

## TROY AND THE TROAD IN THE SECOND MILLENNIUM: CHANGING PATTERNS IN LANDSCAPE USE\*

Over the last 20 years, various studies have focused on Troy as a central place, as well as on the surrounding landscape and other sites in the Troad. Thanks to the work of many specialists, a wide range of data is now available concerning the temporal development of Troy and its material culture, environmental changes, the ancient economy and use of resources, as well as changes in settlement structure throughout the hinterland of the Troad. In our presentation we summarize and interpret some of these areas of evidence.<sup>1</sup>

We begin with a brief outline of the cultural development at Troy, continue with a brief presentation of bioarchaeological evidence and a discussion on the development of settlement patterns and pottery production centers, and then conclude with a look at climatic indicators.

### Archaeology

When taken together, the period of Troy IV and V (EH III–MH II) seemingly separates two eras of prosperity – Troy II/III on one side and VI/VIIa on the other. One of the most important features of the interstice is the fact that the interregional trade contacts of Troy diminished drastically. Pottery evidence shows some exchange with the Aegean, but local Anatolian connections definitively prevail. The small finds are spectacularly unimpressive: a handful of bronze pins, some pieces of obsidian, and stone idols. The buildings in the central part of the citadel are not preserved, but it is obvious (on the basis of what is known) that the architecture must have been less sophisticated in comparison with the preceding Troy II/III and the following Troy VI.<sup>2</sup>

Important changes, although gradual, appear around the beginning of Troy VI Early (MH III–LH I).<sup>3</sup> This is the time when there is a possible re-emergence of local elites, though without doubt there is the re-establishment of far-reaching foreign contacts, visible not only in pottery but also in the material recovered from the few known graves: a Minoan jug of *Creamy Bordered Style*<sup>4</sup>, jewelry made of blue Egyptian faience, gold and rock crystal,<sup>5</sup> and a dagger with an ivory pommel.<sup>6</sup> Foreign contacts are further witnessed in the spectrum of Troy VI Early ceramics: both the shape and the decoration of the earliest Anatolian Grey Ware on the west

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1 See, for example, G.A. WAGNER, E. PERNICKA, and H.-P. UERPMANN (eds.), *Troia and the Troad. Scientific Approaches* (2003); M.O. KORFMANN (ed.), *Troia: Archäologie eines Siedlungshügels und seiner Landschaft* (2006); E. PERNICKA, C. BRIAN ROSE and P. JABLONKA (eds.), *Troia 1988–2008: Grabungen und Forschungen. I. Forschungsgeschichte, Methoden und Landschaft* (Studia Troica Monographien 5 2014).

2 C.W. BLEGEN, J.L. CASKEY, and M. RAWSON, *Troy II. The Third, Fourth and Fifth Settlements* (1951); S.W.E. BLUM, *Die ausgehende frühe und die beginnende mittlere Bronzezeit in Troia. Archäologische Untersuchungen zu ausgewählten Fundkomplexen der Perioden Troia IV und Troia V* (Studia Troica Monographien 4, 2012).

3 C.W. BLEGEN, J.L. CASKEY, and M. RAWSON, *Troy III: The Sixth Settlement* (1953); P. PAVÚK, *Troia VI Früh und Mitte. Keramik, Stratigraphie und Chronologie* (Studia Troica Monographien 3; in print).

4 For the most recent publication, see L. GIRELLA, “The MM IIIA Juglet and the Troy VI Early Cist Tomb in Square A7,” in PAVÚK (*supra* n. 3) Appendix 1.

5 M. PIENIAŻEK, “Luxury and Prestige on the Edge of the Mediterranean World. Jewellery from Troia and the Northern Aegean in the 2nd Millenium B.C. and its Context,” in M.-L. NOSCH and R. LAFFINEUR (eds.), *Kosmos. Jewellery, Adornment and Textiles in the Aegean Bronze Age, Aegaeum* 31 (2012) 503-504, Pl. CXXVa-c.

6 M. KORFMANN, “Troia. Ausgrabungen 2001,” *Studia Troica* 12 (2002) 18, fig. 15. 6; 16. The pommel was almost completely decomposed when excavated, but still traceable in the soil (pers. comm. from the excavator, Pavol Hnila).

