current distribution of the millipede *Metaiulus pratensis* and to determine the environmental and ecological factors characteristic of the sites it inhabits. The millipede was described as new to science from specimens collected between 1939 and 1956, mainly from Wye, Kent. All subsequent UK records have been from the same county and although since discovered in France it remains a very scarce species throughout its range.

Initial records of *M. pratensis* originated from newly ploughed pasture and arable land but it has also been recorded from caves in France. The most recent records in Kent were from

woodlands and wetland in the Medway Valley but it was last collected in 1988 and feared extinct.

During the British Myriapod & Isopod Group Easter field meeting in 2011 visits to a number of sites along the upper Medway floodplain were organised to search for *M. pratensis.* At one of these sites, Yalding Fen, a very strong population of the millipede was located. Specimens were found amongst leaf litter and at the soil-litter interface in seasonally wet grassland and carr.

A note on the discovery and updated observations on identification of the species have been published in the *Entomologist's Monthly Magazine*. A peer reviewed paper on the life history of the species is planned. The current project will continue with a survey of further sites in Kent in spring 2012. It is not at all clear that *M. pratensis* belongs within this ecological grouping and it is recommended that an extension of the work beyond the end of the project will be required to understand the details of the autecological requirements of the millipede.

8.3 *Chrysis fulgida*

Scott Dodd has been attempting to determine the current English distribution of the jewel wasp *Chrysis fulgida.* Twenty-seven trap-nests built to a previously tested design were located at nine localities across Surrey, north Hampshire and Dorset to survey for the presence of the Ruby-tailed Wasp *Chrysis fulgida* during 2010. Sites were chosen using at least two of the following criteria:

- Presence of regenerating *Populus tremula* or locally frequent *Salix repens;*
- Populations of the leaf beetle *Chrysomela populi* present;
- Known locality for *Symmorphus crassicornis.*

Traps were set in an elevated position in all but one locality (Sheet's Heath, Surrey) and ran from April to October 2010. Collected trap nests were kept outdoors over winter with shelter from excessive rain, snow etc. in an attempt to rear their contents. The survey failed to record *C. fulgida* from any of the localities. The host *S. crassicornis* was found to be present at a single site (Eelmoor, N.Hants). The host prey species *C. populi* was present at all sites surveyed.

Human disturbance to traps occurred on several sites in Surrey and the majority of the traps sited at Corfe Common, Dorset and Eelmoor, N.Hants suffered woodpecker damage and this may have affected trap efficiency. Although improvements to traps would probably reduce woodpecker damage human disturbance would remain an issue. Also further funding would be required to significantly increase the number of traps constructed. It is now clear that obtaining more up to date information on the distribution of *C. fulgida* will require a much higher density of trapping sites.

8.4 *Formica rufa, F. lugubris* and *Formicoxenus nitidulus*

The socially parasitic ant *Formicoxenus nitidulus* (the shining guest ant) is reliant on wood ant hosts, in Britain primarily *Formica rufa* and *F. lugubris*. As the conservation of this species relies entirely on the health of wood ant populations, it was decided that a survey to assess the state of *F. rufa* and *F. lugubris* is an important first step towards conservation of *Fx. nitidulus*. Members of BWARS (Bees Wasps and Ants Recording Society) have made observations suggesting that these wood ants are in decline. Any decline is likely to be most evident at the population margins. The midlands and north of England cover both the northern margin of *F. rufa* and the southern margin of *F. lugubris* within Britain, so the survey undertaken by Dr Elva Robinson focussed on these areas.

Almost all the populations surveyed appeared to be healthy, in so far as multiple nests were present, these nests well-maintained by their inhabitants and numerous foragers were evident. Due to the lack of detail in most of the historical records with which to compare the current survey results, it was not possible to assess changes in population health.

For both species, 60-70% of historical records were confirmed. However, the overall pattern seems to be that *F. rufa* is struggling at its northern range, while *F. lugubris* is doing well at its southern range. This view is at odds with the general climate-change driven pattern of species shifting their distributions north, as conditions become more clement. This may suggest that local weather patterns, habitat fragmentation and habitat loss are more significant drivers of extinction for wood ants than overall changes in climate. For *F. lugubris*, although the midlands are the southern margin of this species within Britain, in continental Europe they are found much further south, so *F. lugubris* may be in effect better climatic generalists, adapted to survive poor weather, but tolerant of warmer spells. In contrast *F. rufa* is genuinely at its range margin within Britain, and therefore while it may be better adapted to warmer climes, it seems more likely to be injured by periods of adverse weather. There was no evidence that either species is competitively excluding the other. In almost all cases, the species identity (*F. rufa* vs. *F. lugubris*) was the same in the historical record as in this survey. The two exceptions were almost certainly the result of misidentifications.

