

1. Land snails in archaeology

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Much of the chalklands of southern England are devoid of palaeo-environmental information due to the paucity of waterlogged deposits and lack of pollen survival. While many other areas were served by long stratified pollen cores recovered by palaeogeographers from mires and peat bogs or from waterlogged contexts on, or associated with, archaeological sites, the chalklands were bereft of such data (see Allen, Chapter 9). In a similar way to palynological studies examining long vegetational histories, geographers started to use land snail evidence to look at long stratified sequences of late glacial and colluvial deposits. Land snail analyses (eg, Kerney 1963; Kerney *et al.* 1964), however, looked at environmental change at a slightly smaller, more local, scale than comparable pollen studies on other geologies.

Nevertheless, land snails were used in the early part of the 19th century by pioneering conchologist Alfred Santer Kennard, an enthusiastic amateur, and B. B. Woodward of the Natural History Museum. Kennard's initial work (from c. 1897) was on geological deposits and from 1915, often in collaboration Woodward, he looked at archaeological deposits, such as Woodhenge (1929), Stonehenge (1934), and Thickthorn Down long barrow (1936), see Evans (1972, 5–11), and Allen (Chapter 9). Their work was often based on a combination of hand-picked shells collected by the excavators, and spot samples of visibly shell-rich layers taken by the archaeologists and sent to them. Often they only recorded the shells as rare, present, common or abundant (eg, see Table 9.3), and this was unsatisfactory in palaeo-ecological terms (see Chapter 2, Fig. 2.1). They used snails principally to examine moisture, humidity and rainfall (ie, climate), rather than vegetation cover relating to land-use, though Kennard did make some exceptionally perceptive observations and interpretations (see Allen, Chapter 9).

Palaeographers initially concentrated on land snail analyses to examine the major climatic changes between and within the glacial and interglacial environments (eg, Sparks 1957; 1961; Kerney 1959; 1963; 1965), but detailed palaeogeographic work was conducted on Holocene deposits such as stratified hillwash by B. W. Sparks and Michael Kerney (eg, Sparks & Lewis 1957; Kerney 1968; Kerney *et al.* 1964). These studies examined broad vegetation histories relating to the late glacial and post-glacial climatic developments. This information could, however, be used to examine the changes and modification of that vegetation cover by human action ie, land-use – thus taking land

Useful land snail identification texts

There is no substitute for a reference collection

A reference collection should include verified identifications of both modern and archaeological (subfossil) specimens. No specimen should enter a reference collection unless its identification is 100% secure.

Whilst some texts are essential (*), it is sometimes valuable for the beginner to have a range of descriptions and illustrations provided in other works.

Beedham, G. E. 1972. *Identification of the British Mollusca*. Amersham: Hulton Educational Publications (this is very basic and brief for non-marine, the illustrations are not the best)

Cameron, R. 2008. *Keys for the Identification of Land Snails in the British Isles*. Shrewsbury: Field Studies Council

Cameron, R. A. D. & Redfern, M. 1976. *British Land Snails*. London: Linnean Society of London. Synopses of the British Fauna (New Series) 6. Academic Press (largely surpassed by other texts, but a useful slim tome)

Conchological Society of Great Britain & Ireland website; http://www.conchsoc.net/aids_to_id/help-id.php

Ellis, A. E. 1969. *British Snails*. Oxford: Clarendon Press

* Evans, J. G. 1972. *Land Snails in Archaeology*. London: Seminar Press

Janus, H. 1979. *The Young Specialist Looks at Land and Freshwater Molluscs*. London: Burke Books (rather basic, with illustrations of variable quality)

* Kerney, M. P. & Cameron, R. A. D. 1979. *A Field Guide to the Land Snails of Britain and North-west Europe*. London: Collins

Naggs, F., Preece, R. C., Anderson, R., Peiris, A., Taylor, H. & White, T. S. 2014. *An Illustrated Guide to the Land Snails of the British Isles*. London: Conchological Society/Malacological Society (an excellent, cheap, colour 12 page laminated leaflet available from the Conchological Society of Great Britain & Ireland)

Pfleger, V. 1998. *A Field Guide in Colour to Molluscs*. Leicester: Blitz Editions

Pfleger, V. & Chatfield, J. 1983. *A Guide to the Snails of Britain and Europe*. London: Hamblin

Rowson, B., Turner, J., Anderson, R. & Symondson, B. 2014. *Slugs of Britain & Ireland; identification, understanding and control*. Telford: Field Studies Council (although about 'slugs' it does include semi-slugs and has good illustrations of slug plates)

Welter-Schultes, F. W. 2012. *European Non-marine Molluscs; a guide for species identification*. Göttingen: Planet Poster Editions

Snail texts

Barker, G. M. (ed.), *The Biology of Terrestrial Molluscs*. Wallingford: CABI Publishing

Cameron, R. 2016. *Slugs and Snails*. London: HarperCollins, New Naturalist Series

Current nomenclature

Anderson, R. 2005. An annotated list of the non-marine Mollusca of Britain and Ireland, *Journal of Conchology* 38(6), 607–637

Atlases

Kerney, M. 1999. *Atlas of the Land and Freshwater Molluscs of Britain and Ireland*. Colchester: Harley Books

Kerney, M. P. 1976. *Atlas of the Non-marine Mollusca of the British Isles*. Cambridge: Institute of Terrestrial Ecology

Regional atlases

Killeen, I. J. 1992. *The Land and Freshwater Molluscs of Suffolk*. Ipswich: Suffolk Naturalists' Society (an excellent county guide)

Preece, R. C. 1980. *An Atlas of the Non-Marine Mollusca of the Isle of Wight*. Newport: Isle of Wight County Museum Service Natural History Series 1

Turk, S. M., Meredith, H. M. & Holyoak, G. A. 2001. *Atlas of the Land and Freshwater Molluscs of Cornwall and the Isles of Scilly*. Truro: Environmental Records Centre for Cornwall and the Isles of Scilly (another very good atlas, and contains information on archaeological finds)

snail analysis from geography and palaeogeography into the realms of archaeology and environmental archaeology. Both Sparks and Kerney produced clearly archaeologically-referenced work such as Bronze Age buried soils (Sparks 1960), and more general anthropogenic comment (Kerney 1966). Studies of stratified colluvium were driven by the wish to record long term vegetational changes on the chalk, as pollen had done elsewhere, but the analysis of archaeological samples was based on local environmental reconstruction, if not explicitly land-use and human activity. The bridge between archaeology and geography was largely crossed by the partnership of Michael Kerney (palaeogeography) and his PhD student, John Evans, whose thesis and, ultimately seminal publication, *Land Snails in Archaeology* (1972), made this an accepted discipline within archaeology (see Allen 2006). This also coincided (and perhaps influenced) a growing desire by archaeologists working on the chalklands to understand the local environment and environmental changes driven by human action. Land snail analysis started to become employed in more specific and targeted analyses of several key sites (see Allen, Chapter 9).

Principles and archaeological aims

Land snails provide crucial information for the chalk Downs; one of the most important archaeological areas and monument groups in the country. The vegetation and land-use history of the Downs is built from independent and local land snail evidence, where for rest of the country it is largely based on the pollen record which has both a national, and northwest European, framework. Land snails provide proxy evidence of vegetation structure; indicating the quantity of shade and ground moisture or cover, presence of woodland, openness, occurrence of leaf litter etc., rather than, as pollen or waterlogged plants can, the presence of individual woody or herbaceous species. Sequences of land snail samples though archaeological ditch fills may cover several millennia of deposition and thus relatively long histories of changes in the local environment, which is a proxy for land-use and human activity.

