The Rose Chafer *Cetonia aurata* L. (Coleoptera: Scarabaeidae: Cetoniinae) in Essex: distribution and some aspects of its ecology

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Abstract

The Rose Chafer *Cetonia aurata* L. used to be considered scarce in Essex and in order to find out its current distribution, 148 records were collected from 2003 to 2017. Practically all the records were in the Colchester District, concentrated in the southern part of Colchester; a few records came from West Bergholt and Great Horkesley. An isolated population was discovered in Witham. Except for a few records in south-west Essex, there were no records for the rest of Essex. Their range in north-east Essex is possibly expanding; however, at the moment, it is much smaller than the Stag Beetle *Lucanus cervus* range. Aspects of their ecology revealed that their larvae develop mostly in urban gardens and allotments in all kind of niches: stumps, logs, wood chips, compost, leaf mould, and cultivated places enriched with compost, including flower pots. They are very good decomposers thus play an important role in the recycling of organic matter. Suggestions for their conservation are given.

Introduction

Rose Chafers *Cetonia aurata* Linnaeus, 1758 (Coleoptera: Scarabaeoidea: Scarabaeidae: Cetoniinae) are beautiful iridescent green beetles of a medium size: 12-19 mm (pers. observ.). The adults feed on pollen and nectar for which they have adapted mouthparts (Karolyi *et al.* 2010); they fly very fast with their wing cases down, which have a curvature adapted for that. Their larvae develop in rotting wood and decomposing vegetable matter (Jessop 1986). Their life cycle lasts 2 years, regularly (Fremlin 2008). They mate in late spring to early summer; the larvae develop relatively fast, but from early autumn they become quiescent (Fremlin, unpublished). In the spring the larvae resume feeding and, in early summer, make a hard-shelled cocoon in the place where they have been feeding and undergo metamorphosis inside it. By mid-summer the adults are fully formed; most of the adults will overwinter inside their cocoons; but sometimes in warm autumn days some may venture out (Jessop 1986; pers. observ.). They will only reproduce after overwintering and will die that season.

Rose Chafers breed locally in southern England and Wales, especially in the coastal zone where they may be locally abundant (Whitehead 2004, 2017), but are considered rare in Essex.

Data in the Essex Field Club database has Essex records for the last century only until the 1960s; they were centred around the Epping Forest area, Chelmsford and Colchester, see <u>http://www.essexfieldclub.org.uk/portal/p/Species+account/s/Cetonia+aurata</u>. Jerry Bowdrey considered them scarce in north-east Essex. They are very rare in Suffolk; David Nash found that they were last recorded in that county in 1961 (Nash, 2007), but were re-discovered in 2010 (Nash 2010).

At the same time, in Colchester, from the late 90's, people started noticing this showy beetle and made enquiries at the Natural History Museum; thus suddenly more records were being collected (Jerry Bowdrey, pers. comm.). Meanwhile, I had also become aware of the presence this of species, both when gardening (Fremlin 2008) and when monitoring for Stag Beetles *Lucanus cervus* Linnaeus, 1758 (Coleoptera: Scarabaeoidea: Lucanidae).

This raised several questions. Was their Colchester population unique in Essex? Was it expanding? Also, Colchester being a Stag Beetle hotspot (Clark 1964, 1965; Bowdrey 1997), how did their range and habitat overlap?

The results presented here are an attempt to answer these questions.

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Methods

Records of Rose Chafer adults and larvae were requested in various ways.

First, in 2007 I launched a simple survey in Colchester. I distributed printed forms to members of the Colchester Natural History Society and other people. With the support of Jerry Bowdrey, some forms were displayed in the Colchester Natural History Museum for a short period. Second, via direct canvasing with allotment holders, etc. Third, via the Internet in a couple of websites: in a site dedicated to this species in my homepage, <u>http://maria.fremlin.org/cetonia_aurata/</u> and the Essex Field Club (EFC) website, <u>http://www.essexfieldclub.org.uk/portal/p/Species+account/s/</u> <u>Cetonia+aurata</u>. Recently, the Colchester Natural History Society and the EFC Facebook Groups became a good source of records.

At the same time, while doing research for Stag Beetles, I collected serendipitous Rose Chafer records in various ways: via the Internet about larval enquires (Fremlin 2013) and monitoring gardens. For example, in the Colchester area I monitored one garden in Prettygate, with many decorative oak logs dating back from the 1987 storm, yearly from 2006-2012.

Inspired by the finds of larvae in public paths mulched with wood chips in London: Stag Beetle larvae in a park (Fremlin 2005) and Rose Chafer larvae in an allotment (Chris Hardy, pers. comm.), I monitored regularly wood chip piles in my neighbourhood and in High Woods Country Park, a total of seven. These piles all consisted of 'green' hardwood chips, locally sourced; the pile in High Woods CP was set up in 2012 by the park ranger, George Davidson.

