

# Hymettus

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*Anthophora retusa*  
**The Potter Flower Bee**



**Mike Edwards and Martin Jenner**

**2008**

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people's trust for  
**endangered  
species**

Cover photograph:  
*Anthophora retusa* male by Mike Edwards

# Investigation of the autecology of the bee *Anthophora retusa* (Hymenoptera: Apidae) in 2008.

M. Edwards and M. Jenner.

## 1. Background.

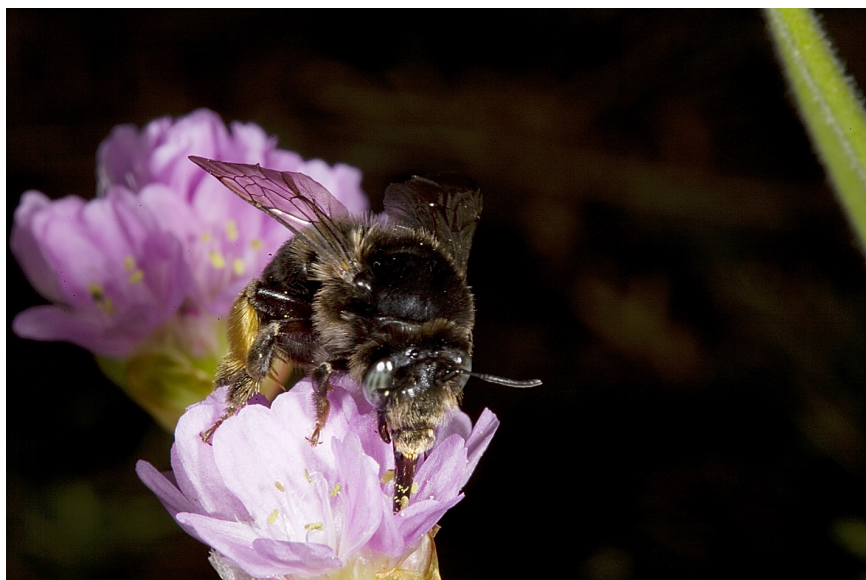
1.1 The anthophorine bee *Anthophora retusa* (photo 1, 2) was widespread in southern England in the period up to the end of the Second World War. However since then it has declined greatly, until today it has been recorded from just four areas since 1990 (Map 1). It is listed as RDB 1 Endangered for the British Isles and is included on the Biodiversity Action Plan Priority Species List.

1.2 At one of these areas it was represented by a single male, found in within the confines of Farnborough Airfield, N. Hants in 1996 (P. Clarkson, det M. Edwards). Despite a lot of survey in the Fleet/Farnborough area, it has not been seen there since.

1.3 Of the other areas, one, on the eastern chalk grassland of the Isle of Wight, has been known at least since the 1980s (G.R. Else). The second, on the military ranges in Purbeck, Dorset, was newly discovered for Dorset by M. Edwards in 1994 and confirmed as being widespread on the ranges during a survey in 2004. The third was discovered by M. Jenner at Seaford Head, Sussex in the early 1990s. Earlier records for East Sussex were from Ditchling, about 30Km to the north-west of this site. All these sites have good populations.

