

Hymettus

Bombus muscorum and *Bombus humilis*
in the South West in 2008



Patrick Saunders

2008

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Cover illustration:
Bombus humilis by Patrick Saunders

Summary

- *Bombus humilis* was more numerous than *Bombus muscorum* on all of the transects apart from one.
- *B. muscorum* is likely to be confused for *B. humilis* in field records. Distribution maps and historical data to be treated with caution.
- *B. muscorum* had the highest counts on sites with both heathland / species rich grassland and near dune systems. A possible link between *B. muscorum* needing larger and higher quality sites in the region than *B. humilis* is suggested.
- *B. muscorum* was reported as uncommon in Devon in past. Historical records indicate a more scattered distribution than *B. humilis*.
- *B. pascorum* was present in lower numbers than *B. humilis* within the highest quality sites.
- There was no evidence to support the theory that *B. humilis* is expanding at the expense of *B. muscorum* in south west England.
- Further transects and survey work are necessary to establish the ecological partitioning between *B. muscorum* and *B. humilis*.
- Fieldwork was possible only within a very narrow window of weather in 2008.

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1. Background

1.1 Survey Aims

This report compares the distribution of *Bombus humilis* and *Bombus muscorum* in Devon and Cornwall. The report seeks to compare the abundance, the distribution and ecology of these species with relevance to other regions.



Figure 1: *Bombus humilis* male

1.2 Previous Work

1.2.1 The distribution of *Bombus humilis* and *Bombus muscorum*

B. humilis can be found all the way along the north Cornish coast with the strongest populations between Boscastle (SX0991) and Gwithian Towans (SW5741). Other sites are scattered around the coast to Lands End and around the Lizard peninsula. There are also some outlying records. The species seems to have declined inland.

B. humilis has greatly declined in Devon, The only remaining stronghold for *B. humilis* (and *B. muscorum*) from my experience is Braunton Burrows (SS4533). Although there are a few recent records of *B. humilis* elsewhere on the north Devon coast, the species appears to be no longer present on the south coast or inland (see Fig.2)

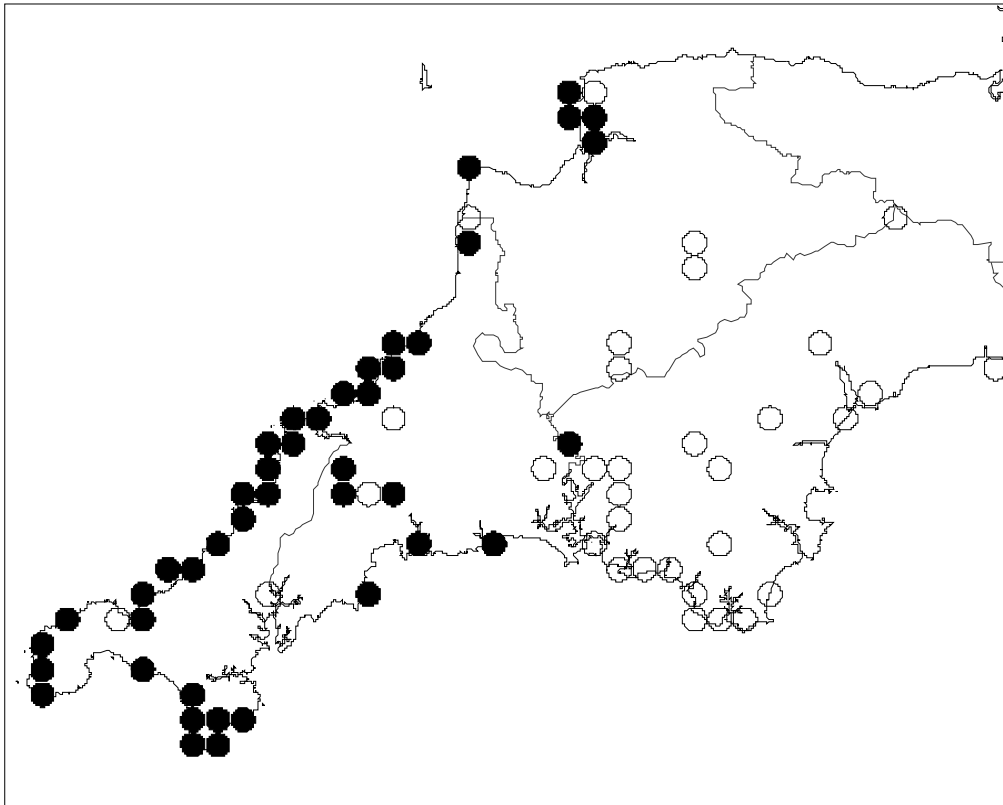


Figure 2: Distribution map for *Bombus humilis* in Devon and Cornwall.
(Black dots post-1990; Hollow circles pre-1990 records)