Principles of land snail analysis:

1. Land snails have shells made of calcium carbonate and aragonite (CaCO_3) that are preserved and survive in calcareous deposits, often derived from the Chalk geology.
2. The shells, despite being broken, can be retrieved from soil samples taken from archaeological deposits (via laboratory processing and microscope sorting), to sizes <0.5 mm.
3. The shells can be identified to taxa, and often to species, and quantified.
4. Individual species have differing habitat, food, environmental and ecological preferences. By examining a whole assemblage (thought to be representative of the past fauna) the palaeo-ecology can be reconstructed.
5. The species' ecology can be related to the micro-environments and nature of the vegetative cover, which relates to the past local environments, and land-use.
6. Sequences of samples allow local land-use histories to be defined.
7. Sampling of multiple sites in a study area allows land-use patterns within a local landscape to be identified and mapped.

Ecology and palaeoecology

One of the principles of land snails in archaeology is that individual species have specific habitat, ecological niche and food requirements, and these can provide an indication of past ecologies. The ecology of the snails is related to their micro-habitat; vegetation, shade, moisture, micro-environment, food, competition and predators. In essence, the fauna is related to the structure of the vegetation (Fig. 1.1), which in turn may be related to land-use. Changes in vegetation cover may relate to natural climatic change over the longer term, but other more specific changes may be anthropogenic and relate to human activities and land-use. In many more complex deposits (colluvium and alluvium), both agencies may be recorded.

The living snail community, therefore, reflects the environment or micro-environments which it inhabits (Evans 1972; 1991a). By examining the ecological and habitat preferences of the species, their interaction and competition, we can understand components of that micro-environment. A land snail community is mobile, and individuals and whole colonies of single species can move hundreds of metres within a few days. Each individual, and each species colony, travels its own path, but collectively they reflect the habitats in which they reside.

What is then required is an acceptably representative sample of that community or fauna (Fig. 1.2). The living community is mobile, and although cohabiting individual species may move across the 'territory' in groups or colonies. Their death, and the process of shell incorporation into the soil or deposit is complex, and that taphonomy is a subject area in itself. Death: we have to assume that a representative proportion of each species dies at approximately the same time, thus enabling each to be incorporated more-or-less uniformly into the deposit or soil. That soil will undergo pedogenic processes including biotic disturbance (roots and soil (micro)-fauna (cf. Carter 1990)), and may be eroded, transported or transformed. Many shells may be lost and broken. In less calcareous conditions they will suffer weathering and dissolve, with none or few, or only the large robust species and fragments, surviving and being preserved.

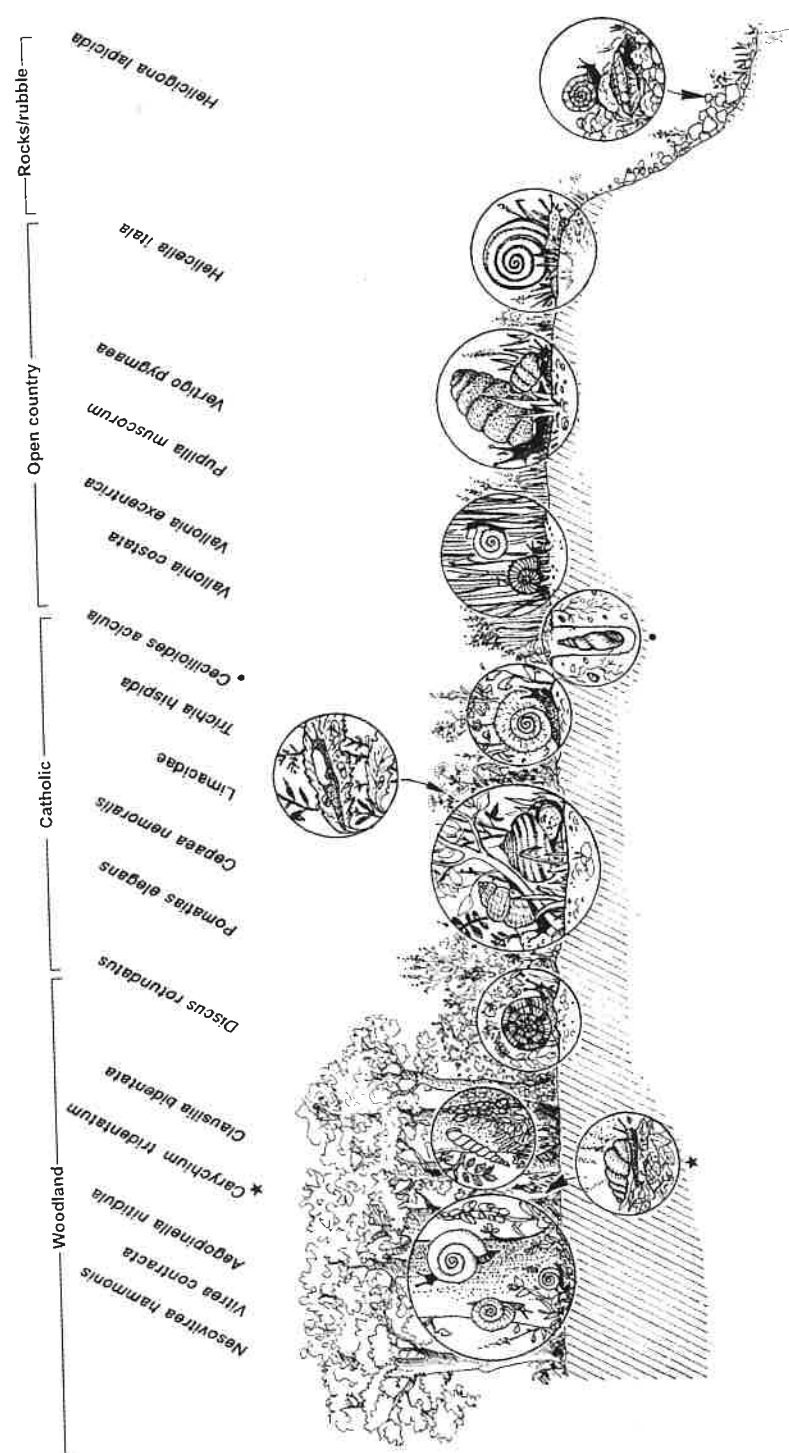


Figure 1.1. Snails' preferences according to moisture, habitat and micro-habitats; the diagonal lines reflect the proportion of moisture or shade afforded by the vegetation cover, and the snails are arranged as in a typical land snail histogram (© Wessex Archaeology, from an original by M. Allen)

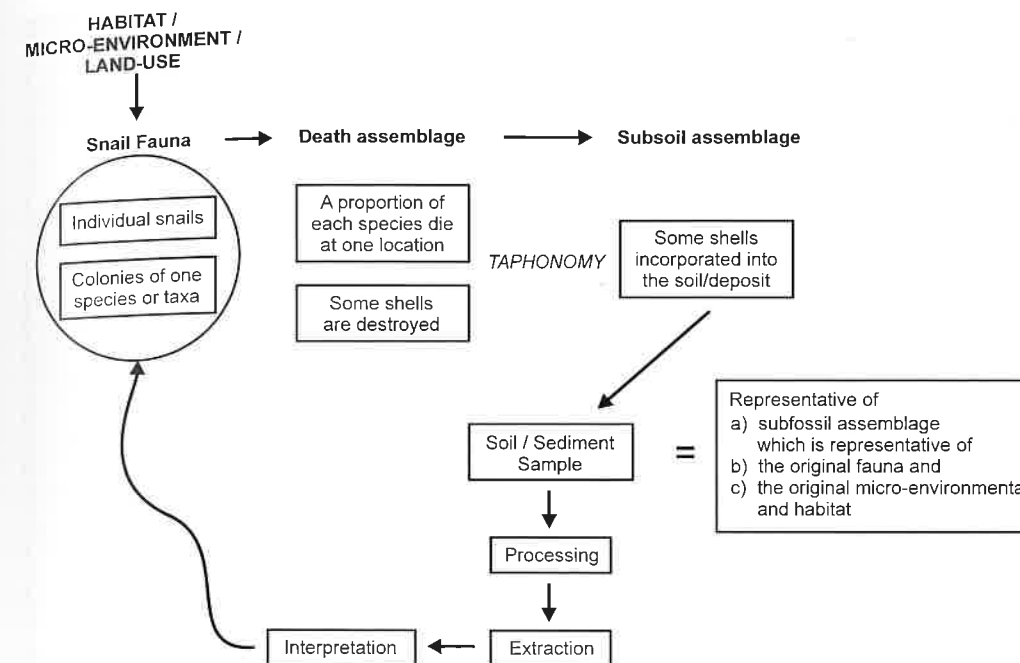


Figure 1.2. Formation of a subfossil assemblage, and the principal stages of analysis and interpretation (based on Evans 1972, fig. 6 & Thomas 1982, fig. 1; illustration: Abby George)

Apart from the complex ecological factors relating to presence, occurrence, abundance and die-off, it is the comprehension of the nature of the deposit, and its formation that is the archaeologist's key role in helping to provide suitable, appropriate, and useful samples for palaeo-ecological interpretation (see Allen, Chapter 2). Following sampling and processing, the archaeological subfossil assemblage provides the basis from which to define the composition of original fauna, which in turn provides the basis of interpretation of the palaeo-environment and land-use.