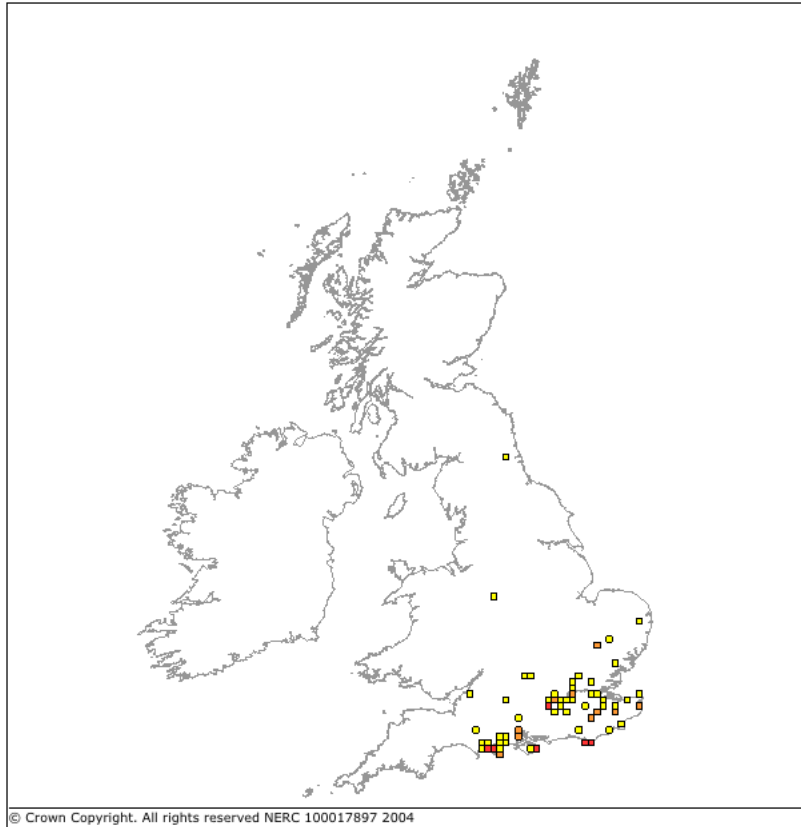


Photos 1,2. Male (above) and female (right) of *Anthophora retusa*.



**10km squares with records for *Anthophora (Pyganthophora) retusa* (Potter Flower Bee) in Great Britain and Ireland**

**Includes the following taxa:** *Anthophora retusa*, Potter Flower Bee, *Anthophora haworthana* [Genus inferred], *Anthophora pennipes* [Genus inferred] & *Anthophora retusa*.



**10km square legend**

- 1990 to 2008 (top)
- 1950 to 1989 (middle)
- 1800 to 1949 (bottom)

**Note:** the most recent (top most) dates will overlay the earlier dates (lower ones) where squares have records in more than one date class.

**Map 1. Distribution of *Anthophora retusa*. Data points from BWARS data held on NBN.**

1.4 The reasons for the decline of this species within its UK range are not clear, but are thought to have some relationship to the intensification of agricultural over the period since the Second World War. Interestingly, this species is thought to be declining over much of its worldwide range. It is red-listed in 7 out of the 20 countries it is known to be found in (N.B. Not all these have red-data lists). The decline appears to mirror those of some of the much more studied Bumblebee species.

1.5 Paul Westrich (Die Wildbienen Baden-Wurttembergs, 1989) records it as a polylectic species, with pollen collected from Brassicaceae and Lamiaceae. Observations in the UK have suggested that Fabaceae are a potentially important pollen source. George Else reports it visiting Kidney Vetch *Anthyllis vulneraria* in the Isle of Wight, Martin Jenner reports it visiting Horseshoe Vetch *Hippocrepis comosa* at Seaford and I have found it visiting Bird's-foot Trefoil *Lotus corniculatus* in Dorset. Both males and females have been extensively reported as visiting Ground Ivy *Glechoma hederacea* (Lamiaceae) in both the Isle of Wight and at Seaford Head.

## 2. The current project.

2.1 During 2008 the current project had 3 main aims:-

a) Establish the extent of the population between Seaford Head and Seaford. Most previous observations had been made within 100m of the Coastguard Cottages, TV 514975.

b) Make field observations of flower visiting by both male and female bees, including, if possible, distinguishing between visits for nectar only and those where pollen and nectar was being gathered by female bees.

c) Seek locations where nesting aggregations could be closely observed, with the intention of removing pollen loads from returning female bees in the second phase of the project (2009). Nesting locations were known from the Coastguard Cottages area, but these were all in the Loess deposits on vertical 50m+ cliffs, not very practical for close observation.

2.2 Visits to the overall area were made by M. Jenner and M. Edwards on:-

9/5/2008, Weather slightly overcast initially, clearing to warm and sunny with slight cool breeze in unsheltered areas. Temperature 18°C plus.

18/05/08, Weather overcast windy with temperature around 12-14 degrees. Did not brighten up all day.

2/6/08 Weather cloudy and overcast which hardly improved throughout the day. Brightened briefly around 1.00pm but still predominately overcast. Temperature under 16°C

4/6/08 Weather much improved and sunny but windy at times especially in exposed areas. Temperature 20°C plus.

2.3 From the above it can be seen that finding good weather conditions was a problem during May and continuity of observation was not very good. This may account for some of the lack of pollen collecting observations, as bees may have been filling up on nectar on visits 2,3 and 4 after spells of poor weather. Observations of nectar-collecting by both sexes were plentiful, however.

2.4 Despite the restrictions of the weather we did establish that the population extended over a much larger distance along the top of the cliff than had been previously known.

2.5 We were also able to identify three potential nest observation sites.

## 3. Extent of the population and observable nest sites.

3.1 The first visit was made in good to excellent conditions. It was clear that the bees were only just emerging, with very fresh males in far greater numbers than females. As has been reported by others, the best way of finding these was examining patches of flowering Ground Ivy.