Anatolian coast show strong connections with pottery from Central Greece during the MH III period.<sup>7</sup> Significant is also the evidence for small scale production of purple dye documented in the lower town. However, in this case it is not clear if this proves Minoan influence, or rather reflects local, North Aegean developments.<sup>8</sup> The architecture of Troy VI Early is still rather modest.

During the course of Troy VI Middle (ca. LH IIA–IIB), Troy finally became a fortified stronghold. As in the case of the preceding Troy VI Early, not very many buildings are preserved from this subperiod, but by Blegen's architectural phase Troy VIe the fortification undergoes a transformation from simple terrace walls to something more substantial. The rebuilding proceeded by segments: first came the south-western part of the citadel wall, which remained in use until the end of the Late Bronze Age; another section was later re-utilized as a foundation for the southern wall of the Pillar House in the following Late Troy VI. The ditch surrounding Troy was most probably also erected in this subperiod.<sup>9</sup> Troy VI Middle is also the time when imports of Matt-painted Wares (of so far unknown provenience) begin, along with the first imports of Mycenaean decorated pottery (LH II) accompanied by a few pieces of imported jewelry,<sup>10</sup> but the small finds evidence for the intensity of interregional contacts is so far rather limited.

The most monumental architecture belongs to Troy VI Late (LH IIIA). The lower town, which probably was used both as habitation and industrial area, reached dimensions of about 30ha by then. Foreign contacts became more intensive, as proved by the existence of personal ornaments made of carnelian, glass and faience, and ivory,<sup>11</sup> as well as imported pottery such as from the Argolid and Cyprus. This subperiod can be considered the acme of local pottery production, showing a wide range of shapes and at times even imitating Mycenaean prototypes.<sup>12</sup> Troy VI ended in a massive earthquake.

During the following Troy VIIa (LH IIIB), some of the large detached buildings on the terraces of the citadel were repaired, but otherwise the preserved architecture looks more modest in comparison to that of the preceding period. The lower terrace of the citadel became filled with tightly-built houses, magazines, and paved streets. That some of the rooms were definitively not used for habitation is based on the fact that they were literally packed with pithoi (Pl. XXXa-b). So far, about 110 pithoi and up to 50 pithos-pits (remains of the pithoi) are documented, mostly in the area of the citadel.<sup>13</sup> These huge storage vessels are estimated to have

- 7 P. PAVÚK, "What can Troia tell us about the Middle Helladic Period in the Southern Aegean?" in F. FELTEN, W. GAUB and R. SMETANA (eds.), *Middle Helladic Pottery and Synchronisms* (2007) 293-306; P. PAVÚK, "Minyan or not. The second millennium Grey Ware in western Anatolia and its relation to Mainland Greece," in G. TOUCHAIS *et al.* (eds.), *MESOHELLADIKÁ. The Greek Mainland in the Middle Bronze Age* (2010) 931-943.
- 8 P. JABLONKA, "Leben außerhalb der Burg – Die Unterstadt von Troia," in KORFMANN (*supra* n. 1 ) 174-175; C. ÇAKIRLAR and R. BECKS, "Murex Dye Production at Troia: an Assessment of Archaeomalacological Data from Old and New Excavations," *Studia Troica* 18 (2009) 94-95, 97-98; P. PAVÚK, "Of Spools and Discoid Loom-Weights: Aegean-Type Weaving at Troy Revisited," in M.-L. NOSCH and R. LAFFINEUR (eds.), *Kosmos. Jewellery, Adornment and Textiles in the Aegean Bronze Age*, *Aegaeum* 31 (2012) 127, n. 56.
- 9 R. BECKS, *Troia im 2. Jahrtausend v. Chr. (Spätbronzezeit–Früheisenzeit): Stratigraphie, Architektur, Befunde*, Unpubl. PhD Thesis, University of Tübingen (2006); BLEGEN, CASKEY and RAWSON (*supra* n. 3 ) 81-113; JABLONKA (*supra* n. 8) 172-174.
- 10 P. PAVÚK, "Aegeans and Anatolians. A Trojan Perspective," in R. LAFFINEUR and E. GRECO (eds.), *EMPORIA. Aegeans in the Central and Eastern Mediterranean*, *Aegaeum* 25 (2005) 272-273; P.A. MOUNTJOY, "Troia Phase VIe and Phase VIg: The Mycenaean Pottery," *Studia Troica* 7 (1997) 275-287; P. MOUNTJOY and H. MOMMSEN, "Neutron Activation Analysis of Mycenaean pottery from Troia (1988–2003 excavations)," *Studia Troica* 16 (2006) 97-123; PIENIAŻEK (*supra* n. 5) 504.
- 11 BLEGEN, CASKEY and RAWSON (*supra* n. 3) 29-30; 372-374; M. PIENIAŻEK, "Dress and Body Ornaments as a Testimony to Cross-cultural Influences in the Northern Area of the Aegean," in N. STAMPOLIDIS, Ç. MANER, K. KOPANIAS (eds.), *Nostoi. Indigenous Culture, Migration and Integration in the Aegean Islands and Western Anatolia during the Late Bronze and Early Iron Age* (in print).
- 12 PAVÚK (*supra* n. 10) 273-275; P. PAVÚK and W. RIGTER, "Goblets, Schüsseln und Kratere – Die Keramik der Perioden VI und VIIa," in KORFMANN (*supra* n. 1) 235-240. All dates of Mycenaean pottery in this paper are based on the current work of Penelope Mountjoy at Troy: P. MOUNTJOY, "Mykenische Keramik in Troia – Ein Überblick," in KORFMANN (*supra* n. 1) 241-252, with further references.
- 13 C.W. BLEGEN, C.G. BOULTER, J.L. CASKEY and M. RAWSON, *Troy IV: The Seventh Settlement* (1958) 7, fig.

