

Land Snails and Woodland Clearances: modern ecological studies and their archaeological implications

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Over thirty years ago, in Land Snails in Archaeology, John Evans argued that when the molluscan evidence from buried soils under Neolithic monuments indicated open-country settings such cleared areas could be considered as probably being on the scale of some hectares. However, he also repeatedly emphasised that confirmation of this depended upon modern quantitative studies on the response of snails to woodland clearance and on modern and sub-fossil investigations into the lateral variation of molluscan assemblages across land surfaces. Since then a number of relevant studies have been undertaken, many by John and his students, and this paper considers how far our understanding has advanced.

Particularly relevant have been studies looking at the response of land snails to environmental boundaries, mainly woodland-grassland borders, and responses to woodland clearance or disturbance. From these, two main conclusions can be drawn. First, it is evident that across long-established boundaries adjacent woodland and grassland faunas may remain discrete, with little spatial overlap. Second, discrete grassland faunas can develop in relatively narrow (less than 10 metres width) isolated grassland stretches within woodland. Together these indicate that in the archaeological record, it may be unlikely that snail evidence alone can distinguish between small (perhaps even sub-hectare) and large (many hectare) clearances.

Another finding worthy of note is that when old grassland clearances within woodlands are enlarged, the newly extended grassland area retains a woodland-type fauna for a considerable period of time (between 15–20 years), even though suitable open-country coloniser species are present in the adjacent older grassland or as minor elements of the woodland fauna itself. This ‘expansion-lag’ for open-country species suggests that where sub-fossil molluscan evidence has been proposed for temporary Mesolithic age woodland clearance episodes (whether natural or anthropogenic) the clearances most likely remained open for some time.

In *Land snails and Archaeology* (Evans 1972), John considered that temporal blurring and spatial mixing of snail populations into re-

covered assemblages made the interpretation of assemblages from buried soils beneath monuments applicable to the wider environ-

ment. He argued that ‘... in a relatively homogeneous environment, such as a cultivated field or chalk downland, the distribution and abundance of a species in the area as a whole tends to be uniform’ (p. 111), and was confident, at the time, that when open-country assemblages were recovered from buried soil surfaces, reflecting either grassland or cultivation prior to monument construction, the cleared areas indicated were of a size that could be ‘... considered in terms of human land use’ and that they most probably represented open areas of some hectares (p. 114). However, he was also well aware that this still needed to be backed up by empirical evidence. Hence he acknowledged that ‘... as a topic of future research, the lateral variation of ancient land-snail faunas over the surface of buried soils is to be recommended, as a problem of both ecological and environmental interest’ (p. 115), and that lateral variation in modern faunas would be likely to occur due to ‘... environmental heterogeneity, however subtle this might be’ (p. 112).

John further addressed the issue of the likely size of the cleared areas, conceding that that it was possible that a woodland clearing of perhaps only 100 square metres might develop its own characteristic – essentially open country – fauna given enough time (p. 116), indicating that where assemblages recovered from buried soils suggested open-country this could not, in itself, be taken as proof of extensive open environments around the site. He emphasised several times that more quantitative work on modern populations of woodland clearances was also needed.

Since 1972 more work has indeed been done, much of it by John himself and/or his research students, and it is of value to revisit these and related issues since they are fundamental to how we interpret the wider spatial relevance of assemblages from buried soils beneath monuments and to how we recognise and interpret prehistoric woodland clearance or disturbance phases using molluscan evidence.

Modern ecological work on small-scale lateral variation of molluscan faunas

The need for modern ecological work on the lateral variation of molluscan faunas was

eventually made starkly evident from John Evans and Amanda Rouse’s analyses of the molluscan assemblages recovered from the buried soil surface beneath the Easton Down long barrow (Whittle *et al.* 1993). Instead of relying solely upon a single vertical sequence through the buried soil – the standard sampling approach to such contexts – they also analysed a series of samples taken from the buried soil surface itself (sample series EDI). The results clearly demonstrated that the barrow had been situated at an environmental boundary, probably woodland-grassland. Crucially, this was not evident from the single sequence through the buried soil (EDIV), the uppermost sample of which indicated open grassland.

The implication of this study was clear. Relying upon a vertical sampling approach was likely to be insufficient to allow extrapolation of the results to the wider environment. This implication fundamentally alters how we should interpret data previously (and still currently) obtained from single vertical sequences through buried soils beneath monuments. The need for caution when extrapolating such data to the surrounding environment is clear. Subsequent modern studies have also confirmed this. For example, Rouse and Evans (1994) went on to show that small-scale spatial variation in topography, aspect and vegetation affected molluscan faunas at Maiden Castle, and Davies and Grimes (1999) and Davies (2003) demonstrated that faunas were affected by small-scale lateral variation in topography, moisture and vegetation in relic watermeadow systems in Wiltshire and Hampshire. Most relevant was the study by Davies (1999) of modern death assemblages across a woodland-grassland boundary at Bossington in Hampshire. This study demonstrated that in general terms the molluscan faunas of the woodland and grassland were discrete, with very little spatial overlap or mixing at or near the boundary of the two habitats. The assemblages recovered from individual turf samples *c.* 2 metres within the woodland showed very little indication of the nearby grassland, and the assemblages recovered from individual turf samples from the grassland *c.* 2 metres from the woodland edge showed minimal evidence of the nearby wood. This study clearly indicated that open-country assemblages could be recovered even if woodland was very close – a matter of metres away. It also strengthened Evans and Rouse’s

interpretation that Easton Down long barrow was built across an environmental boundary rather than merely near one.

