

Cryptocephalus decemmaculatus:

Wybunbury Moss 2014 adult population, ecology of larvae
and suitability of Chartley Moss for reintroductions

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Summary

The leaf-beetle, *Cryptocephalus decemmaculatus* is restricted to one known site in England – Wybunbury Moss. Surveys were conducted at the site in the summer of 2014 to build on the population data that was collected in 2013 (see previous report). Chartley Moss was also visited to assess the suitability of this site for potential reintroductions of this beetle.

Wybunbury was visited four times between the 30th of May and the 8th of July 2014. All of the potentially suitable areas were intensively searched for adults, but numbers were very low. The maximum number of adult beetles recorded was 16 on June the 20th. The very small numbers recorded this year precluded the use of any mark-release-recapture techniques to estimate the 2014 population size. The small numbers of adults this year are very likely a consequence of a two-year life cycle and a very poor breeding season in 2012. Other observations of wild adults and captive larvae have suggested that many of the offspring from a given year require two years to complete their development.

An interesting insight was also gained into *Cryptocephalus* larval ecology. Many larvae, very likely *C. decemmaculatus*, were observed among the branches and leaves of their host plants and not in the leaf litter and moss as has always been assumed. Further work is recommended to learn more about this aspect of larval life history.

Chartley Moss once supported *C. decemmaculatus* and one relatively small part of this site offers host plants that are in similar conditions to those preferred by this beetle at Wybunbury Moss and which could potentially be used for a reintroduction.

In terms of further work, the following is recommended:

- Continue monitoring the population size of *C. decemmaculatus* at Wybunbury Moss.
- Understand the ecology of larvae, specifically the time they spend among the aerial parts of their host plants.
- Survey Chartley Moss to ensure this species no longer occurs at the site. 'Lure' females from Wybunbury Moss could be used to do this.
- Longer-duration studies to further assess if there is any movement of Wybunbury Moss adults between the sub-populations and if habitat management improves this.
- Continued monitoring to gauge how this beetle reacts to further habitat management.
- Surveys of surrounding and/or historical sites in the vicinity to determine if the species is present. 'Lure' females from Wybunbury Moss could be used to do this.

Background

Nineteen *Cryptocephalus* species are found in Britain, many of which are of conservation concern (Hyman and Parsons, 1992). Adults of the genus are fully winged, thermophilic (Erber, 1988) and can be found perching on their respective host plants. The female beetle encases each egg she lays in faeces. The eggs are dropped onto the ground and once hatched the larvae add to their egg case to form a larval case, which they carry around and retreat into at the first sign of danger. It is widely assumed the larvae spend all of their time in the leaf litter, but it seems the larvae of at least some species will ascend vegetation to feed on fresh foliage.

Cryptocephalus decemmaculatus is a particularly enigmatic member of the genus (Figure 1). Adults are found primarily on small *Salix* species, especially willows, although specimens are also found on small *Betula pubescens* trees.



Figure 1. Mating pair of *C. decemmaculatus* and a waiting male on a *Betula pubescens* leaf (Wybunbury Moss, May 20th 2011)

The distribution of the species is unusual (Figure 2) with a small number of disjunct locations. The species is generally found in wet areas. Adults in the one remaining English population (Wybunbury Moss) are found most frequently on willows growing around the edge of the main sphagnum lawn. Only eight confirmed sites and one unconfirmed site (Fenns and Whixhall Moss) are known, with a small cluster in the northwest of England (Stott 1929; Allen, 1960; Allen, 1970; Shirt, 1987; Hyman and Parsons, 1992). Three of the

site records are based on single specimens and *C. decemmaculatus* has always been considered to be rare (Stott, 1929; Allen, 1970). Prior to 1981 the only known UK sites for this species were Chartley Moss in Staffordshire where it had been known since 1879 (Stott, 1929), Burnt Woods in Staffordshire, a single specimen from Abbots Wood in East Sussex (Allen, 1970), Camghouran in Perthshire (Stott, 1929) and a single specimen from Braemar in Aberdeenshire (Allen, 1960). Records also exist for Chat Moss in Lancashire (1983?) and the Muir of Dinnet (Aberdeenshire, 1986 Shell Survey). In 1981 a large population of this species was found at Wybunbury Moss and this colony was the subject of intensive field and laboratory based studies between 1999 and 2002. The author has also returned to the site frequently between 2002 and this present study.