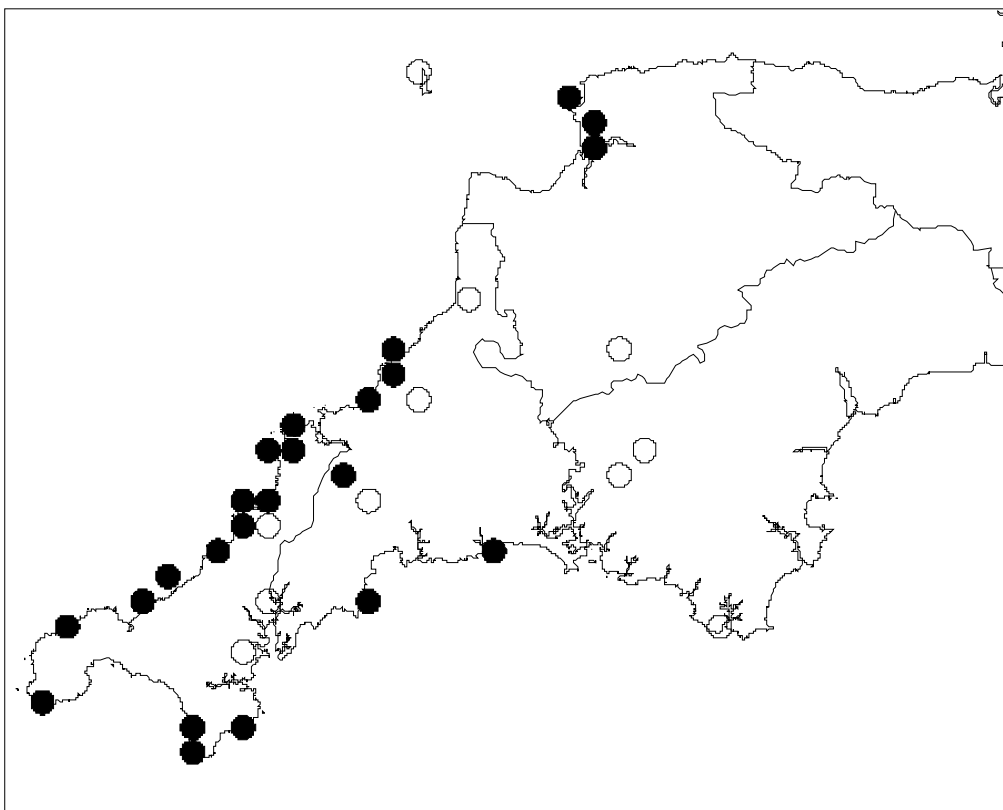


Figure 3: Distribution map for *Bombus muscorum* in Devon and Cornwall.
(Black dots post-1990; Hollow circles pre-1990 records)

B. muscorum seems to have a very similar distribution to *B. humilis* but is more scattered and less abundant (see Fig.3).

Perkins (1923) states that *B. muscorum* “appears to be of great rarity in Devon, as I have only taken it singly in the Bovey district (One male picked out from scores of *humilis* males feeding on scabiose flowers)”. Malcolm Spooner (1985?) says about *B. humilis*, “quite general in South west Devon, but mainly in the drier parts and most common in finer years.”

B. muscorum was possibly more numerous on upland moors such as Dartmoor and Bodmin. “Vale Down, nr Lydford, not rare (1943 & 1944) on various parts of the open moorland in some parts in company with *humilis*, no nests found, females did not appear before first week of May, they visited lousewort - only some of these females were still alive in the beginning of September (Perkins, 1945)”. Sladen (1912) “noticed this species to be commonest in damp cold seasons”.

1.2.2 Habitat of *B. humilis* and *B. muscorum*

The main habitat of *B. humilis* and *B. muscorum* in Devon and Cornwall appears to be maritime cliff grassland commonly associated with headlands and coastal heath / grassland. The main reason for the species’ survival in Cornwall appears to be the survival of the extensive area of semi natural heath / grassland on the northern coastal cliffs kept from succession to scrub by the exposed climate and thin soils. This habitat, although in some cases becoming very narrow, forms a long, continuous strip which fulfils the requirement for the species to have large areas of high quality forage. Approximately 1km² of forage habitat per nest is estimated to be needed (Edwards 2001). Other habitats peripheral to the cliffs are also important, such as dunes and associated neutral grassland.



Figure 4: *Bombus humilis* male

2. Methods

2.1 Site selection

The survey consisted of bee walks on a range of sites in Cornwall thought to be good sites for both or either of the two target species. The 15 sites selected are listed in Table 1.

2.2 Survey methods

The bee walks consisted of timed counts of *B. humilis*, *B. pascorum* and *B. muscorum* where present. The bee walks targeted flower rich areas within the sites. Some additional count data from 2006 was also included.

The main criteria used for separating *B. humilis* from *B. muscorum* were the presence of black hairs in the wing bases (Benton, 2006). Unfortunately this is not a constant character with many *B. humilis* specimens not having black hairs or many *B. humilis* having only one black hair on only one wing base. Contrary to most bumblebees in my experience, queens of these species in Devon and Cornwall are more difficult to separate than workers despite their larger size. Other field characters such as length of hair on thorax (more uneven in *B. humilis*) and general colouring can be very apparent in fresh workers, fresh queens and males. A large number of bees in the field have a general look of *B. humilis* / *muscorum*. This makes counting difficult. For example, at Penhale Point several workers were counted as *B. muscorum* both based on “jizz” and the absence of black hairs but the only voucher taken proved to be *B. humilis*. As such the count data represents a pragmatic approach to this problem. *B. pascorum* is very rarely difficult separate from the other two species in Devon and Cornwall.



Figure 5: *Bombus muscorum* male

3. Survey Results

3.1 Species counts

The results of the counts at the selected sites in 2008 and the additional data from 2006 are given in Table 1.

B. humilis was the commonest species recorded followed by *B. pascorum*. Roughly one third of the sites had more *B. pascorum* than *B. humilis* but *B. pascorum* was thought to have been present in higher numbers, uncounted at the edge of the sites in features such as hedge boundaries or scrub.

Definite *B. muscorum* was rarely recorded. On four sites vouchers of *B. muscorum* were taken and probable *B. muscorum* were recorded on a further six sites. Even if all bumblebees counted as *B. humilis* / *muscorum* are included in the total count they still only account for about 25% of the *B. humilis* recorded.

The best sites for *B. humilis* were Trevoise Head (SW8575), Park Head (SW8470) and Tintagel Head (SX0488). The highest counts of *B. muscorum* were at Penhale Point (SW 7559) and Trevoise Head (SW8575). 2006 provided slightly higher numbers than 2008 although the data from different years can only be roughly compared.



Figure 6: Trevoise Head

Table 1: Species counts from bee walks in 2008 and additional data from 2006

Sites		<i>B. humilis</i>		<i>B. humilis / muscorum</i>		<i>B. muscorum</i>		Voucher retained
Crugmeer SW9077	08/08/08	6w	7m	1w	2m			
Cubert Common SW7859	20/07/08	8w	1m			1w	1m	Y
Doyden, Port Quin SW9680	21/07/08	1w						
Forabury, Tintagel SX0990	15/07/08	4w		2w				
Glebe Cliff, Tintagel SX0588	15/07/08	5w				1w		Y
Godrevy Head SW5843	24/07/08	5w		1w	1m			
Gwithian Towans SW5841	24/07/08	4w	2m	1w		1w		
Park Head SW8470	11/07/08	6w		1w				
Park Head SW8470	25/07/06	20w	1m	1q	6m	1w		
Penhale Point SW7559	20/07/08	2w		4w		6w 1q	4m	Y
Penhale Sands SW7656	26/07/06	2w				1w		
Port Gaverne SX0080	21/07/08	3w						
Port Quin SW9780	21/07/08	1q 3w						
Tintagel Head Sx0488	21/08/06	1q 11w	6m					
Trevose Head (headland) SW8576	08/08/08	2q 12w				5w	1m	Y
Trevose Head SW8576	08/08/06	25w	2m			5w		
Trevose Head SW8576	11/07/08	11w 1q		3w		5w	1m	
Trevose Head SW8576	30/06/06	19w				2w		
Trevose Head SW8576	08/08/08	18w	4m	2w	2m	5w	1m	
Upton Towans SW5739	24/07/08	4w	1m					
West Pentire SW7778	20/07/08		1m	1q				
Kelsey Head SW7660	20/07/08					1q		

