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The distribution of the land snail *Vitrea contracta* (Westerlund) in a calcareous soil on Martin Down, Hampshire, England

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Summary

Detailed analysis of the land snails from a rendzina on Martin Down, Hampshire, England, identified fresh shells of *Vitrea contracta* (Westerlund) throughout the soil profile. This indicated that live snails were present in the soil and not just on the surface. *V. contracta* has not been recorded as a burrowing species so it is suggested that it is living within the soil voids. This conclusion has implications for the interpretation of fossil land snail assemblages from similar soils.

Introduction

The ecological interpretation of land snail assemblages from soils and sediments depends on many assumptions about the origin and history of the assemblages. One of these assumptions is that the sample assemblage originated at the surface as a contemporary death assemblage of snail shells. As a result, it is standard practice to exclude the burrowing species *Cecilioides acicula* (Müller) from an analysis as it may be intrusive and therefore considerably younger than the other shells in the sample (Evans 1972). This is often illustrated in modern soils by the presence of fresh, shiny, translucent shells of *C. acicula* deep in the profile, that must be alive or have died within the previous year. The living appearance of the shell is lost soon after death as the organic periostracum that covers the shell is destroyed (Evans 1972; Cameron and Morgan-Huws 1975).

A modern rendzina (Avery 1980) on Martin Down, Hampshire (NGR SU053184) was sampled in 10 mm spits with an area of 0.4 X 0.4 m (1.6 l). As part of a detailed analysis of the land snail assemblages (Carter 1987), fresh apices of all species were identified and their distributions plotted in 10 mm spits down the soil profile. The extraction procedure used did not discriminate between living and recently dead individuals.

Results

The modern snail community at Martin Down consisted of seven species which reflect the short chalk grassland habitat of the Down. Two types of distribution can be identified in Table 7, either having most shells concentrated in the surface 20 mm, or a uniform spread down the profile to the top of the C-horizon at 170 mm (the lower limit of 10mm spit sampling). *Cecilioides acicula* is the most abundant species and is spread down the profile, as would be expected from its burrowing habit. Five other species (*Cochlicopa lubricella, Vertigo pygmaea, Pupilla muscorum, Punctum pygmaeum, Nesovitrea hammonis*) are concentrated at the surface, reflecting a distribution in life only on or above the soil. The outstanding species is *Vitrea contracta* which, although present at low frequencies, has a distribution similar to *C. acicula,* indicating the distribution of live individuals throughout the soil profile.

The distribution of *Vitrea contracta*

Of the seven species distributions in Table 7, only that for *V. contracta* is unexpected, as it is not referred to in the literature as a burrowing species. With only one or two specimens present in most samples, contamination during sampling must be considered as a possible cause of the distribution. The collection of each 10 mm

Table 7. Frequency of fresh shell apices in 10 mm spits from a soil profile at Martin Down, Hampshire. Nomenclature follows Kerney and Cameron (1979). Key: Cl: Cochlicopa lubricella *(Porro), Vp:* Vertigo pygmaea *(Draparnaud), Pm:* Pupilla muscorum *(Linnaeus), Pp:* Punctum pygmaeum *(Draparnaud), Vc:* Vitrea contracta *(Westerlund), Nh:* Nesovitrea hammonis *(Ström), Ca:* Cecilioides acicula *(Müller).*

Depth (mm)	*Cl*	*Vp*	*Pm*	*Pp*	*Vc*	*Nh*	*Ca*
0-10	92	11	16	4	1	6	28
10-20	41	2	1	2	2	5	46
20-30	4	1	-	-	1	-	30
30-40	4	-	-	-	8	1	31
40-50	2	-	-	-	1	2	35
50-60	-	-	-	-	1	-	43
60-70	-	-	-	-	2	-	50
70-80	1	-	-	-	2	-	57
80-90	2	-	-	-	1	-	61
90-100	-	-	-	-	-	-	24
100-110	-	-	-	-	2	-	25
110-120	-	-	-	-	-	-	26
120-130	-	-	-	-	-	-	32
130-140	-	-	-	-	1	-	35
140-150	-	-	-	-	-	-	36
150-160	-	-	-	-	5	-	39
160-170	-	-	-	-	2	-	23

