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PHYSIS

L'ENVIRONNEMENT NATUREL ET LA RELATION HOMME-MILIEU DANS LE MONDE ÉGÉEN PROTOHISTORIQUE

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PLANT RESOURCE AVAILABILITY AND MANAGEMENT IN PALAEOLITHIC AND MESOLITHIC GREECE*

Primary research of plant macroremains and published archaeobotanical (seed, fruit and charcoal remains, phytoliths) and palynological data are brought together to investigate some of the most illusive periods of the past: the Palaeolithic and Mesolithic. Archaeobotanical practice in Greece, although still not an integral part of excavation projects, has made substantial progress towards understanding past agricultural practices, food plant preparation and consumption, the contribution of certain plant species to human diet, the processing of plants for the manufacture of secondary products, the representation of certain plant taxa in landscape vegetation, and the social role of various plants. The bulk of the studies, however, refers to the Neolithic and Bronze Age periods, with only a few focusing on the Palaeolithic and the Mesolithic, largely reflecting the lack of substantial archaeological research in Greece on these periods. Therefore, until fairly recently these distant eras of our gathering past have been a terra incognita. Several of the projects focusing on the Palaeolithic and Mesolithic of Greece were surface surveys with the principal aim to track down locations of increased tool assemblages that may correspond to actual "sites".[1] None of them has so far resulted in the excavation of any of the spotted "sites", which would permit the implementation of systematic archaeobotanical research. Archaeobotanical data, nevertheless, are being gradually building up since the completion of several long term excavation projects mainly on cave sites (Franchthi, Theopetra, Klissoura, Youra), providing a challenging opportunity to gain insights into people-plant interactions, interwoven within the context of Palaeolithic and Mesolithic hunter-gatherer societies in Greece. It was thus the aim of this study to collate in a uniform database format all available information on plants for these periods in order to pose several methodological and theoretical queries that will provide information on plant resource availability and use and will serve as guides to strengthen the framework of future archaeobotanical work in this field.

The database

Published results of analysis of seed and fruit macroremains, charcoal fragments and phytoliths from all excavated sites in Greece with evidence of Palaeolithic and/or Mesolithic activity were accessed and recorded. Results of primary archaeobotanical analysis from Theopetra and Schisto were also added to the database. Information from pollen diagrams dated to the study period extracted from cores in various locations around Greece was also reviewed to provide the environmental and climatic background in which the archaeobotanical data can be analysed (Pl. LXX). Our endeavour was to combine plant remains that are more

* G. Kotzamani would like to thank the Greek State Scholarships Foundation and the British School at Athens for providing funding for part of this research. We would also like to thank Dr. Hector Orengo for his help with the illustration.

1 E.g. C. RUNNELS, "A prehistoric survey of Thessaly: new light on the Greek Palaeolithic," *JFA* 15 (1988) 277-290; C. RUNNELS and T.H. VAN ANDEL, "The Early Stone Age of the Nomos of Preveza: landscape and settlement," in J. WISEMAN and K. ZACHOS (eds.) *Landscape Archaeology in Southern Epirus, Greece* I, *Hesperia* Supplement 32 (2003) 46-133; Ε. ΠΑΝΑΓΟΠΟΥΛΟΥ, C. RUNNELS, Γ. ΤΣΑΡΤΣΙΔΟΥ, P. MURRAY, S. ALLEN, K. MULLEN and E. ΤΟΥΡΛΟΥΚΗΣ, "*Επιφανειακή έρευνα για τον εντοπισμό Μεσολιθικών θέσεων στην περιοχή Κάντια Αργολίδας,*" *AAA* 35-38 (2005) 23-36; N. EFSTRATIOU, P. BIAGI, P. ELEFANTI, P. KARKANAS and M. NTINOU, "Prehistoric exploitation of Grevena highland zones: hunters and herders along the Pindus range of Western Macedonia (Greece)," *WorldArch* 38(3) (2006) 414-435; O. APOSTOLIKAS and N. KYPARISSI-APOSTOLIKA, "Middle Palaeolithic exploitation of the Lake Plastiras Plateau, Western Thessaly – Greece," in A. DARLAS and D. MIHAILOVIC (eds.), *The Palaeolithic of the Balkans, Proceedings of the XV World Congress, International Union for Prehistoric and Protohistoric Sciences, Lisbon 4-9 September 2006* (2008), 33-37; C. RUNNELS, "Mesolithic Sites and Surveys in Greece: a case study from the Southern Argolid," *JMA* 22.1 (2009) 57-73; F. STRASSER, E. PANAGOPOULOU, C. RUNNELS, P. MURRAY, N. THOMPSON, P. KARKANAS, F. McCOY and K. WEGMANN, "Stone Age seafaring from the Mediterranean: evidence from the Plakias region for the Lower Palaeolithic and Mesolithic habitation of Crete," *Hesperia* 79 (2010) 149–90.