Modern ecological work on woodland clearance and woodland disturbance episodes

There have been very few studies directly addressing how modern snail population responses to woodland clearance or disturbance relate to our interpretation of archaeological assemblages. In considering the general issue both Thomas (1982) and Davies (2003) have pointed out the fallacy of believing that open-country as indicated by assemblages recovered from buried soil surfaces necessarily must suggest a reasonably large area of open landscape and possible continuity with other open areas, else otherwise it is impossible to explain how the open-country species got there. Both authors have emphasised that since some of the species that thrive in open-country can also be present in woodlands, albeit in low numbers, the opportunity for migration is not necessarily a pre-requisite for the establishment of an open-country type fauna within a cleared area. A number of purely modern studies are of help in considering this general point further; firstly in considering how temporary woodland clearance or disturbance through coppicing or firing depresses woodland faunas; and secondly how such impacts allow for the subsequent expansion of open-country species. In archaeological terms these studies are important, since both negative (ie, depression of shade-requiring species) and positive (ie, expansion of open-country species) responses have been taken as indicative of temporary woodland disturbance in assemblages recovered from prehistoric deposits. This is particularly so from tufa deposits where Mesolithic-age temporary clearances or disturbance phases have been proposed from a number of sites in Britain and Ireland (eg, Preece 1980; Preece *et al.* 1986; Preece & Bridgland 1999; Davies & Griffiths 2005).

It is evident from the modern literature that coppicing *may* affect woodland faunas (Berry 1973), although it is certainly not inevitable. Clearly the frequency and intensity of coppicing activity may be important, since some other studies have shown little or no affect on molluscan faunas (eg, Paul 1978;

Millar & Waite 1999). Fire disturbance may also affect woodland faunas although, as in coppiced or cleared woodlands, shade-demanding species can survive by utilising microhabitats on trunks, stumps, fallen branches or logs (Hylander *et al.* 2004), and faunas can fully recover within a one year to 10 year period following disturbance (Kiss & Magnin 2003; Kiss *et al.* 2004). The significance of coarse woody debris as refugia for shade demanding species following disturbance has also been shown in a number of other studies (eg, Caldwell 1996; Coney *et al.* 1982; Fog 1979a; 1979b; Muller *et al.* 2005), with some shade-demanding species, such as *C. tridentatum*, *A. pura*, *D. rotundatus*, *M. incarnatus*, *C. laminata* and *O. cellarius* having been found to be positively associated with such material (Kappes 2005). Small, temporary clearances have also been shown to have little overall effect on woodland faunas by Strayer *et al.* (1986) and Kralka (1986), the latter showing that the original fauna recovered within 5–10 years of clearance, a finding clearly of archaeological importance. As Davies (2003) suggested, such short temporary clearance or disturbance phases are unlikely to be evident in the sub-fossil record. Even if open-country species did temporarily respond positively to similar such impacts in the prehistoric past, the modern data suggest that the shade-demanding species will quickly recover, if indeed they are affected in the first place at all, and the episode is not likely to be apparent in the temporally-blurred sub-fossil assemblage later recovered. More directly, it is worth pointing out that none of the modern studies discussed above show an expansion of open-country species in the short-term clearance or disturbance phases, rather they all only demonstrate a suppression (if at all) of woodland species abundance.

We are left then with two questions. First, how long must clearances actually persist within woodlands, either as result of human or other (eg, grazing) intervention, before noticeably open-country snail faunas become established at the expense of woodland ones? Second, how large do such clearances actually have to be to support obviously open-country faunas, rather than mixed open-woodland ones? The latter is also a question that has a bearing on the extent to which we can perhaps tentatively infer open country areas around monuments when the recovered assemblages do suggest open country as discussed in the previous section. Clearly,