Figure 2. Past and present distribution of *Cryptocephalus decemmaculatus*. [Black symbols = extant populations (positive surveys within last five years); White symbols = extinct/very likely extinct/survey deficient populations].

Methods

Wybunbury Moss was visited on four occasions in the summer of 2014 (May 30th, June 13th, June 20th and July 8th). On each occasion the site was surveyed for the adults. The most efficient survey technique is simple visual searching as the adults are typically found basking on the leaves and twigs of *Salix cf. cinerea* and *Betula pubescens*. The sex, exact location and any other general information were recorded when a beetle was found.

After a single *Cryptocephalus* larva was observed in the upper part of a dwarf *S. cf. cinerea* bush a concerted effort was made to find more larvae by carefully searching the host plants.

Chartley Moss was visited on the 8th of July to assess its suitability for potential reintroductions of *C. decemmaculatus*. Areas with the right combination of host plants (*Salix* spp.) and micro-habitat (warm and sheltered) were identified.

Results

Adults – Wybunbury Moss

Very few adult beetles were observed during 2014 (Table 1). The numbers of adult beetles were too small to allow the use of any mark-release-recapture techniques.

Table 1. Numbers of adult *Cryptocephalus decemmaculatus* observed during 2014

Date	Adults observed
30th May	0
13th June	5 (3 females; 2 males)
20th June	16 (7 females; 9 males)
8th July	5 (2 females; 3 males)

Larvae – Wybunbury Moss

On the 20th of June a single *Cryptocephalus* larva was observed attached to the leaf of a small *Salix cf. cinerea* bush at a height of around 50 cm (Figure 3). Further searching for two hours yielded 21 more larvae in similar situations. Thirty minutes of searching on the 8th of July yielded three more larvae. All of the observed larvae were clinging to leaves and petioles (Figures 4-6) and anchoring themselves in withered leaves (Figure 7) or the holes they had chewed in leaves (Figure 8). A cluster of three larvae were even found among the outer threads of a *Theridion pictum* (Araneae; Theridiidae) nest (Figure 9).

Twenty five larvae were observed in total and 80% of these were found on small *S. cinerea* bushes (Figure 10). The remainder were found on small *Betula pubescens* bushes. The larvae were all found between a height of around 20 cm and 75 cm.

Chartley Moss

Chartley Moss, although much larger than Wybunbury Moss, has few host plants in conditions that are optimal for *C. decemmaculatus*. One small area in Chartley Moss (Area A - Figure 11) was identified as the most promising location as it had numerous *Salix bushes* surrounded by larger trees providing a warm, sheltered micro-climate.



Figures 3 to 8. *Cryptocephalus* larvae in small *Salix cf. cinerea* and *Betula pubescens* bushes. The larvae were clinging to leaves and petioles, while others were partly concealed in withered leaves.



Figure 4. [See Figure 3].



Figure 5. [See Figure 3].



Figure 6. [See Figure 3].



Figure 7. [See Figure 3].



Figure 8. [See Figure 3].



Figure 9. Three *Cryptocephalus* larvae were found on the outside of a *Theridion pictum* nest in a *Salix cf. cinerea* bush.



Figure 10. A typical *Salix cf. cinerea* bush on which *Cryptocephalus* larvae were found. The insets show a larva in situ on this bush. The tip of a mechanical pencil is shown in the smallest inset for scale.



Figure 11. Aerial view of Chartley Moss. Area 1 is the most suitable area for a potential reintroduction of *Cryptocephalus decemmaculatus*.

Discussion

Adults – Wybunbury Moss

The small number of adult beetles observed this year is likely a consequence of a two-year lifecycle. The very wet summer of 2012 meant that very few adults emerged that year. Indeed, no adults were observed during a single visit to the site in 2012. With few adults and poor conditions for finding mates, few eggs would have been laid in 2012. With at least a proportion of larvae taking two years to complete their development it seems that the small numbers of adults observed this year is a consequence of the very poor summer conditions of 2012. Further monitoring is required to confirm if this is the case.