sensitive markers of palaeo-vegetation, landscape management and palaeo-climate (i.e. pollen, phytoliths and charcoal) with the ones that reveal more on gathering activities and the utilisation of certain plants in diet and other daily activities (i.e. seeds and fruits). The chronological starting point for data recording was set at the end of the Middle Palaeolithic period (~46,000-35,000 BP), when the earliest testimonies regarding the use of seeds and fruits from stratified hearths of Theopetra cave are found.

The different methodologies followed in the study of different types of archaeobotanical remains dictated the adoption of somehow diversified recording categories for each of them. A single spreadsheet was used for registering general information regarding each excavation site, the type of botanical evidence retrieved and details on the published references, while for each of the abovementioned categories of remains two separate spreadsheets were used to record sampling/assemblage and taxa information adjusted accordingly for each category. Data from pollen diagrams were treated separately as they referred to locations other than the excavation sites that produced macrobotanical remains and phytoliths. At this stage of our project only broad pollen information has been noted providing a generic outline of the vegetation cover and some climatic indications concerning several areas of Greece during the Palaeolithic and Mesolithic periods.

Data quality

So far the total number of excavated sites that produced archaeobotanical material dating to the Palaeolithic and Mesolithic periods in Greece is eight. Of these, six produced archaeobotanical assemblages of seed and fruit macroremains, five included charcoal material and only one was studied for its phytoliths. Regarding the chronological distribution of the data, the Upper Palaeolithic period is the best represented in five of the eight sites, followed by the Mesolithic, which is supported by botanical evidence from four sites. Late Middle/Early Upper Palaeolithic archaeobotanical material has been retrieved from three sites. Regarding sampling and data quality, the following main observations can be made: (a) Systematic soil sampling for the collection of seed and fruit macroremains was followed in three out of the six sites, at Franchthi, Theopetra and Schisto; (b) Franchthi has the richest seed/fruit assemblage of all; (c) The Theopetra material is the only assemblage covering the whole chronological sequence from the end of the Middle Palaeolithic to the Mesolithic; (d) Minimum mesh sizes used for the collection of seed/fruit plant material in the cases of Klissoura and Maroulas (1mm and 0.50mm respectively) are considered inadequate for the recovery of small items of the wild flora. Thus, part of the material might have been lost during sample processing in the field. At Youra no flotation was conducted, only dry-sieving, resulting also in potential loss of material; (e) Seed/fruit assemblages from Upper Palaeolithic Klissoura[2] and Mesolithic Maroulas[3] might in reality include modern contaminations, as implied by the uncharred state of most seed macroremains; (f) The current underepresentation of phytolith analyses might be soon counterbalanced with the completion and publication of studies from Theopetra and Schisto.[4]

Synthesis of the botanical evidence

In the following discussion a synthesis of the archaeobotanical evidence is attempted, referring to palynological data only as a general guide. Pollen data provide the general picture of the vegetation through a long temporal and spatial perspective that at the moment can only complementally and not comparably be combined with the much narrower site-specific scale

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2 M. LITYNSKA- ZAJAC, "Plant material from Klissoura cave 1 in Greece," in *Eurasian Prehistory* 7 (2) (2010) 87-90.