3.2 Using field glasses it was also possible to see males and females patrolling along the cliff about 2m below the top and visiting abundant patches of flowering Kidney Vetch some 5m down the cliff face (photo 3). Males would fly up and over the edge of the cliff to patrol the Ground Ivy and cliff-top grassland generally. Females were much less so inclined. Great care was needed to be sure that what was being observed was *A. retusa*, as there were always both sexes of the very similar *A. plumipes* present, especially during early May, and specimens were caught for examination at regular intervals, where practical.

**3.3** We decided that the best way of using both the abundance of bees and the good weather on the first visit was to walk slowly along the top of the cliff, generally within a c.75 m strip of unimproved grassland, recording the presence or absence of *A. retusa*, usually through patrolling males, between the Coastguard Cottages and Seaford Town.

**3.4** In this way we were able to show that *A. retusa* extended, in quite reasonable numbers almost all the way along the cliff, with a final observation at TV490982, a distance of about 2.5 Km.. Some males were found several hundred meters inland, but most were in the coastal 75m. strip.

**Photo 3 (right).** Most of the nesting sites were in Loess deposits in situations like this. There were also frequent patches of Kidney Vetch on the near-vertical face.

**Photo 4 (below).** Two small cliff falls, such as this one to the west of Cow Gap, allowed access to small nest sites.



3.5 At the Seaford end we were surprised to find that the small cliffs of sandy material (which was not the same material as the loess deposits) close to the breakwater (TV488982) were only supporting nests of *A. plumipes*. Nests of this species were generally more densely aggregated than the nests of *A. retusa* which we saw; although this apparent difference was rather less obvious later once we were observing a nesting site of *A. retusa* closely. It is probable that the earlier emergence of *A. plumipes* females meant that they had well-established nesting burrows, whilst *A. retusa* females, on this first visit, were only just starting to excavate theirs.

3.6 As we travelled along the cliff we were able to mark three places where *A. retusa* females appeared to be starting digging burrows, two (east of Cow Gap steps, TV 513573; west of Cow Gap steps, TV500976, photo 4) were where local cliff falls allowed, sometimes rather precarious, access to loess deposits, but the best, fortuitously, was at the steps themselves (TV509973).

3.7 On his way home at the end of the day Martin called in on the eastern side of Cuckmere Haven and looked for signs of *A. retusa*, which he found in the shape of two males nectaring on a stand of Ground Ivy. No females were seen on this side of the river and no further visits were made.

3.8 On the second visit we investigated a small cliff face in the middle of the Golf Course (TV975986), of the same sandy material as the cliffs by the breakwater of 3.5, to see if this was being used by *A. retusa*. Poor weather conditions made this a slow job and eventual sun produced only *A. plumipes*, which had been noted here by Martin some ten years earlier.

3.9 No further checks on the extent of the population were made during 2008.

#### 4. Foraging and nesting behaviour.

4.1 On all subsequent visits we split our time between searching for bees at flowers and observing the bees on the identified nest sites. Weather conditions were not good for the middle two visits, in fact on 2/6/2008 we spent four hours looking at the Steps nest site to see one bee fly out for 20 minutes. During this time searches of the flowers revealed no bees either.

4.2 On the first visit bees were seen visiting Ground Ivy, Houndstongue *Cynoglossum officinale* and Kidney Vetch flowers, but, apart from one female observed through binoculars, which appeared to be transferring pollen to its legs, this was entirely for nectar. Most visits were to Ground Ivy. The ratio of males to females on the cliff-top was of the order 50-1, but on the cliff face 3-1.

4.3 On the second visit I spent the first part of the visit observing the westernmost nesting site where we had seen several females apparently digging burrows on the first visit, but, although the holes were present, there was no sign of bees. This could have been because the weather was too dull to tempt them out.

4.4 Meanwhile Martin searched for foraging bees. Both sexes were visiting Houndstongue, Ground Ivy and Thrift *Armeria maritima* on the cliff top and Kidney Vetch on the cliff face. No pollen foraging was observed.

4.5 The weather improved at lunch time, although it was still cool and only intermittently sunny. For the rest of the visit we spent most of the time observing female bees at the Cow Gap nest site, although Martin made occasional sorties to check for flower visiting behaviour, which was as in the morning, but no sign of pollen gathering.