Table 8. Vitrea contracta*: the frequency of fresh and old shell apices in 10 mm spits from a soil profile at Martin Down, Hampshire.*

Depth (mm)	Fresh	Old	Depth (mm)	Fresh	Old
0-10	1	19	90-100	-	9
10-20	2	30	100-110	2	14
20-30	1	52	110-120	-	3
30-40	8	79	120-130	-	2
40-50	1	43	130-140	1	1
50-60	1	52	140-150	-	-
60-70	2	28	150-160	5	-
70-80	2	19	160-170	2	1
80-90	1	14			

spit took at least 30 minutes, so soil and shells could have fallen from the sides of the sampling pit on to a spit during its removal. The degree of contamination caused by this method of sampling is best illustrated by the distribution of *Cochlicopa lubricella*, which is present is large numbers in the surface 20 mm. If it is assumed that all fresh shells of *C. lubricella* below 20 mm are the result of sample contamination, it can be calculated that an average density of 67 shells per 1.6 l in the surface 20 mm produced only thirteen shells in the rest of the samples. This represents an average of only 1.3% contaminants per sample from the surface 20 mm, and clearly cannot account for the distribution of *V. contracta*, which lacks a surface concentration of shells. Therefore, the distribution is not an artifact of sampling and must reflect individuals of *V. contracta* living within the soil. This conclusion has implications for the analysis of fossil snail assemblages in archaeology. If *V. contracta* is behaving like *Cecilioides acicula*, then it may be necessary to treat it in a similar manner and exclude it from the analysis.

The presence of *V. contracta* within the soil is perhaps not entirely unexpected, as it is a characteristic species of cave and rock-rubble communities (Ellis 1969; Evans and Jones 1973). At Martin Down it may be treating the well-structured soil profile with abundant voids like the clast supported rock-rubble habitat—a soil with a well-developed crumb structure is, in effect, clast supported. Of the 29 fresh shells of *V. contracta* recovered, only three had a diameter greater than 2 mm, and half were smaller than 1 mm, so movement within this type of soil without active burrowing is possible. It is interesting to note that most shells of the other species present at Martin Down are within this size range and therefore could, but apparently do not, enter the soil during life.

Evans and Jones (1973, 121) suggested that the presence of *V. contracta* in the cave and rock-rubble assemblages reflects the fact that it is a facultative carnivore, as these habitats may totally lack vegetable matter. This is not the case in the Martin Down rendzina, which contains abundant plant organic matter down to a depth of 160 mm (Carter 1987). Evans and Jones (1973, 128) also suggested that the snail communities of caves and rock-rubble are the product of uniform high humidity in these habitats and this factor may explain the behaviour of *V. contracta* at Martin Down.

If the distribution of fresh *V. contracta* shells is compared with that of old shells (Table 8), the latter category is seen to be concentrated in the upper part of the A-horizon (10-70 mm). This distribution indicates that at least most individuals died at or near the soil surface. A uniform distribution at death would produce at least equally high concentrations of old shells at the base of the A-horizon (110-170 mm). This suggests that *V. contracta* is only temporarily present deep in the soil profile, perhaps when surface conditions are too dry, and, unlike *Cecilioides acicula*, it will return to the surface.

It may be argued that—in the particular example presented here—because *V. contracta* is dying at or near the surface, it does not create any problems for the interpretation of fossil assemblages. However, it does serve to illustrate the point that, at the scale of a snail shell, a well-structured soil can function like a clast-supported rubble layer. In archaeological buried soils, no fresh shells will be present to demonstrate that species other than *Cecilioides acicula* were living in the soil, and it is worth bearing this in mind when trying to interpret ecologically improbable assemblages of shells.

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