Fx. nitidulus was found very rarely during the survey; however, this should not be taken as an indication of the actual occurrence. To thoroughly survey *Fx. nitidulus*, wood ant nests should be visited on warm autumn days, when *Fx. nitidulus* workers and sexuals are commonly seen on the nest surface. Due to the scarcity of warm autumn days, it was not possible to re-visit all the wood ant sites to check for *Fx. nitidulus*, although the list of extant wood ant populations should help to target future studies of the shining guest ant. The high detection rate of *Fx. nitidulus* when surveying conditions were suitable (80%) may be taken to be encouraging, but given the very low sample size (5 sites), clearly a more wide-ranging survey is required before general statements about the prevalence of *Fx. nitidulus* can be drawn.

Extension work should include detailed longitudinal studies of the size and vigour of wood ant populations which can be used for comparisons in future. Outside of this project Elva has

now begun some work using the extinction/persistence data in conjunction with GIS data and historical maps to investigate the roles of habitat loss/fragmentation and local weather patterns in the extinction of *F. rufa* and *F. lugubris*.

8.5 *Philorhizus quadrisignatus*

John Walters has been attempting to characterise the micro-habitat of the carabid beetle *Philorhizus quadrisignatus*. Bushy Park, Middlesex, the only British locality where the beetle has been found reliably in recent years, has been visited but *P. quadrisignatus* could not be located during fieldwork for this project during either 2010 or 2011 although it was recorded by another coleopterist from Hertfordshire in 2011. In the past the beetle has been found under bark of deer grazed hawthorns, under sycamore bark and in the woodland canopy but no further information on micro-habitats could be gathered. Clearly this is a difficult beetle to study as it is so difficult to locate. It may be for example that it occurs high in the canopy of trees and is rarely found. Discovering how to locate it most effectively is a priority before searches can be made more widely; the technique of searching under bark is destructive so alternative methods of finding the beetle need to be investigated e.g. searching tree trunks after dark by torchlight.

8.6 Neoempheria lineola

David Gibbs is attempting to determine the current distribution of the fungus gnat *Neoempheria lineola* and the environmental and ecological factors characteristic of sites it inhabits. The very few records of this species all come from the New Forest in Hampshire apart from a single specimen caught in Oakley Wood, Cirencester, Gloucestershire in 1986. Unfortunately the Bathhurst Estate refused permission to look for this species in Oakley Wood so the survey work was confined to the New Forest. This investigation into the ecological needs of *Neoempheria lineola* required two phases, discovery and observation. First, colonies or populations needed to be located before any observations of ecological preferences or behaviour could be made. To this end Denny Wood was visited on 31st May 2011, The Knowles on 2nd June 2011 and Brinken Wood on 3rd June 2011. In advance of visiting each site, aerial photographs were consulted to locate areas with large numbers of large broad-leaved trees. These areas were then walked, searching for fallen or standing dead wood or mature trees with holes or signs of fungal infection, especially beech. All of these that could be accessed were swept with a white-bag net, above and if possible below fallen branches, along the boles of standing stumps and dying trees and over any fungal fruiting bodies associated with dead wood. All fungus gnats so captured were retained for later examination. If any *Neoempheria* specimens were found then a 10-figure grid reference was taken and it was potted separately.

After three days of searching the three known sites in the New Forest with recent records, no specimens of *Neoempheria lineola* had been found. Indeed fungus gnat abundance and diversity seemed to be particularly poor, for instance only a single female specimen of *Neoempheria pictipennis* was found. Given this it seemed likely that the very warm and dry spring had had a negative effect on the abundance of fungus gnats. Even if it was possible to

find *Neoempheria lineola* in 2011 with more extensive searching, there seemed little or no chance that they could be found in sufficient numbers to start any ecological observations. As the number of days available for the project is limited, it was agreed with the Research Coordinator that there was no point in continuing in 2011 and that the work would be continued in spring 2012.