What can snails tell us? ... what can land snails do for me?

What is more important or immediately relevant to the field archaeologist, is not the neo-ecology, palaeo-ecology, or history of land snail analysis, but a comprehension of 'what can land snail analysis do for me?'. Mollusc analysis is usually undertaken where there are chalky soils or fine grained weakly calcareous deposits, and often analysis is deployed because of the lack of pollen survival. Analyses attempt to provide environmental and land-use reconstruction, in an otherwise palaeo-environmentally challenging landscape.

Some key texts on archaeology and taphonomy

- * Davies, P. 2008. *Snails: archaeology and landscape change*. Oxford: Oxbow Books
- * Evans, J. G. 1972. *Land Snails in Archaeology*. London: Seminar Press
- Allen, M. J. 2007. Molluscan Diversity. In French, C., Lewis, H., Allen, M. J., Green, M. Scaife, R. G. & Gardiner, J. 2007. *Prehistoric Landscape Development and Human Impact in the Upper Allen Valley, Cranborne Chase, Dorset*, 263–271. Cambridge: McDonald Institute Monograph
- Carter, S. P. 1990. The stratification and taphonomy of shells in calcareous soils: implications for land snail analysis in archaeology. *Journal of Archaeological Science* 17, 495–507
- Davies, P. 1998. Numerical analysis of subfossil wet-ground molluscan taxocenes from overbank alluvium at Kingsmead Bridge, Wiltshire. *Journal of Archaeological Science* 25, 39–52
- Davies, P., Gale, C. H. & Lees, M., 1996. Quantitative studies of modern wet-ground molluscan faunas from Bossington, Hampshire. *Journal of Biogeography* 23, 371–377.
- Evans, J. G. 1990. Notes on some Late Neolithic and Bronze Age events in long barrow ditches in southern and eastern England. *Proceedings of the Prehistoric Society* 56, 111–116
- Evans, J. G., Davies, P., Mount, R. & Williams, D. 1992. Mollusc taxocenes from Holocene overbank alluvium in southern central England. In Needham, S. & Macklin, M. G. (eds), *Alluvial Archaeology in Britain*, 65–74. Oxford: Oxbow Monograph 27
- Thomas, K. D. 1982. Neolithic enclosures and woodland habitats on the South Downs in Sussex, England. Bell, M. G. & Limbrey, S. (eds), *Archaeological Aspects of Woodland Ecology* 147–170. Oxford: British Archaeological Report S146
- Thomas, K. D., 1985. Land snail analysis in archaeology: theory and practice. In Fieller, N. R. J., Gilbertson, D. D. & Ralph, N. G. A. (eds), *Palaeoenvironmental Investigations: research design, methods and data analysis* 131–157. Oxford: British Archaeological Report S266

Some key archaeological projects and sites

AVEBURY ENVIRONS

- Evans, J. G. 1983. Molluscan analysis, 101–109. In Evans, J. G. & Smith, I. F., *Excavations at Cherhill, North Wiltshire 1967*. *Proceedings of the Prehistoric Society* 49, 43–117

Horslip barrow, Beckhampton Road, South Street long barrows

- Evans, J. G. 1979. The environment, 275–298. In Ashbee, P., Smith, I. F. & Evans, J. G., 1979. *Excavation of three Long Barrows near Avebury, Wiltshire*. *Proceedings of the Prehistoric Society* 45, 207–300

Avebury

- Evans, J. G., Pitts, M. W. & Williams, D. 1985. An excavation at Avebury, Wiltshire, 1982. *Proceedings of the Prehistoric Society* 51, 305–320

Windmill Hill

- Evans, J. G. 1972. *Land Snails in Archaeology*, 242–248. London: Seminar Press
- Fishpool, M. 1999. Land Mollusca. In Whittle, A., Pollard, J. & Grigson, C., *The Harmony of Symbols; the Windmill Hill causewayed enclosure*, 127–128. Oxford: Oxbow Books

Silbury Hill

- Evans, J. G. 1997. Mollusca [Silbury Hill]. In Whittle, A., *Sacred Mound Holy Rings; Silbury Hill and the West Kennet palisade enclosures; a later Neolithic complex in north Wiltshire*. Oxford, Oxbow Monograph 75, 47

CRANBORNE CHASE, DORSET

- Allen, M. J. 2005. Problems and new scenarios, the Dorset Cursus and molluscan data, the Wyke Down henges and molluscan data, 127–129. In French, C. & Lewis, H., *New perspectives on Holocene landscape development in the southern English chalklands; the upper Allen valley, Cranborne Chase, Dorset*, *Geoarchaeology* 20, 109–134
- Allen, M. J. 2007. Land use and landscape development: the molluscan evidence. In French, C., Lewis, H., Allen, M. J., Green, M., Scaife, R. G. & Gardiner, J. 2007. *Prehistoric Landscape Development and Human Impact in the Upper Allen Valley, Cranborne Chase, Dorset*, 151–189. Cambridge: McDonald Institute Monograph
- Entwistle, R. & Bowden, M. 1991. Cranborne Chase: the molluscan evidence. In Barrett, J. Bradley, R. & Hall, M., *Papers on the Prehistoric Archaeology of Cranborne Chase*, 20–48. Oxford: Oxbow Monograph 11

DORCHESTER LANDSCAPE, MAIDEN CASTLE AND MOUNT PLEASANT

- Allen, M. J. 1997. Land-use history: the molluscan evidence. In Smith, R. J. C., Healy, F., Allen, M. J., Morris, E. L., Barnes, I. & Woodward, P. J., *Excavations Along the Route of the Dorchester By-pass, Dorset, 1986–8*, 166–190. Salisbury: Wessex Archaeology Report 11
- Allen, M. J. 1997. Landscape, land-use and farming. In Smith, R. J. C., Healy, F., Allen, M. J., Morris, E. L., Barnes, I. & Woodward, P. J., *Excavations Along the Route of the Dorchester By-pass, Dorset, 1986–8*, 277–283. Salisbury: Wessex Archaeology Report 11

Maiden Castle

- Evans, J. G. & Rouse, A. 1991. The land Mollusca. In Sharples, N. M., *Maiden Castle; excavations and field survey 1985–6*, 118–125. London: English Heritage Archaeological Report 19

Mount Pleasant

- Evans, J. G. & Jones, H. 1979. The land Mollusca. In Wainwright, G. J., *Mount Pleasant, Dorset: Excavations 1970–1971*, 190–213. London: Report of the Research Committee of the Society of Antiquaries of London 37

HAMBLEDON HILL, DORSET

- Allen, M. J. & Bell, M. 2008. Wider comparisons and discussion. In Mercer, R. & Healy F., *Hambledon Hill, Dorset, England: excavation and survey of a Neolithic monument complex and its surrounding landscape*, 449–454. Swindon: English Heritage Archaeological Reports
- Bell, M., Allen, M. J., Smith, R. W. & Johnson, S. 2008. Mollusc and sedimentary evidence for the palaeo-environmental history of Hambledon Hill and its surroundings. In Mercer, R. & Healy F., *Hambledon Hill, Dorset, England: excavation and survey of a Neolithic monument complex and its surrounding landscape*, 412–454. Swindon: English Heritage Archaeological Reports

