

Small-vertebrate and molluscan analysis from the same site

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Summary

Small-vertebrate and molluscan data from the same two sequences about 55 m apart through Neolithic deposits at Maiden Castle, Dorset, England, are described. The small-vertebrate analysis was done to amplify the molluscan data and extend the spatial range of evidence. The molluscan sequences are matched through their similarities, and the litho-, archaeo- and ^{14}C stratigraphies.

The two small-vertebrate sequences match well, showing that they have at least site if not wider relevance. It is suggested on the basis of their fragmentary nature that the remains are from bird of prey predation and, specifically (in view of the absence of complete bones and skulls and a prey spectrum which suggests a diurnal raptor), from kestrel. They may be interpreted in site and local terms accordingly. From the point of view of the locality, the data probably reflect the selection of prey from areas of terrain such as hedgerows, field edges and river margins rather than randomly from around the roost, and this has to be borne in mind in environmental interpretation. All taxa were present throughout, with the significant exception of newts, which occurred in the lower part of the bank barrow ditch, perhaps reflecting the presence of an on-site permanent pond, and shrews, which occurred at the top of the sequences in a horizon which saw renewed human activity after a period of quiescence.

Interpretation is difficult because of the low numbers. Five kilogramme samples (not 1 kg, as used here) are recommended for future work. Species identifications are the most useful ecological data, so a good reference collection is essential. Identifications to higher taxa such as 'Amphibia' and 'total numbers' can give information of a more general nature and about roost-site activity, and skeletal element proportions can suggest the nature of the predator species.

Introduction

Subfossil Mollusca usually give information about the environment at the sampling spot, but it is seldom possible to extrapolate beyond that to the locality. This is because of the very local significance of the molluscs, and modern work has shown that boundaries between communities can be very sharp (e.g. Boag and Wishart 1982). This is especially true of the later Holocene, from the Neolithic onwards, when most contexts on archaeological sites are from spot or linear features like pits and ditches (Evans 1972). On a wider, regional, scale, broad chronologies of introductions have been detailed for southern and eastern England (Kerney *et al.* 1980), but they relate to long time and biogeography, not environment *per se*, and are therefore largely irrelevant to local issues in environmental archaeology.

One way of obtaining information about a larger area is to take more than one sample column from equivalent chronostratigraphical

sequences. Another is to use other types of biological indicator which, although not giving the very local—or on-the-spot—detail that molluscan assemblages do, are of more general, i.e. local or micro-regional, environmental significance. Pollen and insects are unsuitable in the usual preservational context for land molluscs (aerobic calcareous conditions) because they are not generally preserved, while charcoal, since it is mostly of anthropogenic origin on archaeological sites, is subject to the vagaries of human selection (although see Ashbee *et al.* 1979, table 2, and Dimpleby and Evans 1974).

Small vertebrates offer a suitable possibility because they are well preserved, although in smaller quantities than mollusc shells, and they reflect a bigger area than molluscs because they have larger home ranges. In some cases they reflect the site environment, as when they have fallen into pits or ditches and died there. In others, they are derived from raptor pellets, in which case they reflect

a wider area than shells, but may give less specific information. Clearly it is necessary to separate these two components.

Methods

The excavation in 1985 and 1986 of the Neolithic site of Maiden Castle, Dorset, England, was a suitable opportunity for comparing the use of small vertebrates and molluscs because both were preserved and multiple sample columns were obtained from the same chronostratigraphical (^{14}C) and archaeological sequences. The site is at about 130 m OD, on a chalk ridge with patches of clay-with-flints and plateau gravel. The South Winterbourne stream is 500 m to the south. The National Grid Reference for the sampling location is SY 670885.

The sample sequences

The situation at Maiden Castle is that the infilled ditches of an Early Neolithic double-ditched causewayed enclosure and of a later, but still Early Neolithic, bank barrow are overlain by a bank of an Early Iron Age hillfort. A ditch precedes the causewayed enclosure and this is referred to as the 'pre-enclosure feature'. The archaeology, lithostratigraphy, chronostratigraphy and molluscan sequences are described by Evans *et al.* (1988). The molluscan record (Evans *et al.* 1988; Evans 1990) indicates that the pre-enclosure feature was constructed in woodland, while the causewayed enclosure was constructed at a woodland edge. After a few centuries, the bank barrow was built in partly cleared land. Human abandonment at the hilltop followed and there was regeneration of woodland. In the later Neolithic, renewed human disturbance involved woodland clearance and cultivation. In the Bronze Age, the site was once again abandoned for human use; impoverished grassland developed on a decalcified soil.