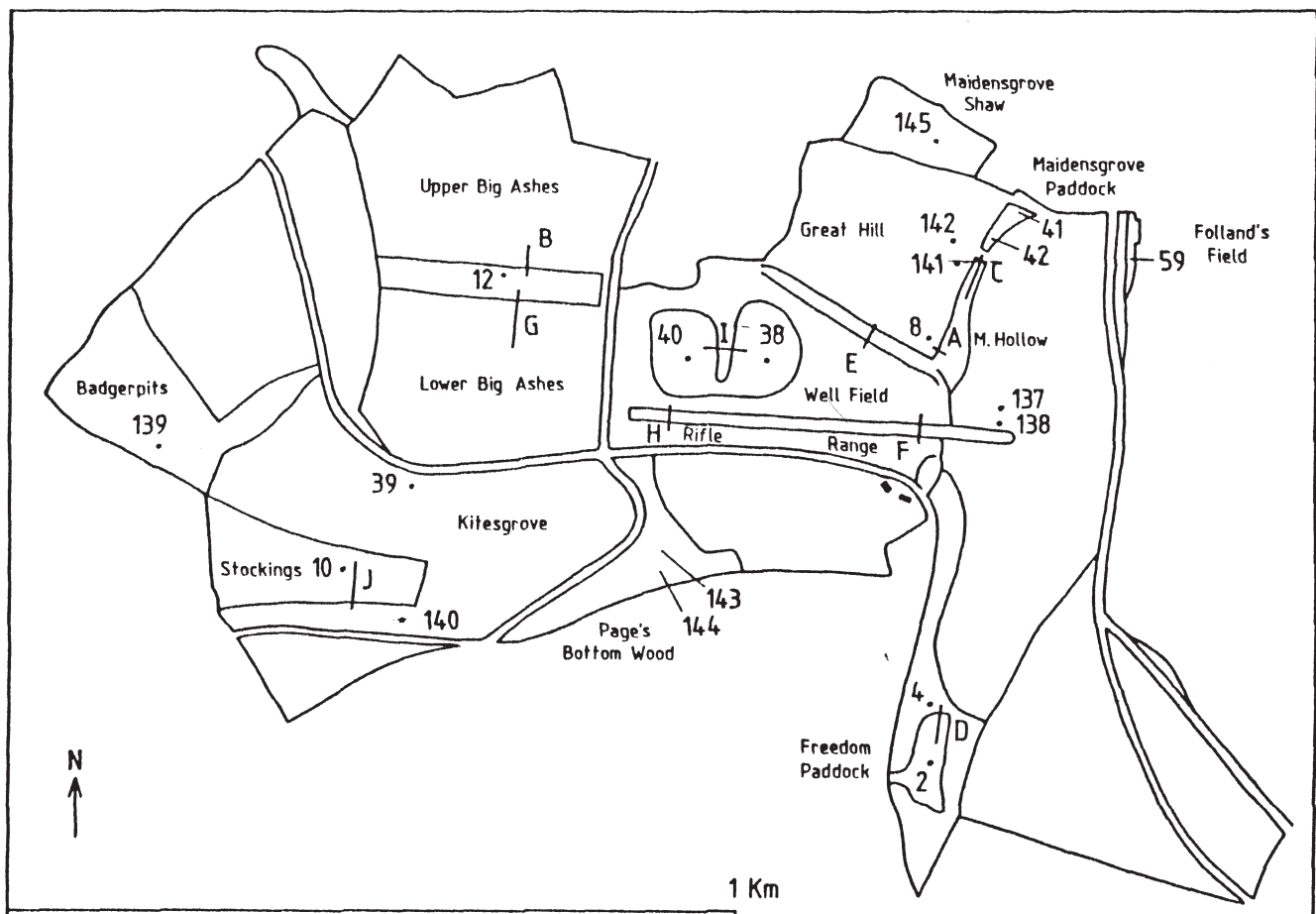
from the studies considered above these are questions that as yet remain unaddressed in the published literature, although that literature is helpful in demonstrating that woodland faunas are generally unaffected by, or recover quickly from, very short-term clearance or disturbance events such as coppicing or natural fires. However, hitherto unpublished work by one of John Evans' research students, Neville Gardner, at The Warburg Reserve in Oxfordshire between 1988 and 1991 (Gardner 1991) is of direct relevance as outlined below.

The Warburg Reserve, Oxfordshire

The Warburg Reserve is a c. 250 hectare nature reserve located on chalk in the Bix Valley near Henley-on-Thames, Oxfordshire. Since 1968 the reserve has been managed by the Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust. Although the reserve is largely wooded, there are a number of wide grassland rides,

some of which are well over a hundred years old, such as the 'rifle range', so-called because it was used for this purpose in the Second World War, and the ride just below the area known as Great Hill. Other rides are more recent, having been added to improve woodland edge habitat, such as that between 'Upper Big Ashes' and 'Lower Big Ashes' in the north-western part of the reserve, and near Well Field in the central part of the reserve (Fig. 6.1). In addition, some of the older rides have been widened in recent years to also increase woodland edge habitat. The reserve therefore offers a combination of older and more recent grassland clearances of different sizes within a generally wooded environment; an ideal location in which to assess molluscan responses to woodland clearances through time. Gardner (1991) used a turf-sampling method along transects crossing some of the woodland-grassland boundaries, and 5 of those transects are considered here; Warburg E, F, G, H, and I (Fig. 6.1). All ages quoted refer to age at time of sampling.