held between 545 (Pl. XXXc) and 1130 liters.<sup>14</sup> The material culture continues without a major break, but the range of pottery shapes becomes both narrower and definitely mass-produced. This is also the time when the local Mycenaean pottery production begins at Troy and imports from the Argolid slow down. Interestingly, Anatolian Grey Ware is now being exported to various sites in the eastern Mediterranean. The most significant collection of personal jewelry also dates to this time and is represented by numerous objects made of faience, glass, gold, silver, carnelian, and steatite.<sup>15</sup>

Troy VIIa, as well as the prosperity, ended around 1200/1180 BC in a way similar to that observed at other contemporary Aegean centers, i.e., a destruction event. Distinctive trait of the following Troy VIIb is the appearance of a large amount of Balkan-type pottery, interpreted as indicating an influx of population groups from the North. During this time the fortification probably lost its function and the import of luxury goods ceased almost entirely.<sup>16</sup>

### Archaeobotany

The archaeobotanical results presented here derive from an analysis of 91 samples (roughly 2500 liters of floated sediment) containing more than 235.000 seed and chaff remains which were the subject of a PhD dissertation,<sup>17</sup> reassessed now in the view of more precise stratigraphical dating of the relevant contexts. Also included are more recent palynological investigations in the Kesik Bay.<sup>18</sup> However, the evidence is somewhat uneven. In terms of excavation strategy, the majority of the archaeobotanical samples derive from Troy IV and VIIb contexts (30 and 31 samples respectively), while other phases are somewhat underrepresented with sediment volumes between 5 liters for Troy VI Early (5 samples) to more than 360 liters for Troy VIIa (12 samples). Conclusions on phases Troy V, VI Early and Middle have to be considered with caution because there are only a few samples and low sediment volumes.

Due to the fact that in some phases storage finds are included in the assemblage while in others no such contexts could be sampled, the diachronic comparison is based on ubiquities of particular crop species (Pl. XXXIa). Cereals are generally presented with more than 50% ubiquity, while they reach their lowest values in Late Troy VI, but are present in almost 70% of the samples in Early Troy VI. This is mostly due to variation in barley frequency which is lowest during Late Troy VI, while the hulled wheats, emmer and einkorn, remain stable throughout the whole sequence. A north-eastern Asian crop in origin, the earliest evidence of broomcorn millet (*Panicum miliaceum*) in the Aegean is from the site of Sesklo during the 7<sup>th</sup> mill cal BP.<sup>19</sup> Broomcorn millet is also present in Early and Late Troy VI and Troy VIIb. As this crop species is resistant to high temperatures and droughts, and grows well in poor soils, such conditions might be considered to have played a role at some time throughout the settlement history of Troy. Late Troy VI is also the phase that provides the broadest crop assemblage in terms of number of different crop taxa used by the ancient settlers. A similar breadth in crop species diversity is visible for Troy VIIb.