Although few adults were observed this year, their distribution across the moss seems to be increasing. On the 20th of June several individuals were observed in a more north-easterly part of the Moss (Area 7 – Figure 12). The areas to the north and east of area 7 become increasingly more fen-like, making it unlikely that *C. decemmaculatus* would be able to expand even further.

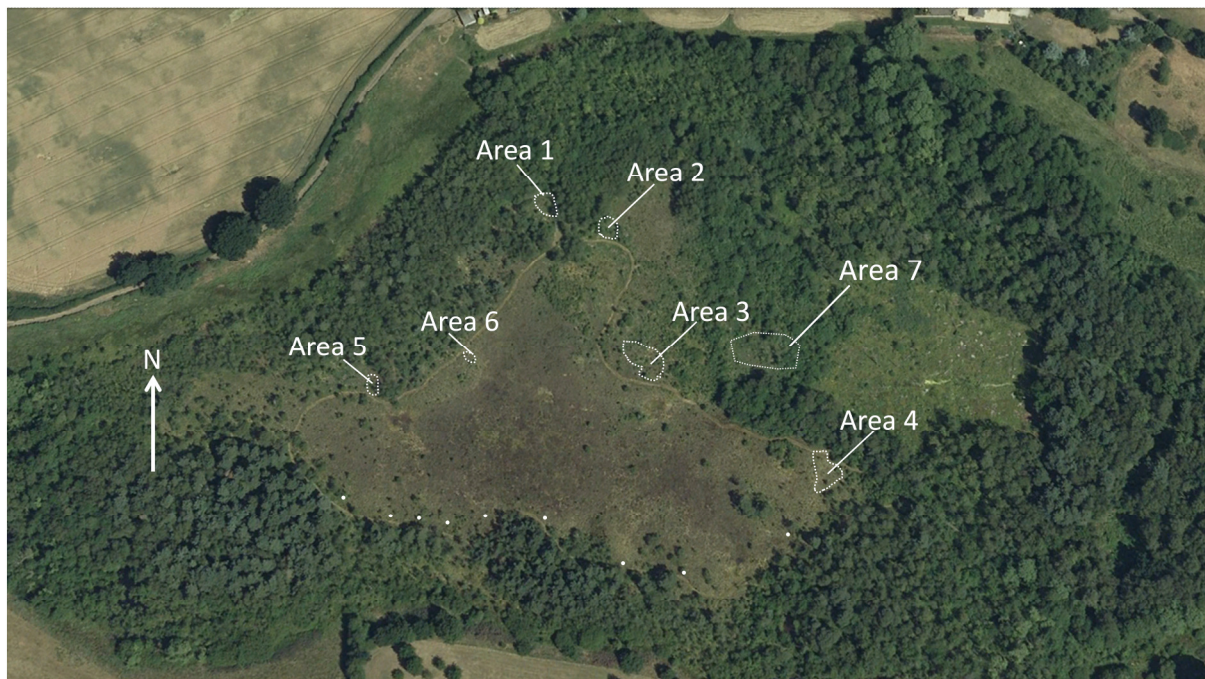


Figure 12. Aerial view of Wybunbury Moss. Adults were observed in more north-easterly areas of the bog (Area 7) in addition to where they are typically observed (Areas 1 to 6).

Larvae – Wybunbury Moss

Wybunbury Moss is home to three *Cryptocephalus* species: *C. decemmaculatus*, *C. labiatus* and *C. parvulus*. In England *C. decemmaculatus* is currently only known from this one quaking bog site, but it is by far the commonest *Cryptocephalus* species at this site (Piper,

2002; Piper and Hodge, 2002; Piper, 2013; Piper and Compton, 2013). It is also the only *Cryptocephalus* species of the three that associates predominantly with *Salix cinerea* (Piper 2002a Piper, 2002b). This suggests the observed larvae were very probably *C. decemmaculatus*, but further work would be needed to confirm this.