Figure 6.1: The Warburg Reserve, Oxfordshire and molluscan sampling transects (from Gardner 1991)



Warburg E

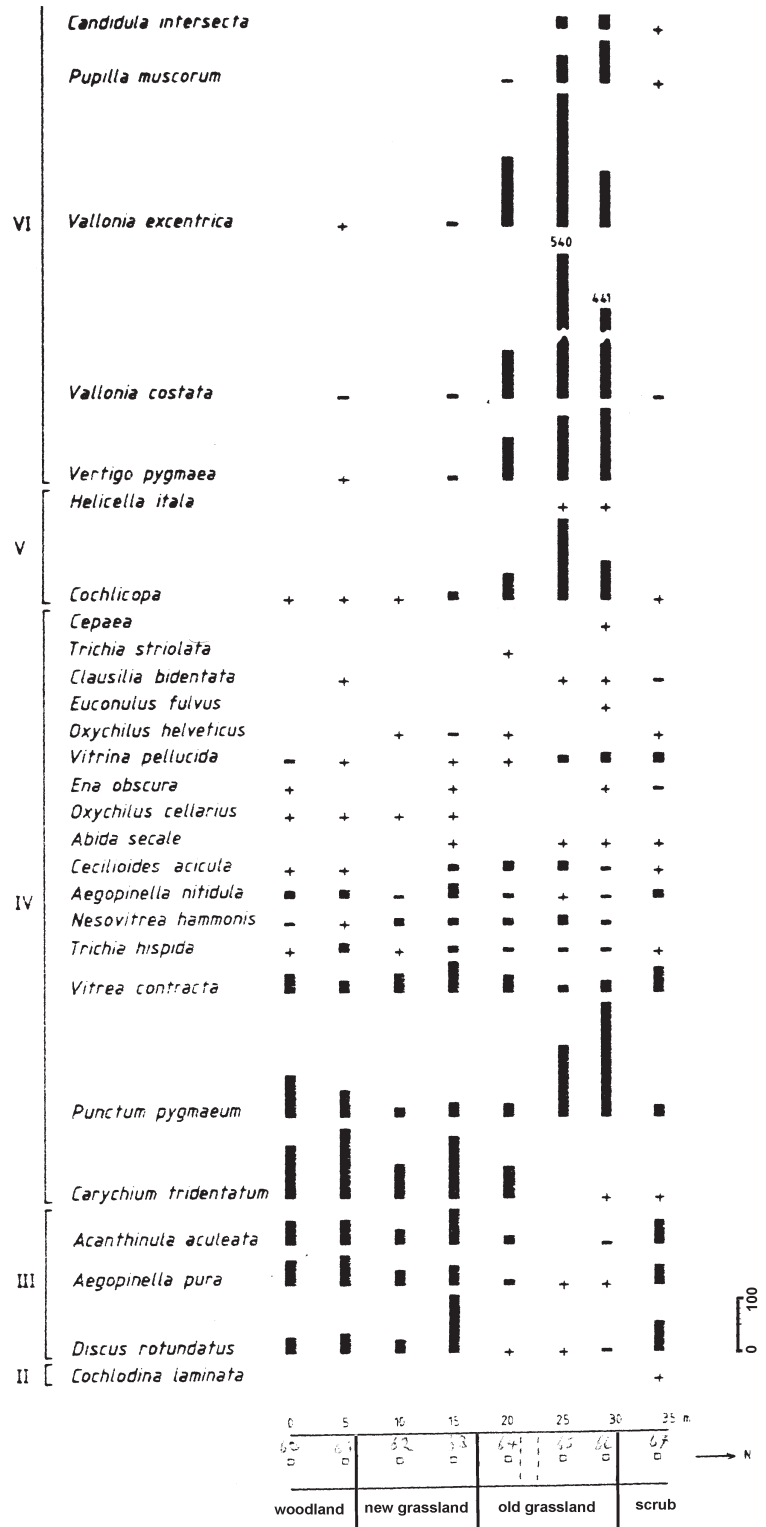
The Warburg E transect was located across a 15 metre ride of at least 100 years old, here referred to as the 'old' grassland, situated below Great Hill (Fig. 6.1) and a recent (*c.* 8 years before sampling) *c.* 12 metre wide ride-extension, here referred to as the 'new' grassland (Fig. 6.2). The molluscan species recovered from the scrub at the northern limit of the transect and from the woodland at the southern limit of the transect consisted mainly of a typical 'woodland' suite, namely *Discus rotundatus*, *Aegopinella pura*, *Acanthinula aculeata*, *Carychium tridentatum* and *Punctum pygmaeum*. Only a few open-country species were recovered from these woody areas – *Vallonia costata*, *Vallonia excentrica* and *Vertigo pygmaea* – all in very low numbers, and most of those from a sample only *c.* 1 metre from the 'new' grassland edge. The 'new' grassland itself was also dominated by the 'woodland' suite of species, with very low numbers of open-country species. In contrast, the 'old' grassland was overwhelmingly characterised by open-country species – *Vallonia costata*, *Vallonia excentrica*, *Vertigo pygmaea* and *Pupilla muscorum*, with shade-demanding species poorly represented with the exception of *Punctum pygmaeum*. Clearly, the 'old' grassland contained a typical grassland fauna, but the 'new' grassland did not, even though it was directly adjacent to the older grassland.

