# CONTENTS

# 1 SUMMARY


- A survey of four ant species (the BAP species *Anergates atratulus*, its host species *Tetramorium caespitum*, the BAP species *Temnothorax interruptus* and the nationally scarce *T. albipennis*) was undertaken, mostly at Dungeness, with limited survey at Rye Harbour.
- At Dungeness the survey involved the use of 0.25cm² quadrats laid along a 5m long transect on areas of dry shingle vegetation, and the distribution of hanging tiles in groups of 20 among patches of relatively homogenous vegetation. Nests were also searched for in dead herbaceous vegetation at Dungeness and Rye Harbour.
- *Anergates atratulus* was not found, a result that was anticipated as this species is a nest parasite occurring at very low densities in the wild.
- *Tetramorium caespitum* was found across all of the open habitats that were surveyed by excavating transects to look for nests, and by the use of tiles placed on the surface of the shingle.
- The highest densities of *T. caespitum* were found on long-term ungrazed *Cladonia* and *Teucrium scorodonia*-rich vegetation. Marginally fewer nests of this species were found on lightly grazed shingle. Very few nests were found on areas that had been heavily grazed in the past, despite the fact that grazing ceased five years ago. The vegetation in the heavily grazed areas was distinct, with low cover of vascular plants and little *Teucrium*.
- *Temnothorax interruptus* was found in areas of coastal *Arrhenatherum* grassland, and lightly grazed lichen dominated grassland with scattered flints on the surface of the vegetation, exposed to sunlight.
- Thirty-five *Temnothorax* nests were found within dead herbaceous plant stems of *Echium vulgare, Digitalis purpurea* and *Crambe maritima at* Dungeness and Rye Harbour. All of these colonies consisted of the species *Temnothorax albipennis*. *T. interruptus* was only found underground. The last two nests were found on 7 November, with both containing larvae.

# 2 INTRODUCTION

A survey for several ant species occurring on the Dungeness and Rye shingle beaches was undertaken during the summer of 2007. The target species were:

- *Anergates atratulus*
- *Tetramorium caespitum*
- *Temnothorax interruptus* and *T. albipennis*

*A. atratulus* and *T. interruptus* are both listed on the UK Government's Biodiversity Action Plan (BAP). The other two species were included in the survey because *A. atratulus* lives inside the nests of *Tetramorium caespitum*, whilst the two *Temnothorax* species look sufficiently similar in the field to require separation under the microscope. Although not listed on the BAP, *T. albipennis* is a Nationally Scarce species.

The object of the survey was to locate nests of these ant species on which further studies might be undertaken in the future, and to suggest relationships between the various stages of vegetation succession on the shingle and ant nesting patterns. *A. atratulus* is a particularly difficult species to locate and therefore the object for this species was to identify areas that supported high densities of its host species.

# 3 METHODS

## *3.1 Survey methodology*

Training on the identification of these ant species was provided by John Pontin and Mike Edwards on 11 July 2007. On completion of the field work, ant specimens were examined and identifications confirmed by Mike Edwards.

Sampling of ants was undertaken in mid-July using 0.25m² quadrats laid in a transect 5m long on a variety of dry shingle vegetation communities, with different grazing histories. Relatively homogenous vegetation was chosen although some variation in vegetation and bare ground was impossible to avoid. The Dungeness vegetation classification of Ferry, Lodge and Waters (1990) was used to identify plant communities.

The vegetation at Dungeness is naturally patchy, a result of the presence of alternating bands of coarse and fine flint shingle. Furthermore the vegetation communities change as you travel inland. The natural succession of vegetation communities across Dungeness ranges from strandline communities on the east coast, through zones characterised by abundant *Crambe maritima*, *Arrhenatherum elatius*, *Cytisus scoparius;* lichen-rich calcifuge grasslands (with two variants from the typical community, one on the margin with wetlands, the other on the eroding south coast of the site); and various wetland and scrub communities. The coastal *Arrhenatherum* grassland, the typical calcifuge grassland, and its variant that grades into wetlands were sampled during this survey. There was insufficient time to sample all of the vegetation communities on Dungeness so the ones most likely to be attractive to ants were chosen. The vegetation in the plots was recorded and photographed before the shingle was turned over with a trowel. All occurrences of the target species were recorded, with specimens kept to confirm the identification. Transects were recorded at the following locations:

| | |
|---|---|
| Transect 1 | Dungeness Estate TR 09461725. Ridge on coastal *Arrhenatherum* mesotrophic grassland, 230m from the sea. Ungrazed ridges subject to light public pressure. Sampled on 14 July 2007. |
| Transects 2 & 3 | Dungeness Estate TR09371725. Ridge on coastal *Arrhenatherum* mesotrophic grassland, 310m from the sea. Ungrazed ridge subject to light public pressure. Sampled on 21 July 2007. |
| Transects 4 & 5 | Dungeness RSPB Reserve. TR07271866. Ridge on typical calcifuge grassland, 2000m from the sea. Ungrazed ridge with little public pressure. Sampled on 12 and 13 July 2007. |

| | |
|---|---|
| Transects 6 & 7 | Dungeness RSPB Reserve. TR06641857. Ridge on typical calcifuge grassland, 1870m from the sea. Lightly grazed ridge with no public pressure. Sampled on 13 and 14 July 2007. |
| Transect 8 | Dungeness RSPB Reserve. TR 06221908. Ridge on recovering typical calcifuge grassland, 2340m from the sea. Until 2002 this ridge was heavily grazed, all year round. Ungrazed since then. Sampled on 12 July 2007. |

In order to check that ant nests were not being missed as a result of inexperience, a series of brown hanging tiles was laid down on the shingle for a period of one to three weeks, and these were turned over during warm sunny weather to determine if the various ant species occurred at the same frequency. The following locations were checked:

a. Dungeness RSPB Reserve. TR07271866. Same general area as transect 3 above. Tiles were checked on 19 July 2007 and 22 August 2007.
b. Dungeness RSPB Reserve. TR06641857. Same general area as transect 4 above. Tiles were checked on 19 July 2007 and 22 August 2007.
c. Dungeness RSPB Reserve TR 06221908. Same general area as transect 5 above. Tiles were checked on 28 August 2007.

Tiles were not laid on Dungeness Estate, partly due to the limited number of tiles available (20), and partly due to limited time during warm sunny weather, but also because it was thought that with higher levels of disturbance on this area there was a risk that they would be removed or broken. One tile was removed from the RSPB reserve which has only limited public pressure.

The tiles were also laid on coastal calcifuge grassland vegetation lacking *Teucrium scorodonia* at TR06551698 and TR06621677 on the Dungeness RSPB Reserve. These were checked on the 9 and 16 September 2007. No ants were found under any of them, although several *T. albipennis* nests were found in dead vegetation stems in the close vicinity. It was concluded that the weather was not warm enough to attract ants to the surface (it was cool and overcast on both visits); consequently this data has not been used in the report.

Tiles were left *in situ* for no more than three weeks to avoid influencing the distribution of nesting ants across the shingle, and were spaced at a minimum distance of 5m apart to reduce the risk of several tiles being used by one large nest, particularly by *T. caespitum.* They were removed at the end of the survey.
As alluded to in the preceding paragraph once it was realised that the *Temnothorax* sp. were using dead herbaceous plant stems for nesting, samples were collected

whenever nests were encountered. This produced a total of thirty five nests at Dungeness and Rye Harbour.

## *3.2 Choice of areas with different grazing pressures*

Differences in grazing pressure have had significant impacts on the vegetation in the three study areas. The three different calcifuge grassland zones were chosen to reflect different grazing pressures. The ungrazed areas (transects 4 and 5) have a thick cover of plants, a sward height of 3-7cm and few stones in amongst the continuous blocks of undisturbed vegetation. Lichens such as *Cladonia* are very prominent in this habitat and form "tall" plants.

The areas of lightly grazed calcifuge grassland (transects 6 and 7) have been managed in this way since the winter of 1999/2000 to benefit some of the BAP bumblebee species that use the site. Stocking densities on this 77 ha shingle unit have varied since then as follows:

Winter Sheep grazing (December – March) over Walkers Outland

| **Year** | **No. ewes** | **Stocking density during winter period** |
|---|---|---|
| 1999/2000 | 250 | 3.2 ewes/ha |
| 2000/2001 | 240 | 3.1 ewes/ha |
| 2001/2002 | 150 | 1.9 ewes/ha |
| 2002/2003 to 2005/2006 | 50 | 0.6 ewes/ha |
| 2006/2007 | 0 | 0 ewes/ha |

In addition to this, between 7 and 10 goats have grazed continuously on this area since 2004.

These areas have similar vascular plant composition to the ungrazed areas, but the sward height varied between 1 and 3cm, and a greater number of stones are exposed to sunlight in the vegetation blocks.