Three sequences were analysed for small vertebrates and molluscs (Figs. 15 and 16):

MC XIII. This goes through the pre-enclosure feature and the overlying infilling of the inner ditch of the causewayed enclosure. The upper part of the sequence is a midden. The deposits are overlain by the bank barrow mound. The snails indicate woodland, and the presence of *Acicula fusca* and *Columella* sp., absent

subsequently, suggests that this was primary. Later there was slight clearance, probably for the construction of the causewayed enclosure and bank barrow.

MC III. This is through the inner ditch of the causewayed enclosure, about 55 m away from **MC XIII**. The deposits are not overlain by the bank barrow, so they continue the sequence until the construction of the Iron Age rampart which seals them. The horizon at which the bank barrow was built is indicated archaeologically (by pottery) and by ^{14}C dating, and there is an increase in open-country snails, specifically *Vallonia costata*, at this point. In the upper part of the sequence the site was abandoned and woodland spread in: *Ashfordia granulata* was characteristic. In the Later Neolithic there was renewed human activity, still in woodland, with *Pomatias elegans* characteristic, followed by clearance and ploughing across the ditch in the Beaker period. The Bronze Age environment was grassland on a decalcified soil.

MC IV. This is a sequence through the bank barrow ditch in the same trench as the **MC XIII** sequence, the whole of which corresponds to the **MC II** sequence between 90 and 0 cm. The same lithostratigraphy, archaeology, ^{14}C dates and molluscan sequences are present, but in an expanded form. Particularly distinctive is the dichotomy within the woodland phase, initially with *Ashfordia* and later with *Pomatias*. This dichotomy was recognised from two other sequences on the hilltop spanning the same time range, and although its significance in ecological terms is not clear, it serves to demonstrate the relevance to the site (i.e. hilltop) of the molluscan data.

Extraction and identification

All bones and teeth greater than 0.5 mm were extracted from the 1.0 kg molluscan samples and identified using the reference collections of the Environmental Archaeology Unit, University of York.

Results

Taxa

Most of the identifications were for teeth, although a few long bones, podials, scapulae, innominates, vertebrae, spines, scales and