Warburg F and H

The Warburg F and H transects were located across the 'rifle range' (Fig. 6.1). Both transects incorporated 'old' grassland of around 8 metres width and of at least 100 years standing, and 'new' grassland (*c.* 13m width at transect G and *c.* 5m width at Transect H) of only 1–2 years standing at the time of sampling (Figs 6.3 & 6.4). The results from both transects showed once again that the 'new' grassland still contained a woodland-type fauna (similar to that described above for Warburg E), but that the 'old' grassland had an established open-country type fauna, in both cases dominated by *Vallonia excentrica* and *Vertigo pygmaea*. As was the case for Warburg E, it is important to note that the 'new' grassland was directly adjacent to the older grassland.

Warburg G

Warburg G was situated across a 20 year-old ride between 'Upper' and 'Lower' Big Ashes



(Fig. 6.1). An area adjacent to that ride had been cleared of woodland *c.* 10 years previously, but had immediately been allowed to revert to scrub, indicated as 'cleared woodland' on the molluscan diagram (Fig. 6.5).

Figure 6.2: Mollusca from transect Warburg E (adapted from Gardner 1991)

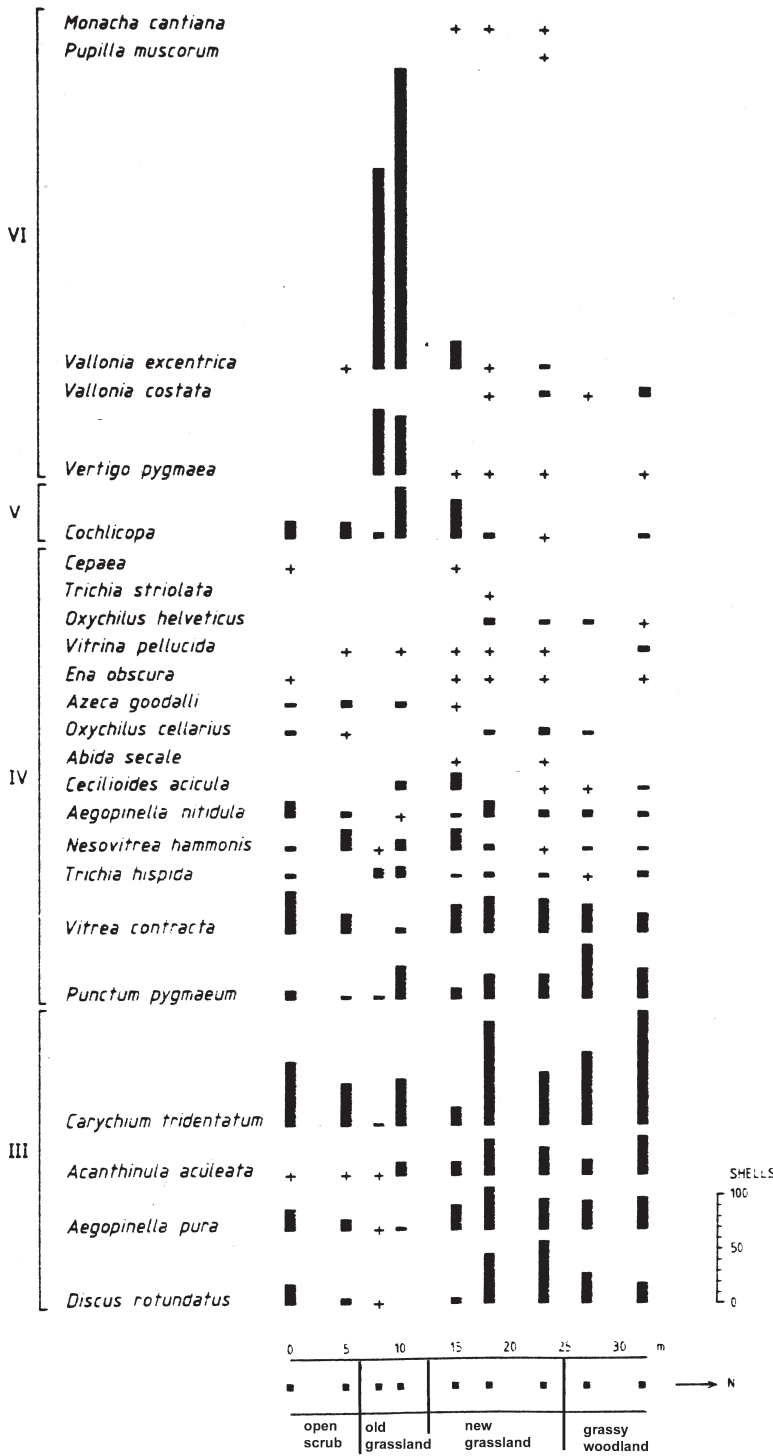


Figure 6.3: Mollusca from transect Warburg F (adapted from Gardner 1991)

The results show that the 20 year-old grassy ride, termed ‘old grassland’ on Figure 6.5, contained an open-country type fauna (*V. excentrica*, *V. costata*, *Vertigo pygmaea*), although as for Warburg E some *Punctum pygmaeum* were also present, as were some *Carychium tridentatum* close to the ‘old’ grassland edge.

