
ARTICLES

THE MIDDLE NEOLITHIC AND THE PLATIA MAGOULA ZARKOU - A REVIEW OF CURRENT ARCHAEOZOOLOGICAL RESEARCH IN THESSALY (GREECE)

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Summary

The substantial settlement mound of Platia Magoula Zarkou, located near the Peneios river in the north of Thessaly, is famous for its Neolithic pottery and for a house-model with figurines. During extended archaeological research at this site, large amounts of animal remains have been excavated ($n = 11613$). They cover periods from the Middle Neolithic to the Middle Bronze Age. These assemblages crucially enlarge the body of archaeozoological data for Thessaly. In this paper the main emphasis will be put on Middle Neolithic material ($n = 2477$), in particular on the reconstruction of livestock management and the exploitation of natural resources, practised by the inhabitants of the Magoula during this very period. The results are evaluated against the background of present archaeological knowledge on Middle Neolithic economy and social life in this part of Greece.

Key Words

Platia Magoula Zarkou, Thessaly, Greece, Middle Neolithic, Livestock and Game, Socio-economic background.

Introduction

Thessaly, one of the most distinctive landscapes of Greece, has attracted the attention of archaeologists ever since it was realised that the proliferation of Early Neolithic communities took place here during the 7th/6th millennia BC. This particular interest is reflected not only

Résumé

Le Néolithique moyen et le site de Platia Magoula Zarkou. Le point sur les recherches archéozoologiques en Thessalie (Grèce).

L'important village en tell de Platia Magoula Zarkou, situé près de la rivière Peneios, dans le nord de la Thessalie, est connu pour ses poteries néolithiques et son modèle réduit de maison accompagné de figurines. À la faveur des recherches archéologiques approfondies menées sur ce site, d'importantes quantités d'ossements animaux ont été collectées ($n = 11613$). Elles renvoient à une période comprise entre le Néolithique moyen et l'âge du Bronze moyen. Ces assemblages accroissent considérablement le corpus archéozoologique issu de Thessalie. Dans cet article, l'auteur centre son propos sur le matériel du Néolithique moyen ($n = 2477$), en particulier sur les informations permettant la restitution de la gestion des troupeaux et l'exploitation des ressources naturelles durant cette période. Les résultats sont confrontés aux connaissances actuelles concernant l'économie et la vie sociale dans cette région de Grèce, au Néolithique moyen.

Mots clés

Platia Magoula Zarkou, Thessalie, Grèce, Néolithique moyen, Troupeaux domestiques et gibier, Cadre socio-économique.

in the large number of Neolithic sites which are archaeologically known ($n = 271$; after Papathanassopoulos, 1996: 50f.) but also in the vast number of publications related to this period and considering a diversity of questions (notably the summaries by Alram-Stern, 1996; Papathanassopoulos, 1996; Whittle, 1996a; another selection of useful

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Table 1: Neolithic sites in Thessaly. Numbers of animal remains per site.

* = In the publication, the total number of remains is not given (1.962 postcranial fragments are found).

** = Number of identified bones; the total number of remains is not given here.

Number	Site	References	Number of remains
1	Platia Magoula Zarkou	Becker, 1991; this volume	11,613
2	Ayia Sofia-Magoula	Driesch and Enderle, 1976	3,919
3	Argissa Magoula	Boessneck, 1962	6,922
4	Otzaki Magoula	Boessneck, 1956	776
5	Arapi Magoula	Boessneck, 1956	143
6	Prodromos	Halstead and Jones, 1980	120kg*
7	Achilleion	Bökönyi, 1989	7,779**
8	Sesklo	Schwartz, 1981	1,950
9	Pevkakia Magoula	Jordan, 1975; Amberger, 1979; Hinz, 1979	25,230
10	Dhimini	Halstead, 1992a	5,340
11	Karatsadhagli	Prummel (ms. 1998)	203

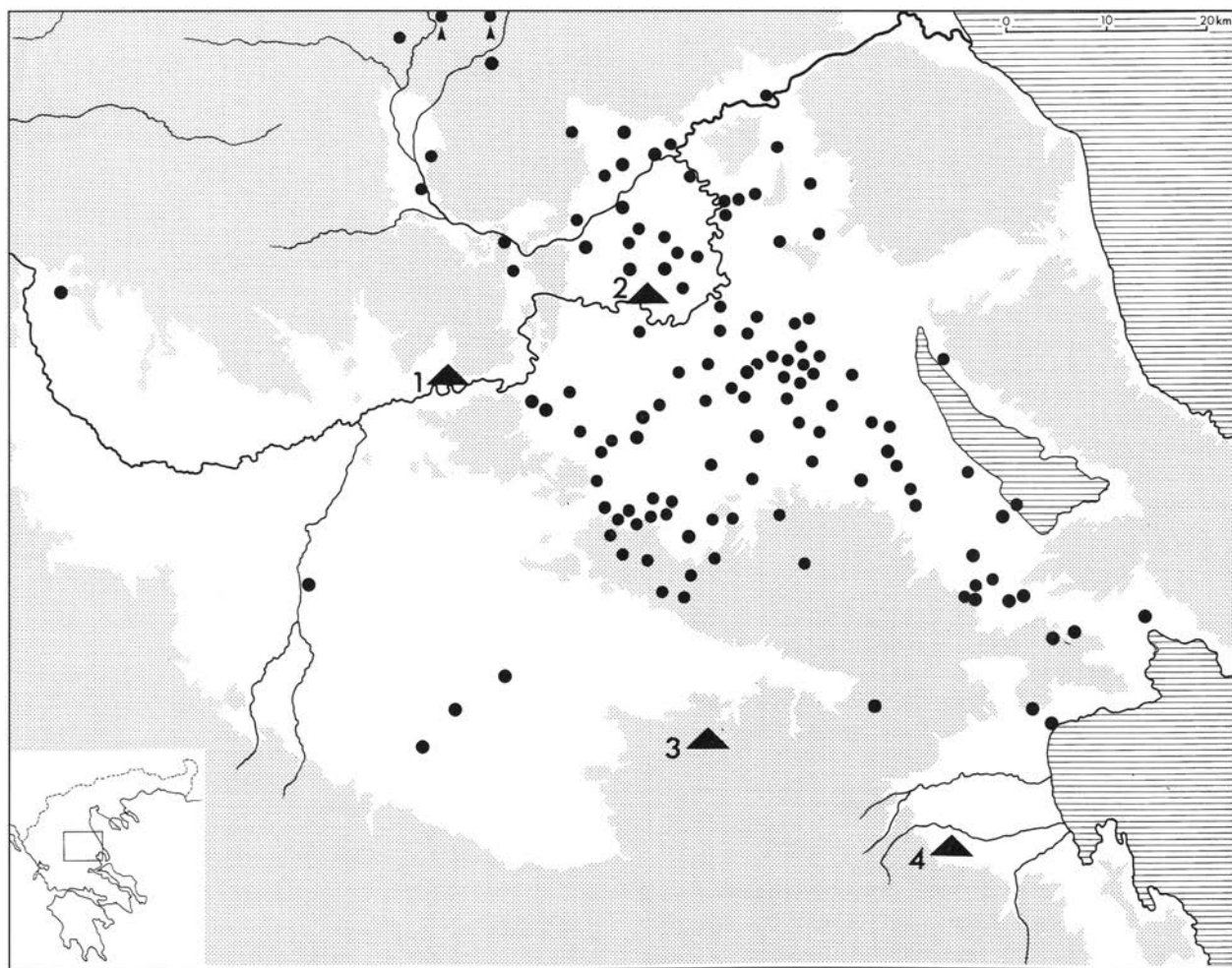


Fig. 1: Thessaly. Mapping of archaeologically known Middle Neolithic sites (n = 129; from Kotsakis, 1996: 50f. and 201ff.) and Middle Neolithic sites with bone finds (triangles: 1, Platia Magoula Zarkou; 2, Otzaki Magoula; 3, Achilleion; 4, Karatsadhagli).

papers is available in *La Thessalie*, 1994). Surprisingly, the topic of economy - fundamental for any cultural development in general - does not seem to feature among these intensively researched themes: only eleven faunal assemblages from Neolithic contexts have been published to date (tab. 1). It is highly questionable whether these data alone can furnish proof of general validity on Thessalian economic developments over a sequence of more than 3000 years. Greece as a whole is not among those European countries such as Denmark or Hungary which enjoy a dense network of archaeozoological research. This becomes evident from an index⁽¹⁾ calculated on a recently established data-base for the whole of Europe (Benecke, 1999: 155). The deficiency of archaeobiological data has contributed to an imbalance in the archaeologist's view of the Thessalian past, so that any new faunal material such as that from the Platia Magoula Zarkou is of particular importance, even more so if it is embedded in a firm chronological framework. To my mind, it is impossible to evaluate a site and its faunal material without understanding the fuller prehistoric context. Hence, the focus of this paper is not a mere presentation of osteological data, but an attempt to "put some flesh on the bones".

The Platia Magoula Zarkou: some general information

The prehistoric site of Platia Magoula Zarkou is a settlement mound 30 km west of Larissa located in the extreme north-east of the western Thessalian Kardhitsa plain, close to the river Peneios (fig. 1.1). It rises 6-7 m above its surroundings and covers an area of 2 ha. Excavations at Platia Magoula Zarkou and in its vicinity have been carried out under the guidance of Kostas Gallis (Museum of Larissa). During several campaigns of excavation and sampling in 1974, 1976, 1981, 1983-84 and 1990, the Magoula and a Late Neolithic cemetery 300 m to the north of the settlement have been intensively researched (fig. 2). The main aim was to clarify the exact chronological position of a particular type of Neolithic pottery: the black polished Larissa ware. Formerly this ware was supposed to be characteristic for the final phase of the Thessalian Late Neolithic, but from the evidence on Platia Magoula Zarkou it became evident that the black Larissa ware has to be re-attributed to the very beginning of this period. Hence, the Late Neolithic chronology of the region had to be re-evaluated (Gallis, 1985; 1987; 1994).