The third block of shingle around transect 8 was heavily grazed by sheep all year round in a manner that produced a very short, species-poor sward. Stocking densities are not available for this area. Grazing was permanently removed from this area in 2002. The vegetation has an unusually high cover of *Agrostis canina* and although *Cladonia* species are present they do not form tall bushy plants, with a sward height less than 1cm tall.

# 4 RESULTS

## *4.1 Observations during initial visit, 7th July 2007*

Specimens of both species of *Temnothorax* were found at Christmas Dell on the RSPB Reserve TR 06011871. These species were found along the edge of patches of the variant of calcifuge grassland grading into damper shingle, together with *Tetramorium caespitum*. *Temnothorax albipennis* and *Tetramorium caespitum* were found in a mosaic of typical calcifuge grassland and *Cytisus* scrub within the railway loop at approx. TR 090170.

## *4.2 Transect results*

Quadrat data from each of the transect runs are summarised in Table 1.

No specimens of *Anergates atratulus* were found in any of the transect runs.

The host species of this ant, *Tetramorium caespitum,* was found in each of the transects. This species appears to be widely distributed across Dungeness within the coastal *Arrhenatherum* grassland. Nests were found in pure shingle with little or no humic material, on or close to shingle where there was a dense mat of roots from the vegetation. In transects 2 and 3 they were found in shingle covered by *Festuca rubra*, whilst in transect 1 the most frequently recorded vascular plant in the vicinity of the nests was *Pilosella officinarum. Teucrium scorodonia,* a plant which is visited by this species in search of honeydew (Pontin, pers comm.) was generally rare and localized in these transects, apart from one quadrat which had a nest close by. Areas with extensive cover of loose flints were not used for nesting.

The density of nesting ants was greatest in the un-grazed calcifuge grasslands on the RSPB Reserve (east of the open Pits). In contrast to the coastal ridges there was a deep bed of humus and *Teucrium* was frequent and relatively abundant. The other obvious components of the vegetation included a range of lichens, particularly *Cladonia* sp, which was the dominant element of the vegetation, and *Rumex acetosa.* Rumex seeds were regularly found a few centimetres underground and were presumably being used as food by this species. This was also observed in lightly-grazed examples of the same habitat (transects 6 and 7), where again the ants were found in shingle with a deep bed of humus, frequent *Teucrium*, and lichens dominating the vegetation.

***Table 1 Summary results of the 5 transect runs***

| Location | Numbers of quadrats containing | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *Tetramorium caespitum* | | *Temnothorax* sp. | | *T. interruptus* | | *T. albipennis* | |
| | Nests | Foraging workers | Nests | Foraging workers | Nests | Foraging workers | Nests | Foraging workers |
| Transect 1. Coastal *Arrhenatherum* grassland. 10 quadrats. TR 09461725 | 4 | - | - | 1 | - | - | - | - |
| Transects 2-3. Coastal *Arrhenatherum* grassland. 20 quadrats. TR 09371725 | 4 | 4 | - | 2 | 1 | 4 | 1 | - |
| Transects 4-5. Ungrazed typical calcifuge grassland. 20 quadrats. TR 07271866 | 9 | 2 | - | 1 | - | - | - | - |
| Transects 6-7. Lightly grazed typical calcifuge grassland. 20 quadrats. TR 06641857 | 5 | 1 | - | 2 | 1 | - | - | - |
| Transect 8. Recovering calcifuge grassland. 20 quadrats. TR 06221908 | 1 | - | - | - | - | - | - | - |

Where nesting ants were found in several adjacent quadrats it is likely that there was a small number of large nests extending over several metres. Nests were found in up to four adjacent quadrats (covering a distance of 2m). Most of the nests were found underground, with ants active underneath larger pieces of exposed flint. One nest was found within a dead *Cytisus scoparius* stem.

Only one nest was found in transect 8 (the calcifuge grassland left ungrazed for five years following decades of heavy sheep grazing). These quadrats were dominated by lichens and bryophytes (species not identified) and had a low diversity of vascular plant species. *Teucrium* was very rare in this area.

Whereas *Tetramorium* was most abundant in the ungrazed calcifuge grasslands the *Temnothorax* species were noticeably less frequent in the ungrazed calcifuge grassland. One *Temnothorax interruptus* nest was found in the lightly grazed calcifuge grassland, with another just outside of the transect. These were underground and

located beneath flints of at least 8cm diameter on the calcifuge grassland. Another nest was found in one of the coastal *Arrhenatherum* grassland transects close to a tussock of *Festuca rubra* and a *Tetramorium* nest. A further four quadrats in the second *Arrhenatherum* grassland transect contained foraging workers of this species.