In 2014, adult *C. decemmaculatus* emerged at some point between May the 30th and June the 13th, but the larvae observed were all at least in their 2nd instar. The 2014 adults would have only just started laying eggs when the larvae were observed, so these must be the progeny of the previous year's adults. This adds to previous work suggesting the larvae of this species take two years to develop in the wild. Other *Cryptocephalus* species are known to require more than one year to complete their development (Owen 1997; 1999; Pers. Obs.). The egg cases completed by *Cryptocephalus* females typically tumble to the ground; therefore, it is likely the larvae observed here ascended the bushes from the ground to feed on fresh foliage. It remains to be seen if they will return to the ground as winter approaches.

Chartley Moss

Only one relatively small area of Chartley Moss offers a set of conditions that is similar to the micro-habitats preferred by *C. decemmaculatus* at Wybunbury Moss. However, before any reintroductions are considered, the continued survival of this species at Chartley Moss must be ruled-out. *Cryptocephalus* beetles, like many rare insects, are difficult to survey for and small populations can exist unnoticed for long periods of time. The window during which adults can be found is rather small and it changes from year to year, depending on the prevailing conditions and the breeding success of the previous year's adults. Therefore, definitively confirming the absence of this species is difficult.

One way to confirm the presence of this species, beyond simple surveys, would be to use newly emerged females as 'lures' as they often found with several males in close attendance. Males and females alike may even produce aggregation pheromones as it is not uncommon to find many individuals on a suitable host-plant. By placing recently emerged females in gauze enclosures on a suitable host-plant any males in the vicinity would be attracted. If this technique was successful it would be an efficient way of searching for a beetle that is easily overlooked when present at very low population densities.

Recommendations for further work

- Continue monitoring the population size of *C. decemmaculatus* at Wybunbury Moss.
- Understand the ecology of larvae, specifically the time they spend among the aerial parts of their host plants.

- Survey Chartley Moss to ensure this species no longer occurs at the site. 'Lure' females from Wybunbury Moss could be used to do this.
- Longer-duration studies to further assess if there is any movement of adults between the sub-populations and if habitat management improves this.
- Continued monitoring to gauge how this beetle reacts to further habitat management.
- Surveys of surrounding and/or historical sites in the vicinity to determine if the species is present. 'Lure' females from Wybunbury Moss could be used to do this.

References

1. Allen, AA (1960). A new capture of *Cryptocephalus 10-maculatus* (Col., Chrysomelidae) in Scotland. *Ent Mon Mag*, 96, 271.
2. Allen, AA (1970) An overlooked Sussex record of *Cryptocephalus 10-maculatus* L. (col., Chrysomelidae). *C. biguttatus* Scop. In *Surrey. Ent Mon Mag*, 106, 120.
3. Erber, D (1988) The Camptosomata. In *Biology of the Chrysomelidae*, (Petitepierre, E. P Jolviet and TH Hsiao, eds), Kluwer Academic Publishers. Netherlands.
4. Hyman, PS and Parsons, MS (1992) A review of the scarce and threatened Coleoptera of Great Britain. Joint Nature Conservancy Council, Peterborough, England.
5. Owen JA (1997) Some notes on the life history of *Cryptocephalus sexpunctatus*. *Entomol Rec J Var* 25:43-48.
6. Owen JA (1999) Notes on the biology of *Cryptocephalus coryli* (Linnaeus) (Coleoptera: Chrysomelidae). *Entomol Gaz* 50:199-204
7. Piper RW (2002a) The UK distribution, ecology and captive rearing of *Cryptocephalus decemmaculatus* (Coleoptera: Chrysomelidae). *Entomol Rec J Var*;114:123-127.
8. Piper RW (2002b). Conservation biology of the genus *Cryptocephalus* and other threatened UK beetles. PhD thesis, School of Biology, University of Leeds.
9. Piper RW & Hodge PJ (2002) The rare species of UK *Cryptocephalus*. English Nature research reports, No. 469. English Nature, Peterborough, UK.
10. Piper RW (2013) *Cryptocephalus decemmaculatus* at Wybunbury Moss, Cheshire. Natural England Research reports.
11. Shirt, DB ed. (1987) British Red Data Books: 2. Insects. Nature Conservancy Council, Peterborough, England.
12. Stott, CE (1929) Re-occurrence of *Cryptocephalus decemmaculatus* in Staffordshire. *Ent Mon Mag*, 65, 268-269.