338; R. BECKS, "Troia VII: The Transition from the Late Bronze Age to the Early Iron Age", in B. FISCHER, H. GENZ, É. JEAN, and K. KÖROĞLU (eds.), *Identifying Changes: The Transition from Bronze to Iron Ages in Anatolia and its Neighbouring Regions* (2002) 42-44, fig. 1. The Pithoi from Troy are currently being studied for publication by our colleague D. Thumm-Dograyan.

14 R. BECKS, W. RIGTER, and P. HNILA, "Das Terrassenhaus im westlichen Unterstadtviertel von Troia," *Studia Troica* 16 (2006), 27-88.

15 E. KOZAL, "Made in« Zypern – Kyprische Gefäße der Spätbronzezeit in Troia", in KORFMANN (*supra* n. 1) 253-258; H. MOMMSEN and P. PAVÚK, "Provenance of the Grey and Tan Wares from Troia, Cyprus, and Levant", *Studia Troica* 17 (2007) 25-42. Only a few of the exported Grey Ware sherds can actually be dated to Late Troy VI (*ibid.*, 29-30), the majority is Troy VIIa. PIENIAŻEK (*supra* n. 5); PIENIAŻEK (*supra* n. 11).

16 R. BECKS, P. HNILA, and M. PIENIAŻEK-SIKORA, "Troia in der frühen Eisenzeit - Troia VIIb1-VIIb3," in KORFMANN (*supra* n. 1) 181-188.

17 S. RIEHL, *Bronze Age Environment and Economy in the Troad: The Archaeobotany of Kumtepe and Troy* (BioArchaeologica 2, 1999).

18 S. RIEHL, E. MARINOVA and H.-P. UERPMANN, "Landschaftsgeschichte der Troas – Bioarchäologische Forschungen," in E. PERNICKA, C. BRIAN ROSE and P. JABLONKA (eds.), *Troia 1988–2008: Grabungen und Forschungen. I. Forschungsgeschichte, Methoden und Landschaft* (Studia Troica Monographien 5 2014).

19 D. ZOHARY and M. HOPF, *Domestication of plants in the Old World: The origin and spread of cultivated plants in West Asia, Europe, and the Nile Valley*, 3rd edition (2000).

Looking at the wild plant seed assemblages, components of open vegetation units are generally over-represented due to the nature of the contexts they derive from (Pl. XXXIb). Seeds of wild plants in archaeological sites represent mainly weeds introduced to the site together with the harvest or by dung used for fuel or building material. Wild plant taxa grouped into their preferred ecological habitats inform on probable vegetation units surrounding Troy. Starting with Troy IV, marine and freshwater environments are represented with high proportions of sedges and grasses. During this phase a strong decrease in oak pollen can be observed, though it remains unclear whether this process is climatic, human related, or both.<sup>20</sup> In Early Troy VI plants from water environments decrease in favor of species from open vegetation probably from habitats further inland. In Late Troy VI there is again an increase in remains from freshwater environments. The most significant signal during this phase comes from increased proportions of maquis and woodland vegetation, probably indicating activities further away from the settlement. The available radiocarbon data from the pollen profile does not allow an exact dating of this phase, but it appears likely that Troy VI Late correlates to a second decrease in oak pollen.<sup>21</sup> In Troy VIIa, there is a strong decrease in the representation of water environments in the wild plant assemblage in favor of open grassland-type vegetation with large amounts of clover. In the time of VIIb the wild plant seed assemblages are similar to those in VI Late.

Changes in the wild plant seed assemblages reflect human activity in particular landscape types that probably existed simultaneously throughout the whole sequence, as well as animal husbandry practices, rather than a general change of vegetation type, although modifications to the different habitats cannot be excluded, as in the case of decreasing oak pollen. The increased presence of maquis and woodland-type taxa in Late Troy VI alternatively may indicate increased transhumance in animal husbandry practices and grazing in areas further away from the settlement. The most intensive use of environments close to bodies of water, such as the Scamander river valley, probably occurred in Troy IV, VI Late and VIIb. During Troy VIIa, drier areas, such as on the low plateau, were intensively exploited.