3 A. MUELLER-BIENIEK, "Archaeobotany in the Mesolithic settlement of Maroulas/Kythnos," in A. SAMPSON, M. KACZANOWSKA and J.K. KOSLOWSKI (eds.), *The Prehistory of the Island of Kythnos (Cyclades, Greece) and the Mesolithic Settlement at Maroulas* (2010) 141-142.

4 G. TSARTSIDOU (pers. com.).

of information provided by the other lines of plant evidence. The discussion puts an explicit emphasis on the seed and fruit macroremains, which form the focus of our research interest.

Late Middle Palaeolithic/Early Upper Palaeolithic

Information on the vegetation of Greece during the later part of the Middle Palaeolithic period derives mainly through pollen diagrams from several parts across the country indicating various oscillations between steppe, forest-steppe and forest communities for the time span between c. 60,000 and 25,000 years ago.[5] Anthracological data for the period are only available from the sites of Theopetra,[6] Laconis[7] and Klissoura.[8] The combination of taxa, such as deciduous *Quercus, Ulmus, Carpinus/Ostrya, Prunus, Fraxinus, Amelanchier, Sambucus, Tilia* and *Juniperus* in the late Middle Palaeolithic Theopetra deposits, points towards the intercession of mild climatic episodes with increased levels of moisture during a period of prevailing glacial conditions.[9] Contemporary (~40,000 BP) charcoal evidence from Laconis records the dominance of *Prunus* (most probably *Prunus amygdalus/P. spinosa*), which is a marker of drier and colder conditions, while the Klissoura assemblage indicates the presence of a mosaic of environments and vegetation types with dry parkland vegetation on the rocky hills giving its place to open woodland with mesophilous (*Acer, Carpinus/Ostrya*, deciduous *Quercus*) and some thermophilous trees at the foothills of the gorge and the valley floor.[10] Only a very low number of diagnostic phytoliths from layers of this period have been recovered, providing no additional information.[11]

The earliest evidence of the links between the prehistoric foragers in the area of modern Greece and their plant world are outlined through the archaeobotanical finds from deposits at Theopetra cave in Western Thessaly, dated to the end of the Middle Palaeolithic period (~46,000-35,000 BP).[12] Seed and fruit macroremains were retrieved through systematic soil sample collection and flotation between 1989 and 2006. The late Middle Palaeolithic assemblage is dominated by leguminous species, followed by a variety of fruits, nuts and wild species with edible and other useful attributes. The detection of a single *Hordeum vulgare* ssp. *spontaneum* grain and an *Avena* sp. pedicil tip may support the suggestion for utilisation of these wild cereal resources but these may equally be intrusions from layers above. Legumes include mainly *Lathyrus cicera, L. nissolia, L. cf. aphaca*, wild lentils (*Lens* sp.), peas (*Pisum sativum ssp elatius/*

5 E.g. P.C. TZEDAKIS, "Long-term tree populations in Northwest Greece through multiple Quaternary climatic cycles," *Nature* 364 (1993) 437-440; T.H. VAN ANDEL and P.C. TZEDAKIS, "Palaeolithic landscapes of Europe and environs 150,000-25,000 years ago: an overview," *Quaternary Sci Rev* 15 (1996) 481-500; G. DIGERFELDT, S. OLSSON and P. SANDGREN, "Reconstruction of lake-level changes in lake Xinias, central Greece, during the last 40.000 years," *Palaeogeogr Palaeocl* 158 (2000) 65-82; P.C. TZEDAKIS, I.T. LAWSON, M.R. FROGLEY, G.M. HEWITT and R.C. PREECE, "Buffered tree-population changes in a Quaternary Refugium: evolutionary implications," *Science* 297 (2002) 2044–2047; B. URBAN and M. FUCHS, "Late Pleistocene vegetation of the basin of Phlious, NE Peloponnese, Greece," *Rev Palaeobot Palyno* 137 (2005) 15-29; V. MARGARI, P.L. GIBBARD, C.L. BRYANT, and P.C. TZEDAKIS, "Character of vegetational and environmental changes in southern Europe during the last glacial period: evidence from Lesvos Island, Greece," *Quaternary Sci Rev* 28 (2009) 1317-1339.