3.2 Observations on foraging of *Bombus humilis* and *B. muscorum* (males and workers)

This study was too limited to determine foraging preferences in detail. All plants the target species were observed on were noted during the bee walks. Figures 7 & 8 summarize the data for all castes of each species. The specific foraging of females for pollen is of greater importance for assessing their habitat requirements (Goulson & Darvill, 2004). This was not assessed although some pollen samples were taken in 2006 and 2005. Previous field observations reinforce a link between queens of both species and Kidney vetch *Anthyllis vulneraria* (Saunders, 2003). The count data does show some differences in foraging preferences. *B. muscorum* shows a preference for Bell heather and a lower than expected use of Fabaceae whereas *B. humilis* primarily utilised Bell heather, Red clover, Betony and Black knapweed although about 65% of observations of *B. humilis* on Knapweed were males not gathering resources for the colony.

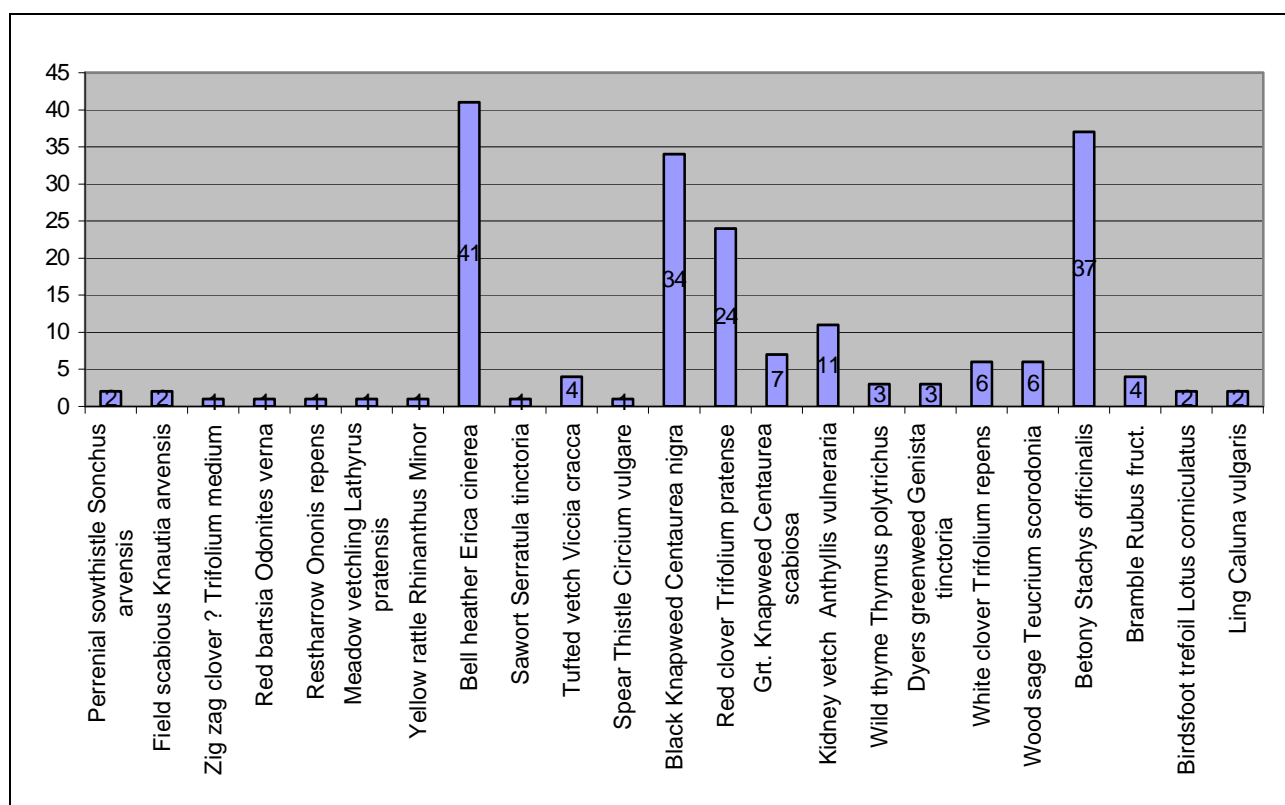


Figure 7: Foraging preferences of *Bombus humilis*

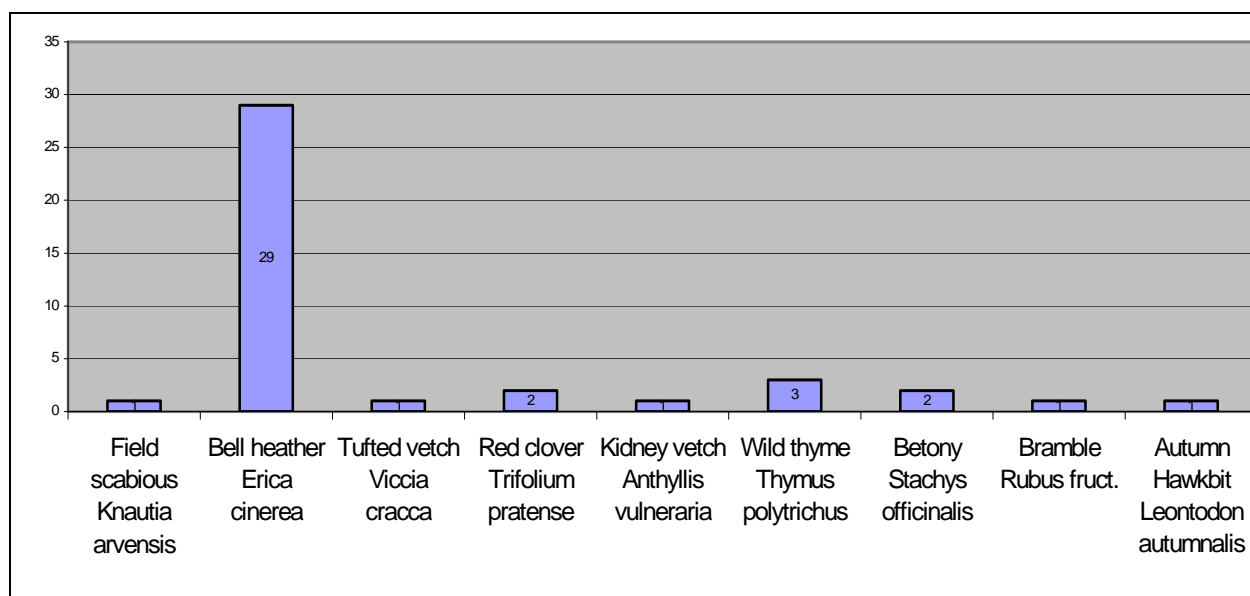


Figure 8: Foraging preferences of *Bombus muscorum*

The most commonly used habitat was flower rich heath and grassland mosaics close to cliff tops or dune edges. Where heath is utilized by *B. humilis* (and *B. muscorum*) it is generally more open with mosaics of grassland supporting Betony *Stachys officinalis*, Saw-wort *Serratula tinctoria* and Knapweed *Centaurea nigra*.