4.6 Despite a lot of activity, with female bees flying in and out for periods of between 10 and 60 + minutes no females were returning with pollen on their legs. The golden hairs on the back legs made them look as if they had pollen, but netting and having a closer look showed this to be not true. Individual bees generally stayed underground for about 20 to 30 minutes before flying off purposefully.

4.7 Some female bees spent a lot of time flying over the nesting site, landing occasionally and doing a short test dig in the soil. Sometimes one would settle down in a particular spot and excavate a burrow. A process which appeared to take about an hour before she would fly off.

4.8 I suspect that there was quite a bit of opportunist burrow take-over attempts, as two bees would apparently enter the same burrow, both to emerge in a bit of a tussle. One of the bees would then fly off. As the bees were not marked it was not possible to identify which bee was which, nor were we present long enough to establish whether usurpation really took place, or whether some bees were just rather bad at finding their nest.

4.9 It was while watching this site that I realised that our earlier observation that *A. retusa* nested in less dense aggregations than *A. plumipes* was probably an artefact of the time of year, with established burrows of *A. plumipes* being easy to see on the first visit, whilst those of *A. retusa* were not dug. At any rate it was quite clear that a lot of bees were nesting in this area (40+ over 20m), mostly in the upper 1m of loess, although a few were in the more rapidly eroding material lower down the cliff, which had a total height of about 10m here.

4.10 The poor conditions of the visit of 2/6/2008 have already been noted, but the 4th was much better, with plentiful observations of female bees at the Cow Gap nesting site and one visit, not for pollen, recorded to Bird's-foot Trefoil.

4.11 However, despite continuing to fly in and out of their nests, the females still were not carrying pollen loads, until one female with unusually dull legs was noted about to enter a burrow. Netting her proved that she did indeed have pollen and she was transferred to a tube in a cool dark place to see if she would comb the pollen off so that we could take it for analysis.

4.12 After about half an hour she was released, having apparently deposited her pollen load on the sides of the tube. Later investigation of the pollen showed it to be a thin film, not the complete load. However, enough has been obtained (just) to ask for a pollen sample identification to be made.

4.13 The remaining activity of the females was either clear nest-searching / digging behaviour, or, on the last two visits repeated attendances at the nest, carrying no pollen, but staying in the nest hole for about half an hour before flying off for periods between 20 minutes and two hours and then repeating the process. It is not clear what this activity represents.

4.14 One nest, which was known to have been entered by a pollen-less female, was carefully excavated in the hope of exposing stored pollen in the cell(s). This nest proved to be empty, with just the characteristic fine mud concretion around the cell. Unfortunately, in the light of later conjectures (see below), this concretion was discarded immediately.

4.15 This fine mud concretion has two possible sources:

- i) It is brought in from an outside source, as is well-known in *Osmia rufa*
- ii) It is manufactured from the surrounding soil of the cell.

4.16 No mud was seen to be carried in on any of the observed visits to nests by females. This leaves option ii) as the most likely one.

4.17 If the fine mud concretion is manufactured within the confines of the cell, it will be necessary for the female to have a source of water or liquid to mix with the soil. No obvious sources of water, and consequently observations of females visiting these to gather water, are present in the area, it being a dry chalk grassland. There is a possibility that the edge of the sea at the bottom of the cliff is providing this.



**4.18** Enquiries of Paul Westrich, who has studied the life-history of a wide range of bee species, elicited the response that he knew of confirmed water-collection in only one species of *Anthophora*, yet all make this fine mud concretion as a cell-lining.

**4.19** This leads us to hypothesise that the females are visiting nectar-rich flowers for a source of liquid to mix with the soil in order to make the fine mud lining of the cell. This would explain the regular visits to the nest, apparently carrying nothing and the time spent below the soil surface. It may suggest why the females spend time visiting nectar-rich flowers from which they do not gather pollen.

**4.20** This utilisation of nectar may be direct, or it may be used to fuel the secretion of a solution from the Dufours Gland.

## **5. Programme for 2009**

**5.1** Continue nest-based observations of female-behaviour, including time spent in nest and away from nests.

**5.2** Gather further information about pollen-foraging, including a more pollen samples recovered from females and observation of bees at flowers.

**5.3** Search for evidence of water-gathering by females at the foot of the cliffs.

**5.4** Excavate a limited number of nests

i) to recover any stored pollen

ii) To provide samples of fine-mud cell lining before any pollen is stored. These samples to be tested for the presence of sugars typical of nectar.

**5.5** If time and weather conditions allow, to investigate any occurrence of *A. retusa* to the east of Cuckmere Haven.

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