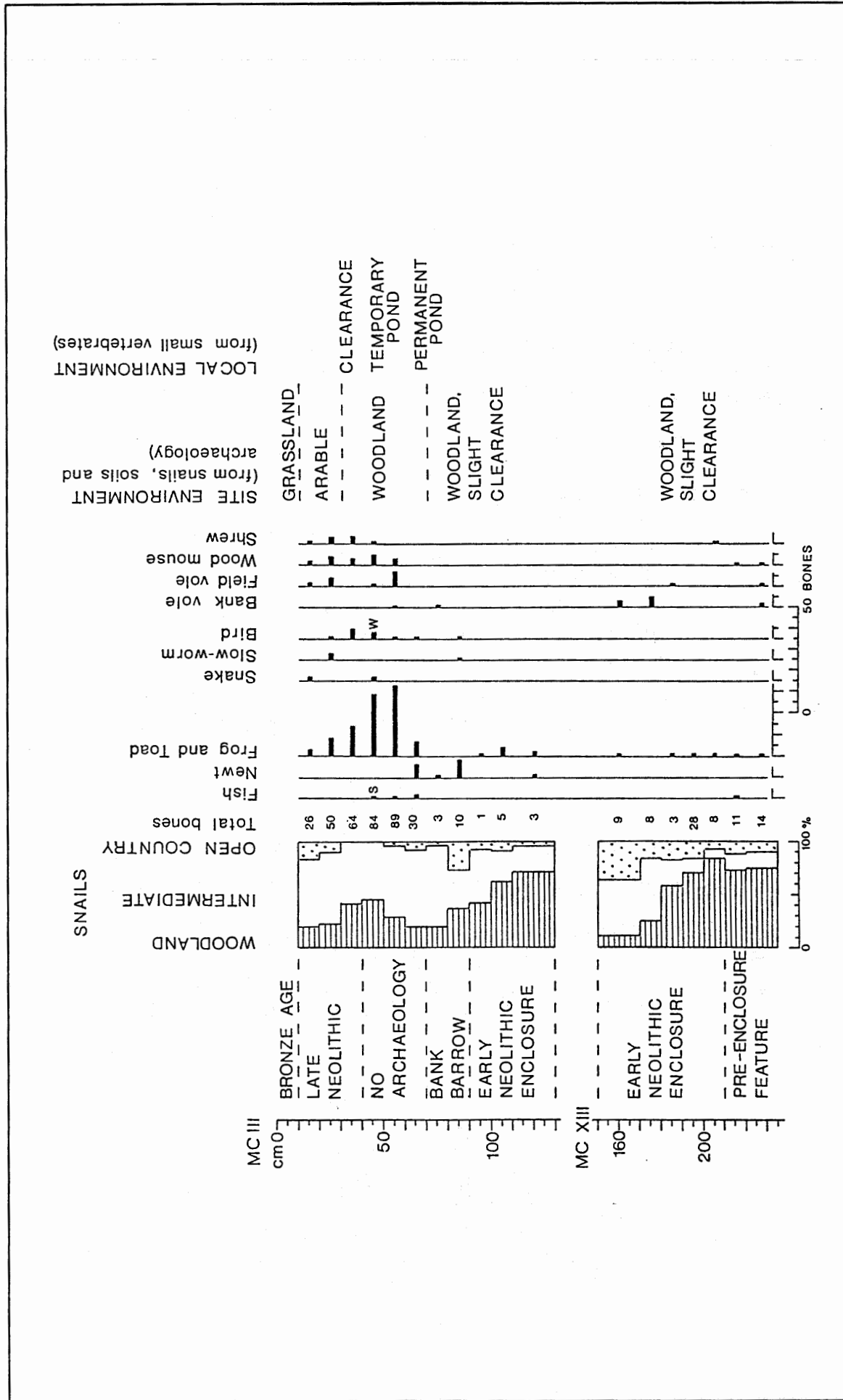


Figure 15. Maiden Castle: combined land-snail and small-vertebrate sequences, MC XIII and MC III. S = stickleback; W = includes one wren. Habitat, archaeological and molluscan sequences from Evans et al. (1988).