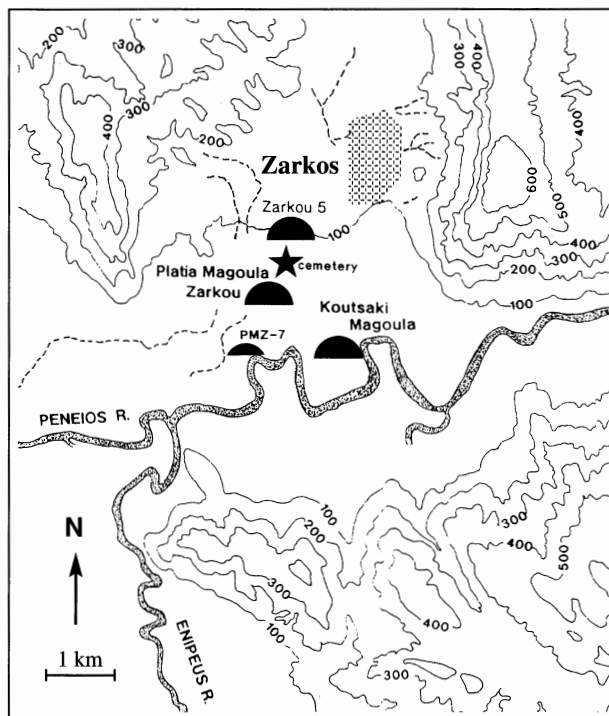


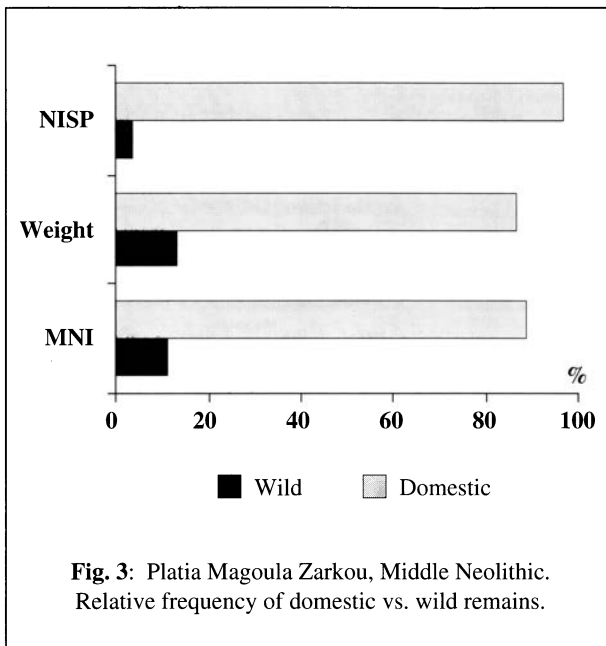
Fig. 2: Location of Platia Magoula Zarkou, other settlement structures and the Late Neolithic cemetery near the bank of the river Peneios (from van Andel *et al.*, 1995: 135).

The Platia Magoula Zarkou is also famous for the recovery there of a completely preserved clay house model with several human figurines (Gallis, 1985). From its deposition in a sacrificial pit under the floor, it is characterised as a foundation offering. It forms a unique piece of evidence for Greece and sheds light on ritual activities and belief in Late Neolithic societies. Another striking recovery from the Platia Magoula Zarkou cemetery was a zoomorphic urn which contained the cremated bones of a child (Gallis, 1996: fig. 14).

The Platia Magoula Zarkou was inhabited from the end of the Early Neolithic until the Middle Bronze Age. Recent geomorphological research has unveiled the changing morphology of the landscape in this micro-region (van Andel *et al.*, 1990; 1995; van Andel and Runnels, 1995; Gallis, 1996). The oldest levels of occupation date to about 6000 BC⁽²⁾. At that time the base of the Magoula was situated 4-5 m below the present surface and at least 1-2 m below river sediments of Late Neolithic date. The Peneios

⁽¹⁾ Index = number of recorded faunal assemblages/area of the country x 1000.

⁽²⁾ Calibrated radiocarbon-data are given for the Early/Middle Neolithic boundary: 5745-5814 calBC (van Andel *et al.*, 1995: 136; Gallis, 1996: 540).



river followed a course different to that of today: during the Early Neolithic, an erosion gully of about 800 m length, a branch of the Peneios, led to the river (ibid.: fig. 3). The oldest traces of settlement activity can be found on the western bank of that gully. In all probability the Early and Middle Neolithic occupation went hand in hand with several episodes of flooding, since thick layers of fluvial clay mixed with charcoal, artefacts and plant material have been uncovered, dating to that period (for details see van Andel and Runnels, 1995: 489f.). With reference to these results, the Platia Magoula Zarkou can be regarded as a floodplain site, one of the rare examples of Neolithic date which have been researched in detail. Moreover, the evidence for floodplain farming and a seasonality in settlement activities have been deduced (ibid.: 491; van Andel *et al.*, 1995: 138; Gallis, 1996: 522). In seasons of high flood, the inhabitants are presumed to have shifted to other drier places; in fact, such a (seasonal?) settlement has been found at Zarkou 5900 m north of Platia Magoula Zarkou on a 100 m hillside (cf. contour lines in fig. 2). Although this seems to represent a convincing reconstruction of the former situation, both aspects are controversial since some crucial questions remain unanswered with reference to the applicability of the Platia Magoula Zarkou results to other sites or regions (contra: Wilkie and Savina, 1997), the degree of importance of floodwater farming during the Early and Middle Neolithic (contra: Halstead, 1989b) and the periodicity of the floods (Halstead, pers. comm.). If the flooding had happened in short intervals (e.g. every year; cf. Whittle, 1996b: 17), it is hard to understand why the Magoula,

located directly on the floodplain, was inhabited repeatedly over such a long period of time, since the disadvantage of flood-damage for houses, crops and not least for the animal and human populations must have been severe. Only if the flooding occurred over widely separated intervals could these periodic disadvantages have been outweighed by advantages such as the variety of natural resources available or the location of the Magoula at a crossing-point between the eastern and western plains, the river corridor being used as a route for trade, exchange and communication. If, however, we follow this line of argumentation, which does not exclude the possibility of shorter or longer abandonment, the term “seasonality” seems increasingly inappropriate. Analysis of the faunal material may contribute to the resolution of this question, as outlined below.

The Middle Neolithic occupation was then followed without a break by the earliest Late Neolithic sequences (Tsangli-Larissa phase). After that phase the site remained unoccupied until the beginning of the Early Bronze Age. It was reoccupied in this succeeding period, as evidenced in the upper four metres of the excavation. This population abandoned the Magoula before the beginning of the Mycenaean era.

Bone material has been collected and analysed from Middle and Late Neolithic as well as Early and Middle Bronze Age strata (tab. 2). Most of the bone finds originate from the Early Bronze Age (59%); the Middle and Late Neolithic are represented in lower, almost identical quantities (21% and 20%), whereas the Middle Bronze Age has yielded 48 bone finds only (less than 1%). The bone material has not been sieved. An inevitable bias against the representation of species with tiny or fragile skeletal elements such as birds, fish, small mammals and of course very young specimens of middle-sized and large mammals, has

Table 2: Platia Magoula Zarkou. Numbers of animal remains (NISP) per stratified unit; MN Middle Neolithic, LN Late Neolithic, EBA Early Bronze Age, MBA Middle Bronze Age.

Category	MN	LN	EBA	MBA	Total
Mammalia, identified	1384	1126	3933	28	6471
Mammalia, not identified	736	1133	2755	18	4642
Aves	-	4	15	-	19
Testudines	9	22	16	1	48
Mollusca	348	14	70	1	433
Total	2477	2299	6789	48	11613

to be taken into consideration. Unluckily, the precise location of the bone material in relation to habitation patterns was not recorded during excavation, hindering the identification of places where particular activities were undertaken such as refuse dumping, butchering of animals or bone manufacturing. Archaeozoological analyses on periods post-dating the Middle Neolithic sequence have already been carried out and published in some detail (Becker, 1991⁽³⁾). A small assemblage of Middle Neolithic bones, unearthed during the campaigns of 1981-84 has also been described previously. It was crucially enlarged by finds from the 1990 campaign, a comprehensive view of which will be given in the following chapters. But, before focusing on the osteological data, I would like to offer a brief compilation of archaeological knowledge already achieved on this particular period of Thessaly's past, combined with actual data gained from the Middle Neolithic at Platia Magoula Zarkou.

The Middle Neolithic period on the Platia Magoula Zarkou in the light of Thessalian developments

The Middle Neolithic in Thessaly, the so-called "Sesklo period", spans the era from 5700/5800 to 5300 calBC, which is a relatively short interval compared to other periods (Alram-Stern, 1996: 99f.)⁽⁴⁾. Radiocarbon dates available from Platia Magoula Zarkou fit well into this chronological framework (cf. footnote 2). On the Platia Magoula Zarkou undisturbed levels of Middle Neolithic occupation have been indicated at a depth of 9 m to 5.3 m. Successive floors with hearths and some few remains of walls were unearthed, but unfortunately they were insufficient to allow a coherent reconstruction of local dwellings. Evidence from other excavations can help to fill this gap. Particularly valuable are several house models (cf. Whittle, 1996a: 59) which, in addition to excavated structures, enabled the archaeologists to reconstruct the Middle Neolithic architecture: broad, rectangular houses with one or more rooms, made of mud brick with internal buttresses and/or porches, some of them built in megaron form. The dwellings are free-standing with narrow passages between them. From the house models, one may assume that at least some walls were painted and decorated with motifs related to those found on contemporary pottery. The most detailed information on architectural matters and on the exploitation of public and private space could be gained from

Achilleion (Winn and Shimabuku, 1989: 46ff.). Clear evidence for stables, whether connected to houses or separately constructed, has not yet been found. A certain massiveness and durability of architecture is indicated, suggesting that private ownership and a long-lasting continuity of settlement activities existed. Archaeologists are even inclined to assume the existence of a certain social hierarchisation (Gimbutas *et al.*, 1989; Kotsakis, 1994).