The ‘cleared woodland’ contained a woodland-type fauna identical to that found in the bramble and older woodland to the south. Clearly none of the open-country species had been able to take advantage of the temporary clearance even though it was situated adjacent to the older grassy ride.

Warburg I

The Warburg I transect was located across two areas of 14 year-old grassland separated by old woodland (Fig. 6.1). The molluscan results (Fig. 6.6) show that both areas of grassland contain faunas similar to that within the woodland, with very few open-country species represented.

Archaeological implications

The data obtained from the Warburg Reserve provides very useful answers to the questions posed by John Evans in 1972 as outlined in the introduction of this chapter, and they also have considerable implications for the interpretation of molluscan assemblages from buried soils under monuments – both those collected in the past and those to be collected in the future. There are also implications with respect to using Mollusca as indicators of temporary woodland clearance or disturbance from other contexts such as tufa.

First, the data confirm the pronounced lateral variation of molluscan faunas across environmental boundaries. Where open-country type faunas were present at Warburg (transects E, F, G and H) there was very little spatial overlap with woodland-type faunas in adjacent woodland. This accords with similar previous studies into the small-scale spatial distribution of Mollusca (above). The archaeological implication is that when grassland is indicated from the surface of buried soils beneath monuments, this does not mean that the wider environment was also grassland. It is entirely possible that more wooded environments were a mere matter of metres away (see below also).

Second, the data from Warburg allow us to consider how large woodland clearances have to be before they gain a predominantly open-country type fauna. It is striking that the older grassland of the rifle range (transects F, H) is only 8 metres in width. While it is clear that a very small number of shade-demanding taxa are present in that narrow grassland strip, the wider