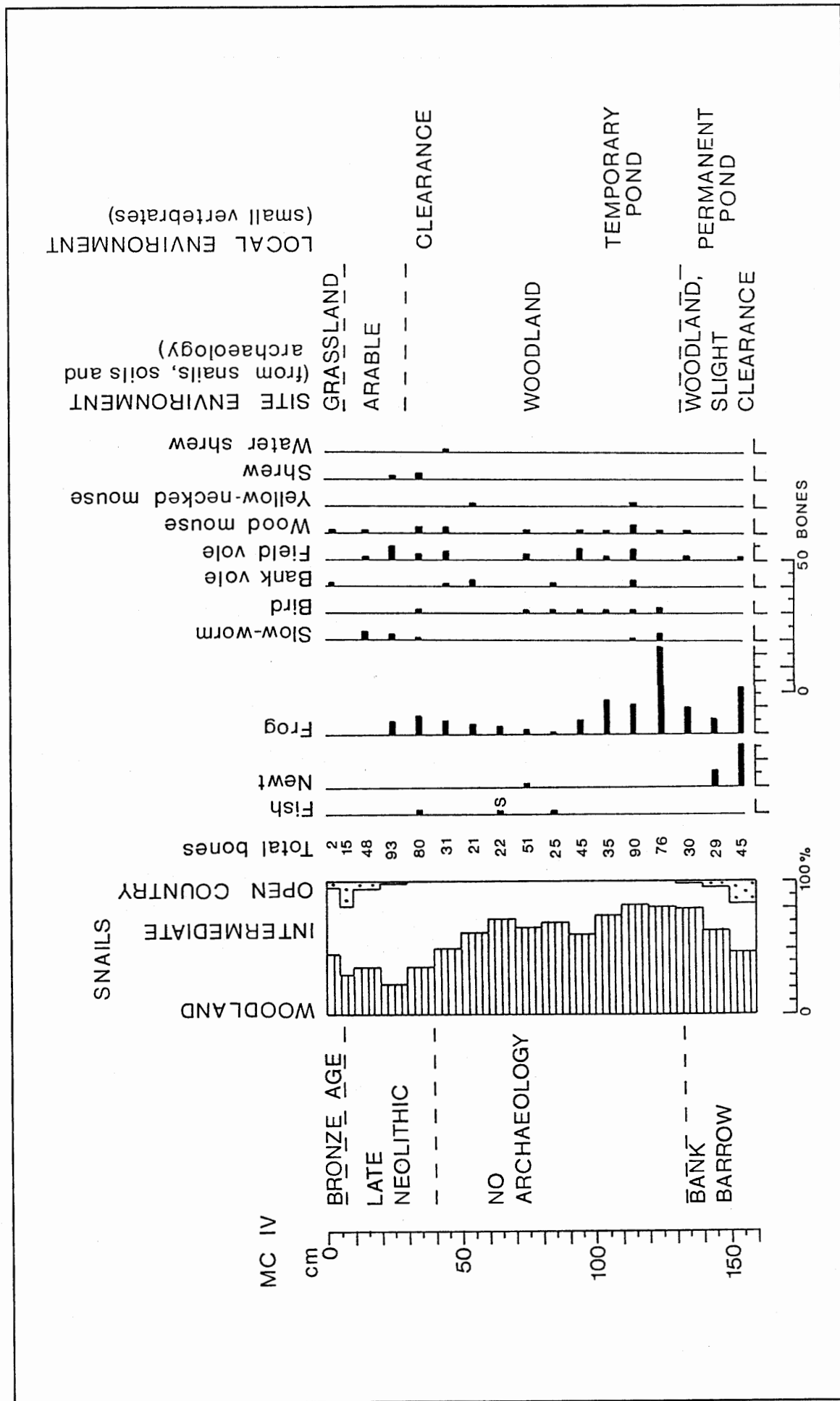


Figure 16. Maiden Castle: combined land-snail and small vertebrate sequences, MC IV. S = stickleback. Habitat, archaeological and molluscan sequences from Evans et al. (1988).

skull fragments were determinable. Much, however, could be identified only to groups such as 'mouse/vole', which is useful only for the information it gives on total numbers of fragments and the composition of the assemblages in terms of skeletal elements (Fig. 17).

The following taxa were identified:

- (i) fish, all very small, including stickleback, *Gasterosteus aculeatus* (L.).
- (ii) toad, *Bufo* sp.
- (iii) frog, *Rana* sp. Some material was identified only to toad/frog but both groups were present in all profiles.
- (iv) newt, indet. (Amphibia, Salamandridae).
- (v) bird, all very small, of pipit/wagtail size, and one wren, *Troglodytes troglodytes* (L.).
- (vi) probably grass snake, cf. *Natrix natrix* (L.), identified from a vertebra (cf. Holman 1985).
- (vii) probably adder, cf. *Vipera berus* (L.), identified from a tooth.
- (viii) slow-worm, *Anguis fragilis* (L.).
- (ix) shrew, probably all common shrew, *Sorex araneus* L.
- (x) water shrew, *Neomys fodiens* (Pennant).
- (xi) bank vole, *Clethrionomys glareolus* (Schreber).
- (xii) field vole, *Microtus agrestis* (L.).
- (xiii) mouse, probably wood mouse, *Apodemus sylvaticus* (L.).
- (xiv) probably yellow-necked mouse, *Apodemus flavicollis* (Melchior), identified from a distal end of a humerus plus shaft and an upper first molar. In view of the difficulties in identifying this species even with complete mandibles (e.g. Bramwell *et al.* 1990), these identifications must remain tentative.

Taphonomy and origin of the material

All the material was fragmentary, usually only the smallest bones, the phalanges, being complete. Mostly there were single teeth, parts of long bones and skull and mandible fragments, the last two categories with never more than two or three teeth *in situ*. There were no complete skulls and jaws. Most of the long bones were incomplete, often with epiphyses partly destroyed and the shafts with long oblique breaks. These data, together with the general paucity of fragments (Figs. 15 and 16), indicate that the material is not from animals that died in their place of deposition but from predator debris, and specifically from bird of prey pellets. Elsewhere on the site, in Iron Age storage pits, complete skeletons (including those of weasels) were preserved, and these are from animals caught in the pits (information from Miranda Armour-Chelu, who has worked on the Maiden Castle bone), but this is not the origin of the material discussed here. The contexts, too, are wide ditches which, after a small amount of infilling and weathering of the sides, would have allowed easy escape; they would not have functioned as natural pitfall traps.