The Platia Magoula Zarkou pottery was of a typical Middle Neolithic style and shape, e.g. red-on-white ware, grey ware, cups with broadly shaped handles, flat bowls and pottery with flame patterns (Gallis, 1996: 120f.). A considerable regional variation in ceramic styles during the Thessalian Middle Neolithic is witnessed which hints at the existence of differing social systems in particular areas.

Other significant items from the Platia Magoula Zarkou record can be highlighted, such as stone artefacts ($n = 150$) made from red, brown and grey jasper, obsidian and tan/grey chert (Elster, 1994: 170ff.). Some of these implements were used for hunting game as well as butchering, meat processing and skinning of animals. In particular, obsidian tools turn out to be highly meaningful, since the far-distant sources of obsidian require a "long-term and long-distance procurement strategy" (*ibid.*: 173).

Another most fascinating category of finds are anthropomorphic figurines, some of which have been found on the Platia Magoula Zarkou (Gallis, 1996: 524). In addition to theriomorphic figurines, they are found in many Middle Neolithic contexts in Thessaly. These figurines are considered to be substitutes for ritual or religious expressions. From an archaeozoologist's point of view, figurines interpreted as frog-, snake- and bird-goddesses are of particular interest, revealing mythic themes which are partly rooted in Palaeolithic traditions (Gimbutas, 1989: 180ff.). Animal figurines are formed either as separate items, attached to vessels (protomes such as those found in Achilleion; *ibid.*: 201ff.) or in shape of vessels. They usually portray domesticated species, the most striking examples of which are a bovine head, attached to a house model and two figurines which represent rare illustrations of animals heavy with their young (cf. Toufexis, 1994: 166f.).

Closely connected to this field of belief are matters of the concept of an afterlife, a central theme of which our knowledge is still very meagre, due to the low number of burials recovered to date. They imply that cremation of the dead was practised.

⁽³⁾ Here one may also find a detailed description of all archaeozoological methods used for analysis.

⁽⁴⁾ Unless otherwise indicated, all information given in the following section is taken from papers in Papathanassopoulos, 1996; Alram-Stern, 1996 and *La Thessalie*, 1994.

Fire destruction in some settlements indicates a violent end of the Middle Neolithic in Thessaly (Gallis, 1996: 64). The beginning of the Late Neolithic is mainly characterised by significant qualitative changes. Not only does the number of sites expand but the frequency of dwellings increases in already established settlements which were partly abandoned during the Middle Neolithic. Furthermore, technological innovations (increase in standardised tools), changes in social hierarchisation - Dhimini being a most remarkable example (cf. Aslanis, 1995; Halstead, 1992a) - and political development are evidenced. This development is reflected for example in the occurrence of prestige-related items such as artefacts made from spondylus (Müller, 1997: 94), which are among the most challenging objects in a network of Neolithic long-distance trade.

Turning now to archaeobiological aspects, one has to consider that although the climate is assumed to have been similar to that of today⁽⁵⁾, the landscape during the Neolithic period must have been very different to everything one can see in modern-day Thessaly, the grainstore of Greece. Pollen diagrams suggest that the former vegetation consisted mainly of oak forest in the lower reaches and conifers on the upland slopes. Small river valleys, floodplains and fertile soils on terraces were suitable for cultivation. Farmers had only to clear dense vegetation to obtain arable land. According to van Andel *et al.* (1995), floodplain farming was regularly practised, an assumption which is supported by the Platia Magoula Zarkou results, as mentioned above. In contrast to this, Halstead (1989a) suggests that settlers in the Early and Middle Neolithic mainly cultivated light, arable soils in small woodland clearings on the elevated river terraces.

Middle Neolithic agriculture is characterised by harvesting and cropping a long-lasting traditional choice of cultivated plants: two-rowed and six-rowed barley (*Hordeum vulgare*, *H. distichum*), emmer (*Triticum dicoccum*), einkorn (*Tr. monococcum*) and lentils (*Lens culinaris*); pea (*Pisum sativum*) and bitter vetch (*Vicia ervilia*) are evidenced from Pre-Pottery Neolithic levels; Macaroni wheat (*Tr. aestivum/durum*), flax (*Linum*), grass pea (*Lathyrus sativus*) and chickpea (*Cicer arietinum*) arrived on the scene in the Early Neolithic (Kroll, 1991: 161ff.). This spectrum is more or less identical with that of the Middle Neolithic; only a questionable find of Common millet (*Panicum*) from the Otzaki Magoula has to be added.

Gathered plants include figs (*Ficus*), pears (*Pyrus*), acorns (*Quercus*), grapes (*Vitis*), almonds (*Amygdalus*) and pistachios (*Pistacia*). For Platia Magoula Zarkou, several botanical samples from Middle and Late Neolithic levels as well as from Early Bronze Age structures were submitted for examination (Kroll in Becker, 1991: 77; Jones and Halstead, 1993). The Middle Neolithic samples yielded emmer, einkorn, barley, lentils, bitter vetch, one example of darnel (*Lolium temulentum*) and at least one cache of acorns. According to Halstead (1987; 1989b; 1992b), agriculture was of prime importance during the Thessalian Early and Middle Neolithic and cereal and pulse crops provided the bulk of the diet; meat from domestic and wild mammals, although undoubtedly necessary for a nutritional balance, played only a subsidiary role.

The reconstruction of Middle Neolithic subsistence strategies obviously has a preliminary and highly speculative character. The mapping of sites, given in figure 1, highlights the situation: out of 129 archaeologically known sites on the Thessalian plains, just four have yielded osteological data from Middle Neolithic levels (cf. additionally Payne, 1985: 237 tab. 9; database from Benecke *et al.*, forthcoming). Only two of them provide enough material to allow relevant conclusions: Achilleion (n = 5279 determined mammal bones; Bökönyi, 1989; see fig. 1.3) and Platia Magoula Zarkou (Middle Neolithic levels: n total = 2477). The faunal assemblages excavated at Otzaki-Magoula (fig. 1.2) and Karatsadhagli (fig. 1.4) exhibit only 159 and 130 determined bones, respectively (Boessneck, 1956; Prummel, in press⁽⁶⁾). The picture provided by this database might be thought somewhat discouraging, so for this reason I have also integrated the less well-represented sites in my comparative analyses.

Platia Magoula Zarkou: the bone remains from Middle Neolithic levels

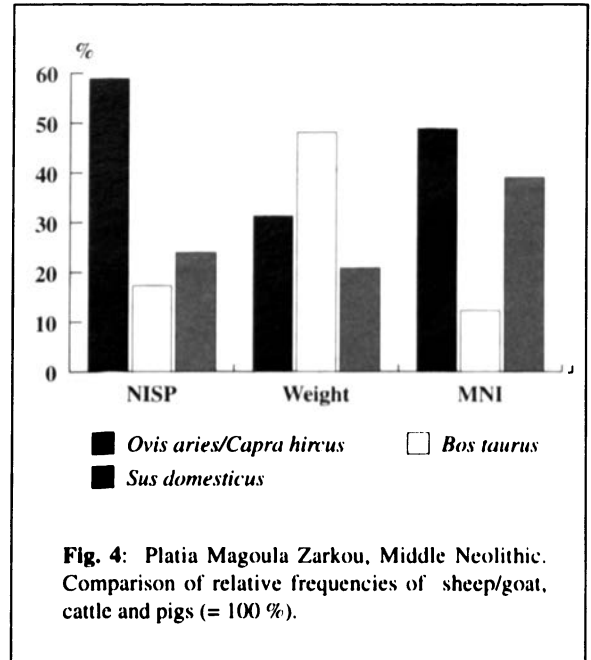
The bone material, mainly slaughter and consumption residues, originates from habitations excavated from Middle Neolithic levels in Platia Magoula Zarkou. It adds up to 2477 finds (bone weight: 20341g; tab. 3). Due to the poor preservation, only 65% of all mammalian remains could be identified to species level. Among these, domesticated animals largely predominate. They mirror the "classic repertory": sheep and goats, cattle, pigs and dogs (tab. 3). The list of wild species is rather limited: red deer, roe deer,

⁽⁵⁾ A modified Mediterranean climate, most probably with a little more humidity in the average year.

⁽⁶⁾ This number of n = 130 also includes Early Neolithic finds. A preliminary report was presented by W. Prummel on the last years ASWA conference in Paris.

Table 3: Platia Magoula Zarkou. Middle Neolithic. Amount of material per species or category. * = without molluscs.

Species/category	NISP	Weight	MNI
<i>Ovis aries/ Capra hircus</i>	772	4847	40
<i>Bos taurus</i>	226	7459	10
<i>Sus domesticus</i>	312	3240	32
<i>Canis familiaris</i>	28	154	7
<i>Bos primigenius</i>	8	1715	1
<i>Cervus elaphus</i>	21	564	3
<i>Capreolus capreolus</i>	12	60	3
<i>Vulpes vulpes</i>	1	5	1
<i>Felis silvestris</i>	1	3	1
<i>Lepus capensis</i>	3	5	2
<i>Bos taurus/primigenius</i>	5	283	2
<i>Ovis/Capra/Capreolus</i>	138	118	/
<i>Bos/Cervus</i>	79	433	/
Mammalia, not identified	514	502	/
Testudines	9	20	4
Mollusca	348	933	<178>
Total	2477	20341	106*



aurochs, fox, wild cat and hare can be listed. A considerable quantity of molluscs (*Unio crassus*, $n = 348$) and some tortoises (*Testudo hermanni*, $n = 2$ plus *Testudo* sp., $n = 4$) as well as terrapins (*Mauremys caspica*, $n = 3$) have additionally to be mentioned.