STONEHENGE LANDSCAPE

- Allen, M. J. Before Stonehenge, 41–62, parts of discussion 470–284. In Cleal, R. M. J., Walker, K. E. & Montague, R. 1995. *Stonehenge in its Landscape: twentieth century excavations*. London: English Heritage Archaeological Report 10
- Allen, M. J. 1997. Environment and land-use; the economic development of the communities who built Stonehenge; an economy to support the stones. In Cunliffe, B. & Renfrew, C. (eds), *Science and Stonehenge*, 115–144. Oxford: Proceedings of the British Academy
- Allen, M. (North Kite), Bell & Jones (Coneybury), and Entwistle, R. (various sites); all in Richards, J. C. 1990. *The Stonehenge Environs Project*. London: English Heritage Archaeological Reports 16

Entwistle, R. (various sites). In Richards, J. C. 1990. *The Stonehenge Environs Project*. London: English Heritage Archaeological Reports 16

Durrington Walls

Evans, J. G. 1971. Durrington Walls: the pre henge environment. In Wainwright, G. J. & Longworth, I. H., *Durrington Walls: Excavations 1966-68*, 329-337. London: Report of the Research Committee of the Society of Antiquaries of London 27

Woodhenge

Evans, J. G. & Jones, H. 1979. Woodhenge (The land Mollusca). In Wainwright, G. J., *Mount Pleasant, Dorset: Excavations 1970-1971*, 192-197. London: Report of the Research Committee of the Society of Antiquaries of London 37

ASCOTT-UNDER-WYCHWOOD, OXFORDSHIRE

Evans, J. G. 2007. The snails. In Benson, D. & Whittle, A., *Building Memories: the Neolithic Cotswold long barrow at Ascott-under-Wychwood, Oxfordshire*, 55-70. Cardiff Studies in Archaeology. Oxford: Oxbow Books

DOVER, KENT

Preece, R. C. 1998. Mollusca. In Preece R. C. & Bridgland, D. R. (eds), *Late Quaternary Environmental Change in North-west Europe: excavations at Holywell Coombe, south-east England*, 158-212. London: Chapman & Hall

RUNNYMEDE, SURREY

Evans, M., & Evans, J. G. 2000. Chapter 7: Molluscan evidence. In Needham, S. P., *The Passage of the Thames: Holocene environment and settlement at Runnymede* 125-138. London: British Museum Press

Evans, J. G. 2000. Discussion [of the molluscan evidence]. In Needham, S. P., *The Passage of the Thames: Holocene environment and settlement at Runnymede* 138-145. London: British Museum Press

DEPOSITS

Colluvium (see Chapter 9, Allen)

Allen, M. J. 1995. The prehistoric land-use and human ecology of the Malling-Caburn Downs; two late Neolithic/Early Bronze Age sites beneath colluvium, *Sussex Archaeological Collections* 133, 19-43

Allen, M. J. 2007. Evidence of the prehistoric and medieval environment of Old Town, Eastbourne: studies of hillwash in the Bourne valley, Star Brewery Site. *Sussex Archaeological Collections* 145, 33-66

Bell, M. G. 1983. Valley sediments as evidence of prehistoric land-use on the South Downs. *Proceedings of the Prehistoric Society* 49, 119-150

Ellis, C. 1985. Flandrian molluscan biostratigraphy and its application to dry valley deposits in East Sussex. In Fieller, N. R. J., Gilbertson, D. D. & Ralph, N. G. A. (eds), *Palaeoenvironmental Investigations: research design, methods and data analysis*, 157-165. Oxford: British Archaeological Report S226

Ellis, C. 1986. The postglacial molluscan succession of the South Downs dry valleys. In Sieveking, G. de G. & Hart, M. B. (eds), *The Scientific Study of Flint and Chert* 175-194. Cambridge: University Press

Evans, J. G. 1972, *Land Snails in Archaeology*, 311-316 (esp. Pink Hill). London: Seminar

Lynchets

Evans, J. G. 1972, *Land Snails in Archaeology*, 316-321 (esp Overton Down and Fyfield Down). London: Seminar

Fowler, P. J. & Evans, J. G. 1967. Plough-marks, lynchets and early fields, *Antiquity* 41, 289-301
See Hambledon Hill (above)

Alluvium (see Chapter 7, Robinson)

Evans, J. G. 1991. The land and freshwater Mollusca. In Needham, S. P., *Excavation and Salvage at Runnymede Bridge, 1978*, 263-274. London: British Museum

Evans, J. G. 1992. Mollusca. In Butterworth, C. A. & Lobb, S. J. (eds), *Excavations in the Burghfield Area, Berkshire*, 130-143. Salisbury: Wessex Archaeological Report 1

Sand dunes (see Chapter 4, Walker)

Bell, M. & Johnson, S. 1990. Mollusca and other zoological evidence. In Bell, M., *Brean Down Excavations 1983-1987*, 246-250. London: English Heritage

What can land snails define?

Unlike pollen, the landscape and palaeo-environmental proxy information derived from snails cannot define the vegetation species, but rather the vegetation *character* and *structure*, and local surface micro-environments. How does this help define past land-use? They are not a dating tool, though sometimes assemblages and interpretations can be crudely placed within a generic chronological timescale (see Chapter 9, Table 9.1). We must assume that the land snail assemblages, acquired via soil samples taken from dated or datable sealed contexts on site, are representative of the past living assemblages in some form (see Fig. 1.2). The latter, in itself, is a major assumption that needs careful consideration during sampling, analysis and interpretation. Sequences of land snail samples though dated deposits can provide evidence of *changes* in those micro-habitats, many of which may be a direct, or indirect, consequence of human action and activities. The types of micro-environment that land snails can define is multitudinous; but in terrestrial terms these include aspects of vegetation structure, ground cover, soil surface, rockiness etc. Differences between closed canopy woodland with bare soil, or those with leaf litter, or with an understory vegetated grassy sward can be determined. At the other end of the spectrum more open country assemblages may enable the differentiation between dry short grassland (ie, grazed or trampled), and longer mesic grassland representing rough pasture or open downland. Changes between these environments may suggest onset of grazing and pasture, or of trampled grassland.

Advancement in interpretation has come with the maturing of the discipline and with more detailed ecological research. Two open country assemblages that John Evans described from the dry valley colluvium at Pink Hill, Buckinghamshire were clearly different, but he admitted that 'just what these mean in terms of habitat change is not clear' (see Evans 1972, 312-316). Those at the base (50-100 cm; open country phase

a), contained a range of shade-loving species including *Carychium tridentatum*, *Discus rotundatus* and other shade-loving species. These decreased or disappeared in the upper colluvium (0–50 cm; open country phase b), where there is concomitant rise in proportions of *Vallonia excentrica*, a significant presence of *Pupilla muscorum*, and *V. costata* decline. Although Evans was perplexed, it has been suggested that these might represent changes between hawthorn and juniper seres, to more open dry grassland (Allen 1991a) ie, from luxuriant vegetation of tall grasses such as false oat grass (*Arrhenatherum elatius*), brome grass (*Bromopsis erecta*), false brome (*Brachypodium sylvaticum*) and meadow oat grass (*Avenula pratensis*), together with woody species such as hawthorn scrub (*Crataegus* sp.), dogwood (*Cornus sanguinea*), etc, and possibly with dog's mercury (*Mercurialis perennis*) (Tansley 1949), to more open short grassland, possibly dominated by sheep's fescue (*Festuca ovina*). Among the most important open country assemblages are those that might indicate bare ground and loose broken soil. The first possibly relate to bare grassless trampled ground, but the second more clearly relates to clearance or tillage and soil breaking. The identification of these environments may suggest clearance of woodland and preparation of land for grazing or occupation, and the onset of tillage and farming. Within open country assemblages, it is not always easy to separate xerophilic assemblages relating to short grazed grassland from those of tillage. Often the presence of *Pomatias elegans*, which favours loose and broken soil, is taken as an indicator of clearance or tillage. In many cases the detailed soil descriptions and interpretation, form part of the geoarchaeological interpretation embracing those from land snails.