I participated in the Bury Buckets for Beetles (BB4B), a project developed by the Royal Holloway University in conjunction with the People's Trust for Endangered Species aimed at Stag Beetle conservation (Al-Fulaij 2007); I monitored six buckets filled with a mixture of small logs, wood chips and soil, from 2006-2011, yearly.

Results

A total of 148 Rose Chafer records were collected for Essex, from 2003 until 2017. There were 139 records mostly determined from photos; the adults are very easy to identify and the larvae are very distinctive with their small head capsule and small legs. There were 21 returned survey forms without a voucher, all from trusted recorders; these included 9 without a date.

Several records from other counties and from abroad were discarded, except one from Polstead, Suffolk. The former included four records of larvae in plant pots: one from Southampton, Hampshire; one from Letchworth Garden City, Hertfordshire; and two from Switzerland: Basel and near Geneva.

Geographical distribution

Practically all the Essex records were in the Colchester District (139), Fig. 1; they were concentrated around the Colchester area, all south of the river Colne, covering Maldon and Lexden Road areas, followed by Stanway. They included a substantial contribution from my garden (25) and allotment (15), both in the Maldon Road area. The furthest south records being from Layer-de-la-Haye (1) and Colchester Zoo (1). There were also a good number of records from the eastern side of town (9). Further north, there were records from gardens in West Bergholt (5) and Great Horkesley (1). Not far, just across the Suffolk border, there was one record of larvae in Polstead, from the colony reported by the late David Nash, (Nash 2007, 2010).

There were a few records from Witham, Braintree District, where there is a thriving population in a private garden (6). A few records were from southwest Essex: Roding Valley Meadows, Epping Forest District (1) and Hackney Marshes, Hackney District (2).



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Fig. 1. Distribution of *Cetonia aurata* records in Essex from 2003 to 2017 on a 10 x 10 km grid. Colchester District records are mostly in Colchester. To the west, Braintree District records are in Witham. The south-west records are in Roding Valley and Hackney Marshes. The northernmost record is in Polstead, Suffolk, TL999402. Black dots, records; double red circle, Colchester centre, TL999252; red dot, author's garden, TL986244. The River Colne, and Abberton and Hanningfield reservoirs are indicated in blue.

Habitat location

The majority of the records came from urban gardens (102) and allotments (24). Some beetles were found in the street (4) and even indoors (1). A few were found in country parks (12) and other natural areas (5), Fig. 2.



Fig. 2. Location of Rose Chafer Cetonia aurata records





Fig. 3. Monthly frequency of Rose Chafer Cetonia aurata records, from 2003 to 2017, total 139.



Plate 1. Rose Chafers *Cetonia aurata* found under an oak log: row of cocoons made with their faecal pellets, bottom; one teneral imago recently escaped from a broken cocoon, left; and larvae at various stages of development, top row. Photo taken on 29/viii/2012.



Plate 2. Competitive mating of Rose Chafers *Cetonia aurata* on rhubarb flowers. Photo taken on 11/v/2005.



Plate 3. Rose Chafer *Cetonia aurata* foraging on a cardoon flower. Note the pollen adhering to the bristles and the curvature of the wing case. Photo taken on 06/ix/2007.

The records were roughly divided in equal parts of adults (63) and larvae (70), plus some cases in which larvae were found together with cocoons and/or teneral adults (6), Fig. 3 below, Plate 1. The adults were sighted from March till October, mostly when visiting flowers; there was a sharp rise in activity in May, followed by June and July. Many beetles were often sighted competing



Plate 4. A couple of Rose Chafers *Cetonia aurata* foraging on a rose. Note the gnawed petals. Photo taken on 29/v/2011.

for mates on rhubarb flowers earlier in the season, Plate 2. They could stay a long time foraging on the flowers, particularly on globe artichokes and cardoons, and sometimes got covered with pollen, Plate 3. They did not seem to inflict any damage on the flowers, except for gnawing the petals of their preferred cultivar roses, Plate 4. For a list of the flowers that they visited, see Appendix.

Records of larvae were received throughout the year; they were all in urban gardens (69) and allotments (9), except for one record in Hilly Fields Nature Reserve, Colchester, in Hawthorn wood chips.

Larval habitats

The larvae were found developing in a great variety of substrates, which could be divided in two categories. One, wood-related: under logs, stumps, and inside BB4B buckets; this accounted to 47% of the records, Fig. 4, left dotted area. Two, vegetation-related: compost and leaf mould piles, and places enriched with organic compost: flower pots and others such as: vegetable bed, trench and planter. This category accounted for 53% of the records, Fig. 4, right. For the trees associated with Rose Chafer larvae, see Appendix.