6 Μ. ΝΤΙΝΟΥ, "Προκαταρκτικά αποτελέσματα της ανθρακολογικής ανάλυσης από το σπήλαιο της Θεόπετρας," Ν. ΚΥΠΑΡΙΣΣΗ-ΑΠΟΣΤΟΛΙΚΑ (επιμ.), Σπήλαιο Θεόπετρας – 12 χρόνια ανασκαφών και έρευνας 1987-1998," Πρακτικά Διεθνούς Συνεδρίου, Τρίκαλα 6-7 Νοεμβρίου 1998 (2000) 69-80.

7 E. PANAGOPOULOU, P. KARKANAS, G. TSARTSIDOU, E. KOTJABOPOULOU, K. HARVATI and M. NTINOU, "Late Pleistocene Archaeological and Fossil Human Evidence from Laconis Cave, Southern Greece)," *JFA* 29 (2002) 323-349.

8 M. NTINOU, "Wood charcoal analysis at Klissoura cave 1 (Prosymna, Peloponnese): the Upper Palaeolithic vegetation," *Eurasian Prehistory* 7 (2) (2010) 47-69.

9 ΝΤΙΝΟΥ (*supra* n. 6).

10 PANAGOPOULOU *et al.* (*supra* n. 7); ΝΤΙΝΟΥ (*supra* n. 8).

11 R.M. ALBERT, "Hearths and plant uses during the Upper Palaeolithic period at Klissoura cave 1 (Greece): the results from phytolith analyses," *Eurasian Prehistory* 7 (2) (2010) 71-85.

12 Γ. ΚΟΤΖΑΜΑΝΗ, "Από τη συλλογή στην καλλιέργεια: αρχαιοβοτανική διερεύνηση των πρώιμων σταδίων εκμετάλλευσης των φυτών και της αρχής της γεωργίας στον ελλαδικό χώρο (σπήλαιο Θεόπετρας, σπήλαιο Σχιστού, Σιδάρι, Ρεβένια)," Διδακτορική Διατριβή, Α.Π.Θ., Φιλοσοφική Σχολή, Τμήμα Ιστορίας & Αρχαιολογίας [GRI-2010-5538] (2010).

humile) and seeds identified only as *Vicia/Lathyrus*. Among the six types of fruits and nuts present (juniper, fig, blackberry, hackberry, grape and sea-buckthorn) juniper finds are the most numerous. The repertoire of wild plants includes a wide range of genera and species belonging to 14 plant families. *Lithospermum arvensis* seeds are the most numerous but *Echium* sp., *Myosotis arvensis, Galium/Asperula, Medicago* spp. and *Eleocharis palustris* also occur in considerable amounts.