Domesticated animals comprise the main source of meat and raw material (fig. 3). Concerning the bone count (NISP), wild mammals amount to 3.4%. From the bone weight and the minimum number of individuals (MNI), their ratio can be calculated at 13.1% and 11%, respectively. Among the domesticates, a dominance of small ruminants is well reflected: sheep and goat yield about 60% of all bones and about 50% of all individuals (fig. 4). The ratio of sheep vs. goats is estimated at 3.5: 1⁽⁷⁾. From the weight of the bones, an equivalent to the procurement of meat, cattle comprise 48%, and the small ruminants only 31%. Hence, beef was eaten more often than mutton. Concerning the NISP and the bone weight, pigs did not play a dominant part in meat production. That contrasts to their ratio among the individuals counted: in this category pigs amount to remarkable 39%. One may critically ask in how far these ratios of deadstock truly reflect the composition of livestock raised by the inhabitants of the Platia Magoula

Zarkou during the Middle Neolithic, because the biasing of the sample through a diversity of taphonomic factors is comparatively high and causes also different survival patterns for each species (cf. Halstead, 1992b: 22). In total, the evidence from Platia Magoula Zarkou suggests that the full range of Neolithic livestock was consumed on a fairly balanced level, pointing to a rather mixed livestock. This contrasts to some degree with the overwhelming dominance of sheep and goat during the Early Neolithic. The relatively high number of pigs gives the impression of a more sedentary society, unaccustomed to regular movement to other locations.

Frequency of body parts

The presence/absence analyses of skeletal elements imply that domesticated animals were slaughtered and consumed within the boundaries of the settlement. All body parts of food animals are well represented (Appendix, tab. 6). Only a closer look to the data reveals some incoherence (fig. 5): for cattle, the presence/absence analyses exhibit a lack of vertebrae, costae, femora and pelvis. Additionally an over-representation of refuse from feet can be detected. The pig data reveal an extreme biasing of the

⁽⁷⁾ Out of a total of 40 individuals, 14 could be definitely assigned to sheep, four to goat and the majority ($n = 22$) remained unspecified.

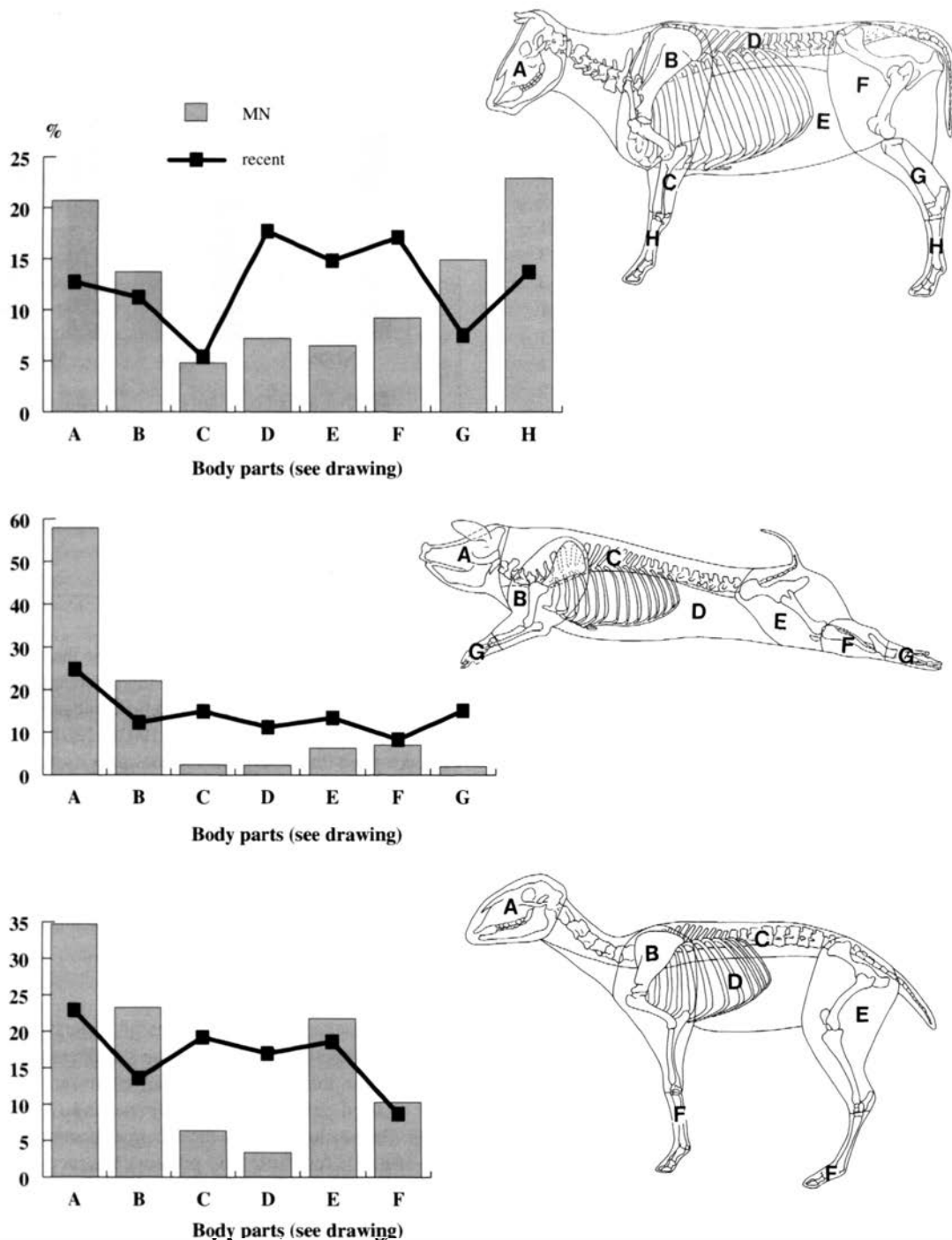


Fig. 5: Platia Magoula Zarkou, Middle Neolithic. Cattle, pig and sheep/goat: Comparison of body part frequencies in Middle Neolithic levels vs. complete skeletons (basis: bone weight).

material towards the front part of the animals (head and shoulder girdle), partly caused by different preservation conditions of teeth-bearing elements and more fragile postcranial elements of mostly non-adult specimens. In sheep and goat a considerable lack of meat-bearing elements such as vertebrae and ribs is found. In addition to taphonomic factors, these results might be caused by a deliberate distribution of certain body parts e.g. transport of meat portions off the site (cf. Becker, 1991: 37; Halstead, 1992b). In this context, it is striking that for red deer only antler and parts of fore- and hindlegs are recorded (Appendix, tab. 6), pointing to butchering of large game elsewhere and the preparation and to consumption of selected portions, as well as the dumping of specific refuse within the boundaries of the excavated area.

Butchery

It is worth mentioning that in Middle Neolithic levels, the fragmentation of bones from domesticates is more intensive than in all other periods (fig. 6). Within the refuse of Early Bronze Age and Late Neolithic levels, fragments which are preserved to less than one third of a complete element are in the majority: 69 and 76%. In the Middle Neolithic, this ratio exceeds 80%. Bones preserved to a half or one third of a complete element comprise 16-18% (Middle Neolithic: 14.7%) and better preserved pieces (two thirds or more) add up to 8-13% (Middle Neolithic: 4.5%; calculated from tab. 17 in Becker, 1991: 35). Comparable ratios

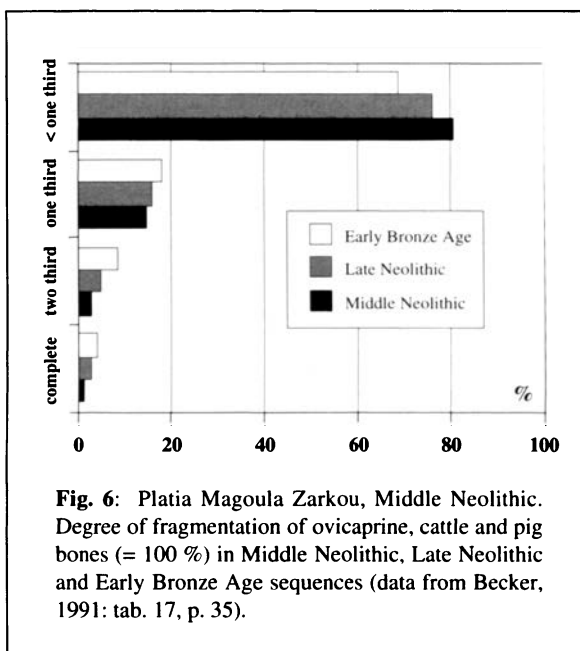
can be established if one carries out separate analyses for each domestic species. For red deer, it is striking to note that the postcranial elements are far less intensively crushed than comparably large bones of domestic animals. This is particularly true of the Middle Neolithic remains: only 37% of the deer finds are fragmented to more than one-third of a complete element, in contrast to 86%, 75% and 74% evidenced for ovicapriines, cattle and pigs (Becker, 1991: tab. 17).