In previous years all over wintered queens were observed foraging on Kidney vetch *Anthyllis vulneraria*. It is suspected that the abundance of Kidney vetch is of vital importance to queens with Kidney vetch possibly being the most important vegetation requirement for colony establishment. During 2008 survey work took place too late to observe this.

The abundance of peripheral flower rich heath, dunes, unimproved and semi improved grassland is the most important factor for foraging workers and determines the strength of the population. Importantly these sites need to have a continuity of flowers stretching from late May to September.

During the survey some partitioning between the species was observed with *B. muscorum* seeming more abundant on areas within the sites with an abundance of *Erica cineraria*.

3.3 Observations on a *Bombus humilis* nest

A *B. humilis* nest was discovered on 11/07/08 at Trevoise Head at OS grid reference SW85197611 (see Fig.9). The photos in Figures 10 & 11 were taken on 08/08/08. There appeared to be less activity on this date, the nest possibly having broken up. Although I did not disturb very deeply inside there was no queen obvious, just several living workers and a couple of dead workers. A few workers flew from the nest in the course of observation and a number of *B. humilis* were foraging nearby on Red clover. The area surrounding the nest had greater diversity of plants in flower on the previous visit (11/07/08) with a number of workers entering and leaving the nest.



Figure 9: *Bombus humilis* nest site Trevoise Head



Figure 10: *Bombus humilis* nest



Figure 11: *Bombus humilis* workers at nest

The nest was north to north-west facing, at least 4-5 inches in diameter within Thrift tussocks and possibly vole runs in a Cornish hedge about 2-3 feet above ground. Most accounts of this species have emphasised *B. humilis* nesting on the ground. The hedge although a man made feature was very similar to the cliffs. The bees may possibly nest in the cliffs themselves where they provide a suitable aspect. In this situation the nest would be protected from some predators of ground nesting bees such as badgers.

B. humilis males were seen congregating around a probable scent mark point which consisted of tall Knapweeds along a Cornish hedge boundary about 1km away from the nest site.

3.4 Other Observations

Over two days 29/08/08 and 30/08/08 a number of sites on the Somerset Levels were visited, primarily to search for *Bombus sylvarum*. These sites were Walton Heath (ST456387), Ham Wall RSPB reserve (ST4539), Westhay (ST454437) and Shapwick Heath (ST4241). *B. muscorum* had been recorded from a number of these sites on previous visits in 2006 as had one *B. humilis*. Neither of these species was recorded in 2008 and only one *B. sylvarum* was recorded at Ham Wall. Ellis collected 38 *B. sylvarum* on two dates at Ham Wall (17/8/04 and 25/8/04) (Ellis *et al.*, 2006). One area with high numbers of *B. sylvarum* in 2006 is now flooded reedbed at Walton Heath (ST456387), possibly suitable for bitterns but not for *Bombus*.

One male *B. muscorum* was recorded at Velvet Bottom 30/08/08 (ST5055) above Cheddar Gorge.

4. Conclusion

B. muscorum had the highest counts on sites where heath / species rich grassland and reasonably large dune systems occurred close together. One *B. muscorum* was recorded at Glebe Cliff, Tintagel (SX0588), a site far away from any dune systems, and at Dannonchapel Valley (SX0382) where only heath / species rich grassland occurred. The sites with just *B. humilis* seemed to be heath / species rich grassland without other habitats and sometimes this grassland reduced to a narrow cliff top habitat such as Port Quinn (SW9780) or Port Gaverne (SX0080). The field work suggests that *B. humilis* may be able to tolerate lower quality, more isolated or smaller sites than *B. muscorum* in the region. Although the edges of the dune systems were very important, neither *B. muscorum* nor *B. humilis* were present in high numbers on the dune systems themselves such as at Upton Towans (SW5739).

Many studies mention links between wetter habitats and *B. muscorum* but no such link was established during this survey. It is possible that numbers of the two species are linked in some way with one having a better year at the expense of the other. Some anecdotal evidence suggests *B. humilis* expanding at the expense of *B. muscorum* but it seems likely that in Cornwall's Atlantic climate the changing weather could cause both long term and short term fluctuations benefiting either species. *B. muscorum* (a northerly species) (Williams *et al.*, 2007) would benefit from a wetter, cooler summer and *B. humilis* from hotter, drier summers. The very diverse micro-climates of different sites in Cornwall (from The Lizard to the North coast) could further buffer or accentuate the effects of climate on an individual population.

The survey work was limited by the poor weather in summer 2008 which was cool even when not raining. It was fortunate that most of the survey took place early as most of August was very wet and cool. May and June in Cornwall can be hot, but this year my personal experience was of about 2 or 3 days of what I would class as hot summer weather between April and September. On many weather forecasts the temperature on the east coast of Scotland was the same as south Cornwall. The bumblebees on the north coast of Cornwall did not seem obviously effected by the less than favourable conditions, although some of the counts in 2006 were higher and I did not do any counts later than the first week of August. It did seem they were less obviously affected than other groups such as butterflies.

In addition to limiting foraging opportunities a major concern with the weather could be the very high rainfall falling in short periods that occurred throughout the summer. This could affect ground nesting bees such as *B. humilis* and *B. muscorum* by flooding their nests.

Intensive farming is likely to have had the most effect on the distribution of both species and is likely to explain the "coastal squeeze" operating in Devon and Cornwall. Much of the region is grazed or cut for silage very intensively with few areas of flower rich grassland large enough to support the rarer species remaining.