One nest of *T. albipennis* was found in a dead plant stem (*Echium vulgare*) in transect 2, and three nests were found under flints just outside of the transects through the lightly grazed calcifuge grassland

On several occasions individual *Temnothorax* specimens were observed but disappeared before they could be captured. Consequently they could not be identified. These were found in all the transects except transect 5, and were most numerous in transects 2 and 4 – the two transects that contained the *T. interruptus* nests.

## *4.3 Use of tiles*

The results of the sampling using tiles is summarised in Table 2. These data show a similar trend to that observed in the transects. No *Anergates* were found. No ant species were found in the calcifuge grassland recovering from heavy grazing. Slightly more nesting *T. caespitum* and foraging workers of the same species were found in the ungrazed calcifuge grassland than in the lightly grazed calcifuge grassland. *T. interruptus* was not found in the ungrazed calcifuge grassland but two tiles revealed one nest and a foraging worker in the lightly grazed calcifuge grassland. One nest of *T. albipennis* was found in the ungrazed and lightly grazed calcifuge grassland.

***Table 2 Summary results of ants found under tiles in the RSPB reserve***

| Location | Numbers of quadrats containing | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *Tetramorium caespitum* | | *Temnothorax* sp | | *T. interruptus* | | *T. albipennis* | |
| | Nests | Foraging workers | Nests | Foraging workers | Nests | Foraging workers | Nests | Foraging workers |
| Ungrazed typical calcifuge grassland. 20 quadrats. Near TR 07271866 | 6 | 2 | - | - | - | - | - | 1 |
| Lightly grazed typical calcifuge grassland. 20 quadrats. Near TR 06641857 | 5 | 1 | - | - | 1 | - | 1 | 1 |
| Recovering calcifuge grassland. 20 quadrats. Near TR 06221908 | - | - | - | - | - | - | - | - |

## 4.4 *Sampling of Temnothorax nests in dead herbaceous plant stems*

Thirty-five nests containing *Temnothorax* species were found in dead plant stems in a variety of locations on Dungeness and Rye Harbour. Although a small number were upright in growth position the majority were detached stems lying on the shingle. In some of the snapped plants access was obtained from the hollow cavities at either end of the stem, but in the upright stems and some of the snapped stems small entrance holes had been nibbled into the stem to access a hollow cavity on the interior. Plant species that could be positively identified were *Echium vulgare*, *Crambe maritima* and *Digitalis purpurea*. A fourth species *Senecio jacobaea* may also have been involved. All of these nests were found to be *T. albipennis* (see Table 3).

In the vicinity of transect 2, two 5x5m quadrats produced 1 and 3 nests respectively. On Lydd ranges 6 nests were found in a similar sized quadrat.

***Table 3 Comparison of numbers of nests of Temnothorax species found in dead herbaceous plant stems***

| Location | Vegetation community | No stems examined | *T. albipennis* nests | *T. interruptus* nests |
|---|---|---|---|---|
| Dungeness Estate TR093172 | Coastal *Arrhenatherum* grassland | 5 | 5 | 0 |
| Rye Harbour TQ942178 | Coastal *Arrhenatherum* grassland | 5 | 5 | 0 |
| Lydd Ranges TR063 and TR060174 | Typical calcifuge grassland & the variant associated with damper shingle | 7 | 7 | 0 |
| Dungeness RSPB Reserve TR065169 and TR066167 | Typical calcifuge grassland & the variant associated with damper shingle | 14 | 14 | 0 |
| Dungeness RSPB Reserve TR071185 and TR075183 | Mosaic of *Cytisus* scrub, typical calcifuge grassland & the variant associated with damper shingle | 4 | 4 | 0 |
| Total nests | | 35 | 35 | 0 |

# 5 DISCUSSION

## 5.1 *Anergates atratulus and Tetramorium caespitum*

As was expected before the project commenced no specimens of the parasitic *Anergates atratulus* were found. It is rare, occurs at low densities and was not found during the previous survey by Hoy (2001). Excavating transects is not an efficient way of surveying for this species because it takes prohibitively long time to find a large sample of nests. Morris and Parsons (1992) found small numbers of this species using water traps but this does not enable information to be gathered on the nesting sites. A more efficient way of surveying for this species would be to place a large number of tiles, or small pieces of tin, for short periods of time across the site to increase the chance of finding this species.