There was a significant number of records of larvae in flower pots, 15, representing 20 %; they included one hanging basket. The pots had mostly been used to grow bedding plants and tomatoes, successfully, in spite of the presence of the larvae. The number of larvae found in those pots ranged from 1 to 11, the latter occurred in two instances. There was only one record of a sickly Japanese Maple, a rather old specimen; about 10 larvae were found in that pot. These were followed by records in compost enriched soil, 8, 10%; a similar kind of habitat.



Fig. 4. Substrates in which the Rose Chafer *Cetonia aurata* larvae were found developing. Left, dotted area: wood-related. Right, plain area: vegetation-related.

The records in wood chips (10) were from six big piles, mostly in composting containers, except for a couple of heaps: one in a garden and another in Hilly Fields NR. The 'green' chips were all colonised promptly, except in High Woods CP: nil results over the next three years. This is perhaps no coincidence because it was the only wood chip pile north of the River Colne. In the colonised piles, sometimes the larvae were found in great numbers; for instance, in an allotment, the following season, over 100 larvae were found in willow chips; the chips were thoroughly decomposed, Plate 5. Stag Beetle larvae were found together with Rose Chafer larvae only in one wood chip pile and this is explained below.

Habitat overlap with Stag Beetle larvae

Of a total of 79 larval records, 21 records also had Stag Beetle larvae (27%). They were all in wood-related substrates, except for two in leaf mould. These records were from only four Colchester gardens: two records in gardens with stumps of *Eucalyptus* and Holly; six records in the Prettygate garden all underneath the same log, which in general had both species for several years; thirteen records in my garden: leaf mould pile (2), a couple of BB4B buckets, during several years (6) and a very large wood chip pile of Norway Maple (5). In the latter the larvae of both species were found in vast numbers for several seasons (Fremlin, unpublished), Plate 6. This was the only wood chip pile that had larvae of both species.

Discussion

The vast number of Rose Chafer records obtained for the Colchester area proved that there is a thriving population in the south of the town, perhaps expanding eastwards; at present, there were no town records north of the River Colne. A new population was discovered in Witham, and a few records were obtained for south-east Essex, close to London, from natural areas. However, there were no records from elsewhere in Essex. I am not sure if this represents the real situation



Plate 5. Some of the Rose Chafer *Cetonia aurata* larvae found in a pile of willow chips. Note the nice brown mould. Photo taken on 19/vi/2008.



Plate 6. A few of the larvae found in a pile of Norway Maple chips cut on 28/06/2010. Note the brown mould and a few non-decomposed chips. Stag Beetle *Lucanus cervus* larvae, top, and Rose Chafer *Cetonia aurata* larvae, left bottom cluster. Photo taken on 28/ii/2012.

or not. Admittedly, this survey started with a strong bias towards Colchester; but it seems to have reached the public from a wide geographical range. For instance, the larval record received from

Suffolk was from the garden reported by the late David Nash (2010). Emails came also from various towns in the south of England; for example, Bristol, were they are rather common, and even from abroad. They were mostly enquiries about the larvae by gardeners inquisitive about their wildlife.

The adults do not raise the same type of concern, except for the fact that they sometimes damage the roses. Some pollinator scarab beetles feed on flower petals because they are nutritious (Gottsberger & Webber 2018). In the continent, Dominik Vondráček has observed them gnawing on petals of *Rosa canina, Rubus, Crataegus, Sorbus* and *Syringa* species (pers. comm.). It would be interesting to look deeper into this.

The apparent lack of records from the south of the county, could be because the adults can easily be overlooked and this is somehow paradoxical because they are really conspicuous once you know what to look for. For instance, in my allotment, were on warm sunny days one can easily spot several foraging adults, there are many allotmenteers who have never seen them. Conversely, in gardens where their larvae can be found in great numbers, the adults are sometimes very seldom sighted because they don't have their favourite flowers, so people have no idea what the larvae are. All this could explain the lack of records in some areas.

Habitat location

The records were overwhelmingly from urban gardens and allotments in the southern side of Colchester. Out of the 14 allotment sites situated south of the river, there were 5 with valid records and 4 with good testimonials. This is very good news for the Rose Chafers; it shows how important allotments are as a wildlife refuge (Bowdrey 2008).

Larval ecology

Rose Chafer larvae occupied many niches. They were found, almost equally, in wood-related or vegetation-related substrates. They took to 'green' wood chips very readily and sometimes in one season they transformed them into a very nice mould; the same with compost and leaf mould piles. Thus they are very good decomposers.

The number of records in flower pots and places with compost enriched soil were surprisingly high, 30% of the total; as far I know this is reported here for the first time. Probably, the larvae ended up in such places because the females were attracted to the compost being used (Landvik *et. al.* 2016). In any case, no damage seems to have been done to the plants probably because there was plenty of room for them to move about and they don't feed on roots. In captivity, flower chafer (Cetoniinae) larvae will starve to death if offered only live plant roots (McMonigle 2008).