Most of the material is probably from kestrel, *Falco tinnunculus* Linné, pellets, as suggested by the small size of the prey (absence of larger vertebrates such as squirrels, mustelids, etc.), the prey spectrum (which suggests daytime hunting), the very varied diet (Village 1990) and the very fragmented nature of the material. Owls, for example, and especially the barn owl, *Tyto alba* (Scop.), produce pellets with relatively complete long bones, and skulls with teeth often in place (Andrews 1990). Diagrams of skeletal element proportions (Fig. 17) do not match those of either barn owl or kestrel as presented by Andrews (1990). His data show more skull fragments and fewer phalanges for kestrel; however, these are from modern pellets and it may be that, in soils, skull fragments become broken down. There is also the point that the Maiden Castle material may be from more than one predator species.

With regard to this last point, the possibility must also be considered that the amphibian bones are from a different source, specifically from animals that lived (even if transiently) and died on the site, especially since they are rarely taken by kestrels today (Village 1990). The topography of the site and the porosity of

the chalk would not have allowed the ditches to have held water long enough for amphibians to breed in them, and there are no aquatic mollusc assemblages, but it is possible that they were suitable sites for hibernation. However, the amphibian remains are as fragmentary as the mammalian and other material and, although more abundant in some levels, this abundance is low by comparison with what might be expected from the remains of complete skeletons. Furthermore, although there is a concentration of amphibian remains in the lower part of the MC IV sequence, this location is fortuitous, being matched by a similar concentration at the same chronological level in the MC III sequence, but much higher up in the ditch. We therefore conclude that the amphibian remains are likewise from raptor pellets, although not discounting the possibility that they may be from a different, perhaps more local, origin than some of the mammalian material. Certainly, it appears that freshwater habitats were being exploited by the raptors, if the fish bones, too, were from pellets.

Examination of the types of corrosion to distinguish different types of raptor (e.g. Mayhew 1977) and to separate the effects of pedological processes from stomach acid corrosion (e.g. Andrews 1990) was not made, in view of the small amount of material, the probability that more than one raptor species was involved, the uncertainties of distinguishing diurnal and nocturnal raptors (Andrews 1990) and the variety of deposits.

The sequences

The main features of the sequences are as follows:

(i) allowing for absences which can be attributed to small sample size, almost all taxa are present throughout. The two exceptions are newts and shrews. Some taxa, such as frogs and toads, are abundant and continuously present; others, such as fish and bird, are in low numbers and sporadic. Field vole and wood mouse are more uniformly present than bank vole.

(ii) the earliest deposits (MC XIII) are characterised by bank voles, contrasting them with later levels.

(iii) newts are characteristic of the bank

barrow horizon.

(iv) frogs and toads are abundant in the woodland horizon between the Early and Late Neolithic.

(v) shrews, including water shrew, are present mainly in the Late Neolithic horizon.

(vi) the MC IV sequence is broadly similar to the equivalent part of the MC III sequence 55 m away.

Discussion

Size of area represented by the material

Various indications suggest that the small-vertebrate sequences reflect the local rather than solely the sampling spot environment, and in this respect they differ from the molluscan data:

(i) The home ranges of the small vertebrates are large, especially when compared with those of land mollusca.

(ii) As argued above, in the specific case of Maiden Castle, the material is probably of bird of prey pellet origin, and this implies a greater sphere of reference with regard to environmental interpretation than would be the case if the bones had derived only from animals whose home ranges had encompassed the sampling spots. For kestrels, the home range varies from about one to about ten square kilometres (Village 1990).

(iii) There are two similar sequences which match chronologically from the bank barrow level upwards, 55 mm apart, illustrating that the individual sequences are of more than sample spot significance. This is deemed to be the most important result of the investigation.

In addition, the remains are giving information about roosting/nesting sites (or, at the very least, pellet-regurgitation sites), usually well above ground on posts, in trees or in buildings. Thus the increase in abundance of remains in the period of human abandonment between the Early and Late Neolithic is probably a reflection of the increasingly wooded nature of the site at this time.