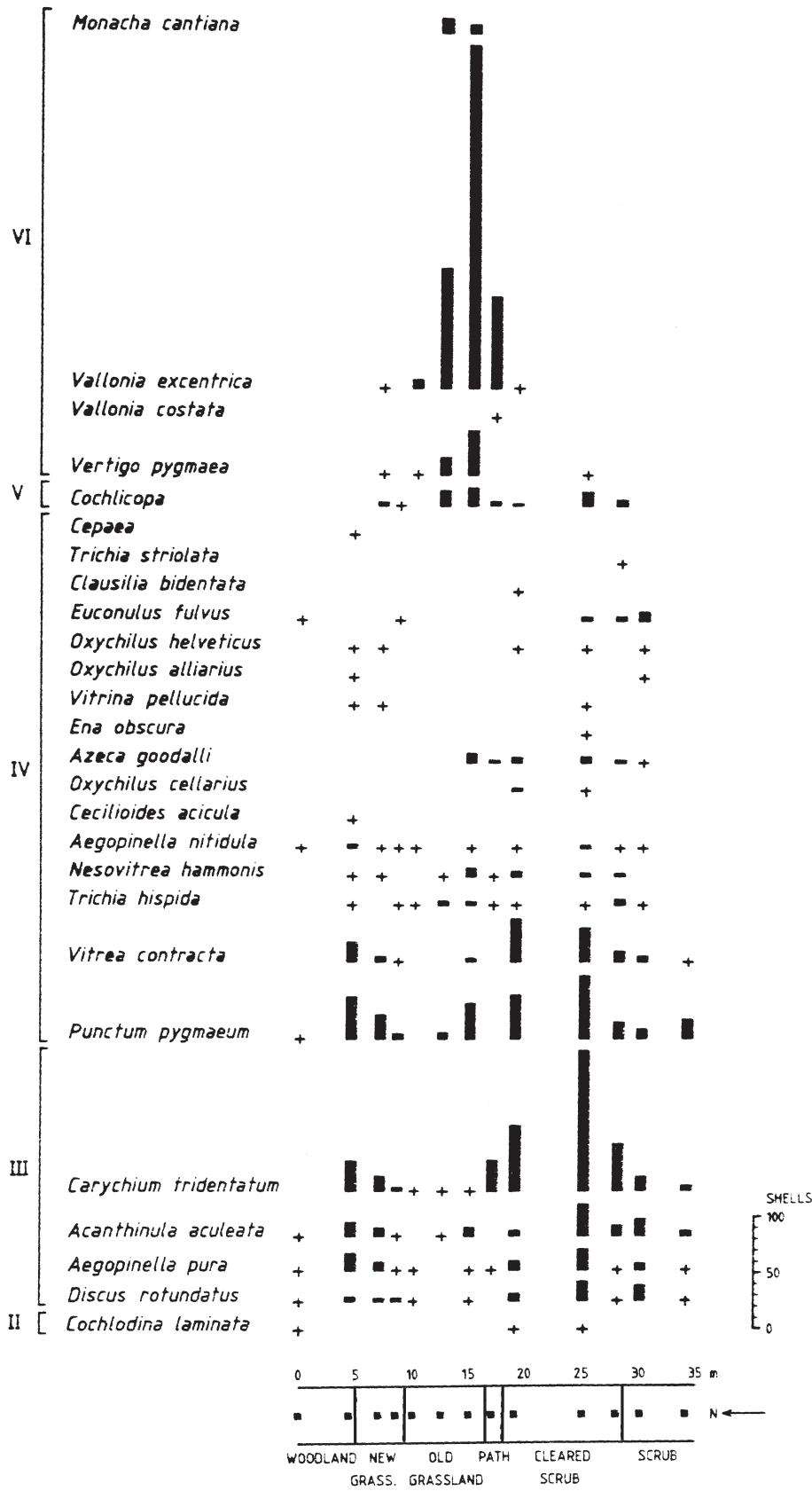
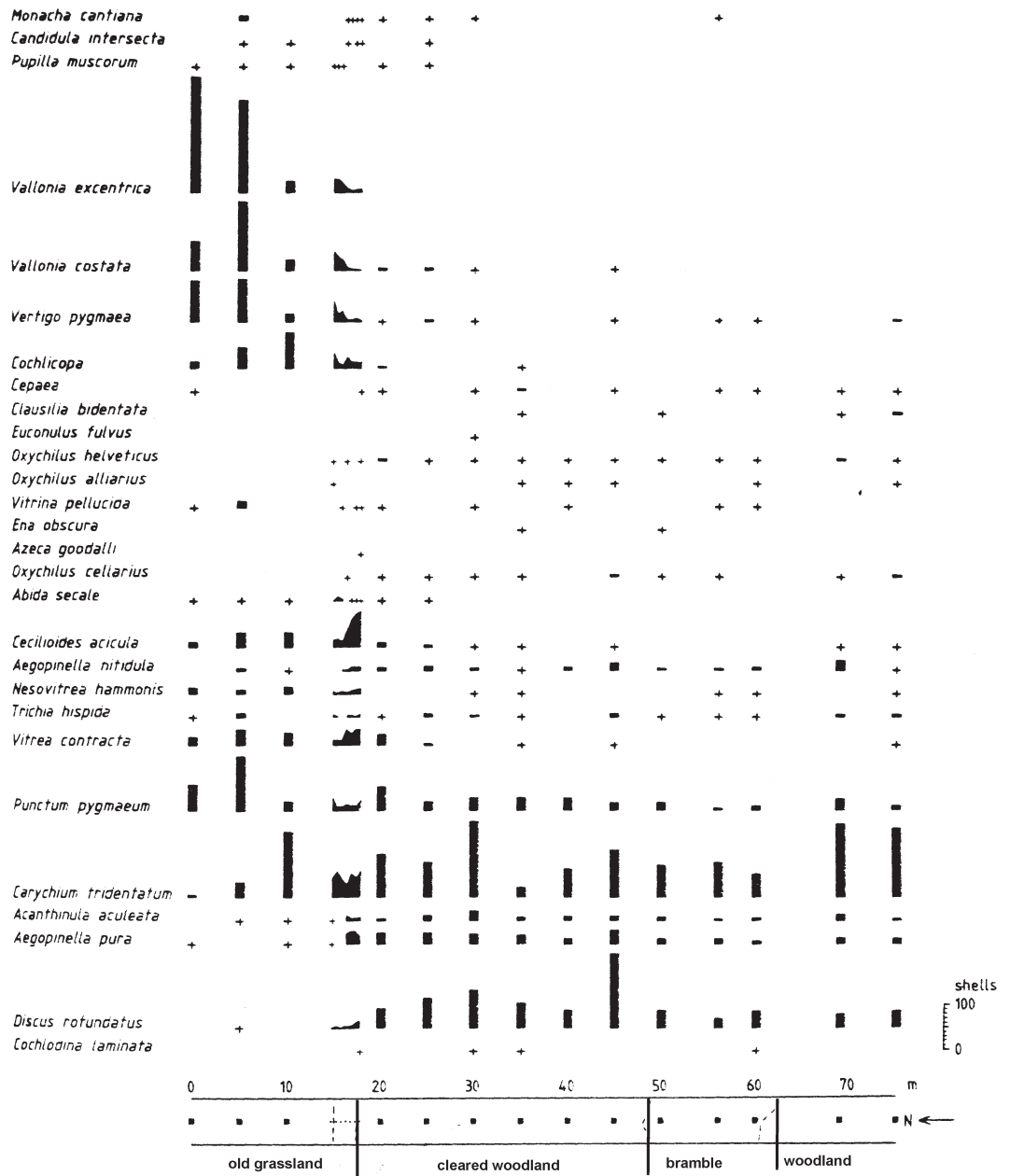


Figure 6.4: Mollusca from transect Warburg H (adapted from Gardner 1991)

Figure 6.5: Mollusca from transect Warburg G (adapted from Gardner 1991)



(c. 13 metre) old grassland ride of transect E shows far fewer shade-demanding individuals compared to the very high numbers of open-country species, particularly toward the middle of the ride. If this was an archaeological assemblage this tiny 'woodland' species presence would undoubtedly be classified as residual or intrusive (or at most as indicative of slightly tussocky grassland), rather than as indicative of extensive woodland only a few (5 or so) metres away. Together with the first point outlined above, this means

that 'grassland' as indicated from buried soils surface assemblages need not necessarily imply more than a fairly limited clearing in an otherwise wooded landscape.