Any initiatives supporting creation of flower rich grassland and / or clover rich habitats such as pollen and nectar margins or Red clover leys are likely to encourage expansion of the two species. Whilst there has been some implementation of pollen and nectar margins within the region a similar scheme based on boosting Environmental Stewardship options within the grazed landscapes particularly Red clover leys should be urgently implemented to benefit both species

5. Acknowledgements

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Appendix: raw data

Species Name	Quantity	Forage	Status of forage	Location	Grid	Capture Date	Comments
<i>Bombus humilis</i>	1w ?	Betony <i>Stachys officinalis</i>	Abundant	Park Head	SW8470	11/07/2008	
<i>Bombus humilis</i>	2w	Betony <i>Stachys officinalis</i>		Park Head	SW8470	11/07/2008	
<i>Bombus humilis</i>	2w	Perennial sowthistle <i>Sonchus arvensis</i>	Rare	Park Head	SW8470	11/07/2008	
<i>Bombus humilis</i>	1w	Red clover <i>Trifolium pratense</i>	Abundant	Park Head	SW8470	11/07/2008	
<i>Bombus humilis</i> / <i>muscorum</i>	1	Birdsfoot trefoil <i>Lotus corniculatus</i>		Park Head	SW8470	11/07/2008	
<i>Bombus pascorum</i>	1	Betony <i>Stachys officinalis</i>		Park Head	SW8470	11/07/2008	
<i>Bombus pascorum</i>	1w	White clover <i>Trifolium repens</i>	Dominant	Park Head	SW8470	11/07/2008	
<i>Bombus pascorum</i>	1w	Wood sage <i>Teucrium scorodonia</i>	Rare	Park Head	SW8470	11/07/2008	
<i>Bombus pascorum</i>	1w	Red clover <i>Trifolium pratense</i>		Park Head	SW8470	11/07/2008	
<i>Bombus pascorum</i>	1w	Greater Birdsfoot trefoil <i>Lotus pedunculatus</i>		Park Head	SW8470	11/07/2008	
<i>Bombus humilis</i>	2w	Field scabious <i>Knautia arvensis</i>	Occasional	Trevoise Head	SW8576	11/07/2008	
<i>Bombus humilis</i>	1w	Grt. Knapweed <i>Centaurea scabiosa</i>	Occasional	Trevoise Head	SW8576	11/07/2008	
<i>Bombus humilis</i>	2	Bell heather <i>Erica cinerea</i>	Frequent	Trevoise Head	SW8576	11/07/2008	
<i>Bombus humilis</i>	5w	Red clover <i>Trifolium pratense</i>		Trevoise Head	SW8576	11/07/2008	
<i>Bombus humilis</i>	1	White clover <i>Trifolium repens</i>	Dominant	Trevoise Head	SW8576	11/07/2008	
<i>Bombus humilis</i>	1q	Kidney vetch <i>Anthyllis vulneraria</i>	Occasional	Trevoise Head	SW8576	11/07/2008	
<i>Bombus humilis</i> / <i>muscorum</i>	1	Betony <i>Stachys officinalis</i>	Frequent	Trevoise Head	SW8576	11/07/2008	
<i>Bombus humilis</i> / <i>muscorum</i>	1	Red clover <i>Trifolium pratense</i>	Locally Abundant	Trevoise Head	SW8576	11/07/2008	
<i>Bombus humilis</i> / <i>muscorum</i>	1	Wild thyme <i>Thymus polytrichus</i>	Occasional	Trevoise Head	SW8576	11/07/2008	
<i>Bombus muscorum</i>	1w	Wild thyme <i>Thymus polytrichus</i>		Trevoise Head	SW8576	11/07/2008	
<i>Bombus muscorum</i>	1m	Betony <i>Stachys officinalis</i>		Trevoise Head	SW8576	11/07/2008	
<i>Bombus muscorum</i> (prob)	3w	Bell heather <i>Erica cinerea</i>		Trevoise Head	SW8576	11/07/2008	
<i>Bombus pascorum</i>	1w	Field scabious <i>Knautia arvensis</i>		Trevoise Head	SW8576	11/07/2008	
<i>Bombus humilis</i>	1	White clover <i>Trifolium repens</i>	Occasional	Glebe Cliff Tintagel	SX0588	15/07/2008	
<i>Bombus humilis</i>	1m	Betony <i>Stachys officinalis</i>		Glebe Cliff Tintagel	SX0588	15/07/2008	voucher
<i>Bombus humilis</i>	1w	Red clover <i>Trifolium pratense</i>		Glebe Cliff Tintagel	SX0588	15/07/2008	
<i>Bombus humilis</i>	2	Bell heather <i>Erica cinerea</i>		Glebe Cliff Tintagel	SX0588	15/07/2008	
<i>Bombus jonellus</i>				Glebe Cliff Tintagel	SX0588	15/07/2008	
<i>Bombus muscorum</i>	1w	Bell heather <i>Erica cinerea</i>	Occasional	Glebe Cliff Tintagel	SX0588	15/07/2008	voucher
<i>Bombus pascorum</i>	1	Bittersweet <i>Solanum dulcamara</i>		Glebe Cliff Tintagel	SX0588	15/07/2008	
<i>Bombus pascorum</i>	5	Bramble <i>Rubus fruct.</i>		Glebe Cliff Tintagel	SX0588	15/07/2008	
<i>Bombus pascorum</i>	5	Black Knapweed <i>Centaurea nigra</i>		Glebe Cliff Tintagel	SX0588	15/07/2008	
<i>Bombus pascorum</i>	1	White clover <i>Trifolium repens</i>		Glebe Cliff Tintagel	SX0588	15/07/2008	
<i>Bombus pascorum</i>	1	Red clover <i>Trifolium pratense</i>	Rare	Glebe Cliff Tintagel	SX0588	15/07/2008	
<i>Bombus pascorum</i>	2	Betony <i>Stachys officinalis</i>	Locally Abundant	Glebe Cliff Tintagel	SX0588	15/07/2008	