Most samples derive from radiocarbon-dated hearths or surfaces with distinct combustion traces that are directly linked to human activity, hence ensuring the anthropogenic origin of the material. Consequently, the examination of the seeds and fruits from the Late Middle Palaeolithic assemblage of Theopetra cave as probable refuse of successive episodes of food preparation and consumption, may lead to the extrapolation of some interesting results concerning the management choices of early foragers in Greece as regards the utilisation of vegetative resources. The attested taxonomic variety of wild legumes, fruits and nuts indicates the significant contribution of these plants to the dietary habits of the prehistoric dwellers of the cave, supporting a substantial spectrum of resource management practices. The precise role (nutritional, medicinal, etc.) of the other wild species cannot be directly inferred but, most probably, the late Middle Palaeolithic users of the cave were employing the different parts of the various plants identified for a variety of activities according to their properties. Fresh leaves, roots and tubers as well as several other plant species, whose consumption in a raw state or processing methods do not favour preservation through charring in archaeological deposits, would also be important seasonal elements of the diet and valuable raw material for the manufacturing of every-day products and utensils. Many of the plants could have been also processed/used in open air, outside the cave, reducing thus the chances of their incorporation into the site's deposits. The seasonal availability of the plant species from late Middle Palaeolithic Theopetra points towards its use from the middle of spring until end of the autumn, although transient use of the cave over this time span cannot be excluded.

The few available late Middle/Early Upper Palaeolithic archaeobotanical data do not provide conclusive evidence on the degree of intensity in plant resource exploitation or the strategies employed in gathering and managing these resources. They are, however, the earliest indications available from this region that prove specific human-plant relationships, setting the scene for tighter plant management by much later population groups.

Upper Palaeolithic

Local variations according to altitude and area are evident in the Lateglacial pollen record but the general picture suggests that *Quercus* was probably dominating in the south and/or low altitudes as observed in the cores of Kopais and Tseravinas, while *Pinus* was probably the dominant species in the north and/or at higher altitudes, as observed in the cores of Nisi, Khimaditis and Tenaghi Philippon.[13] More data that provide information on the Lateglacial period are available from pollen cores from Ioannina, Xinias, Kastritsa and Edessa, suggesting the predominance of an overall open landscape with steppe vegetation especially at low altitudes and climatic conditions with little precipitation, in an overall diverse environment.[14]

Archaeobotanical data are available for the whole chronological spectrum of this period (~35,000-10,000 BP), with better quality and more abundant material (as regards the seeds and fruits) deriving from the later phases (after ~18,000 BP). Qualitative and quantitative data of postglacial Upper Palaeolithic archaeobotanical assemblages seem to mark a widening of the plant spectrum employed by people and indicate probably some degree of intensification in their exploitation at the end of this period.

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13 I.T. LAWSON, S. AL-OMARI, P.C. TZEDAKIS, C.L. BRYANT and K. CHRISTANISS, "Lateglacial and Holocene vegetation history at Nisi Fen and the Boras mountains, Northern Greece," *Holocene* 15 (2005) 873-887.

14 S. BOTTEMA, "The prehistoric environment of Greece: a review of the palynological record," in P.N. KARDULIAS (ed.), *Beyond the site. Regional studies in the Aegean area* (1994) 45-69; N. GALANIDOU, P.C. TZEDAKIS, I.T. LAWSON and M.R. FROGLEY, "A revised chronological and palaeoenvironmental framework for the Kastritsa rockshelter, northwest Greece," *Antiquity* 74 (2000) 349-355.

Anthracological data from Klissoura cave[15] during the early phases of the Upper Palaeolithic (33,000-27,000 BP) do not differ significantly from the previous period, pointing towards roughly a similar vegetation environment around the cave. Nonetheless, there is now direct available evidence from multiple hearths for firewood collection, which include the major components of open parkland and woodland formations around the site (*Acer, Quercus, Ulmus, Prunus*). A multi-purpose function has been proposed for these hearths.[16] Contemporary phytolith evidence from the same site suggests that the climate would have been more humid than in later periods, while the presence of phytoliths of sedges further indicates the availability of nearby water sources and may reflect certain dietary habits given their advantages as a valuable source of starch and proteins.[17]

Plant macroremains of seeds and fruits dating to early phases of the Upper Palaeolithic (~25,000 BP) have been unearthed from the caves of Franchthi[18] and Theopetra.[19] At Franchthi the assemblage was dominated by Boraginaceae seeds, while at Theopetra there is a reduced number of finds and a limited range of species compared to other periods, including mostly juniper finds. Plant evidence from Franchthi and Theopetra suggests limited human activity in both caves during this time interval. Klissoura cave also provided recently some very poor and rather equivocal data.[20]

