
A CAPTURE-MARK-RECAPTURE STUDY OF STAG BEETLES IN COLCHESTER

During the period May 15 – August 12 2007, stag beetles were monitored in a suburban area in south-west Colchester, Essex. This area happens to be in one of Clark's kilometre squares, TL9824, or "CRGS", the acronym for Colchester Royal Grammar School, where he was a biology teacher. Clark was the first person to study stag beetles in Colchester (Clark, 1964, 1965). In 1996 there was another survey, with also good records for this area (Bowdrey, 1997).

In the present study stag beetles were monitored most intensively between May 15 and July 6, in the evenings from 21.00 h, as part of a three year phenology study. After July 6 the beetles were recorded on a casual basis until August 12. See Fig.1. Stag beetles found at other times and elsewhere were also recorded.

Each beetle, when first captured, was measured, marked and released promptly; flight was intercepted by hand. Coded marks were punctured on their elytra at the beginning using a battery operated cautery, AMI AM-21 UltraFyn, Aaron; then with a needle on a dowel because it was easier and more reliable to operate. The coding system used was the same as Mendéz (2008).

Total stag beetle sightings 384: 270 males, 98 females and 16 unknown; female-to-male ratio 1 : 2.8.

118 (43%) males and 43 (44%) females were captured marked and released; female-to-male ratio 1 : 2.7.

34 (29%) males and 11 (26%) females were recaptured; female-to-male ratio 1 : 3.1. See Table 1 for details of the recaptures.

The majority of beetles, 204 sightings (53%), were found in Cambridge Walk (CW), an alleyway running between established back gardens, which acts as a natural trap. The first males were sighted there on May 18, and hung around for a few days. Soon after the first female was sighted, May 30, the males became extremely mobile seeking them, particularly in the vicinity of three nests, where many fights and a few matings were observed. All nests are fairly recent: *nest a* is in a front garden in the roots of a holly (*Ilex aquifolium*) tree felled Nov 2005; *nest b* is in the author's back garden against the fence to CW, in two cherry (*Prunus sp.*) tree stumps which were felled in 2002 and 2005; and *nest c* is in the roots of a sycamore (*Acer pseudoplatanus*) tree felled in 2002 which is right by some railings in CW. See in Fig. 1 how close they are.

The maximum distance between recaptures was 80 m for a male recaptured in CW near *nest b*, he had travelled from the southern side of CW in 2 days.

A female from *nest a*, was found 3 days later, in the northern end of CW, 149 m in a straight line, probably it flew there. A couple of males travelled 52 m, from *nest a* to CW to just the other side of the fence from *nest b*. They were found fighting for one female together with 6 other males in a ball, like rugby players.

After June 21, past the peak flying activity, one male stag beetle which got stuck in a crevice near *nest c*, was 'recaptured' eight times, until it finally died.



Fig. 1

Aerial photograph of the monitored area - dimensions 0.5x 0.7km². The path marked as a dotted line was monitored on a bicycle, starting anticlockwise from the author's house, marked **x**. The alleyway Cambridge Walk runs NNE. Known stag beetle nests are marked **a**, **b** & **c**. The playground of the CRGS is partially visible at the top. Photo © getmapping.com.

Table 1

Number of times individually marked beetles were recaptured	Number of recaptured individually marked beetles	Males	Females
1	32	22	10
2	9	9	0
3	1	1	0
4	2	1	1
5	0	0	
8	1	1	
	45	34	11

The longest distance between recaptures was 25m for a male, one of the eight rugby players near *nest b*; he was found dead in the author's garden, possibly killed by a cat. Several females were recaptured in the area near *nest b*, average distance between recaptures for those was 18m.

Discussion

The year 2007 was exceptionally good for stag beetles in the monitored area, the record 384 sightings allowed for interesting analysis of the data, in particular for the females which are always outnumbered by the males (Fremlin, 2008). Despite the fact that the methodology was quite different the present urban study compares remarkably well with the study of a village garden 18 Km northeast of Colchester, in Bentley, Suffolk, with an established nest during the previous year (Hawes, 2006).

Results of both studies are shown on Table 2.

There is great similarity between results on both sites. First, in both studies, as expected, more males than females were marked; note that the female-to-male ratio was the same. The percentage of recaptured beetles in the Bentley garden was higher than in Colchester which was to be expected as there the beetles were much more thoroughly monitored. Unlike in Colchester, there they were trapped and searched for under logs; plus their flight was intercepted with a long net and in Colchester it was only by hand.

Table 2

	Captured males	Captured females	Captured female-male ratio	% Recaptured males	% Recaptured females	% Recaptured female-to- male ratio
Bentley, 2006	100	38	1 : 2.6	36	42	1 : 0.9
Col- chester, 2007	118	43	1 : 2.7	29	26	1 : 1.1

What is interesting though is that in both studies there was no sex bias in the percentages of the recaptured beetles. Indeed this was evident in the Colchester study for the percentage of marked beetles, which was respectively 43% and 44%. This interesting result would deserve further analysis as it raises a few questions. For instance, are there any other capture-mark-release studies of sexually dimorphic species showing the same results?

This unique study shows that forty-four years on from the first survey in the area

(Clark, 1964), stag beetles continue to thrive in south-west Colchester. People are always felling trees in their gardens thus providing *Lucanus cervus* with ideal continuous stepping stones well below the 500 to 1000m distance recommended by Rink (2007).

Moreover it is now known that stag beetles are guided by an acute sense of smell, (Harvey, 2007), which undoubtedly helps the females with their quick colonization of new nesting sites. Ranius (2006) suggest that species in more permanent habitats have relatively limited dispersal; possibly this explains the success of *Lucanus cervus* in favoured urban areas where becoming isolated doesn't seem to be such a threat. However the ever present threat is urban development, unfortunately.

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