<i>Bombus humilis</i>	1	Wood sage <i>Teucrium scorodonia</i>	Occasional	Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus humilis</i>	1q	Tufted vetch <i>Vicia cracca</i>		Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus humilis</i>	1	Zig zag clover ? <i>Trifolium medium</i>	Rare	Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus humilis</i>	1	Black Knapweed <i>Centaurea nigra</i>		Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus humilis /muscorum</i>	2	in flight		Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus pascorum</i>	13	Tufted vetch <i>Vicia cracca</i>	Occasional	Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus pascorum</i>	2	Black Knapweed <i>Centaurea nigra</i>	Locally Abundant	Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus pascorum</i>	1	Birdsfoot trefoil <i>Lotus corniculatus</i>	Rare	Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus pascorum</i>	2	Betony <i>Stachys officinalis</i>	Locally Abundant	Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus pascorum</i>	2	White clover <i>Trifolium repens</i>	Occasional	Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus pascorum</i>	2	Restharrow <i>Ononis repens</i>		Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus pascorum</i>	1	Yellow rattle <i>Rhinanthus Minor</i>		Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus pascorum</i>	2	Red clover <i>Trifolium pratense</i>	Rare	Forabury Tintagel	SX0990	15/07/2008	
<i>Bombus humilis</i>	1	Red bartsia <i>Odonites verna</i>		Cubert Common	SW7859	20/07/2008	
<i>Bombus humilis</i>	6	Red clover <i>Trifolium pratense</i>		Cubert Common	SW7859	20/07/2008	
<i>Bombus humilis</i>	1m	Wild thyme <i>Thymus polytrichus</i>	Occasional	Cubert Common	SW7859	20/07/2008	
<i>Bombus humilis</i>	1	White clover <i>Trifolium repens</i>	Occasional	Cubert Common	SW7859	20/07/2008	voucher
<i>Bombus muscorum</i>	1w	Wild thyme <i>Thymus polytrichus</i>		Cubert Common	SW7859	20/07/2008	voucher
<i>Bombus muscorum</i>	1m	Autumn Hawkbit <i>Leontodon autumnalis</i>	Abundant	Cubert Common	SW7859	20/07/2008	
<i>Bombus pascorum</i>	4	Red bartsia <i>Odonites verna</i>	Locally Abundant	Cubert Common	SW7859	20/07/2008	
<i>Bombus pascorum</i>	16	Red clover <i>Trifolium pratense</i>	Locally Abundant	Cubert Common	SW7859	20/07/2008	
<i>Bombus pascorum</i>	1	Yellow rattle <i>Rhinanthus minor</i>	Dominant	Cubert Common	SW7859	20/07/2008	
<i>Bombus pascorum</i>	1	Bramble <i>Rubus fruct.</i>	Occasional	Cubert Common	SW7859	20/07/2008	
<i>Bombus pascorum</i>	2	White clover <i>Trifolium repens</i>		Cubert Common	SW7859	20/07/2008	
<i>Bombus humilis</i>	1	Bell heather <i>Erica cinerea</i>		Penhale Point	SW7559	20/07/2008	
<i>Bombus humilis</i>	1w	Birdsfoot trefoil <i>Lotus corniculatus</i>	Occasional	Penhale Point	SW7559	20/07/2008	
<i>Bombus humilis /muscorum</i>	4w	Bell heather <i>Erica cinerea</i>		Penhale Point	SW7559	20/07/2008	
<i>Bombus muscorum</i>	6w	Bell heather <i>Erica cinerea</i>	Abundant	Penhale Point	SW7559	20/07/2008	voucher retained not muscorum !!!
<i>Bombus muscorum</i>	1q	Bell heather <i>Erica cinerea</i>		Penhale Point	SW7559	20/07/2008	
<i>Bombus muscorum</i>	4m	Bell heather <i>Erica cinerea</i>		Penhale Point	SW7559	20/07/2008	
<i>Bombus pascorum</i>	1	Bell heather <i>Erica cinerea</i>		Penhale Point	SW7559	20/07/2008	
<i>Bombus humilis</i>	1m	Black Knapweed <i>Centaurea nigra</i>		West Pentire	SW7778	20/07/2008	
<i>Bombus humilis /muscorum</i>	1q	Betony <i>Stachys officinalis</i>	Occasional	West Pentire	SW7778	20/07/2008	
<i>Bombus muscorum</i>	1q			Kelsey Head	SW7660	20/07/2008	
<i>Bombus pascorum</i>	1	White clover <i>Trifolium repens</i>		West Pentire	SW7778	20/07/2008	

<i>Bombus pascorum</i>	1	Birdfoot trefoil <i>Lotus corniculatus</i>	Occasional	West Pentire	SW7778	20/07/2008
<i>Bombus pascorum</i>	1	Bramble <i>Rubus fruct.</i>		West Pentire	SW7778	20/07/2008
<i>Bombus humilis</i>	2	Betony <i>Stachys officinalis</i>	Locally Abundant	Port Quinn	SW9780	21/07/2008
<i>Bombus humilis</i>	1	flight		Port Quinn	SW9780	21/07/2008
<i>Bombus humilis</i>	1q	Restharrow <i>Ononis repens</i>		Port Quinn	SW9780	21/07/2008
<i>Bombus pascorum</i>	1	Betony <i>Stachys officinalis</i>		Port Quinn	SW9780	21/07/2008
<i>Bombus pascorum</i>	4	Red clover <i>Trifolium pratense</i>	Locally Abundant	Port Quinn	SW9780	21/07/2008
<i>Bombus pascorum</i>	1	Restharrow <i>Ononis repens</i>		Port Quinn	SW9780	21/07/2008
<i>Bombus pascorum</i>	1	White clover <i>Trifolium repens</i>	Locally Abundant	Port Quinn	SW9780	21/07/2008
<i>Bombus humilis</i>	1	Black Knapweed <i>Centaurea nigra</i>		Doyden Port Quinn	SW9680	21/07/2008
<i>Bombus pascorum</i>	3	flight (possible nest)		Doyden Port Quinn	SW9680	21/07/2008
<i>Bombus pascorum</i>	2	Black Knapweed <i>Centaurea nigra</i>	Frequent	Doyden Port Quinn	SW9680	21/07/2008
<i>Bombus pascorum</i>	1	White clover <i>Trifolium repens</i>	Rare	Doyden Port Quinn	SW9680	21/07/2008
<i>Bombus humilis</i>	3	Black Knapweed <i>Centaurea nigra</i>		Port Gaverne	SX0080	21/07/2008
<i>Bombus pascorum</i>	1	<i>Crepis capillaris</i>		Port Gaverne	SX0080	21/07/2008
<i>Bombus pascorum</i>	2	Sawort <i>Serratula tinctoria</i>	Occasional	Port Gaverne	SX0080	21/07/2008
<i>Bombus pascorum</i>	2	Black Knapweed <i>Centaurea nigra</i>	Locally Abundant	Port Gaverne	SX0080	21/07/2008
<i>Bombus pascorum</i>	1	White clover <i>Trifolium repens</i>	Abundant	Port Gaverne	SX0080	21/07/2008
<i>Bombus pascorum</i>	3	Betony <i>Stachys officinalis</i>		Port Gaverne	SX0080	21/07/2008
<i>Bombus pascorum</i>	1	Wood sage <i>Teucrium scorodonia</i>	Abundant	Port Gaverne	SX0080	21/07/2008
<i>Bombus humilis</i>	1	Wild thyme <i>Thymus polytrichus</i>	Abundant	Upton Towans	SW5739	24/07/2008
<i>Bombus humilis</i>	1m	Bramble <i>Rubus fruct.</i>		Upton Towans	SW5739	24/07/2008
<i>Bombus humilis</i>	1	Meadow vetchling <i>Lathyrus pratensis</i>	Rare	Upton Towans	SW5739	24/07/2008
<i>Bombus humilis</i>	2w	Red clover <i>Trifolium pratense</i>		Gwithian Towans	SW5841	24/07/2008
<i>Bombus pascorum</i>	7	Viper bugloss <i>Echium vulgare</i>	Frequent	Upton Towans	SW5739	24/07/2008
<i>Bombus pascorum</i>	3	Bramble <i>Rubus fruct.</i>	Locally Abundant	Upton Towans	SW5739	24/07/2008
<i>Bombus humilis</i>	2m	Black Knapweed <i>Centaurea nigra</i>		Gwithian Towans	SW5841	24/07/2008
<i>Bombus humilis</i>	1	Yellow rattle <i>Rhinanthus minor</i>	Locally Abundant	Gwithian Towans	SW5841	24/07/2008
<i>Bombus humilis</i>	1	Tufted vetch <i>Vicia cracca</i>		Gwithian Towans	SW5841	24/07/2008
<i>Bombus humilis /muscorum</i>	1	Red clover <i>Trifolium pratense</i>	Rare	Gwithian Towans	SW5841	24/07/2008
<i>Bombus muscorum</i>	1	Tufted vetch <i>Vicia cracca</i>	Rare	Gwithian Towans	SW5841	24/07/2008
<i>Bombus pascorum</i>	3	Black Knapweed <i>Centaurea nigra</i>	Occasional	Gwithian Towans	SW5841	24/07/2008
<i>Bombus pascorum</i>	2	Yellow rattle <i>Rhinanthus minor</i>		Gwithian Towans	SW5841	24/07/2008
<i>Bombus humilis</i>	3w	Bell heather <i>Erica cinerea</i>	Locally Abundant	Godrevy Head	SW5843	24/07/2008
<i>Bombus humilis</i>	1	Betony <i>Stachys officinalis</i>	Locally Abundant	Godrevy Head	SW5843	24/07/2008
<i>Bombus humilis</i>	1	Red clover <i>Trifolium pratense</i>	Locally Abundant	Godrevy Head	SW5843	24/07/2008