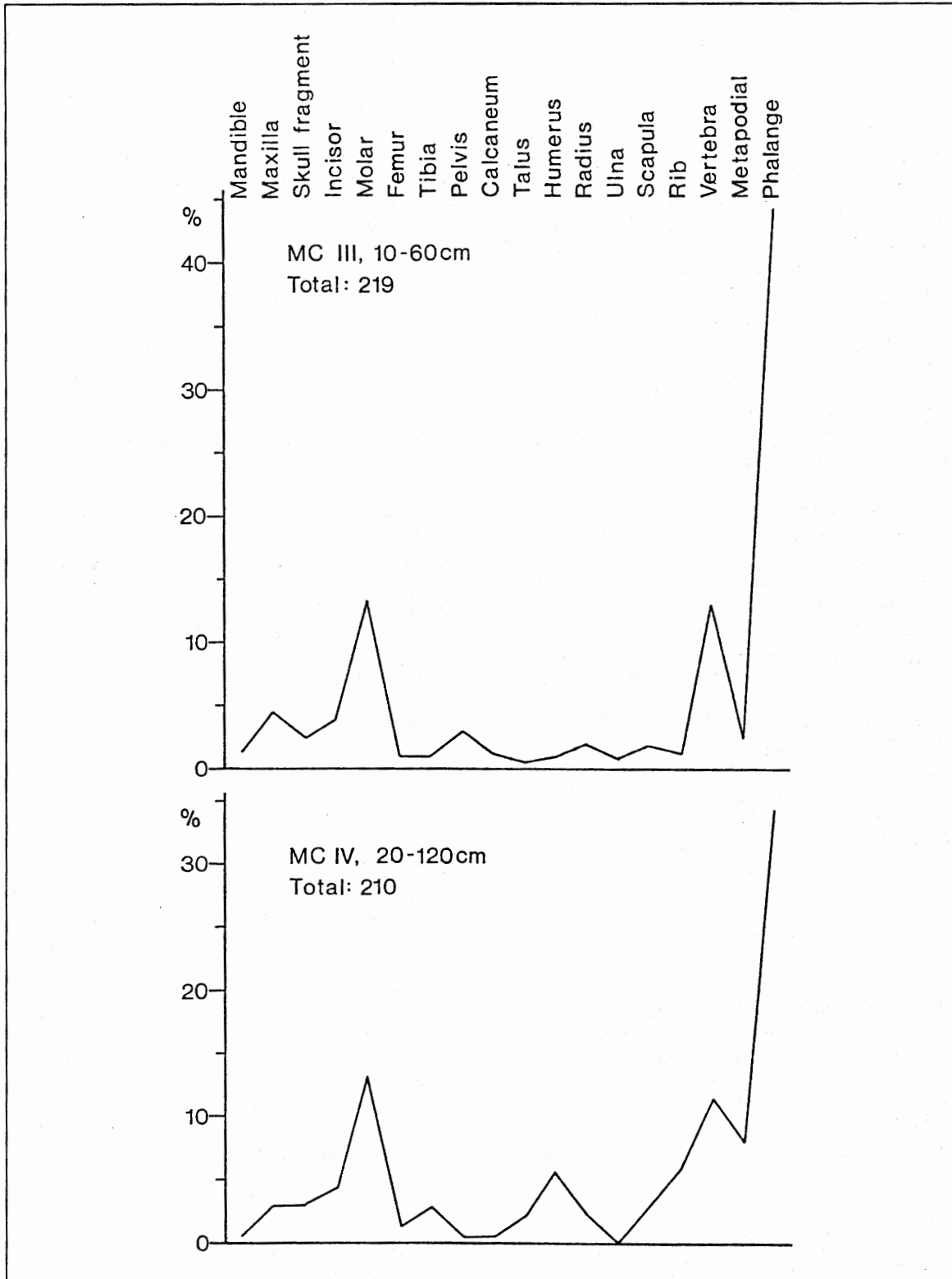


Figure 17. Maiden Castle. Skeletal element proportions of small vertebrates as percentages of fragments whose skeletal element was identified (not of total fragments).

General environmental interpretation

Because the material probably derives from bird of prey pellets it does not reflect a uniform area, for particular raptors select particular parts of the landscape for their hunting and have particular prey preferences. The kestrel, for example, argued as being the main species responsible for the accumulations at Maiden Castle, hunts scrubby hillsides and woodland edge, as well as grassland, and has a very varied diet, although concentrating on field vole, *Microtus agrestis* (Masman *et al.* 1988; Village 1990); barn owls, on the other hand, select long strips of open land along field edges, streams or woodland/arable interfaces, and also prey very heavily on field voles (Shawyer 1987). These aspects of raptor behaviour need to be borne in mind when considering the results.