Charcoal evidence from the end of the Upper Palaeolithic sequence of Klissoura (<15,000 BP) differs from that in previous layers by the lack of the mesophilous component of the vegetation and by the presence of *Prunus*, indicative of open, dry formation.[21] *Prunus* is also abundantly recorded in the sequence of the Boila rockshelter, Epirus, during the Lateglacial (13,000-10,000 BP).[22] Phytolith analysis has reached similar conclusions. The identification of C4 phytoliths from the short grass chloridoid subfamily suggests a drier environment and a more open landscape than in the underlying layers.[23] This difference is attributed to the local precipitation regime and the effect of climatic extremes of previous timespans, that is the Last Glacial Maximum – ~26,000-19,000 BP – during which there is no evidence for human presence at Klissoura.[24]

The available seed and fruit macrobotanical data from Franchthi,[25] Theopetra and Schisto,[26] from these later phases of the Upper Palaeolithic period, corroborate the systematic collection and use of several plant species, including wild cereals (barley and oat), wild legumes (vetch, grass pea, lentil and pea), wild fruits and nuts (terebinth, almond, pear, juniper, fig, blackberry, hackberry, common hawthorn, *Prunus* fruits, grape, sea-buckthorn, cornelian cherry, elderberry) and other plants of the surrounding environment. The exploitation of wild barley and oat is more evident in the Upper Palaeolithic assemblages of Franchthi and Schisto compared to Theopetra, where these two species have a much more limited presence, outnumbered by seeds of wild legumes. The scanty presence of wild einkorn (*Triticum monococcum* ssp. *boeoticum* var. *aegilopoides*) in the case of Theopetra cave is harder to explain. These finds, if they do belong to wild plants of this species and not to partly developed seeds of cultivated einkorn intruding from excavation levels above, manifest the distribution of wild einkorn within the geographic boundaries of the southern Balkans during the late Pleistocene-early Holocene, rendering this a particularly important record. Nonetheless, their meager occurrence does not permit any claim regarding their systematic or intensive exploitation.

15 NTINOU (*supra* n. 8).
16 NTINOU (*supra* n. 8) 61.
17 ALBERT (*supra* n. 11).
18 J. M. HANSEN, "The Palaeoethnobotany of Franchthi Cave," in T. W. JACOBSEN(ed.), *Excavations at Franchthi Cave*, Fascicle 7 (1991).
19 KOTZAMANH (*supra* n. 12).
20 LITYNSKA-ZAJAC (*supra* n. 2).
21 NTINOU (*supra* n. 8).
22 M. NTINOU, *El Paisaje en el Norte de Grecia desde el Tardiglaciar al Atlantico: Formaciones Vegetales, Recursos y Usos* (2002).
23 ALBERT (*supra* n. 11).
24 NTINOU (*supra* n. 8).
25 HANSEN (*supra* n. 18).
26 KOTZAMANH (*supra* n. 12).

The Upper Palaeolithic archaeobotanical assemblages of all three caves suggest the time span between the beginning of spring and the end of autumn as the most probable period of their use or seasonal habitation. However, as noted by Hansen,[27] all edible species could have been stored for consumption during winter months if they had been collected in adequate quantities and the cave had some storage means. The absence of such means from the excavation finds may be due to their potential perishable nature or the extent of the excavated areas.

Notable is also the presence of a rather substantial quantity of well preserved juniper seeds, kernels and fragments of the actual fruit in several late Upper Palaeolithic samples from Theopetra cave dated to about 15,175 – 14,700 BP (oxa 18129). Taking into account the anthracological data that point to an increase in the proportion of juniper vegetation after 25,000 BP,[28] it may be that these finds represent the use of juniper tree branches with their fruits attached as fuel in the hearths, although deliberate fruit collection and consumption cannot be excluded.