The host species *T. caespitum* appeared to be widely distributed across Dungeness in open unshaded grasslands, as was the case during Hoy's study of 2001. The highest densities of this ant were in ungrazed lichen-dominated calcifuge grassland with frequent *Teucrium* and a good depth of humus. Light grazing by goats and sheep appeared to marginally reduce the density of this species whilst heavy grazing pressure appears to have resulted in a significant reduction in the density of the ant, persisting 5 years after grazing was removed. This may reflect the length of time taken for the slow-growing vegetation communities to recover. The species also is locally common in coastal *Arrhenatherum* grassland with a good cover of vegetation where the stones are stabilised by the presence of abundant plant roots.

## 5.2 *Temnothorax interruptus and T. albipennis*

These species showed a slightly different response to grazing to that observed in *Tetramorium caespitum*. They were almost completely absent in the ungrazed transects of the typical calcifuge vegetation and less frequently found under tiles in the ungrazed vegetation compared to the lightly grazed vegetation. This contrasts with the findings of Morris and Parsons who recorded these insects in ungrazed areas of lichen heath in the late 1980s. This may be because the transects were recorded along strips of homogenous vegetation, largely avoiding the vegetation-gravel edge along the strips of vegetation, with the exception of one quadrat.

Both *Temnothorax* species were found along the vegetation margin at Christmas Dell. *T. albipennis* was also found in dead vegetation stems, particularly *Echium vulgare, Crambe maritima* and *Digitalis purpurea*, in areas of disturbed shingle vegetation. These species are known to be thermophilous nesting under stones exposed to sunlight (Hoy 2001). The data suggest that the density of ground nesting *Temnothorax*

*interruptus* may be increased by light grazing. In the grazed areas there was a greater cover of medium sized stones within the blocks of vegetation which would benefit these thermophilous species during sunny weather. (5.8% cover in lightly grazed areas compared to 1.1% cover in ungrazed areas - if one quadrat on the shingle/vegetation margin in one of the ungrazed transects is excluded).

Conversely there is also a clear indication that long-term heavy grazing pressure will eliminate these insects, probably through eliminating the plant species that provide their invertebrate prey.

It was notable that whilst roughly equal numbers of nests of the two *Temnothorax* species were found underground (three *T. interruptus* and four *T. albipennis*) all thirty five of the nests found above ground in dead herbaceous vegetation belonged to *T. albipennis*. Hoy also found *T. albipennis* nesting in sticks, although only one nest was reported. This might represent a difference between the two species, or it may have been influenced by the cool summer weather in 2007 with *T. interruptus* remaining underground. The last two nests were found on 7 November at Rye, both containing larvae.

Parsons and Morris demonstrated that the occurrence of *T. interruptus* was skewed towards the coastal *Arrhenatherum* vegetation, whilst Hoy found particularly large numbers of this species in an area of young calcifuge grassland further to the east of the areas sampled near Kerton Road. In this study this species was found in low numbers in both the coastal area and the lightly grazed calcifuge grasslands.

# 6 RECOMMENDATIONS FOR FUTURE WORK

1 The use of large numbers of tiles/small tins spread extensively across the Dungeness for short periods of time during the summer to increase the chances of identifying areas of significance for *Anergates atratulus* and confirming the areas used by significant numbers of *Temnothorax interruptus* in a wider range of shingle communities.

2 Recording of vegetation communities in the vicinity of nests to identify important plant species.

3 Further sampling of dead vegetation to test whether or not *T. interruptus* nests are entirely subterranean. This year's data may have been influenced by the low temperatures this summer.

# 7 RELEVANT PUBLICATIONS

Ferry, B., Lodge, N., and Waters, S. (1990). Dungeness: a vegetation survey of a shingle beach. *Research and survey in nature conservation* **26.** Nature Conservancy Council

Hoy, S. (2001). *Species Recovery Program Survey for the Ant Anergates atratulus (Schenk, 1852) (Hymenoptera: Formicidae) – with reference to other heathland (and coastal) ants of conservation interest Part II (Dungeness Survey report – 2001)* Unpublished English Nature Report

Morris, R.K.A. & Parsons, M.S. (1992). *A Survey of the Invertebrates on the Shingle of Dungeness, Rye Harbour and Orfordness.* NCC Report, **77.** Joint Nature Conservation Committee, Peterborough.

Pontin, J. (2005). *Ants of Surrey*. Surrey Wildlife Trust

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