Buried soils

Land snail information from buried soils beneath monuments (barrows, banks, ramparts) can provide indications of the pre-monument, or pre-site, activity and address questions such as; was woodland clearance undertaken for this monument?, was it built in an already pre-existing, long cleared, area with established grassland? Neolithic long barrows were the first monuments built in the country (c. 37th century BC; Whittle *et al.* 2011) and may often be the earliest archaeological evidence on site, or even in the landscape. But evidence of woodland clearance, and the presence of an established grassland in the buried soil beneath these monuments may suggest otherwise. Clearance of woodland may have occurred decades to centuries before monument building, and may not always, therefore, be related to monument building. This is demonstrated by the well-published sequence from the South Street long barrow, Wiltshire (Fig. 1.3; Evans 1972; see Allen Chapter 9). Beneath the barrow was not only a buried soil, but also ard marks scouring the chalk surface. The land snail evidence from nine, close-interval samples through the buried soil indicated environmental change and a whole series of land-use phases clearly indicating a longevity of human activities prior to the barrow construction. These included; (1) local clearance of the open woodland to create an area for activity, (2) a phase of soil disturbance, tillage and arable, and (3) the establishment of a dry, grazed or trampled, grassland sward, all prior to the construction of the long barrow. This undoubtedly indicates decades, but probably centuries, of ?Neolithic activity prior to the act, or acts, of monument

building. Similarly soils under Bronze Age round barrows may indicate if the barrow cemetery was established on newly cleared land created for the cemetery, previous long term pasture, or even on soils thinned by agriculture, and potentially, in prehistoric terms, exhausted (cf. Allen 1997a).

Barrow ditches

Barrow ditches can provide long histories of land-use and human activity. Turves fallen from the buried soil through which the ditch was cut can often be found on the base the ditch, and these ironically, provide information on the land-use that preceded the ditch digging. The ditch fills can then provide long histories of environmental change that succeeded ditch and barrow construction. It is, therefore, possible to salvage information of pre-monument environments, even in landscapes where buried soils do not survive and all upstanding monuments have been obliterated by mechanical ploughing.

Importantly the ditch provides information about the landscape in which, for instance, the barrow, or site, resided and can provide clear evidence of human activity associated with the site (see Evans 1990). At Buckskin, Hampshire, a relatively simple Bronze Age barrow provided an intriguing land-use history which drove the archaeological interpretations of the barrow history (Fig. 1.4; Allen *et al.* 1995). A treehollow beneath the barrow confirmed the existence of a former dense deciduous woodland with a leaf litter floor. This forest had been removed a long time before the barrow was built, and a short grazed grassland had become established. It was in this downland pasture that the barrow was built. So despite little archaeological evidence of earlier activity, the barrow was clearly not the first human activity there.

Barrows are often false-crested on hillsides, and carefully positioned so that they are visible from some distance (Woodward 2000; Woodward & Woodward 1996; Field 1998, 315–16); perhaps from the settlement sites situated lower on the chalk slopes or in valley bottoms. Once constructed, it is often believed by archaeologists that these barrows were gleaming white mounds of chalk (Garwood 2003, 50–1), and were maintained as such as markers to the ancestors, and as conspicuous places in the landscape (Tilley 1999). At both Buckskin (Allen *et al.* 1995) and Twyford Down (Allen 2000), Hampshire, however, this was clearly not the case. By analogy with the ditch infilling rates Overton Down experimental earthwork (Bell *et al.* 1996), we can see that, within only decades, a shade-loving assemblage had invaded the ditch, and we take this as indicating, not a wider woodland regeneration, but local shady conditions on the barrow itself comprising scrubby vegetation possibly of brambles, and young hawthorn etc, and herbaceous vegetation in the ditch. The barrow was not maintained (or ?venerated), but neglected. Grazing of the Down which had existed for decades, if not centuries, seemed also to have ceased. The barrow was not, however, entirely abandoned. At Buckskin, possibly realising it was a monument of the ancestors, later in the Bronze Age it was cleared, and a short grassland sward re-established, and two cremations inserted into the barrow (1680–1310 cal BC). Once again, however, after this act, the barrow was soon left to become an overgrown morass of vegetation, while that at Twyford Down showed lush herbaceous vegetation probably in the ditch.

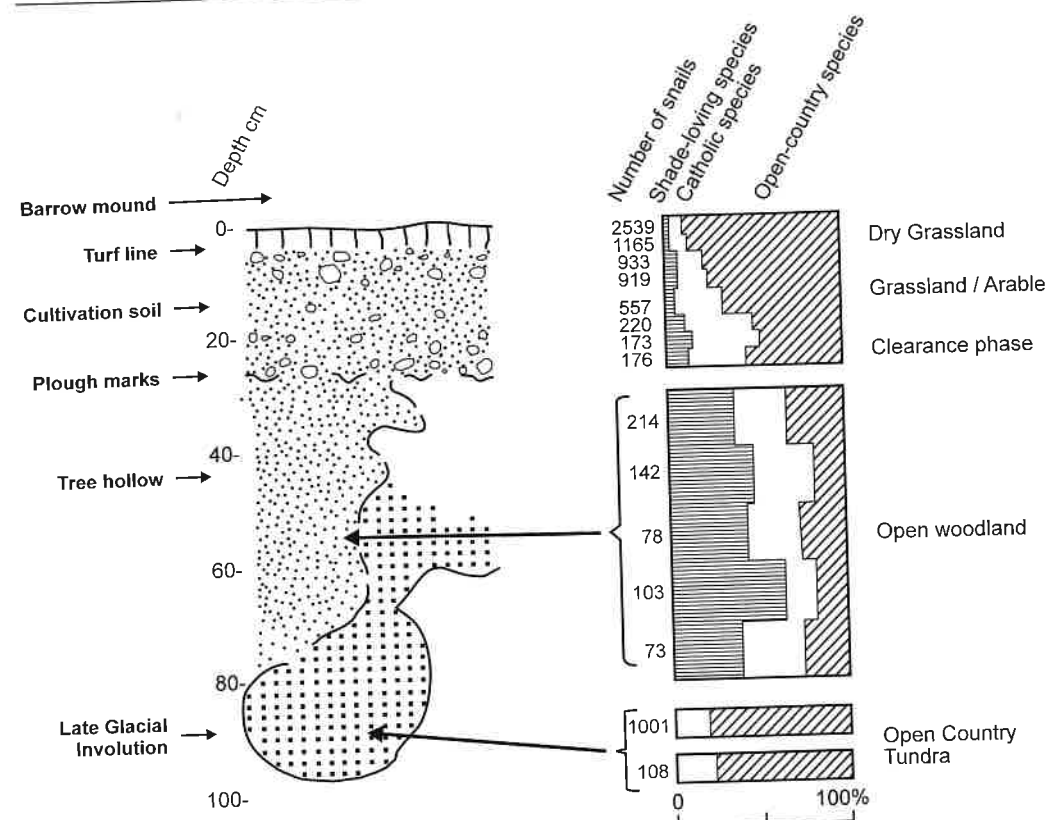


Figure 1.3. Summary of the land molluscs from South Street long barrow (after Evans 1971, fig. 9; 1972, fig. 90; Illustration redrawn with modifications by Abby George)

More subtle landscape changes associated with barrows have been suggested elsewhere. At Round-the-Down, East Sussex, for instance, vegetation regeneration was seen on the mound indicating it too had become overgrown. In the later stages of ditch infilling, the barrow existed in open grazed or tilled downland, and an increase in open country species and the change in composition of the shade-loving species indicated that the mound itself was under long ungrazed mesic grassland (Allen 1995a).