Some particular fragmentation patterns deserve mention: ribs of sub-adult and adult pigs were often cut into pieces of equal length and found together in one location (five cases); two rib fragments exhibited many fine striations. Cut-marks are also evident near the distal joint of a tibia. A pig humerus was roughly perforated mid-shaft. A skull of a pig is cut in half and displays numerous cut-marks on the frontal bone and near the right orbita. Seven rib fragments of sheep or goat as well as a radius, a metatarsus and two carpalia bear cut-marks. A cranial frontal bone and a scapula of *Bos* show many fine incisions. They provide evidence for the use of cattle bones as pads for cutting (fig. 7e). Significant cut-marks are also visible on some antler fragments of red deer, a clear hint of antler processing. A red deer metatarsus shaft was split into seven elongated pieces which could be restored to form a whole diaphysis⁽⁸⁾. The question concerning the butchering of dogs cannot be answered definitively. Although the dog remains are badly damaged, there was no particular evidence of cut-marks (ibid.: tab. 18) which would indicate a purposeful portioning, defleshing or skinning.

In sum, an intensive butchery of food animals is indicated here, above all during the Middle Neolithic period. Reasons could lie either in a higher demand for marrow or in the necessity of utmost exploitation of all the nourishing parts because of a shortage in the food supply during that period. No evidence for intensified manufacturing based on bone is recorded.

Age profile/culling and sexing

Although the ageable material in ovicapriines is small and does not allow us to draw far-reaching conclusions on herd management (tab. 4), it is worth mentioning that a high rate of young and very young animals is indicated. The rate may be estimated even higher if the biasing of bones from very young specimens through taphonomic factors is taken into account. If we consider the number of animals per age class for all ovicapriines ("Total" in tab. 4), more than 70% of the animals were culled before maturity, mostly around



⁽⁸⁾ In table I these fragments were counted as "1".

Table 4: Platia Magoula Zarkou. *Ovis aries*/*Capra hircus*. Combined dental and postcranial evidence for MNI.

Category	Age at death	<i>Ovis</i>	<i>Capra</i>	<i>Ovis/Capra</i>	Total	%
Neonatus	< 1 month			4	4	10.0
Infantile	1-6 months			11	11	27.5
Juvenile	6-18 months	2		3	5	12.5
Young-adult	about 18-28 months	7	1	1	9	22.5
Adult	> 30 months	5	3	3	11	27.5
Total		14	4	22	40	100.0

six months and 1.5 years of age, respectively. This mortality pattern implies a slaughtering of younger sheep mainly during winter months, conflicting with the assumption of an abandonment of the site during the period of high flood from December to May and an annual seasonality in settlement activities. Moreover, the number of ovicaprines of reproductive age in this sample is extremely low and one is inclined to assume that the fully-grown animals were kept and slaughtered elsewhere. The slaughtering patterns hint at an economy which was geared to the exploitation of meat.

It must be added that the goat specimens exclusively range in the adult to young-adult category (tab. 4). Five pelvic bones from sheep allowed sexing: one came from an adult female, two from adult males and two from young males.

For cattle as well, a combined estimation of age at death from dental and postcranial evidences is offered due to the lack of ageable mandibula: out of ten individuals, only four are fully adult (older than 3.5 years), three are sub-adult (between 2 and 3.5 years) and another three of younger age (less than 2 years) when slaughtered. If I interpret these few data properly, draught power or prestige herding seemingly was not the aim of cattle management. Mortality rates for cattle conform to a meat profile, and indeed a primary focus on meat is generally predicted throughout the Neolithic.

Among the pigs slaughtered on the Magoula, age classes at and around 2 years predominate: piglets of under 1 year of age are represented with MNI = 7, those of 1-2 years of age with MNI = 14. Very young animals are most probably underestimated here, compared to the number of bones originally discarded, due to taphonomic factors mentioned above. Two pigs of sub-adult age and 9 mature individuals of more than 3.5 years of age have to be added.

The majority of the seven dogs represented here were fully grown at the moment of their death (older than 18 months); only one was of younger age (first premolar breaks through).

Reconstruction of body size

The size development of domesticated animals from Platia Magoula Zarkou has already been analysed at length (Becker, 1991). Measurements on bones from the 1990 campaign are not very numerous (Appendix, tab. 8) and thus, can add only minor information to the results already discussed. For sheep and goat, it has been shown that Neolithic specimens were of considerably smaller withers height than those from Bronze Age periods. The latter reach 65.8 cm on average whereas for the Neolithic, sheep of 58.5 cm and 62.3 cm are found. These differences in body-size may also point to a changing mode of exploitation (> wool) in post-Neolithic periods, when sheep of a differing stature or "breed" carrying a woolly coat instead of a hairy one, may have been introduced. It was in Early Bronze Age Thessaly, that this process was documented for the first time in Europe (Benecke, 1994: 234).

Cattle bone measurements, although small in number, indicate a large size of Middle (and Late) Neolithic animals kept by the Platia Magoula Zarkou inhabitants (Becker, 1991: 22f.). Two sub-adult/young *Bos* specimens of extremely robust stature from the Middle Neolithic levels support this impression, although the possibility that they may have been wild cannot totally be excluded. The keeping of fairly large domestic cattle and the existence of wild cattle which were hunted in the vicinity of the site adds weight to the idea of local interbreeding. Moreover, an autochthonous domestication of cattle in Thessaly may be considered. Unfortunately, Bökönyi's suggestion (1989: 324) that Achilleion could be one of the places where this may have happened, still lacks major osteological support.

As some measurements indicate, pigs from Platia Magoula Zarkou - those of Middle Neolithic levels included - were of fairly small stature and could easily be separated from their wild ancestors. The dogs from the Magoula seem to belong into a middle- to small-sized category of specimens (for further details see Becker, 1991).

Pathology and anomalies

Few cases of pathological changes in ovicaprines could be evidenced⁽⁹⁾: two mandibulae of young sheep (2nd molars break through) show an abscess on the corpus (fig. 7a, b); one adult sheep was hornless. In cattle bones, too, pathological features are rarely found: a third phalanx with exostosis near the joint (fig. 7c), a proximally preserved metatarsus with circum-joint exostosis (fig. 7d), a femur shaft fragment with some ossification on the surface and a metatarsus shaft of a very large domestic/wild specimen with the same pattern may be mentioned. One case of abnormality in pig bones was documented: a mandibula of an adult pig showed an irregular abrasion of the third lower molar.

Bone and shell utilisation

Implements found in Middle Neolithic levels from Platia Magoula Zarkou, can be allocated to the following categories: bone points (n = 3), needles (n = 6), long bone chisels (n = 1), smoothing implements (n = 2), tooth pendant (n = 1), antler implements, most probably axes (n = 2), shell pendants (n = 2) and valves of *Unio* with particular abrasions (n = 16). The latter is a unique type of utensil (fig. 8) which has not yet been recorded for Neolithic Thessaly (cf. Stratouli, 1998). From the 1990 material some worked bones have to be added to the above listed repertory: a sheep tibia was highly polished around the shaft, but unfortunately the working end was

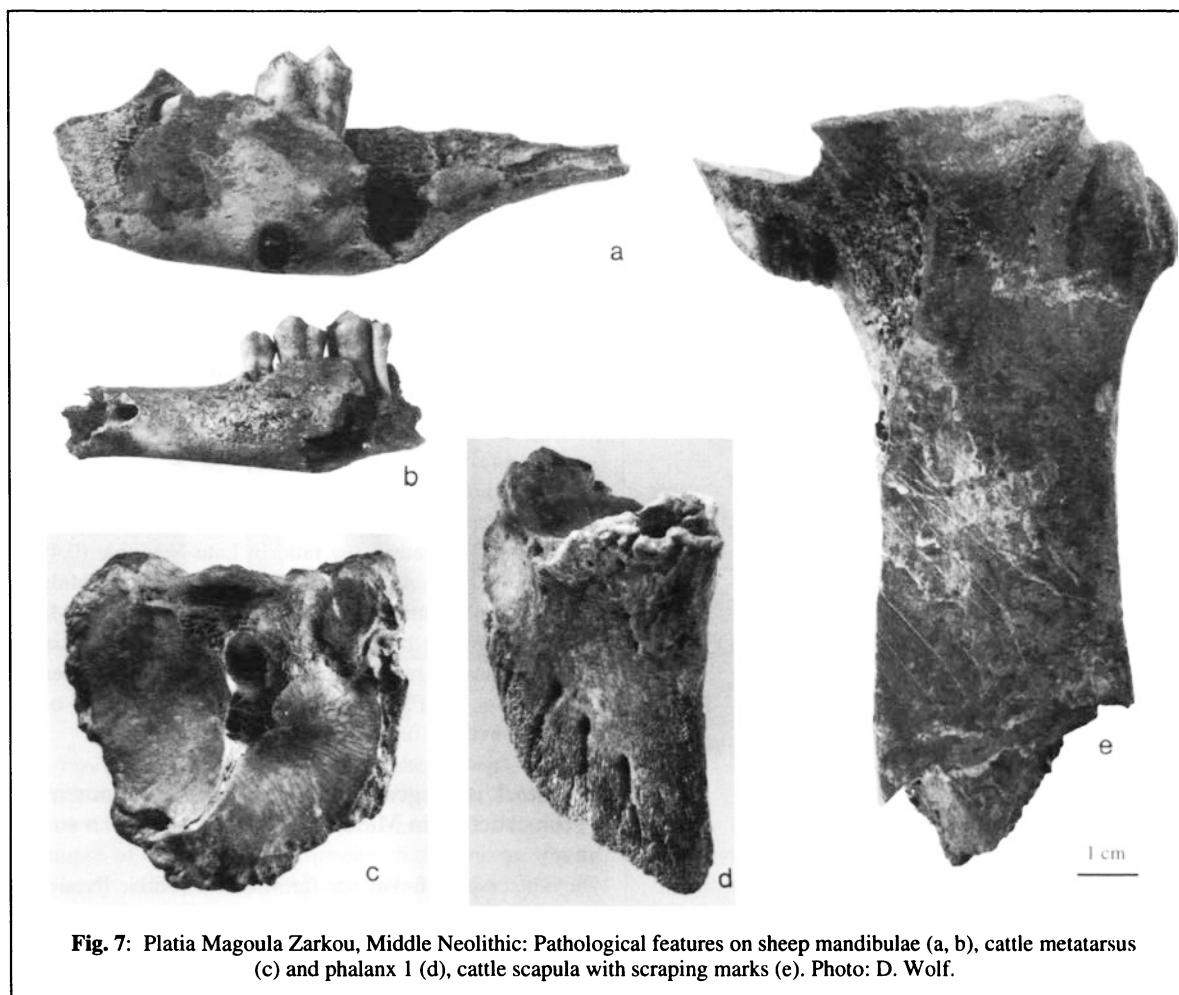


Fig. 7: Platia Magoula Zarkou, Middle Neolithic: Pathological features on sheep mandibulae (a, b), cattle metatarsus (c) and phalanx 1 (d), cattle scapula with scraping marks (e). Photo: D. Wolf.

