

## DO JUVENILE SLOW-WORMS LIVING UNDER A REFUGE INTERACT WITH ONE ANOTHER?

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It is well-known and well-documented that Slow-Worms (*Anguis fragilis*) spend part of their time beneath flat objects on the surface of the ground. These may include stones, pieces of wood, and pieces of sheet or corrugated metal. Part of the reason is that individuals may increase their body temperature by conduction, as a result of solar infra-red radiation heating the upper surface (e.g. Barker & Hobson, 1996; Gaywood & Spellerberg, 1996; Reading, 1996, 1997; Riddell, 1996; Platenberg, 1999). It is equally well-known, but less well-documented, that individual Slow-Worms appear to vary enormously with respect to the frequency, duration and constancy of this behaviour (e.g. Platenberg, 1999). Most people who have studied Slow-Worms regard them as highly unpredictable animals - one of the authors of this paper sometimes calls them "chaotic" (in the rather precise way in which a physicist would use this term).

Observations were made in 1999 on a population of Slow-Worms in an allotment in Bristol. Some of the individuals in this population could be recognised from close-up photographs. This technique was first used for identifying slow-worms by Smith (1990) and was developed by Platenberg (1999). This note records the presence of three individually-recognisable juveniles (i.e. animals which would have been born in 1998) underneath a plastic fertiliser sack measuring 40 x 40 cm between 28 May and 16 June 1999. This was present on the allotment before observations began. The sack was turned over, and the presence or absence of the three recognisable Slow-Worms recorded by photographing all the lizards present,

on 24 occasions between 11.00 a.m. and 20.00 p.m. during this period. Other work on the same allotment had shown that repeatedly examining a refuge by overturning (and then replacing) it does not inhibit the Slow-Worms using it provided that they are not handled, because the frequency of observation of marked individuals did not decrease with time (Lowson, 1999). The record for the three individuals is shown in Figure 1.

The first thing to notice about these data is that none of the juveniles was present on all occasions. The pattern of presence or absence appeared to be random. This was tested rigorously, using simple probability calculations.

Juvenile 1 was present on 14/24 sampling occasions. The sequence of times present looks random, but the sample size is too small to test this using the Poisson series. Juvenile 2 was present on 6/24 occasions. If the presence of both individuals was a random variable, i.e. one did not influence the other, and neither was influenced equally by external factors, then both should have been present together on  $0.58 \times 0.25 = 0.15$  of sampling occasions, which is 3.6 samples. The observed figure was 4 samples. Similar reasoning can be used to calculate the probabilities of finding individuals 1 and 3, 2 and 3, and 1, 2 and 3 together. The results are shown in Table 1. In all cases - bearing in mind that the observed values can only be integer - the observed and expected values show exact agreement.

Combination	Observed	Expected
1 and 2	4	3.6
1 and 3	5	5.3
2 and 3	2	2.3
1, 2 and 3	1	1.3

**Table 1.** Observed and expected number of occasions ( $N=24$ ) when different combinations of three individual juvenile Slow-Worms were found under a plastic fertiliser sack.

Juvenile 1	X	X		X	X		X	X	X	X	X		X	X		X	X	X						
Juvenile 2	X					X				X	X		X					X						
Juvenile 3		X	X	X			X	X			X	X	X					X						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

Fig. 1. Presence (X) or absence (no symbol) of three juvenile Slow-Worms under the plastic sack on 24 sampling occasions.

The picture of Slow-Worm activity which is emerging – although it is a hazy one – is that individuals spend much time foraging in soil, leaf litter and elsewhere, but may occupy refuges beneath stones and other objects from time to time (see references in the first paragraph). The data presented here provide circumstantial evidence that individual interactions, whether positive or negative, do not influence this behaviour. This is just a “snapshot” of one aspect of the behaviour of Slow-Worms. So little is known about these elusive animals, however, that we thought it was worth recording.

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