Field, boundary, and 'linear' ditches

Ditches are often valid sources of stratified and dated palaeo-environmental records. The ditch, and often sedimentation within the ditch, can be dated and the infill history may cover many centuries, and probably millennia (see Allen, Chapter 2). Ditches often mark boundaries within farmed and open landscapes (obviously excepting park pales), and in some cases snails from the ditch can indicate the nature of that

boundary. If this is a bank, just as with barrows, it is possible to suggest whether this was a grazed or overgrown bank. In other cases where ditches are slight and the banks would have been ephemeral, it has been possible to suggest the presence of hedges, even on prehistoric sites such as at Alington Avenue, Dorset (Allen 2002). Perhaps the most important information ditches can provide, as alluded to above, is the long land-use history. Many multi-period sites with evidence of Neolithic, Bronze Age and Iron Age activity, for instance, may often be taken to suggest continuous occupation, because all the period boxes have been ticked. This may be far from the case. Episodes of abandonment may be seen by vegetation regeneration within the ditch fill sequence. Ditch fills can often be dated by artefacts discarded into them. Periods of reduced- or non-activity which might punctuate the settlement record are often, but not always, associated with stabilisation in the upper secondary ditch fills and soil formation prior to tertiary (ploughwash) infilling.

Care needs to be expressed by both analyst/interpreter of the land snail assemblages, and the archaeological reader. The presence of vegetation regeneration in a ditch is often taken to indicating lessening of intensity, or frequency, of activity around the ditch, and thus in the landscape as a whole. As such, it can be taken by analyst or archaeologist, or both, to suggest abandonment of settlement or activity in the landscape locale. Indeed, there are hints of this made by Evans for the regeneration seen in the upper fills of the Stonehenge ditch (Evans 1984) where, on reflection, vegetation regeneration might essentially be that restricted to the ditch itself (Allen 1995b, 116). Longer grasses and herbaceous plants often take hold as ditch infilling rates slow down, and if not maintained by human hand, or animal grazing, then brambles, hawthorn and dogwood etc., can often quickly take hold; and this is what the land snail assemblages may represent.

Primary ditch fills

The primary fill of ditches are often dominated by vacuous chalk rubble and its deposition is often rapid. Fills sometimes represent over 30% (a third) of the ditch, and may have occurred over just a few decades, as the Overton Down experimental earthwork and other observations have shown (Bell *et al.* 1996; Bell 1990; Allen 1995a). The environment of deposition is hardly conducive to snail life; and samples composed principally of the blocky chalk rubble, largely negates the presence of shells. Consequently Evans suggested, quite rightly, that these were not the best contexts to sample, and both recommended and practised the non-sampling of these deposits. Here, I disagree. At the very base of the primary fill is often a thin fine calcareous mud, or wash, representing possibly the very first rain wash into the ditch that frequently contains shells; although such deposits often difficult to sample. The chalk rubble may contain a few shells, often too few for statistically valid palaeo-environmental information. Nevertheless, these may have derived from the soil through which the ditch was cut, and provide important glimpses of the pre-ditch environment, especially if buried soils and fallen turves are absent. What may be important is that these shells may provide a contrast with those from the later ditch infills, indicating a significant change between pre- and post-ditch environments.

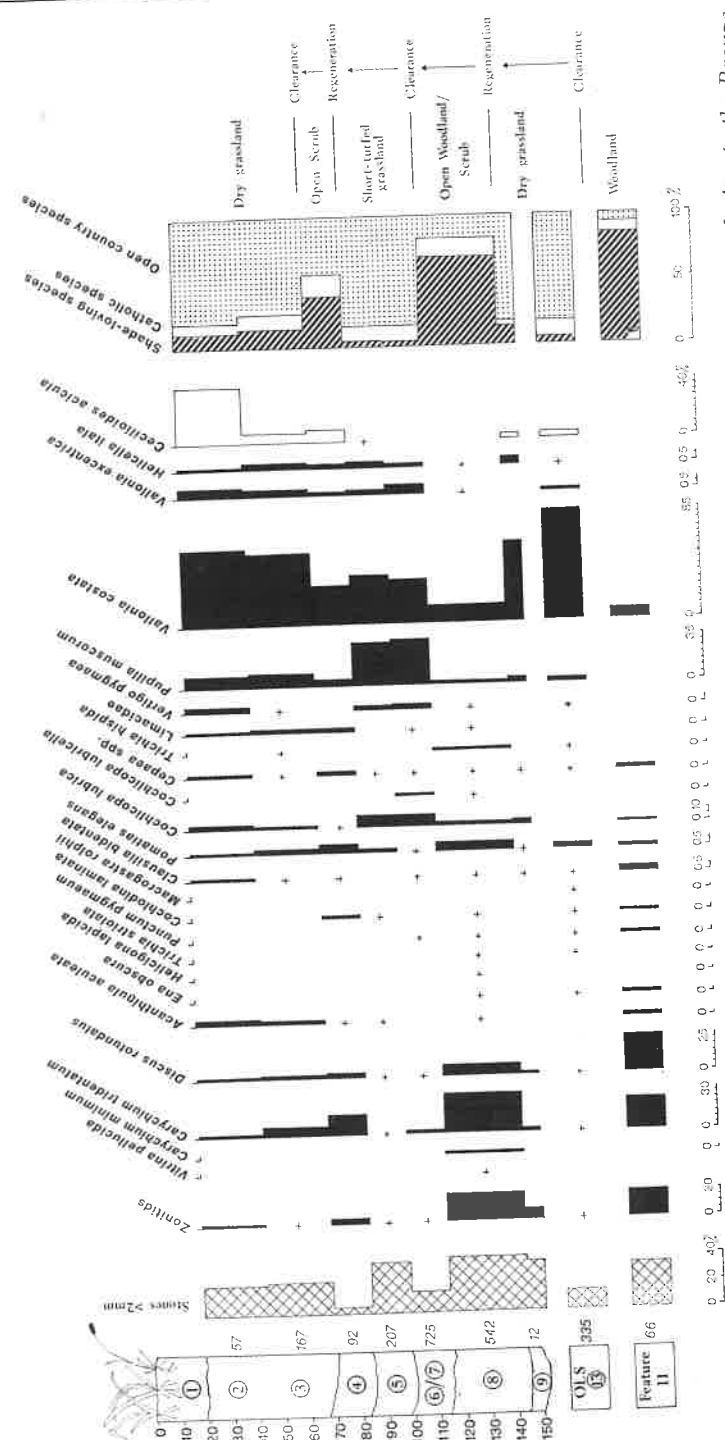


Figure 1.4. Buckskin barrow, Hampshire; the land snail evidence showing a land-use history of human action relating to the Bronze Age barrow (from Allen et al. 1995, fig. 12)

Hibernating snails

Finally, with regard to ditches, caches of shells are sometimes recovered. Often these may be noted and collected by the excavators as they may be the larger and more robust species such as *Cepaea* spp. (with a moderately large, 20–25 mm, banded shell), or *Pomatias elegans* with its very robust winkle-like shell. Excavators have been known to consider caches of *Cepaea* spp. to be potentially food-waste (but see Taylor & Bell, Chapter 12, for examples of land snail middens), however, these may be hibernating colonies. Large species often hibernate in colonies, often adhering to each other to create a seal to prevent drying-out and freezing during long, cold winter months. The vacuous chalk rubble provides an ideal habitat in which to shelter, and such caches of shells at the Bronze Age barrow ditch at Round-the-Down were created as a result of a proportion of those large colonies not surviving the winter; whether as a result of natural mortality, or an exceptional harsh winter cannot be determined (Allen 1995a).

Pits and postholes

Many features contain purely anthropogenic deposits which are not useful to sample (see Allen, Chapter 2). The upper fills of large pits in particular, however, may contain 'tertiary fills' *sensu* Evans (1972, 321–8) and Limbrey (1975, 290–300), which have infilled more naturally and largely after the main use of the pit had ceased, and without direct human interference. These are often essentially colluvial fills, accreting slowly, and so contain a longer time depth. They have the potential to provide evidence for environmental change, see for instance the Neolithic pit at Easton Lane, Hampshire (Allen 1989), where steady opening of the landscape is indicated as the pit infilled.