⁽⁹⁾ A detailed micro-structural analysis of these skeletal diseases has been carried out by M. Schultz/Centre of Anatomy, University of Göttingen. These results will be presented in a further publication on animal palaeopathology.

broken off. It remains unclear what type of implement is represented here. The same goes for a polished shaft fragment of a sheep radius. Three worked cattle bones have to be mentioned: a scapula fragment which was shaped like a chisel, and two scapula fragments with highly polished and smoothed ridges, the function of which is unknown. More detailed textual and graphic information about bone, antler and shell artefacts can be gathered from the previous publication on the Platia Magoula Zarkou finds (Becker, 1991: 37ff.).

Hunting activities

Hunting most obviously did play a minor role in the procurement of meat and raw material (tab. 3; Appendix, tab. 6) and the list of species and elements is correspondingly short. Only one fully adult aurochs (*Bos primigenius*) is evidenced for the Middle Neolithic levels on Platia Magoula Zarkou, represented by a mandibula fragment, a section of the neck column and a femur-shaft

fragment. Cervids seemed to have been the main target during hunting sessions: twenty-one bones from at least three fully adult red deer (*Cervus elaphus*)⁽¹⁰⁾ and at least three roe deer (*Capreolus capreolus*) are represented. The latter were also fully grown when being killed. One adult red fox (*Vulpes vulpes*) as well as an adult wild cat (*Felis silvestris*) were recorded. Three bone fragments - a rib, a radius and a calcaneus - are the only surviving evidence for hares (*Lepus capensis*), one of the most regularly hunted species in Greek prehistory. The age structure of the wild mammals hunted carries no implications for seasonal activity, since fully grown cervids and carnivores can be killed all year round, although antler and fur would be in their prime state during autumn and winter time.

Exploitation of non-mammalian resources

Tortoises and terrapins. Nine fragments of turtle carapaces were found. They belong to Hermann's tortoise (*Testudo hermanni*) and to the stripe-necked terrapin (*Mauremys caspica*). Four remains are too fragmented for closer identification, but they most probably belong to the genus *Testudo*. Both species occur regularly on Thessalian sites (Becker, 1991: tab. 16). The question must remain open as to whether their meat was eaten, whether their blood and intestines were used for medical treatment or whether the carapaces were taken as utensils or receptacles. *Testudo hermanni* ranges in areas with hot summers and can be found in moist or dry habitats with preferably dense vegetation, whereas *Mauremys caspica* is found in large, open waters and river systems.

Molluscs. 14% of all faunal remains derive from molluscs (*Unio crassus*; tab. 2). It is most remarkable that, contrasting to a rather low ratio in Late Neolithic (0.4%) and Early Bronze Age periods (1.0%), molluscs in Middle Neolithic levels are ten times more frequent (fig. 9). Most of the valves are broken, indicating deliberate opening. Hence, a meal of raw shellfish seems either to have been a delicacy for the Platia Magoula Zarkou inhabitants or a necessity in times of food shortage.

Livestock management, hunting and environmental reconstruction in Middle Neolithic Thessaly: a summary

The corpus of evidence for Middle Neolithic livestock management is still relatively patchy. The results summarised here are not exhaustive but they allow a first

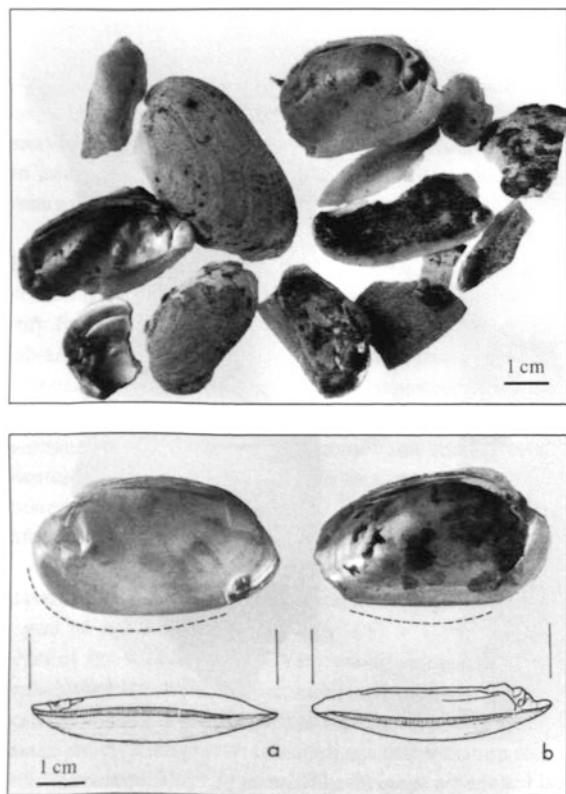


Fig. 8: Platia Magoula Zarkou, Middle Neolithic. Unworked (above) and worked (below) valves of *Unio*. Photo: D. Wolf.

⁽¹⁰⁾ Their body size has already been investigated elsewhere (Becker, 1991: 26f.).

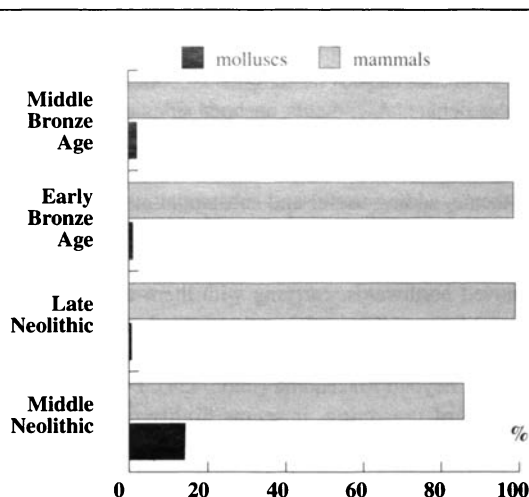


Fig. 9: Platia Magoula Zarkou. Frequency of mammals and molluscs in Middle and Early Bronze Age (MBE, EBA), and also in Late and Middle Neolithic (LN, MN) sequences (basis: NISP).

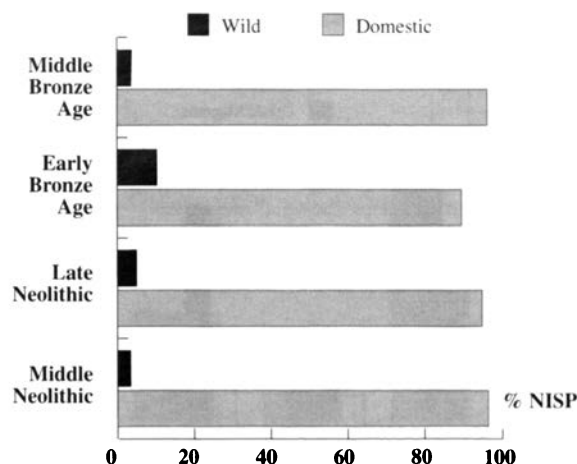


Fig. 10: Platia Magoula Zarkou. Comparison of domestic vs. wild remains in Middle and Early Bronze Age (EBA), Late Neolithic (LN) and Middle Neolithic (MN) sequences on Basis of NISP (left) and bone weight (right).