However, as far as I know there is just one exception. In the case of wild populations in treeless coastal areas, where the larvae develop on a peat rich soil which has a dense root system, they seem to do some damage to the plants; this is a highly distinctive habitat and these populations are of high conservation status (Whitehead 2017).

The problem is that it is often mentioned that flower chafers (Cetoniinae) are root feeders (*cf.* Nash 2007 and various websites). A correspondent summarized it very well:

"Then looked on the internet to find out what they were I realized they were some kind of chafer from the internet photos but very unfortunately most sites lump all chafers together and advise you to get rid of them."

This misconception has been going on for some time (Fremlin 2008, 2018) and needs to be addressed. After all the Rose Chafer (Cetoniinae) larvae are very different from the root chafer (Melolonthinae) larvae; the former crawl on their backs, really fast, and no other larvae do that (Fremlin 2018).

Overlap with Stag Beetle larvae

Stag Beetles have a thriving population in urban Colchester (Clark 1964, Bowdrey 1997, Fremlin & Fremlin 2010), but only over a quarter of the Rose Chafer records overlapped with their larvae. Perhaps this is no coincidence because the Stag Beetle larvae have other habitat preferences. They develop far more in the soil interface of wood-related substrates (88 %), rather than on vegetation-related substrates (12%) (Fremlin 2013); whereas the Rose Chafers have about equal preferences.

At the moment the north-east Essex Rose Chafer population has a much smaller range than the Stag Beetles' population. The latter is confined to the south of the river Colne, whereas the Stag Beetles have a much wider range in the Colchester District and spill over to Tendring District. The habitat and range of overlap of these interesting urban species deserves to be investigated further.

Conservation

From the way in which the larvae turned up in all kinds of niches in urban gardens, one can see that they respond well to good gardening practices. Therefore conservation advice for this urban population is very simple: people should be encouraged to recycle as much organic matter as possible in their own gardens and allotments. Participating in the borough recycling garden waste programs should be discouraged; these collections have been called "the garden impoverishment program". Also after tree cutting, leaving stumps, logs and in particular wood chips, would benefit them as well as the Stag Beetles.

Conclusion

This study confirmed the existence of an isolated Rose Chafer population in Colchester; it seems to be thriving and perhaps even expanding. Like the Stag Beetle it is a synanthropic species, but at the moment its Colchester range is much smaller. The reasons why both species favour the area are rather mysterious; could it be that there is something especially attractive in the soil? Could it be that the area has a specially enhanced microclimate? Possibly, the scant number of records obtained elsewhere in Essex is not representative of the reality. Thus some questions remain open and others have been raised.

As a bonus, this study brought a deeper understanding of the ecology of this species in urban areas: it is very beneficial. First, the adults are pollinators (Englund 1993). Second, the larvae are very good decomposers. Their habit of turning up in plant pots is perhaps not to their advantage. It is relatively easy to persuade the public that larvae in compost piles are good, but not so easy when they are found in plant pots. This problem needs to be addressed in the future in order to protect a species, which has a key role in urban gardens and allotments - the precious biodiversity oases in a relentlessly growing urban area. Rose Chafers deserve to become a 'flagship species' alongside the Stag Beetles.

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Appendix

Flowers associated with foraging adult Rose Chafers Cetonia aurata

Species	Common name	No. of records
Allium ampeloprasum	Leek	1
Anethum graveolens	Dill	1
Buddleja davidii	Butterfly-bush	2
Circium sp.	Thistle	1
Cosmos sp.	Cosmos	2
Cynara cardunculus	Cardoon	2
Cynara cardunculus var. scolymus	Globe artichoke	1
<i>Echinops</i> sp.	Globe Thistle	1
<i>Eryngium</i> sp.	Eryngium	1
Hebe sp.	Hebe	1
Helianthemum sp.	Cultivar Rock Rose	1
<i>Hydrangea</i> sp.	Hydrangea	1
Paeonia sp.	Peony	1
Pastinaca sativa	Parsnip	1
Photinia	Photinia	1
Pyracantha sp.	Pyracantha	1
Rheum rhabarbarum	Rhubarb	5
Rosa sp.	Rose	2
Rubus fruticosus	Bramble	1
Sambucus nigra	Elder	1
<i>Spiraea</i> sp.	Spiraea	1
Viburnum opulus	Guelder Rose	1

Wood associated with Rose Chafer C. aurata larvae

Species	Common name	No. of records
Conifer sp.	Conifer	1
Crataegus sp.	Hawthorn	1
Eucalyptus sp.	Gum tree	1
Fraxinus sp.	Ash	2
Ilex aquifolium	Holly	1
Quercus robur	Oak	8
Robinia pseudoacacia	Black Locust	1
Salix sp.	Willow	1
<i>Tilia</i> sp.	Lime	2