The assemblage is a mixed terrestrial and amphibious one, with a few aerial and aquatic representatives. The terrestrial taxa reflect a heterogeneity of local habitats—open (field vole), scrub (bank vole, shrew) and woodland (mice)—although species should not be assigned too rigidly to habitats. The amphibious species may have been living on the hilltop in artificial ponds and/or taking advantage of the Neolithic ditches for shelter and hibernation, while breeding by the South Winterbourne stream, 500 m away. Whatever the case, they were part of the raptor spectrum, not living and dying in the Neolithic ditches in their place of burial. The aquatics (fish and, to a lesser extent, water shrew) at least are clearly from further afield.

The temporal sequence

Little can be said about the pre-enclosure and Early Neolithic enclosure levels because numbers of bones are low, but the abundance of bank vole in MC XIII against the paucity of field vole (and in contrast to the situation in the later part of the bank barrow ditch fill) is perhaps significant and indicative of good scrubby ground cover in and around woodlands.

The distinctive feature of the bank barrow horizon, the abundance of newts, suggests the presence of a pond on the hilltop, although there is the alternative possibility that these and other amphibians were breeding in water bodies further afield. If a pond had been present on the hilltop in the Neolithic period it would certainly have had to have been an

artificial, clay-lined one. A pond would have been a not unlikely feature of the site in view of the predominantly cattle-raising economy of the Early Neolithic, and especially the importance of causewayed enclosures in this.

Allowing the pond hypothesis, the later absence of newts in the earlier part of the secondary woodland stage when the hilltop was abandoned suggests that the pond became infilled. This was a period of considerable diversity in the small-vertebrate assemblages, indicating an undisturbed environment for raptor roosting and nesting, and supporting the archaeological and molluscan evidence for human abandonment and woodland regeneration on the hilltop.

In the upper, Later Neolithic, parts of the sequences, toads and frogs decline, suggesting water was further away. Shrews are characteristic at this time, although the ecological significance of this is unknown. Their appearance with the land snail *Pomatias elegans* may be commented on, with the implication of a possible predator-prey relationship. Terry O'Connor has suggested a relationship with human activity and, as this was a period of renewed human activity, first in woodland, and later in a cleared and cultivated landscape, the shrews may in some way be reflecting this.

Wider implications of the results

The small-vertebrate data do not reflect the detailed story shown by the molluscs for the site (Evans *et al.* 1988). Instead, they indicate a heterogeneous landscape around Maiden Castle from the very beginning of the sequence, that is prior to the construction of the causewayed enclosure, and this is backed up by other evidence. For example, surface flint scatters, studied by Peter Woodward, show localised areas of activity at the eastern end of the hilltop and on the valley sides in the Early Neolithic, probably prior to the causewayed enclosure. So there was probably some clearance of woodland in the locality. The enclosure itself was probably sited on the edge of this activity, at the woodland edge, and there is molluscan evidence that the eastern end of the enclosure was in more open country than the western end, where the sample series described in this paper came from. Indeed, evidence generally from causewayed enclosures in southern England suggests them to have been sited on the edge

of territories, in woodland clearings (Evans *et al.* 1988).

Wood charcoal, studied by Rowena Gale, amplifies the picture further. Oak and other woodland trees were exploited in the Early Neolithic and continued in use into the bank barrow horizon and secondary woodland stage. By the time of the Late Neolithic clearance, however, shrubs of wet and acidic soils were being utilised, indicating that people needed to exploit areas further afield than previously for timber and reflecting progressive clearance of the area and the need to go further afield than previously for timber.

All this suggests that the Later Neolithic woodland in the ditches at Maiden Castle, and perhaps too as recorded at other sites in southern and eastern England (Evans 1990), was specific to these sites. This is not to say that abandonment or relaxation of use of the land was not a general feature of then landscape at this time, only that such practice was being registered more fully in the ditches of monuments than elsewhere.

Conclusions

Small vertebrates, when derived from raptor pellets, give information additional to that from molluscs at the local and small-regional scales. The most important observation to emerge from the work at Maiden Castle is that two later sequences, from points 55 m apart, are similar. But bigger samples, at least 5 kg, are needed to provide more precise data. The sort of information about subtle environmental changes in vegetation cover that are revealed in modern studies of raptor pellet debris can only be obtained with much larger data bodies than used in this paper (e.g. Yalden and Morris 1990). Reference material is crucial because information at other than the species level is only useful for indicating general trends in input and possibly raptor species.

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