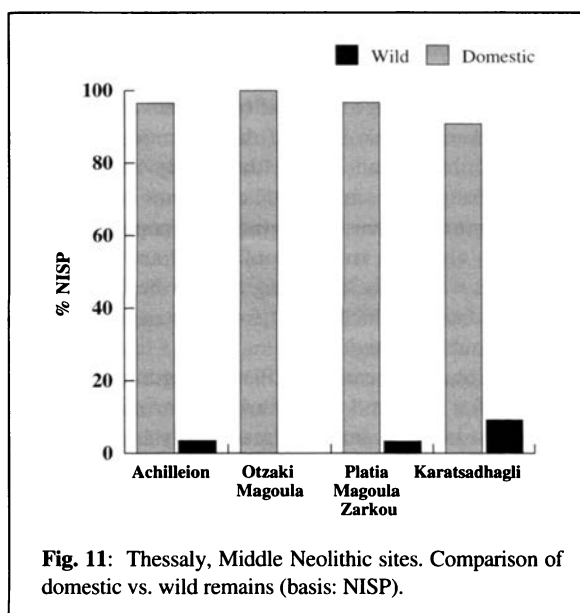
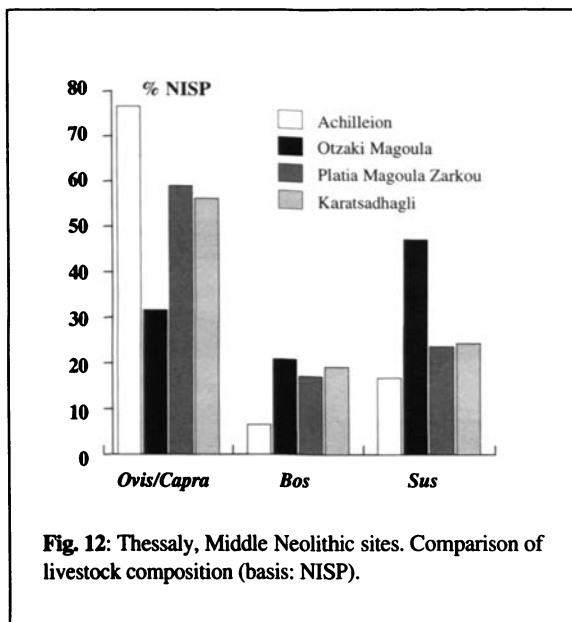


Fig. 11: Thessaly, Middle Neolithic sites. Comparison of domestic vs. wild remains (basis: NISP).

glimpse of economic developments during this period. In Thessaly, subsistence strategy reveals a certain continuity from the Early Neolithic onwards, in so far as the requirement of meat and raw material was largely based on the keeping and breeding of domesticated animals. The results from Platia Magoula Zarkou strengthen this view: domesticated animals played a dominant role throughout the entire sequence of occupation (fig. 10). Only in the Early Bronze

Age did it slightly lose ground: wild species emerge a little more often here, although the differences are scarcely dramatic. Middle Neolithic levels from Platia Magoula Zarkou exhibit no unexpected results; moreover, the latter coincide well with the frequencies gained from other Thessalian sites of this period. They all exhibit low percentages of wild mammal remains (fig. 11).

This region-wide conformity in ratios of wild to domestic species contrasts markedly with the composition of Middle Neolithic livestock in the areas under discussion (cf. fig. 12). In Achilleion, a high level of small ruminants (76.6%) and a very low number of cattle bones (6.5%) coincides with a low pig ratio (16.9%), whereas in Otzaki Magoula a very high frequency of pigs (47.5%) is evidenced. These strikingly large differences in meat consumption may reflect a different composition of livestock which could be influenced by the location of the sites concerned and by contrasting environmental conditions. Achilleion is located on low foothills above the western Kardhitsu plain, Otzaki Magoula is situated near the Peneios in the northern part of the Larissa plain. The two plains exhibit differences in climate, precipitation level and water regime, as has been demonstrated by Halstead, the western basin being "well watered, with an average rainfall of 600-1000 mm and a dense network of more or less perennial watercourses" whereas the eastern plain exhibits a more "semi-arid" character (Halstead, 1989b: 70). Under these circumstances, a livestock composition quite the opposite of what is evidenced here



might have been expected (cf. fig. 12). Not too much should be read into these data, however, since we know too little about the environmental conditions in the particular micro-regions. Moreover, the amount of material from the two sites is extremely dissimilar (5279 vs. 159 bones) and the reliability of the latter sample is highly questionable. This applies also to a further comparable sample: the investigations in Karatsadhaghi ($n = 203$) provided results which resemble very much those gained from Platia Magoula Zarkou ($n = 2477$) with a clear (but not exceptionally large) dominance of ovicaprids (59 and 56%), pigs being the second most important species (24%) and cattle representing the lowest number of remains (fig. 12). Karatsadhaghi is located at the border of the small southern coastal plain at an altitude of 200 m (fig. 1). Oaks and pistachio trees are assumed to have grown in the neighbourhood (Prummel, 1998). This environment would certainly offer an adequate basis for the raising of pigs. A similar vegetation cover can be envisaged in the vicinity of Platia Magoula Zarkou. The nearby hills and the Chasia mountains may also have been extensively covered with woods such as deciduous oaks (acorn has been listed among the gathered plants). From these results, although few in number and to some degree doubtful in their reliability because of the weak and largely inhomogeneous database, a divergence in meat consumption is indicated which evidently was influenced by a different composition of livestock, the geographical setting of the sites and by the local vegetation cover.

The ensuing question of Middle Neolithic herd management cannot easily be answered. Whether transhumant

pastoralism in Greece is a recent historical phenomenon or whether it reaches back as far as to the Neolithic, is a matter still under debate. Arguments on both sides are currently summarised by Chang (1999: 135ff.), who also presents a more theoretical focus for understanding this widely discussed theme, adding useful and substantial ethno-archaeological data. At least for the Iron Age, Kilian (1973) could plausibly argue that some elements of Thessalian populations moved northwards, carrying with them characteristic ornamental fittings. Kilian claims these people to have been nomadic herdsman who annually migrated over great distances, even beyond Macedonia (ibid.: 434). Pursuing Halstead's line of reasoning, it seems highly questionable whether or not the present summer pastures of the Mediterranean landscape were already in existence in prehistoric millennia: he proclaims these pastures not to be a natural part of the ancient landscape, but a man-made feature. Movements from lowland to mountains in seasons of scarce grazing would be necessary only if large numbers of sheep and goats were kept, which inevitably would produce grazing pressure (Halstead, 1987). From my assessment of the Middle Neolithic data available to date, it is much too early to form a definite conclusion. On the other hand, as the archaeological record has revealed – although the evidence has not gone unchallenged – mobility and movement apparently were characteristic traits of the community living at Platia Magoula Zarkou during the (Early and) Middle Neolithic. Changing environmental conditions such as periodic flooding might occasionally force the population from their homes, entailing transport of goods and household equipment as well as the removing of their herds to higher ground – all factors which might form a starting-point for regular transhumant activity.

In addition, the location of Platia Magoula Zarkou at the edge of a lowland area and at a crossing point between two large plains may reasonably have brought about quite frequent contacts between the inhabitants of the Magoula and transient peoples which in turn might have influenced the development of systems of trade and exchange (cf. Halstead, 1992b). Finally, mobility would also have been a sensible strategy with a view to minimising risks of low food procurement. That a certain shortage in food might well have occurred during the Middle Neolithic is hinted at by the strikingly intensive fragmentation of bones from food animals on the one hand and by the comparatively high ratio of additional food sources such as mussels on the other.

The exploitation of natural resources other than molluscs may also add weight to this line of argumentation. But, before considering this point, I would like to draw a

Table 5: Spectrum of wild mammal species represented from Thessalian sites with Neolithic sequences. 1: Platia Magoula Zarkou, 2: Ayia Sofia-Magoula, 3: Argissa Magoula, 4: Otzaki Magoula, 5: Arapi Magoula, 6: Prodromos, 7: Achilleion, 8: Sesklo, 9: Pevkakia Magoula, 10: Dhimini, 11: Karatsadhagli (references see tab. 1; for no. 2-5 and 9 cf. A. von den Driesch, 1987: tab. 1).

Species	1	2	3	4	5	6	7	8	9	10	11
<i>Bos primigenius</i>	+		+			+	+		+	+	
<i>Cervus elaphus</i>	+	+	+	+	+	+	+	+	+	+	+
<i>Cervus/Dama dama</i>				+					+		
<i>Capreolus capreolus</i>	+			+		+	+	+	+	+	+
<i>Capra ibex</i>							+				
<i>Capra aegagrus</i>									+		
<i>Sus scrofa</i>	+	+	+	+	+	+	+	+	+	+	
<i>Vulpes vulpes</i>	+						+		+		
<i>Felis silvestris</i>	+	+							+		
<i>Ursus arctos</i>									+	+	
<i>Martes martes/foina</i>									+		
<i>Meles meles</i>								+			
<i>Lepus capensis</i>	+	+		+	+		+	+	+	+	
Insectivora							+		+		

general picture of faunal wildlife in Neolithic Thessaly (tab. 5). As already mentioned, wild mammals contributed only modestly to Neolithic subsistence strategies. Nevertheless the list of mammal species for the whole of Thessaly is manifold. Some of the larger wild mammals are represented with a degree of regularity all over Thessaly (tab. 5). The dominance of red deer (in 100% of all sites), wild boar (82%), roe deer (73%) and hare (73%) is noteworthy, while other mammal species are much less in evidence. The faunal results underline the archaeobotanic considerations, featuring a more or less wooded environment with some few cleared areas and an overall richness of biological resources (cf. Halstead, 1992a: 29). This is in some way corroborated by the fact that even today many of the ungulate and carnivore species still survive in Greece, although not in Thessaly itself (Ondrias, 1965; see references in Stubbe and Krapp, 1993; Niethammer and Krapp, 1986).

Particular species which were represented in contemporaneous sites north and south of the plains are lacking in

prehistoric Thessaly or are controversial in terms of their former natural range: the fallow deer (Becker, 1997, 1998) and of course the lion (Becker, 1986: 167ff.) are cases in point. The very slight evidence for fallow deer being excavated from Thessalian sites is interpreted either as representing the remains of imported fallow deer skins ($n = 1$, Pevkakia Magoula; Driesch, 1987: 10) or their identification is doubtful (Argissa Magoula, $n = 2$, Boessneck, 1956)⁽¹¹⁾. It is only Bökönyi (1989: 322) who presumes a natural range of fallow deer near Achilleion, though on the basis of three identified fragments only. In my own opinion, the possibility of importation of raw materials - hides, processed meat or even live fallow deer - cannot be excluded and would offer a more feasible explanation for the Achilleion finds.

Also from Achilleion, evidence for another ungulate species, even more unexpected, was claimed: *Capra ibex*⁽¹²⁾. If the identification is sustainable and an intermingling with other closely related animals such as large,

⁽¹¹⁾ From Platia Magoula Zarkou, no fallow deer remains are represented, contrary to the interpretation that Yannouli and Trantalidou (1999: 260) have placed on my (German) text (Becker, 1991: 25ff.).