voucher

<i>Bombus humilis /muscorum</i>	1m		Godrevy Head	SW5843	24/07/2008
<i>Bombus humilis /muscorum</i>	1	Red clover <i>Trifolium pratense</i>	Godrevy Head	SW5843	24/07/2008
<i>Bombus jonellus</i>	1		Godrevy Head	SW5843	24/07/2008
<i>Bombus pascorum</i>	2	Red clover <i>Trifolium pratense</i>	Godrevy Head	SW5843	24/07/2008
<i>Bombus humilis</i>	1	Grt. Knapweed <i>Centaurea scabiosa</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus humilis</i>	12	Betony <i>Stachys officinalis</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus humilis</i>	4m	Black Knapweed <i>Centaurea nigra</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus humilis</i>	1	Black Knapweed <i>Centaurea nigra</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus humilis</i>	3	Bell heather <i>Erica cinerea</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus humilis</i>	3	Red clover <i>Trifolium pratense</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus humilis /muscorum</i>	2m	Betony <i>Stachys officinalis</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus humilis /muscorum</i>	2	Red clover <i>Trifolium pratense</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus muscorum</i>	1m	Field scabious <i>Knautia arvensis</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus muscorum</i>	3	Bell heather <i>Erica cinerea</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus muscorum</i>	1q	Red clover <i>Trifolium pratense</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus muscorum</i> (prob)	1m	Red clover <i>Trifolium pratense</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus pascorum</i>	3	Black Knapweed <i>Centaurea nigra</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus pascorum</i>	2	Grt. Knapweed <i>Centaurea scabiosa</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus pascorum</i>	5	Betony <i>Stachys officinalis</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus pascorum</i>	2	Red clover <i>Trifolium pratense</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus pascorum</i>	1	Bell heather <i>Erica cinerea</i>	Trevoise Head	SW8575	08/08/2008
<i>Bombus humilis</i>	2	Red clover <i>Trifolium pratense</i>	Trevoise Head (headland)	SW8576	08/08/2008
<i>Bombus humilis</i>	9	Betony <i>Stachys officinalis</i>	Trevoise Head (headland)	SW8576	08/08/2008
<i>Bombus humilis</i>	2q	Betony <i>Stachys officinalis</i>	Trevoise Head (headland)	SW8576	08/08/2008
<i>Bombus humilis</i>	1	Sawort <i>Serratula tinctoria</i>	Trevoise Head (headland)	SW8576	08/08/2008
<i>Bombus muscorum</i>	5	Bell heather <i>Erica cinerea</i>	Trevoise Head (headland)	SW8576	08/08/2008
<i>Bombus muscorum</i>	1m	Bell heather <i>Erica cinerea</i>	Trevoise Head (headland)	SW8576	08/08/2008
<i>Bombus pascorum</i>	1	Sawort <i>Serratula tinctoria</i>	Trevoise Head (headland)	SW8576	08/08/2008
<i>Bombus pascorum</i>	2	Betony <i>Stachys officinalis</i>	Trevoise Head (headland)	SW8576	08/08/2008
<i>Bombus humilis</i>	1	Tufted vetch <i>Vicia cracca</i>	Crugmeer	SW9077	08/08/2008
<i>Bombus humilis</i>	1	Red clover <i>Trifolium pratense</i>	Crugmeer	SW9077	08/08/2008
<i>Bombus humilis</i>	1	Spear Thistle <i>Cirsium vulgare</i>	Crugmeer	SW9077	08/08/2008
<i>Bombus humilis</i>	1	Black Knapweed <i>Centaurea nigra</i>	Crugmeer	SW9077	08/08/2008
<i>Bombus humilis</i>	5m	Black Knapweed <i>Centaurea nigra</i>	Crugmeer	SW9077	08/08/2008
<i>Bombus humilis</i>	1m	Wood sage <i>Teucrium scorodonia</i>	Crugmeer	SW9077	08/08/2008
			Locally Abundant		
					voucher taken thought possible <i>muscorum</i>