Wetter habitats

Wetter landscapes are dealt with later: floodplains and alluvium by Robinson (Chapter 7), and freshwater and slum by O'Connor (Chapter 8). Archaeologists are often interested in the nature of specific deposits within features; what is this 'clay' (usually a silt or silty clay) in the bottom of my pit – does this represent water? Is this hollow a pond? Is this feature a waterhole? Is this feature a drain? Did this ditch contain water? Did this valley contain flowing water? The archaeological site we are excavating is on a floodplain; were the base of the pits wet or water-filled? Amphibious species in alluvium or in archaeological features on a floodplain or former floodplain, may reflect seasonal flooding, or reflect seasonally high groundwater tables.

Ponds and waterholes present an interesting conundrum and need to be tackled by geoarchaeological examination of the *in situ* deposits. Large, shallow, dished hollows are not uncommon on rural chalk sites, and to suggest that they may be ponds, waterholes or dew ponds is potentially both reasonable and feasible. Proof via snails is not, however, always that easy. Obviously if freshwater shells are present, especially if they are slum species typical of small, still, and shallow bodies of water,

then interpretation is clear. Where any aquatic shells are absent, however, this does not preclude the feature having held water temporarily or even 'permanently'. If a waterhole or pond is artificially created in the downland, and especially if it is filled with rain, or groundwater, then it is unlikely to contain any freshwater or aquatic snails. Without a source habitat in close proximity, no colonisation of aquatic snails can occur, see Thomas (1985). It is not surprising, therefore, to find that examined isolated hollows or ponds contain fully terrestrial assemblages. Bearing this in mind it is possible to determine the presence of standing, stagnant, or permanent, or seasonal bodies of water. The presence of obligatory marsh species may indicate dampness, and catholic slum species may suggest pools of standing temporary water, while obligate hygrophiles, might indicate permanent water or even flowing water.

Pits and water

Aqueous-looking deposits in pits may suffer from the same ambiguities, but the presence of aquatic species likely to live in small bodies of water may confirm interpretations derived from the sediments. A number of Iron Age pits from hilltop hillforts have, surprisingly, contained rare, and often individual, shells of aquatic and obligatory marsh species. A single occurrence in one pit might seem to be explicable by natural causes. However, Ken Thomas suggested that nine specimens of the aquatic catholic species *Radix balthica* (*Lymnaea peregra*), from three samples in an Iron Age pit at Winklebury, Hampshire, were brought on site 'in vegetation or mud derived from a local marshy or aquatic habitat' (1977, 73), and thus were evidence of the exploitation of riverine environments (probably the River Loddon). Subsequently finds of freshwater or obligatory marsh species in a number of Iron Age hilltop sites show that they occur on several sites, albeit infrequently (Table 1.1). At the hillfort site of Battlesbury, Wiltshire, six aquatic and one marsh species were recorded from ten contexts including Iron Age pits, ditches and a posthole. The aquatic species were mainly catholic, tolerating a wide range of conditions (*Armiger crista*, *Gyraulus albus*, and *Pisidium subtruncatum*), ditch aquatic species, mainly occurring in slow-moving plant-rich streams (*Valvata cristata*), moving-water species (*Bithynia tentaculata*) and amphibious species (*Lymnaea truncatula*). The solitary marsh species, *Vertigo moulinsiana*, also present, can be found in areas adjacent to those inhabited by the true aquatic species.

Assemblages from other Iron Age hilltop sites such as Codford Circle, Wiltshire (Bryant 2002; Allen unpubl.), Danebury (Evans & Hewitt 1991), Barksbury (Allen 1995c; 2002), Winklebury, Hampshire (Thomas 1977), and The Bowsings, Gloucestershire (Allen 1998), have all contained aquatic and/or obligatory marsh species (Table 1.1). All of these hilltop enclosures have a source of freshwater within close proximity, and this strongly suggests that the exploitation of resources from the riverine contexts was common, but precisely what that resource was continues to remain speculation. Only at Danebury are freshwater taxa not recorded. Notably this is the furthest site from the nearest watercourse, while at Maiden Castle no Iron Age pits were examined (Evans & Rouse 1991). We suspect resources exploited could be alluvial mud or clay, reeds from the floodplain, or even the river water itself.

Table 1.1. Iron Age hilltop sites with Iron Age pits or other contexts examined for snails; many containing freshwater/obligatory marsh species (after Allen 2008, table 6.24)

Site		Altitude above nearest water course	Distance to nearest water course
The Bowsings, Gloucestershire	●	15 m	0.1 km to Windrush valley
Barksbury, Hampshire	●	20 m	0.2 km to Anton
Winklebury, Hampshire	●	30 m	0.8 km to Loddon tributary
Battlesbury, Wiltshire	●	c. 65 m	1 km to Oxendene Bottom, 2 km Wylde
Codford Circle, Wiltshire	●	100 m	1 km to Chitterne Brook, 1.6 km to Wylde
Maiden Castle, Dorset	⊗	40 m	0.4 km to Winterbourne
Danebury, Hampshire	○	80 m	3.4 km to Test

Key: ● = pits (or features) with freshwater species; ○ = pits (or features) with no freshwater species; ⊗ = no pits examined

Colluvium

Moving away from archaeological sites, and into the realms of 'off-site' archaeology, the presence of hillwash, or colluvium, provides superb opportunities for long stratified sequences of environmental change and land-use history. After studies in the 1950s, from a palaeo-geographic perspective, it became clear that these can provide a proxy record of human activity and land-use (Evans 1972). Indeed sequences were examined at a number of places with an archaeological agenda, as highlighted by John Evans, such as at Pitstone, Buckinghamshire (Evans 1966). The real archaeological breakthrough was via Martin Bell's analyses of hillwash sequences on the South Downs (1975–81), culminating in his seminal paper (1983), which demonstrated that most erosion was related to human activity, and that changes in land-use and human activity could be recorded over several millennia.

Soil erosion is accelerated by the human actions of deforestation and tillage, and the resulting colluvium can unpredictably vary from >1 m to over 3 m and accumulate over 9000 years (Bell 1983; Allen 1988; 1991b; 1992). This stratified sequence of sediment provides encoded land-use records via the snails. The South Downs and Wiltshire have probably been best studied (see Allen 1992; 2005), and many show changes from woodland, to open woodland to pasture and tillage in prehistory, and reverting to pasture and downland in the medieval period. This sequence clearly charts the development of the Downs from progressive prehistoric woodland removal, to tillage and soil erosion. Soils became thin and agriculturally unviable, and that the whole landscape reverted from a prehistoric arable, to one of medieval pasture and sheep farming. This is shown at Strawberry Hill, south of Devizes in Wiltshire, where a sequence of 34 contiguous samples through the 3.1 m sequence of colluvium covered a 9000 year long land-use history (Fig. 1.5; Allen & Gardiner 2009, fig. 5.2). Reconsideration of the colluvial sequence at Southerham Grey Pit, just metres downslope

