VIII. Archaeobotanical and Zooarchaeological Remains – Revisited

Paul Halstead

VIII.1. Composition of the Archaeobotanical and Zooarchaeological Assemblages in Context

The charred plant remains from PMZ include concentrations of the following taxa: the pulse crop bitter vetch (*Vicia ervilia*), of Middle Neolithic, Late Neolithic and Early Bronze Age date; the cereal crops hulled (probably six-row) barley (*Hordeum vulgare*) and emmer (*Triticum dicoccum*), of Early Bronze Age date; and acorns (*Quercus* sp.), of Middle Bronze Age date. The material is typical of charred assemblages of this date range from Greece in the heavy predominance of crops over gathered fruits/nuts[960] and also in the relatively balanced representation among the former of cereals and pulses.[961] The apparently striking continuity in cultivation of just one pulse, bitter vetch, from the sixth to the third millennium BC (Middle Neolithic to Early Bronze Age) should be treated with caution: the number of samples is small; and, as previously noted,[962] the concentrations from the upper Middle Neolithic and lower Late Neolithic levels might be derived from the same charring episode, redistributed by later building activity.

The PMZ faunal assemblages are likewise fairly typical of those from mainland Greece:[963] in terms of numbers of identified specimens (NISP), remains of birds, fish and reptiles were few, perhaps partly due to lack of sieving during excavation; among mammals, domesticates far outnumbered wild species, although the latter increased from 3% in the Middle Neolithic to 5% in the Late Neolithic and 10% in the Early Bronze Age; and, among the domesticates, sheep/goats (mainly sheep) outnumbered cattle and pigs throughout (Tab. VIII.1).[964]

Tab. VIII.1 Taxonomic composition of mammalian faunal assemblages (numbers of identified specimens) (P. Halstead)

		MN*	LN**	EBA**
Sheep/goats	NISP % of total domestic	772 57.7	673 62.9	1893 53.7
Cattle	NISP % of total domestic	226 16.9	198 18.5	796 22.6
Pigs	NISP % of total domestic	312 23.3	182 17.0	793 22.5
Dogs	NISP % of total domestic	28 2.1	17 1.6	46 1.3
Total domestic	NISP	1338	1070	3528
Wild	NISP % of total mammal	46 3.3	56 5.0	405 10.3
Total mammal	NISP	1384	1126	3933

* after Becker 1999; ** after Becker 1991; NISP = numbers of identified specimens

960 Cf. Valamoti 2015.
961 Halstead 1994; Valamoti et al. 2011.
962 Jones – Halstead 1993, 3.
963 Cf. Halstead 1996; Cantuel et al. 2008.
964 After Becker 1991; Becker 2000.

VIII.2. Land Use at Platia Magoula Zarkou in Context

Prior to major 20th century drainage works, the west Thessalian Basin was subject to frequent and widespread flooding,[965] following the early-spring snow melt in the surrounding mountains. Coring around PMZ and the neighbouring Early Neolithic site of Koutsaki Magoula has identified multiple flooding episodes, at least locally, in the northeast corner of the basin contemporary with Early Neolithic and Middle Neolithic habitation[966] and this, in turn, has underpinned controversial arguments concerning the nature of both early settlement[967] and early farming[968] in Thessaly and further afield.

Alasdair Whittle, seeking to downplay the traditional distinction between seasonally mobile Mesolithic foragers and sedentary Neolithic farmers, argued that thin occupation levels and flimsy architecture at Early Neolithic Achilleion and elsewhere in the same region represented short-lived residential episodes,[969] while the documented flooding at PMZ would have enforced seasonal abandonment of this site. Flimsy Neolithic 'huts' co-existed with more substantial 'houses', however, as within living memory in the same region, and this contrast in architectural forms has alternatively (and arguably more persuasively) been interpreted in terms of varying levels of household investment in claims to plots of land.[970] Furthermore, the evidence for flooding lacks the resolution necessary to determine its frequency, extent and duration and thus to confirm claims of enforced abandonment of PMZ. Cornelia Becker countered this circumstantial argument for seasonal abandonment, noting that evidence for the slaughter of young lambs/kids shortly after birth implied a human presence during the expected late-winter to spring season of likely flooding.[971] Of course these very young animals might represent deaths either during exceptionally dry years, when seasonal abandonment was not necessary, or during the expected dry season but of animals born atypically early or late. Such caution involves an element of 'special pleading', however, and Becker's counter-argument is, at worst, no weaker than the circumstantial case for regular seasonal flooding and abandonment.