9. Development of Hymettus Ltd.

9.1 An Annual Report and accounts for the year from 1st April 2010 to 31st March 2011 have been prepared for submission to Companies House and the Charity Commissioners as required by law. The report stated that:

Hymettus is dedicated to the conservation of invertebrates many of which provide ecological services fundamental to public health, food production and public well-being. In addition and in line with the aim of the UK BAP and other public policies, Hymettus subscribes to the view that all invertebrates are worthy of conservation for their own sake and so is working for the public benefit.

The main function of Hymettus is the undertaking of high quality research into the ecology of British invertebrates which provides information helping to more efficiently and more effectively conduct conservation actions. These projects are currently attempting to ascertain the habitat and forage requirements, distributions and genetic diversity of over 40 uncommon and threatened species. The research has encompassed sites and species throughout the British Isles from beetles and ants on the south coast to mining bees and bumblebees in the Highlands and Islands. Hymettus, has initiated or continued species specific work on ten species of ground beetle, one planthopper, two species of fungus gnat, two species of long-legged fly, one species of jewel wasp, one species of spider wasp, two species of potter wasp, six species of solitary wasp, eight species of solitary bee, seven species of ant and three species of bumblebee. In addition, further work on ecological groupings of species has been supported.

The results of research projects are disseminated as free downloads from the Hymettus website. Dissemination of less technical and more practical results to a wider audience is achieved through the production of advisory leaflets (currently 23) which are also available as free downloads from the Hymettus website. Many of these leaflets are written for the wider public. A particular success of the last year was a bid for funds to reprint two informative leaflets on gardening and farming with bumblebees in mind. The demand for the gardening leaflet was so great that it is already out of print again. The broadening of the research base of Hymettus from aculeate hymenoptera to invertebrates more generally is seen as a significant step in line with its charitable aims.

Information gathered from Hymettus' research projects is fed into the National Biodiversity Network where the records become readily available for use in research by the amateur naturalist community as well as professional scientists. Also the information can be used by Local Authorities, wildlife trusts and others to ensure that planning decisions take into account the ecological services and other public benefits provided by invertebrates.

The Hymettus website provides links to the websites of a range of voluntary organisations from RSPB to Bees, Wasps & Ants Recording Society, Dipterists' Forum and the British Myriapod & Isopod Group. Each of these organisations encourages voluntary involvement in conservation

amongst enthusiastic amateurs and the wider public, often through citizen type research activities.
Partnerships continue to be central to achieving the objectives of Hymettus. The organisation is working in partnership with other organisations in the voluntary sector including Bumblebee Conservation Trust, RSPB and Surrey Wildlife Trust on several ongoing projects. In addition, working relationships continue to be built with academic institutions both to provide support to students and as a partner in successful research bids. Hymettus led a partnership involving several voluntary biological recording organisations that submitted a successful bid to Defra for biodiversity research funding that will run until 2012.

9.2 Hymettus is actively seeking to work with new partners including commercial organisations, academic institutions and other non-hymenopteran interest groups. The Hymettus led bid referred to above was successful and formed a substantial proportion of the organisation's work in 2011.

9.3 Hymettus has begun work this year on three projects funded under the Insect Pollinator Initiative. The first, entitled *Impact and mitigation of emergent diseases on major UK insect pollinators*, is led by Dr Rob Paxton in partnership with Dr Mark Brown at Royal Holloway, University of London and Dr Juliet Osborne at Rothamsted Research. Hymettus has been involved in the collection of samples of bees from the field at sites across Britain. These bees are then tested for disease prevalence at Royal Holloway, University of London. The project will be continuing into 2012.

9.4 The second and third IPI projects both involve Hymettus providing taxonomic skills in the identification of thousands of field collected specimens over the next three years. The second project is *Linking agriculture and land use change to pollinator populations* led by Professor Bill Kunin at the University of Leeds in partnership with Professor Jane Memmott at the University of Bristol, Dr Nigel Boatman at the Food and Environment Research Agency, Dr Richard Morton at the NERC Centre for Ecology and Hydrology and Dr Simon Potts at the University of Reading. The third project is *Sustainable pollination services for UK crops* led by Dr Koos Biesmeijer at the University of Leeds in partnership with Dr Mette Termansen and Dr Andy Challinor at the University of Leeds, Dr Giles Budge at the Food and Environment Research Agency National Bee Unit and Dr Simon Potts at the University of Reading. Further details of all three projects can be found on the BBSRC website at http://www.bbsrc.ac.uk/pollinators/.