Mesolithic

During the period from about 12,000 to 10,000 BP the available pollen data show the predominance of steppe vegetation, particularly at lower elevations, whereas at higher elevations deciduous and coniferous forest seems more common.[29] Between 10,500 and 7,500 cal BP *Sclerophyllous* taxa, indicative of warm/dry summers, seem to expand mainly in southern but also, to a degree, in northern Greece.[30] A change towards more wooded landscapes does not seem to coincide with the Younger Dryas/Preboreal global temperature increase but it seems to take place about 600 years later.[31]

Charcoal evidence from Youra shows the co-dominance of *Juniperus* and *Phillyrea-Rhamnus* during the early stages of the Mesolithic in the 9th millennium that has been interpreted as an indication of the fast establishment of evergreen woodland in an open juniper-dominated environment.[32] During the Mesolithic period junipers gradually disappear and the vegetation cover on the island is characterised by typical mesomediterranean evergreen woodland species (*Phillyrea-Rhamnus*, *Arbutus* sp. and evergreen *Quercus, Cercis siliquastrum,* Leguminosae etc.). The vegetation around Theopetra cave at the beginning of the Holocene also shows the expansion of deciduous species, particularly oak, although the presence of *Pistacia terebinthus* indicates a still-open canopy.[33]

The climatic amelioration from the end of the Pleistocene-beginning of the Holocene onwards, with the gradual increase in temperature and humidity levels, resulted in the proliferation of mixed woodland vegetation and favoured the variability and availability of plant resources.[34] The systematically collected Mesolithic assemblages of seed and fruit macroremains from the caves of Franchthi[35] and Theopetra[36] reveal the utilisation of a broad range of plant resources, largely similar to that of the later phases of the Upper Palaeolithic assemblages. The Mesolithic archaeobotanical material from the cave of Cyclops at the island of Youra,[37] adds some scanty evidence from an insular environment but the nature of the

27 HANSEN (*supra* n. 18) 160.
28 NTINOY (*supra* n. 6) 73.
29 S. BOTTEMA, "The vegetation history of the Greek Mesolithic," in N. GALANIDOU and C. PERLES (eds.), *The Greek Mesolithic. Problems and Perpsectives, BSA Studies* 10 (2003) 33-49.
30 LAWSON *et al.* (*supra* n.13).
31 BOTTEMA (*supra* n. 29).
32 M. NTINOU, "Charcoal analysis," in A. SAMPSON (ed.), *The cave of the Cyclops. Mesolithic and Neolithic Networks in the northern Aegean, Greece*, II *Bone Tool Industries, Dietary Resources and the Palaeoenvironment and Archaeometrical Studies* (2011) 297-314.
33 NTINOU (*supra* n. 22).
34 BOTTEMA (*supra* n. 29).
35 HANSEN (*supra* n. 18).
36 KOTZAMANH (*supra* n. 12).
37 A. SARPAKI, "Archaeobotanical seed remains," in A. SAMPSON (ed.), *The cave of the Cyclops. Mesolithic and Neolithic Networks in the northern Aegean, Greece*, II – *Bone Tool Industries, Dietary Resources and the Palaeoenvironment and Archaeometrical Studies* (2011) 315-324.

data from Maroulas[38] is extremely poor and equivocal to provide useful insights. The data from Franchthi mainly indicate the use of wild barley, oat and lentil as well as of some fruits and nuts, such as almond and terebinth, and occasionally of pear and capper, throughout the period.[39] The contemporaneous assemblage of Theopetra cave[40] shows a stronger dependence on wild legumes (pea, vetch, bitter vetch, grass pea, lentil), a trend observed already from the Middle Palaeolithic period, while the occurrence of wild cereals seems limited (with only some remains of barley and possibly oat and einkorn). The variety of fruits and nuts in the Mesolithic samples of Theopetra, including mainly species such as juniper, sea-buckthorn, hackberry and hawthorn but also fig, are largely indicative of the mountainous and woodland environment of the site, and hint at the importance of these resources in the dietary habits of the cave's inhabitants.