⁽¹²⁾ 15 bones from 8 individuals are identified (Bökönyi 1989: tab. 13.2). S. Bökönyi continues: "...the Neolithic ibexes at Achilleion represent the first occurrence of the species in the Early Holocene of Greece, indicating that this area of distribution extended into Greece in prehistoric times" (ibid.: 321).

male, domestic goats can be excluded, this evidence demands some explanation. A natural range of ibex in the Thessalian plains is less probable than importation, e.g. through contact with people living in mountainous regions to the West. *Capra ibex* is represented for example in Late Palaeolithic cave sites in the Epirus (Bailey and Gamble, 1990: Asprochaliko). In the Epirus mountains ibex populations may well have survived into more recent periods and thus may have been repeatedly an object of trade or exchange.

The questionable evidence for wild goat from Pevkakia Magoula also deserves mention. *Capra aegagrus* is represented by an extremely large 1. phalanx. According to Amberger (1979: 195), this bone may derive from the hide of a wild specimen which was imported from North-west Anatolia or from some other part of Asia Minor where *Capra aegagrus* naturally ranges.

If we now turn back to the evidence from Platia Magoula Zarkou, it is true that the spectrum of wild species is quite limited. None the less, it allows us to draw a picture of the population's activity radius while exploiting their environment (tab. 5): the inhabitants of the Magoula hunted species living in forest environs (red deer, wild boar, carnivores), at forest borders (roe deer, aurochs) and in floodplains (geese and ducks); they also exploited fresh-water resources (molluscs). The presence of hares conforms with the reconstruction of a more-or-less wooded environment with cleared areas of arable land, where this species could have found an adequate habitat. The impression gained from all the evidence excavated at the Magoula, is of a wider annual circulation in the exploitation of wild resources. The question is, whether the lack of wild boar in Middle Neolithic assemblages and the relatively high frequency of the same species in the Late Neolithic has a significant meaning or whether it is simply a matter of bias (Becker, 1991: 28). I do not wish to discuss in greater detail the often debated problem of reconstructing a former wildlife population in a particular region from the slaughter and consumption refuse of a site. It is a self-evident fact that, more often than not, taxonomic richness is a function of sample size, one impressive example being the bone material found in Pevkakia Magoula. Excavations on this site produced a large amount of bone material, yielding a spectrum of 16 mammal species, 27 bird species, 5 species of tortoises, 13 species of fish and 19 species of molluscs (Driesch, 1987: tabs.1-5). There is no comparable faunal assemblage known for the Thessalian Middle Neolithic, hence a truly representative and convincing reconstruction of the former wildlife cannot yet be built up.

Concluding remarks

The Thessalian Middle Neolithic seems to have been a phase neither of dramatic change nor of crucial innovation, but rather of consolidation and increased sedentarism. Despite this overall impression, tentative signs of changes are indicated in the archaeological record. As has been shown from architecture, settlement patterns and the occurrence and distribution of pottery and stone artefacts, age-old traditions seem to break up at this time and instead new trends emerge which differ considerably from region to region. Many of these aspects have been traced from the Platia Magoula Zarkou.

In this paper, I have surveyed the faunal remains which may be found at Middle Neolithic sites in Thessaly and have argued that these remains should be considered as a valuable part of the archaeological record. Remarkably little attention has been paid by prehistorians to the study of husbandry and the exploitation of natural resources during the Middle Neolithic, although these activities represented one of the corner-stones of economic and social development. While the faunal data are still very patchy, some tendencies can be detected: alterations in livestock composition, in particular an increased importance of pigs; a different treatment of game and food animals in terms of butchering; the transport of processed meat off-site; broad-spectrum hunting activities which presumably were encounter-oriented; and a supplementary exploitation of resources such as molluscs. Some of the archaeozoological results invalidate former archaeological assumptions concerning seasonality, for there is no hint of seasonal change in the evidence provided by the Platia Magoula Zarkou bone remains. The manifold aspects of the relations between man and the animal world include also factors beyond husbandry and meat consumption. We know that domestic animals had a specific role in everyday perceptions and in ritual activities, as is reflected in theriomorphic figurines and in the decoration of pottery and house models.

It has to be concluded that archaeozoological results may significantly assist in the understanding of how Middle Neolithic societies developed and how networks operated, but all attempts to answer these questions in more detail are doomed to failure unless a larger number of well-stratified bone assemblages are excavated. Specific evidence for the economic sphere and the surrounding environment, particularly during the Middle Neolithic in Thessaly, is only just beginning to emerge. The role of the Platia Magoula Zarkou in this process, being a typical Middle Neolithic site in a rather exceptional location, cannot yet be estimated.

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tory of the European Vertebrate Fauna" beforehand and to Wietske Prummel who most kindly put her manuscript on the Karatsadhagli bones at my disposal. Last but not least I owe a lot to Arthur MacGregor for improving the English text so "charmingly".

Appendix

Table 6: Platia Magoula Zarkou. Middle Neolithic levels. Frequency of skeletal elements per species according to bone count (and weight): A *Ovis aries/Capra hircus*, B *Bos taurus*, C *Sus domesticus*, D *Canis familiaris*, E *Bos primigenius*, F *Cervus elaphus*, G *Capreolus capreolus*, H *Vulpes vulpes*, I *Felis silvestris*, J *Lepus capensis*.

Skeletal elements	A	B	C	D	E	F	G	H	I	J
Proc.corn./antler	4 (234)	2 (62)				6 (146)				
Cranium	50 (281)	17 (459)	51 (448)							
Maxilla	6 (95)		19 (370)	2 (11)						
Dentes superior.	25 (136)	3 (144)	1 (4)	1 (1)			1 (3)			
Mandibula	80 (953)	15 (699)	45 (1001)	4 (53)	1 (784)		1 (3)			
Dentes inferiores	38 (137)	10 (183)	17 (52)		1 (50)					
Atlas	3 (78)		2 (35)		1 (175)					
Epistropheus	4 (59)	1 (79)			1 (150)					
Vert. cervicales					1 (83)					
Vert. thoracicae	8 (66)	7 (271)	5 (34)				1 (1)			
Vert. lumbales	9 (90)	5 (82)	2 (9)							
Vert. indet.	2 (3)	7 (74)								
Sacrum		1 (30)								
Costae	98 (159)	33 (487)	32 (76)	8 (13)		1 (7)	1 (2)			1 (2)
Sternum	1 (5)									
Scapula	51 (494)	8 (674)	31 (330)			1 (27)	1 (6)			
Humerus	33 (220)	11 (348)	14 (187)	1 (2)		1 (20)	1 (15)			
Radius	55 (319)	5 (314)	5 (57)			1 (26)				1 (1)
Ulna	12 (41)	2 (45)	15 (142)			1 (28)	1 (2)			
Carpalia	1 (1)	3 (63)								
Metacarpus	27 (170)	8 (392)	9 (41)							
Pelvis	25 (251)	5 (146)	9 (129)				3 (14)			
Femur	40 (159)	11 (539)	11 (74)	6 (42)	1 (225)	2 (42)			1 (3)	
Tibia	107 (571)	23 (760)	29 (204)	6 (32)	1 (222)	1 (23)		1 (5)		
Fibula			1 (1)							
Talus	1 (5)	3 (192)	1 (7)			1 (69)				
Calcaneus	4 (18)	3 (158)	2 (14)							1 (2)
Centrotarsale	1 (1)	1 (29)				1 (32)				
Tarsalia	1 (1)	1 (13)								
Metatarsus	32 (174)	18 (659)	2 (5)			1 (84)	1 (11)			
Metapodium	47 (101)	10 (195)	3 (5)			2 (20)	1 (3)			
Phalanx I	5 (22)	6 (154)	4 (8)		1 (26)	2 (40)				
Phalanx II	1 (2)	2 (43)	1 (1)							
Phalanx III	1 (1)	5 (165)	1 (6)							
Total	772 (4847)	226 (7459)	312(3240)	28 (154)	8 (1715)	21 (564)	12 (60)	1 (5)	1 (3)	3 (5)

Table 8: Platia Magoula, Middle Neolithic. Measurements (according to Driesch, 1976; for additional measurements, see Becker, 1991: 62ff.)

<i>Ovis aries</i>								
Mandibula	LP2-P4	22.1	LM3	24.2		Humerus	BT	26.7
	HvP2	16.9	BM3	8.9				
Scapula	GLP	35.3	31.3			Radius	Bp	31.5
	LG	26.8	25.1				BFP	28.4
	BG	21.0	20.5				Dp	16.5
	KLC	21.6	19.0					
Ulna	LO	42.3				Metacarpus	Bp	21.8
	KTO	21.6					Dp	15.5
	Tpa	25.6						
	BPc	17.9						
Pelvis	LA	27.2	26.3	27.6	24.7			
	KH	14.8	—	18.0				
Metatarsus	Bp	19.4	KD	11.0	—			
	Dp	19.6	Bd	23.6	23.7			
			BCon	11.2	11.1			
			DCon	16.1	15.9			
			DI	9.9	10.5			
<i>Capra hircus</i>								
Scapula	GLP	32.6						
	LG	26.8						
	BG	22.1						
<i>Bos taurus</i>								
Scapula	GLP	78.1				Phalanx 1 anterior	Lpe	60.8
	LG	65.2					Lme	60.5
	BG	57.3					Bd	34.4
	KLC	64.8						
Phalanx 2	GL	39.9				Phalanx 3	LGI	32.2
	Bp	29.3					BGI	21.3
	Bd	24.8						
<i>Sus scrofa</i>								
Mandibula	LP2-M3	97.8						
<i>Canis familiaris</i>								
Mandibula	LM1	23.1						
	BM1	8.5						
Femur	DC	14.8				Femur	Bd	23.0

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