STRAWBERRY HILL

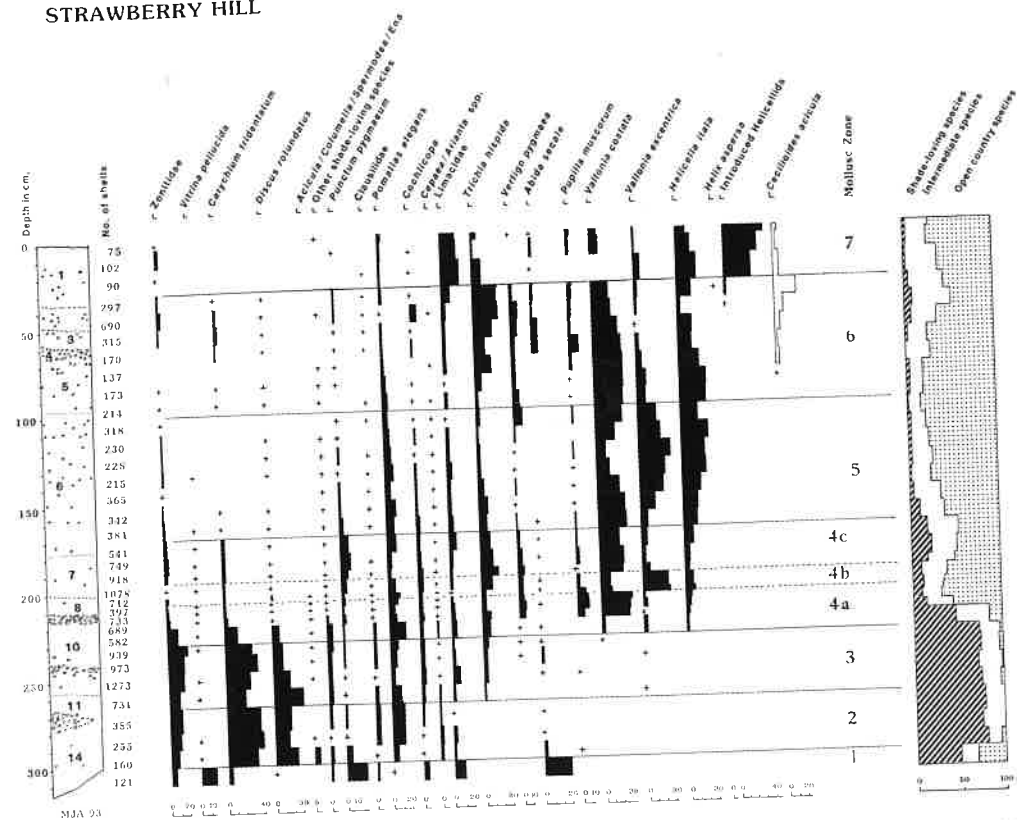


Figure 1.5. Strawberry Hill, Wiltshire; land snail histogram – showing 9000 years of development or creation of the downland

from the Round-the-Down Bronze Age barrow discussed above, showed a clear break in the assemblage composition of the open country species (Fig. 1.6), which, like those at Pink Hill, Buckinghamshire that puzzled Evans (1972, 312–16), have remained unexplained for many years (Allen 1995d). I now think this difference, characterised in the main by a predominance of *Vallonia costata* changing to one of *Pupilla muscorum* (Fig. 1.6), may reflect a change between arable land cultivated by ard (just creating a bare soil seed furrow), to that cultivated by plough which turns the soil creating a very different ground micro-habitat. Dated colluvial sequences are a very powerful interpretative tool providing a complementary combination of sediment and land snail evidence.

Site narratives

The potential of land snail analyses on any archaeological site needs to be realised by

Southerham Grey Pit

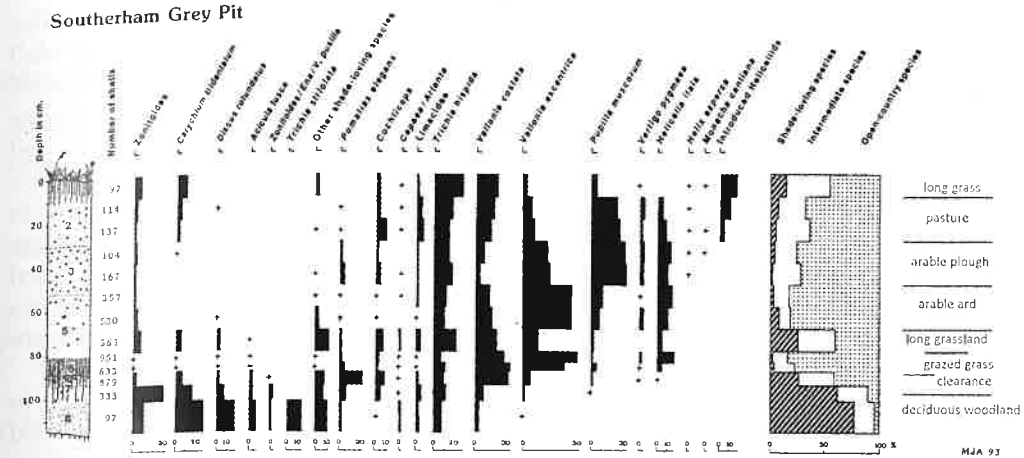


Figure 1.6. Southerham Grey Pit, East Sussex; land snail histogram, note the previously unexplained change in the open country-dominated assemblages (after Allen 1995b, fig. 4, with additions)

a suitable sampling strategy; ie, the selection of appropriate sequences and contexts with which to build a chronological narrative of the site. Most important is the fact that the deposits, or sequence, can be dated by the archaeologists; either by artefacts or absolute dating – without which the environmental changes documented by the land snails cannot be related to the archaeological site history. Sampling may often include natural treehollows, which are important in defining early prehistoric woodland presence: was there ancient woodland here? Or was the area naturally open and that openness attracted human occupation (Allen & Scaife 2007; Allen & Gardiner 2009; Allen, Chapter 9)? Careful selection of a range of buried soils, long stratified ditch deposits (essentially micro-colluvial sequences), and appropriate pits fills, enable a site narrative to be constructed. Examples can be seen by John Evans and Amanda Rouse's work at Maiden Castle (Evans & Rouse 1991; Evans 1991b), the Dorchester environs more widely (Allen 1997a) and on the Malling-Caburn Downs in Sussex (Allen 1995, 37).

Mapping land-use

For many archaeologists the provision of local site environmental histories is important, but for others is only a short-term aim. These data can be compared between sites and regions to look at a broad climatic and land-use development (see Chapter 9, Table 9.5). More recently, and from a strong archaeological view point, an attempt has been made not just to define change through time, but to examine and attempt to map land-use and vegetation across both space and time. Exemplary but crude attempts were made by the late Bob Smith for the Avebury area (1984), principally reviewing snail and pollen

evidence, but also incorporating bone, charcoal and geoarchaeological data. Inspired by this analytical reconstruction, and essentially based almost wholly based on land snail data, this was similarly attempted for the Dorchester area (created 1987, but published Allen 1997a, fig. 120), and the Stonehenge area. Initial, rather basic, landscape mapping was published for the Stonehenge environs in 1990 (Allen *et al.* 1990, fig. 155), and significantly revised in 1997 (Allen 1997b, pls 1–5) and is currently being significantly refined again (see Allen, Chapter 9). Such visualisations are, however, very expensive in analysis research time, requiring many stratified sequences from multiple sites. Each site may contain analysis of several contexts and features, and collectively the sites, located with a defined study area, allow spatial differences within prescribed time windows to be defined, and ultimately enable interpretive mapping of land-use over both space and time (eg, Allen 1997b, pls 1–5).

Land snail analysis in archaeology has come a long way from tentative attempts to examine moisture relating to 'climatic' environments of past cultures, to the detailed hypotheses of land-use from sites, to landscape histories. As such these land-use maps can engage directly and more readily with archaeological interpretation and hopefully bring the two 'disciplines' closer together, enabling greater dialogue, increased focused research, and better narratives. At a much wider level the landscape reconstruction video at the Stonehenge Visitor Centre is largely based on land snail data. This enables the public at large to engage with the changing archaeological landscape and land-use over time.

Acknowledgements

This chapter was principally inspired by John Evans and his book, 'the bible', *Land Snails in Archaeology*, and working on land snails with Martin Bell; I thank them and Charly French, for many wide-ranging discussions and the continued support. Thanks are also due to Alan Clapham for discussions on ecology. Amateur and professional archaeologists, and my students, continue to be fascinated by the 'stories' land snail can tell, and along with those mentioned above, has encouraged me to continue and pursue snails and geoarchaeology.

In completing this chapter I thank Tom Walker for information about key texts, and Jo Brück, Duncan Garrow and Paul Garwood for information on barrows.

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