Although little can be argued on current evidence regarding the exact nature of the relations between the Mesolithic human groups and their surrounding vegetative environment, these could potentially involve a wide behavioural spectrum, ranging from simple collection and procurement of wild plants, to care and tending of wild plant population stands or even the cultivation of wild species, through application of practices such as seeding and harvesting, or small scale tillage, without leading to genetic and subsequent phenotypic alterations of the plants. Extensive evidence for the presence of artifact types associated with the cultivation of plants and the processing of plant products like those occurring in abundance in Natuffian sites and early agricultural settlements of southwest Asia, (i.e. stone mortars and pestles, blades with use marks) is lacking from Greek sites and this was put forward to suggest the absence of tight links between people and plants in the Greek Mesolithic.[41] However, qualitative and quantitative differences in material culture expressions associated with plant use between the two regions cannot *a priori* be addressed to support the inexistence of interactive relations of this kind in the Aegean region. Indeed, the broad range of species recorded so far in Greek Mesolithic botanical assemblages associated with anthropogenic activity together with the local species variations offer some hints for the existence of certain relationships between humans and plants in the area during this period. Additional recovery of bioarchaeological remains and further sample-by-sample analysis of the existing assemblages holds great potential to provide insights towards this direction. Through this emerging picture of tighter links of increasing complexity between Mesolithic human groups and their surrounding plant world, the adoption of the agricultural way of production, as the primary choice for food procurement during the 7th millennium BC, does not strike as a radical and sudden change. Instead it seems to be the outcome of a long term sequence of interactive links between humans and plants, jointly modulated by native as well as exogenous elements, traditions and innovations, local experiments as well as knowledge transmitted in both time and space.

Conclusion

The collation of all lines of plant evidence in a single database has allowed some first glimpses into Paleaeolithic and Mesolithic plant exploitation activity in Greece, highlighting the potential that research in these early periods holds towards understanding a way of life markedly different to ours. This study has delineated the availability of resources and the limitations posed by the environment, and has helped establish the management of a series of species by the early foragers, allowing insights into early preferences and practices. What is interesting is that a generally substantial spectrum of resources seems to have been utilised since the early stages of recorded human habitation, which on current evidence seems to further increase by the end of the Upper Palaeolithic/Mesolithic period. Wild einkorn was found in the Upper Palaeolithic levels of Theopetra and radiocarbon dating for this is scheduled, as it

38 MUELLER-BIENEK (*supra* n. 3).
39 HANSEN (*supra* n. 18).
40 KOTZAMANH (*supra* n. 12).
41 C. PERLES, *The early Neolithic of Greece* (2001).

is a particularly important record. If its dating is secure then it will be the earliest indication for its presence in the region. Future archaeobotanical work on the Palaeolithic and Mesolithic of Greece will clarify aspects of the relationship between early foragers and their ambient plant world and of the intensity of plant resource management, and help us gain a better understanding of the contribution of native populations to the mechanisms involved in the much later transition to agriculture.

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ILLUSTRATION

PL. LXX Map of Greece indicating Palaeolithic and Mesolithic sites with available botanical macro- and micro-remains data.


AEGEAN SEA
IONIAN SEA
Excavated sites
1: Boila rockshelter
2: Theopetra cave
3: Cyclops cave, Youra
4: Schisto cave
5: Klissoura cave
6: Franchthi cave
7: Laconis cave
8: Maroulas, Kythnos
Pollen cores
a: Tenaghi Philippon
b: Giannitsa
c: Edessa
d: Nisi
e: Khimaditis
f: Rezina
g: Gramoutsi
h: Tseravinas
i: Ioannina I, 249 & 284
j: Kastritsa
k: Ziros
l: Xinias
m: Kopais
n: Phlious
o: SL152 marine core
p: Lesbos