<i>Bombus humilis</i>	1m	Red clover <i>Trifolium pratense</i>	Occasional	Crugmeer	SW9077	08/08/2008	voucher taken possible <i>muscorum</i>
<i>Bombus humilis</i>	2	Red clover <i>Trifolium pratense</i>		Crugmeer	SW9077	08/08/2008	
<i>Bombus humilis /muscorum</i>	1m	Black Knapweed <i>Centaurea nigra</i>		Crugmeer	SW9077	08/08/2008	
<i>Bombus humilis /muscorum</i>	1w	Red clover <i>Trifolium pratense</i>		Crugmeer	SW9077	08/08/2008	
<i>Bombus humilis /muscorum</i>	1m	Red clover <i>Trifolium pratense</i>		Crugmeer	SW9077	08/08/2008	
<i>Bombus pascorum</i>	6	Tufted vetch <i>Vicia cracca</i>	Occasional	Crugmeer	SW9077	08/08/2008	
<i>Bombus pascorum</i>	3	Betony <i>Stachys officinalis</i>	Occasional	Crugmeer	SW9077	08/08/2008	
<i>Bombus pascorum</i>	2	Red clover <i>Trifolium pratense</i>		Crugmeer	SW9077	08/08/2008	
<i>Bombus pascorum</i>	2	Wood sage <i>Teucrium scorodonia</i>		Crugmeer	SW9077	08/08/2008	
<i>Bombus pascorum</i>	3	Red clover <i>Trifolium pratense</i>		Crugmeer	SW9077	08/08/2008	
<i>Bombus humilis</i>	5	Grt. Knapweed <i>Centaurea scabiosa</i>		Trevoose Head	SW8576	30/06/2006	
<i>Bombus humilis</i>	10	Kidney vetch <i>Anthyllis vulneraria</i>		Trevoose Head	SW8576	30/06/2006	
<i>Bombus humilis</i>	1	Wild thyme <i>Thymus polytrichus</i>		Trevoose Head	SW8576	30/06/2006	
<i>Bombus humilis</i>	3	Dyers greenweed <i>Genista tinctoria</i>		Trevoose Head	SW8576	30/06/2006	
<i>Bombus muscorum</i>	1	Wild thyme <i>Thymus polytrichus</i>		Trevoose Head	SW8576	30/06/2006	
<i>Bombus muscorum</i> (prob)	1	Kidney vetch <i>Anthyllis vulneraria</i>		Trevoose Head	SW8576	30/06/2006	
<i>Bombus humilis</i>	3	White clover <i>Trifolium repens</i>		Park Head	SW8470	25/07/2006	
<i>Bombus humilis</i>	4	Wood sage <i>Teucrium scorodonia</i>		Park Head	SW8470	25/07/2006	
<i>Bombus humilis</i>	4	Betony <i>Stachys officinalis</i>		Park Head	SW8470	25/07/2006	
<i>Bombus humilis</i>	2	Bramble <i>Rubus fruct.</i>		Park Head	SW8470	25/07/2006	
<i>Bombus humilis</i>	1	Birdsfoot trefoil <i>Lotus corniculatus</i>		Park Head	SW8470	25/07/2006	
<i>Bombus humilis</i>	1	Tufted vetch <i>Vicia cracca</i>		Park Head	SW8470	25/07/2006	
<i>Bombus humilis</i>	1m	Betony <i>Stachys officinalis</i>		Park Head	SW8470	25/07/2006	
<i>Bombus humilis</i>	5w	Black Knapweed <i>Centaurea nigra</i>		Park Head	SW8470	25/07/2006	
<i>Bombus humilis /muscorum</i>	1q			Park Head	SW8470	25/07/2006	
<i>Bombus humilis /muscorum</i>	6m	Black Knapweed <i>Centaurea nigra</i>		Park Head	SW8470	25/07/2006	
<i>Bombus muscorum</i> (prob)	1w	Betony <i>Stachys officinalis</i>		Park Head	SW8470	25/07/2006	
<i>Bombus humilis</i>	1w	Bramble <i>Rubus fruct.</i>		Penhale sands	SW7656	26/07/2006	
<i>Bombus humilis</i>	1w	Black Knapweed <i>Centaurea nigra</i>		Penhale sands	SW7656	26/07/2006	
<i>Bombus muscorum</i>	1w	Bramble <i>Rubus fruct.</i>		Penhale sands	SW7656	26/07/2006	
<i>Bombus humilis</i>	21	Bell heather <i>Erica cinerea</i>		Trevoose Head	SW8576	08/08/2006	
<i>Bombus humilis</i>	1m	Bell heather <i>Erica cinerea</i>		Trevoose Head	SW8576	08/08/2006	
<i>Bombus humilis</i>	3	Black Knapweed <i>Centaurea nigra</i>		Trevoose Head	SW8576	08/08/2006	
<i>Bombus humilis</i>	1	Betony <i>Stachys officinalis</i>		Trevoose Head	SW8576	08/08/2006	
<i>Bombus humilis</i>	1m	Betony <i>Stachys officinalis</i>		Trevoose Head	SW8576	08/08/2006	

<i>Bombus muscorum</i> (prob)	5	Bell heather <i>Erica cinerea</i>	Treose Head	SW8576	08/08/2006
<i>Bombus humilis</i>	1q		Tintagel Head	SX0488	21/08/2006
<i>Bombus humilis</i>	3m	Black Knapweed <i>Centaurea nigra</i>	Tintagel Head	SX0488	21/08/2006
<i>Bombus humilis</i>	3w	Black Knapweed <i>Centaurea nigra</i>	Tintagel Head	SX0488	21/08/2006
<i>Bombus humilis</i>	1w	Ling <i>Caluna vulgaris</i>	Tintagel Head	SX0488	21/08/2006
<i>Bombus humilis</i>	1m	Ling <i>Caluna vulgaris</i>	Tintagel Head	SX0488	21/08/2006
<i>Bombus humilis</i>	2m	Bell heather <i>Erica cinerea</i>	Tintagel Head	SX0488	21/08/2006
<i>Bombus humilis</i>	6w	Bell heather <i>Erica cinerea</i>	Tintagel Head	SX0488	21/08/2006
<i>Bombus humilis</i>	1w	Autumn squill <i>Scilla autumnalis</i>	Tintagel Head	SX0488	21/08/2006
<i>Bombus pascorum</i>	3w		Tintagel Head	SX0488	21/08/2006
<i>Bombus pascorum</i>	5w	Ling <i>Caluna vulgaris</i>	Tintagel Head	SX0488	21/08/2006
<i>Bombus pascorum</i>	2w	Bell heather <i>Erica cinerea</i>	Tintagel Head	SX0488	21/08/2006