

FLUCTUATIONS IN ABUNDANCE OF COCCINELLIDAE

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Even the casual observer cannot fail to notice that the numbers of ladybirds (Coccinellidae) fluctuate markedly in abundance from year to year. Yet despite this there seems hitherto no attempt to assess the magnitude of such fluctuations over a period of years. This paper describes the results of sampling ladybirds in a Malaise trap operated continuously for ten consecutive years (1972-1981) in a garden in the suburbs of Leicester.

The garden is 55 years old and is therefore mature and well-established. It covers an area of 658 m² and is situated at the corner of a busy road 3.8 km from the centre of the City of Leicester. Like all gardens it is a mosaic of open spaces and shade and contains the rich variety of trees and plants so characteristic of older suburban gardens. A fuller description is given in Owen (1981).

A Malaise trap is an open-sided tent-like construction of fine netting with an internal baffle of netting, supported by poles and strings. Flying insects wandering into the trap tend to fly upwards on meeting the central baffle and eventually fall into a pot containing 70% alcohol at the apex. No attractant is used and so the only insects caught are those that enter the trap of their own accord. All insects trapped are of course killed but the effect of the trap on the garden fauna is negligible because it samples an area of only 2.6 m² to a height of 1.1 m. A colour picture of the Malaise trap set in Leicester garden is reproduced in Owen (1978). During the ten-year period, 4260 ladybirds of eight species were trapped.

Table 1. Fluctuations in numbers of Coccinellidae caught in a Malaise trap in a garden during ten consecutive years.

	1972	1973	1974	1975	1976*	1977	1978	1979	1980	1981	Total
<i>A. 2-punctata</i>	168	324	155	424	346	359	239	30	129	53	2227
<i>A. 10-punctata</i>	4	1	4	9	25	20	8	1	9	4	85
<i>C. 7-punctata</i>	4	—	—	121	564	86	33	17	18	2	845
<i>C. 11-punctata</i>	2	—	1	108	98	12	2	—	—	—	223
<i>T. 22-punctata</i>	1	16	—	14	39	3	—	—	—	—	73
<i>P. 14-punctata</i>	15	8	8	38	346	160	38	149	29	14	805
<i>C. 14-guttata</i>	—	—	—	—	1	—	—	—	—	—	1
<i>C. renipustulatus</i>	—	—	—	—	—	—	—	—	1	—	1
Total	194	349	168	714	1419	640	320	197	186	73	4260

* These figures are slightly higher than those given in Owen (1976b), an article published just before the 1976 season was over.

During the first three years (1972-1974) the weather was not unusual, but in the summer of 1975, particularly in the first two weeks of August, it was unusually hot and sunny and rainfall was

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scarce. Then in 1976 there was a severe summer drought, probably the most spectacular for about 250 years. By mid-August the land was parched and brown, the grass had stopped growing, and the patch-work quilt of many coloured fields, so typical of the English countryside, faded to a uniform pale brown. "Plagues" of ladybirds were reported the length and breadth of the country (Owen 1976a). The summers of 1977-1981 saw a return to the kind of weather experienced in 1972-1974, but the effect of the 1975-1976 weather on the insect fauna of the garden did not entirely disappear until 1980.

What happened to ladybirds in each of the ten years is summarized in Table 1. As shown, there were conspicuous year to year fluctuations in abundance of the six common species (two species appeared once only). In the best year (1976) about twenty times as many ladybirds were trapped as in the worst year (1981), but each species fluctuated in abundance in a different way, as detailed below.

Adalia 2-punctata (L.)

This is the common garden ladybird in most places in England. In the Leicester garden larvae and adults feed on aphids associated with woody shrubs and trees. After hibernating the adults appear on the first warm days in March, mate and lay eggs in May and June, and produce a new generation of adults from July onwards. As shown in Table 1, *A. 2-punctata* was the commonest species in each year except 1976 when *C. 7-punctata* and *P. 14-punctata* became particularly abundant, and 1979 when the population collapsed.

Table 2. Monthly occurrence of *Adalia 2-punctata* in the Malaise trap, 1972-1981.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1972	2	28	18	42	69	9	—
1973	19	72	163	58	11	1	—
1974	3	26	45	28	43	9	1
1975	13	22	113	147	82	34	13
1976	5	39	106	162	23	6	5
1977	1	75	39	68	102	66	8
1978	4	113	77	28	6	8	3
1979	—	4	8	4	10	4	—
1980	8	47	49	20	4	1	—
1981	1	11	6	3	21	6	5
Total	56	437	624	560	371	144	35

Table 2 shows the monthly occurrence of *A. 2-punctata* in the Malaise trap. Those taken in April-June were almost all hibernated individuals from the previous year (in some years, notably 1976, a few freshly emerged adults appeared in late June), while those

taken in July-October were mainly the new generation (with a few hibernated individuals lingering on into early July in some years). Overall, hibernated ladybirds were slightly more abundant ($N = 1117$) than the new generation ($N=1110$), but there are striking differences between years. Thus in 1973, 1978 and 1980 the May-June peak in abundance was followed by a decline in numbers in July-October, while in 1972, 1975, 1976, 1977 and (less obviously) in 1974 the May-June peak was followed by an increase in numbers in July-October. In 1979 and 1981 too few were trapped for any trend to be detectable. Evidently, then, in some years breeding in the garden is less successful and relatively fewer of the next generation are produced than in other years. Alternatively, a substantial proportion of those produced move away quickly and are not trapped. It is also possible, particularly in 1975 and 1976, that some *A. 2-punctata* moved into the garden in July and August to swell the resident population.