For Tjeerd van Andel and Curtis Runnels, flooding round PMZ was less an obstacle to residence than an opportunity for a distinctive form of crop husbandry – 'floodwater farming' – in which crops were sown on the fertile alluvium exposed by receding floodwaters. In addition to obvious Near Eastern sources of inspiration, van Andel and Runnels, like Andrew Sherratt before them,[972] cited early modern travellers' reports of this practice yielding bumper harvests for minimal effort. In principle, the possibility of prehistoric floodwater farming at PMZ could be tested by carbon isotope analysis of the recovered charred grain,[973] although in practice interannual and longer-term variability in lowland precipitation would complicate definition of a baseline for rain-fed husbandry, thus posing considerable problems of equifinality in interpreting results. Anyway, closer examination of recent attempts at floodwater farming in central and northern Greece indicates that the extent and strength of flooding were too unpredictable for dependable sowing beforehand (in autumn) and that waters usually receded too late for secure sowing afterwards (in late spring) of Old World cereals or pulses and often even of New World grain crops with their more favourable summer growing season.[974] Even if flooding occurred annually around Middle

965 Piket 1959; Mimikou – Koustoyannis 1995.
966 Van Andel et al. 1995.
967 Whittle 1996b.
968 Van Andel – Runnels 1995.
969 Whittle 1996b.
970 E.g. Kotsakis 2006.
971 Becker 2000; also Halstead 2005.
972 Sherratt 1980.
973 Cf. Wallace et al. 2013.
974 Halstead 2014a, 26, 192–193.

Neolithic to Early Bronze Age PMZ, therefore, it is most unlikely to have supported regular and successful grain harvests, leaving rain-fed crops as the most likely subsistence base.

The present author has argued that rain-fed crop husbandry was relatively small-scale and intensive ('horticultural') in the Neolithic, but larger-scale and more extensive ('agricultural') in the Bronze Age.[975] Support for this proposed contrast was claimed in the even representation of cereals and pulses in the Neolithic, compared with the predominance of cereals in the Bronze Age,[976] on the grounds that harvesting was more difficult and labour-intensive for pulses than cereals and thus tended in the recent past to be restricted to small-scale crops on infield plots.[977] This argument, drawing on the charred grain data from (inter alia) PMZ, has now received more direct empirical support, albeit from Knossos and Kouphovouno in southern Greece, from nitrogen ($\delta^{15}N$) and carbon ($\delta^{13}C$) isotope analyses of Early and Middle Neolithic charred grain that imply manuring of wheat crops and possible watering of peas, respectively[978] – both management practices more typical of small-scale horticulture than large-scale agriculture.[979]

Understanding of Neolithic and Bronze Age animal husbandry has been significantly enriched in recent years by isotopic analyses of food residues adhering to or absorbed by ceramic cooking vessels, as a result of which we now know that Early Neolithic and later farmers in Greece, as elsewhere, exploited the milk of livestock as well as the carcasses of deadstock.[980] Traces of carcass fats are much more frequent than those derived from milk, but such relative frequencies are a very insecure basis for estimating the dietary importance of milk.[981] As Becker reported for PMZ,[982] however, the slaughter ages of domestic ruminants in the Neolithic of Greece are generally dominated by juvenile deaths, implying an emphasis on rearing for meat and limited potential for milk production, while greater survivorship of adult male ruminants at some Bronze Age sites suggests that any shift towards greater use of livestock 'secondary products' was focused on draught or fibre rather than milk.[983] While livestock were evidently exploited for their milk, therefore, this use was not intensive and thus is unlikely to have made a major contribution to human subsistence, unless livestock were kept in very large numbers.

The scale and also mobility of Neolithic and Bronze Age animal husbandry have been much debated.[984] In the recent past, these two variables were closely interrelated: seasonal mobility (e.g. between lowland winter and upland summer pasture) enabled maintenance of larger numbers of livestock and was usually not considered worthwhile for only small herds.[985] Becker addressed the issue of seasonal mobility in the case of Middle Neolithic PMZ, noting that deaths of very young sheep and goats implied human presence in late winter to spring when the site was supposedly vulnerable to flooding, although this does not preclude the movement of livestock to the uplands in summer.[986] Paul Halstead extended a similar approach to a range of Neolithic sites, including lowland tell 'villages' such as PMZ, but also mid-altitude 'hamlets' and caves.[987] The approach is far from foolproof, because it rests on the assumption of a fairly narrow birth season,[988] whereas a few individuals were probably born unusually early or late, and because only young deaths can be aged accurately enough to be informative, so lack of evidence for slaughter in a particular

975 Halstead 1981.
976 Halstead 1994, 204–205, tab. 7.1.
977 Halstead 2014a, 79, 103–105, 119.
978 Bogaard et al. 2013; Vaiglova et al. 2014; Halstead – Isaakidou 2020.
979 Halstead 2014a.
980 Evershed et al. 2008; Whelton et al. 2018a.
981 Halstead 2014b, 421.
982 Becker 1991, 20–24; Becker 2000, 11–12.
983 Halstead 1996; Isaakidou 2006; Cantuel et al. 2008.
984 E.g. Sampson 1992; Halstead 1996; Cavanagh 1999.
985 E.g. Halstead 1991.
986 Becker 2000.
987 Halstead 2005.
988 Cf. Balasse et al. 2020; Tornero et al. 2020.

season may be insignificant. Nonetheless, remains of infant sheep/goats, ostensibly representing deaths in late winter to early spring, are found at both lowland villages and mid-altitude hamlets and caves, offering no support for suggestions that the latter were occupied by seasonally mobile herders,[989] presumably as a base for exploiting, or *en route* to/from, upland summer pastures.

