NOTES AND COMMENTS

DIFFERENTIAL DAMAGE IN A MIXED COLONY OF THE LAND SNAILS *CEPAEA NEMORALIS* AND *C. HORTENSIS*

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The ecological relation between these two species has long been a puzzle. Most often they are found in separate colonies, occasionally in overlapping colonies, and rather rarely the colonies seem to occupy exactly the same area. Alkins (1922) noticed that overlapping colonies were commoner on limestone than off it. Oldham (1929) noted that joint colonies did not seem to occur on blown sand, and because of this Boycott (1934) allowed that the species might sometimes be in competition. Cartwright (1922); Dalgliesh (1930); Diver (1940); Lowe (1944) and Stratton (1950) all add information while confirming the pattern of colonies. Alkins' and Oldham's observations suggest that in poor habitats the species cannot live together, but as they both live separately in these habitats this is presumably because of competition. When they occur together is competition absent or merely reduced? This cannot be answered by simply observing the overlap of colonies; other evidence must be used. The facts I record below may help to answer the question.

In a small beech wood, the Shoulder of Mutton Plantation, on Hackpen Hill, Marlborough Downs (Nat. Grid Ref. SU 131742), both *nemoralis* and *hortensis* are found. On the east side near the track, but still in the wood, there is a nettle-bed and beyond this the floor of the wood is rather bare, cow-grazed and grassy. This part of the wood is on clay from the clay-with-flints beds. Both species occur in and outside the nettle-bed. On 12th April 1954 I visited the wood with Dr P. M. Sheppard. Both species were active and we collected all the live snails we could find in and around the nettles; most of them were crawling on the trees. Many of the shells were found to be damaged, some so badly that it was remarkable that the snails had lived to repair them, some so slightly that there was but a small crack, not of course to be confused with growth stoppage marks. It is uncertain how the shells became damaged; some of the cracks could have come from the snail falling off trees, others were undoubtedly the result of attacks by predators. Our total collection, classified by phenotype and damage, is given in table 1.

The numbers in most of the classes are rather small, so that most comparisons must be made with Fisher's exact test for 2×2 tables. The *hortensis* are predominantly yellow five-banded and the *nemoralis* pink un-banded so that the two species look very different, on the whole, in this sample. This is related to the background, the *nemoralis* being typical of that species in beech woods, while *hortensis* is often five-banded in this habitat (Cain and Sheppard, 1954). Although colonies with pink do occur in *hortensis*, they are uncommon and this could conceivably be related to the occurrence of the various forms of *nemoralis*. The *nemoralis* are commoner outside the nettle-bed, the *hortensis* commoner inside it, and the probability that this is a chance distribution is much less than one in a thousand.

Much more surprising than these differences are those in the proportions of damaged shells in the two areas. In *hortensis* a greater proportion are damaged in the grassy part, in *nemoralis* a greater proportion in the nettles. These differences have probabilities of occurring by chance of 0·028 and 0·036 respectively. As in both cases snails are more often damaged in the area where their species is less common, the two probabilities may be combined to give a χ^2 (with four degrees of freedom) of 13·79 which is significant at the one per cent. level. This makes it reasonably certain that snails are more likely to become damaged in the area where the other species predominates. Until the causes of the cracks and breaks are known the import of this will be obscure, but at least it shows that even in mixed colonies there are differences between the species which may be an expression of competition.

TABLE 1

Classification by phenotype and damage of Cepæa *collected from the Shoulder of Mutton Plantation. Y = yellow, P = pink, B = brown. 12345 = five-banded, 00300 = one-banded, 00 : 00 = with one interrupted band, 00000 = unbanded*

Nettle bed		Damaged	Undamaged	Total
C. hortensis	Y 00000	1	3	4
	Y 12345	6	23	29
	Total	*7*	*26*	*33*
C. nemoralis	Y 00000	1	1	2
	Y 00300	2	0	2
	P 00000	5	0	5
	Total	*8*	*1*	*9*
Grass area				
C. hortensis	Y 00000	1	0	1
	Y 12345	5	4	9
	Total	*6*	*4*	*10*
C. nemoralis	Y 00000	2	0	2
	Y 00300	2	1	3
	P 00000	8	7	15
	P 00300	1	4	5
	B 00000	0	1	1
	B 00 :00	0	1	1
	Total	*13*	*14*	*27*

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DURATION OF MEIOSIS IN RELATION TO TEMPERATURE

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1. INTRODUCTION

Knowledge of the time taken by meiosis is rather fragmentary and is sometimes given without specifying the temperature. The following examples of published data on the duration of meiosis illustrate this : *Lilium longiflorum* and *Gasteria*, 4 days (Marquardt, 1937 ; Straub, 1937) ; *Vicia faba*, 3 to 4 days (Marquardt, 1951) ; *Antirrhinum majus*, from the last premeiotic mitosis to tetrad, 30 to 34 hours (Ernst, 1938) ; *Tradescantia reflexa*, at room temperature, 18 to 23° C., 2 days (Sax and Edmonds, 1953) ; *T. paludosa*, at an unspecified room temperature, 52 hours (Steinitz, 1944) ; *Œnothera* at 10° C., 12 days, but from leptotene to metaphase I, only 6 days (Linnert, 1951). No attempt seems to have been made to determine the times taken by meiosis in the same organism over a wide range of temperatures. On the other hand, in mitosis Barber (1939) studied the rate of chromosome movement at anaphase in staminal hairs of *Tradescantia* at various temperatures, and much fuller data on plant and animal material have been provided by Hughes (1952). Brown (1951) determined the duration of various stages of cell division in root tips of *Pisum* at the temperatures of 15, 20, 25 and 30° C.

In the present paper an account is given of an attempt to determine the rate of complete meiosis (not the various stages) in pollen mother-cells of the Bluebell, *Endymion nonscriptus* (L.) Garcke at different temperatures, and to compare this with the rate of mitosis.

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