Adalia 10-punctata (L.)

The ecological requirements of this species appear to be similar to those of *A. 2-punctata*. It is not known to have bred in the garden but probably does so, at least occasionally. The adults were often seen feeding on the same clusters of aphids as the adults of *A. 2-punctata*. A few were recorded hibernating in dense vegetation. *A. 10-punctata* appeared every year in numbers ranging from one to 25 (Table 1). Records were scattered throughout each summer and even in 1976, the best year, there was no obvious evidence of an influx.

Coccinella 7-punctata L.

This is the common large ladybird which around Leicester feeds on aphids associated with low-growing, herbaceous vegetation, especially field crops. It is the one most often reported as "migratory" (Williams 1958), but whether it is a true migrant is a matter for conjecture. More likely it periodically irrupts and undertakes mass movements.

Table 3. Monthly occurrence of *Coccinella 7-punctata* in the Malaise trap, 1975-1981.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1975	1	—	—	—	95	20	5
1976	1	18	4	321	173	38	9
1977	1	49	11	4	2	14	5
1978	7	24	1	—	1	—	—
1979	—	—	—	—	—	17	—
1980	10	5	1	1	1	—	—
1981	—	2	—	—	—	—	—

Four were recorded in the trap in 1972 but none in 1973 and 1974, although one was seen in the garden in late March 1974, suggesting successful overwintering. The sudden appearance of large numbers in 1975 and especially in 1976, followed by a gradual

decline until 1981 is strikingly different from the annual fluctuations in numbers of *A. 2-punctata*.

Table 3 shows the monthly occurrence of *C. 7-punctata* from 1975 onwards. One was recorded in April 1975, none in May-July, and then suddenly 95 in August, mainly in the first two weeks, with a further 25 in September and October. In August *C. 7-punctata* was extremely common in the garden, but no larvae or pupae had been found earlier in the season, strongly suggesting a movement into the garden from surrounding fields where, I think, the aphid food supply had failed. Substantial numbers remained all winter and were active whenever the weather was mild. Overwintered individuals were trapped in April-June 1976, and enormous numbers were found all over the garden mating and laying eggs. Subsequently larvae and pupae were found on herbaceous plants, providing the first positive breeding records. In July and August, at the height of the drought, adults became extremely abundant everywhere. In these two months *C. 7-punctata* was nearly twice as abundant in the trap as *A. 2-punctata*. Many overwintered and 61 were trapped in April-June 1977; thereafter numbers fell, despite successful breeding, and the species was less common in April-June 1978, and rare in July-October of that year. By the spring of 1979 there were few about and none was trapped until September when there was a considerable movement into the garden. This was followed by many overwintering, their reappearance in April-June 1980, but few records subsequently.

The events of early August 1975 thus started a chain reaction whose effect did not really disappear until the summer of 1980. This ladybird has bred in the garden every year since 1976 until 1981 when it disappeared as a breeding species.

(To be continued)

CARPOPHILUS MARGINELLUS MOTSCH. (COL., NITIDULINAE)
OUT-OF-DOORS IN SUFFOLK. — On 1 June, 1978, I found a single specimen of *Carpophilus marginellus* resting on low saltmarsh vegetation at Sutton, near Woodbridge, Suffolk (TM 2748). Mr. A. A. Allen in summarising the British out-of-doors records of this beetle (1958, *Entomologist's mon. Mag.* **94**: 70) suggested that its occurrence in the wild was probably limited to the vicinity of stacks, dumps or other man-made habitats where extra heat from fermentation was available — cf. also subsequent records from Berks. (Woodroffe, G., 1969, *Entomologist's mon. Mag.* **105**: 192) and Wilts. (Nash, D., 1976, *Entomologist's mon. Mag.* **111** (1975): 50). Although the Suffolk specimen may have been a straggler from such a habitat, there is a strong possibility that the beetle could have bred in the decaying, undisturbed tidal refuse which littered the area, and which would also have been able to provide the extra heat for out-of-doors development. Despite much sieving of the latter, no further examples were discovered.

I thank Mr. A. A. Allen for confirming my determination of the specimen. — D. R. NASH, 266, Colchester Road, Lawford, Essex, CO11 2BU.



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