Finally, the data show that grassland clearings within woodland have to be established for between 15–20 years before open-country species become predominant (transects E, F, G, H). Younger grassland rides of 2–14 years age still have woodland-type faunas (transects E, F, H and I). Most importantly, the woodland-type faunas persist in these

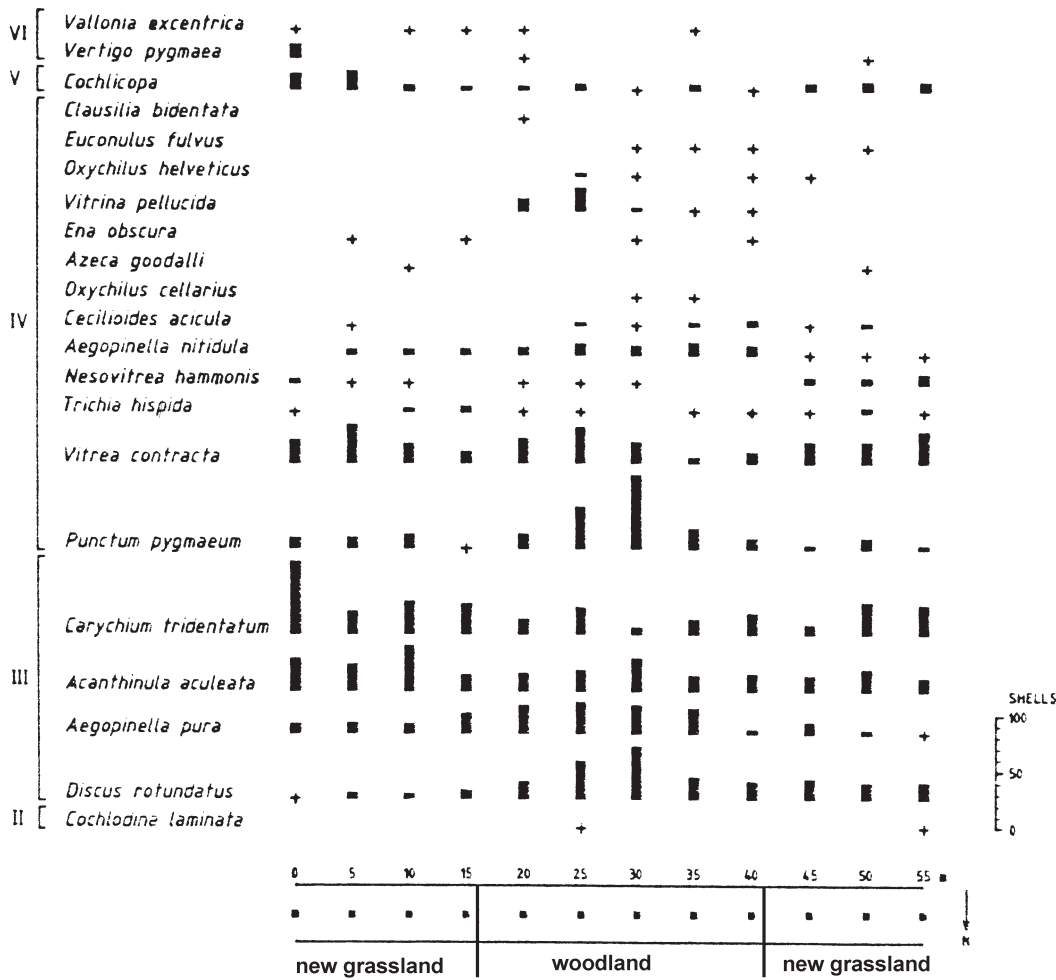


Figure 6.6: Mollusca from transect Warburg I (adapted from Gardner 1991)

younger grassland even when there is directly adjacent older grassland areas which offer a convenient source pool of the open country species (transects E, H, F). Archaeologically, this would indicate that where grassland is indicated from assemblages recovered from buried soils surfaces beneath monuments the grassland must have been established for at least 15 years prior to monument construction. It also suggests that where molluscan evidence from tufa deposits seems to indicate temporary woodland clearances or disturbances these are not singular events, rather that the clearance or disturbance must have led to open conditions being maintained (either by anthropogenic or natural agency) for a number of years; the single clearance event in Warburg G, which was then immediately left to naturally regenerate, showed no positive response from open country species.

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