Conversely, recent isotopic analyses offer some support for Neolithic herding of limited mobility. First, strontium isotope analysis of a small sample of cattle, sheep, goat and pig teeth from Early Neolithic to Late Neolithic sites in northern Greece has, with one possible exception, yielded ratios compatible with local geology, thus offering no hint of distant grazing.[990] Secondly, in a larger-scale study of domestic animals at Late Neolithic Makriyalos, again in northern Greece, strontium isotope ratios likewise offered no evidence of long-distance movement, although $\delta^{13}C$ values do indicate movement of cattle to pastures, probably in coastal wetlands, beyond the immediate vicinity of the site.[991] Various circumstantial lines of evidence also point towards animal husbandry being of modest scale. First, neither pollen nor charcoal data, at least in central and northern Greece, reflect degradation or opening up of lowland vegetation, such as might be expected if domestic animals were kept in large numbers.[992] Secondly, both cattle and pigs declined in size through the Neolithic,[993] implying that domestic females did not regularly mate with the larger wild male aurochs and boar roaming the landscape and this, in turn, implies that the domesticates were kept in small enough numbers to be under close control. Thirdly, nitrogen isotope values of Neolithic human skeletons do not differ between lowland farming villages and cave/hamlet sites,[994] implying consumption of similar amounts of animal protein and thus contradicting suggestions that the latter sites were inhabited by more or less specialised pastoralists.

VIII.3. Cultures of Food Consumption at Platia Magoula Zarkou in Context

In the recent past, bitter vetch was regarded solely as a fodder crop in Greece and its consumption as a starvation food during the World War II occupation of Greece caused the permanent incapacitation of some individuals.[995] Like the also toxic but frequently eaten food/fodder crops of the genus *Lathyrus*, however, bitter vetch can be de-toxified for human consumption. An interesting question, with far-reaching economic and cultural implications, is that of when bitter vetch and other obligate fodder crops achieved their currently low cultural status in the Mediterranean.[996] Unfortunately the grain finds from PMZ (and other Neolithic and Bronze Age sites in Greece) are, as yet, insufficient to answer this question.

Becker's reports on the PMZ animal bones presented the evidence for carcass butchery and bone fragmentation in greater detail than was usual. As has subsequently been observed for other sites in Greece,[997] the Neolithic assemblage from PMZ included a lower percentage of cut specimens than its Bronze Age counterpart, suggesting more intensive butchery of the latter. The fact that cut marks are much more frequent at PMZ on bones of wild (red deer, roe deer and especially boar) than of domestic animals[998] provides some empirical support for more recent arguments that the intensity of butchery is related to prevailing 'rules' on the sharing of carcasses as these

989 E.g. Sampson 1992.
990 Whelton et al. 2018b.
991 Vaiglova et al. 2018.
992 E.g. Bottema 1982; Marinova – Ntinou 2018.
993 E.g. von den Driesch 1987.
994 Papathanasiou 2015.
995 Halstead 1990.
996 Halstead 2012.
997 Halstead 2007; Isaakidou 2007.
998 Becker 1991, 35, tab. 18.

are likely to have differed between wild and domestic animals.[999] Becker's observation that Middle Neolithic bones are more intensively fragmented than those of Late Neolithic and especially Early Bronze Age date[1000] is also matched by subsequent comparisons of fragmentation at Early Neolithic to Middle Neolithic versus later Neolithic and Bronze Age sites – a contrast likewise tentatively attributed to the progressive relaxation over time of cultural obligations to share carcass products.[1001]

VIII.4. Conclusions

Since the 1990s, the volume of published macroscopic archaeobotanical and zooarchaeological data from the Neolithic and Bronze Age of Greece has grown considerably. By and large, the accumulation of new macroscopic data has served to show that PMZ was, in terms of plant and animal exploitation, fairly typical of later prehistoric open-air village settlements in Greece. Indeed, additional macroscopic data, especially zooarchaeological data, have in several cases shown that observations reported for the PMZ assemblage exemplify more widespread patterns. What has plainly revolutionised understanding of plant and animal husbandry and consumption in later prehistoric Greece, however, is the development of new diagnostic tools, based on analysis of carbon, nitrogen and strontium isotopes. These have begun to shed radically new or more secure light on livestock diet and movement, the use of carcass and dairy fats, and human diet.

[999] E.g. Halstead 2007; Isaakidou 2003; Isaakidou et al. 2018.
[1000] Becker 2000, 11.
[1001] Halstead – Isaakidou 2011; Isaakidou et al. 2018.