Finally, sometime in the Early Iron Age, a major soil erosion event must have taken place in the vicinity of Troy, since in the southern part of the Lower Town at least 1.5 meters of cultural layers were swept away, all the way down to the bed-rock. Again, reasons for this are open to speculation, but were very likely the result of previous anthropogenic activities.

### Archaeozoology

Although we are still awaiting the final results, archaeozoological analysis reveals a pattern similar to that of the archaeobotanical analysis during the time of Troy IV. The inhabitants seem to be employing a subsistence practice of risk-buffering, indicated by a broad spectrum of wild game, many bones of young pigs (evidence for premature slaughtering), and a low percentage of cattle. During Troy V and Troy VI Early the relation between cattle and the small ruminants changed. Preliminary analyses indicate continuous increase in cattle breeding at the time of Troy VI Late and VIIa. Unlike the claim in the original publication by Blegen, bones of domesticated horse do not appear at the very beginning of Troy VI, but only in its middle subperiod<sup>22</sup> and larger quantities occur only by Troy VI Late. In addition, the spectrum of bones from wild animals points to the practice of prestige hunting of wild goat, and maybe also red deer, by the elite during this period. This is especially conceivable in the case of wild goat, since the Trojans would have had to travel for more than one day to reach the natural habitation area of this animal, which was in the southeast of the Troad.<sup>23</sup>

20 RIEHL, MARINOVA and UERPMANN (*supra* n. 18).

21 RIEHL, MARINOVA and UERPMANN (*supra* n. 18).

22 The evidence used by Blegen does not contradict this, as it turns out that the (few) relevant deposits containing early domesticated horse were incorrectly dated by him, cf. PAVÚK (*supra* n. 3) chapter 4.2.

23 H.-P. UERPMANN, "Environmental Aspects of Economic Changes in Troia," in WAGNER, PERNICKA, and UERPMANN (*supra* n. 1) 251-262, figs. 1-2. The data generated based on the bones coming from the excavations of C.W. Blegen (*ibidem*, fig. 2) should be excluded, since some of the bones obviously have not been recorded or were lost afterwards, therefore this material does not represent the original spectrum.



### Settlement patterns in the Troad

Surveys in the area of Troy were initially conducted by Blegen and his team, but were later expanded by John Cook, Aşkıdıl Akarca, and also by the new team from Tübingen (especially R. Aslan and G. Bieg).<sup>24</sup> These surveys have established the existence of a number of settlements in the area during the second millennium BCE, most of which were concentrated on the coast. However, none of the mentioned surveys can really be described as intensive, in the modern sense of the word, as they all targeted the identification of more or less obvious landmarks.

A detailed analysis of the finds collected by the new team, as well as the incorporation of previous observations, now makes it possible to be more specific about the organization and dynamics of the settlement structure in the Troad (Pl. XXXIIa-b).<sup>25</sup> The data show that, in terms of settlement density, we have almost no sites dating to the period of Troy IV, just a handful of sites dating to the period of Troy V, and only a few more (4 sites) corresponding with the earliest part of Troy VI. A major change seems to occur at the transition between Troy VIa and VIb/c, i.e., halfway through Early Troy VI, when almost all of the identified second millennium BCE sites show occupation (13 sites). Typological changes in the pottery identifiable at Troy, mainly the introduction of ribbed carinated bowls with an upright shoulder, are recognizable not only throughout all of the Troad but also throughout all of NW Anatolia.<sup>26</sup> We can thus say that a similar increase in the number of sites sometime during LH I (in southern Aegean terms) might be a more widespread phenomenon applicable to the whole of NW Anatolia.<sup>27</sup> This high visibility of sites continues into Middle Troy VI (15 sites), but in the following period we see some shift in settlement patterns as the number of identified sites dating to Late Troy VI and to VIIa decreases slightly (10 – 12 sites). More significant however, is not so much the number of sites but rather the decreased frequency of Late VI–VIIa material at the majority of sites (Pl. XXXIIb). In addition, some of the sites seem to be newly settled at this time. Thus, it seems that during LH IIIA and IIIB there is a return to lower site density with only a small number of better populated sites (only 4–5 sites rich in relevant finds). Also telling is the absence of Tan Ware, so typical of Troy VI Late and VIIa, at most of the other sites in the Troad.<sup>28</sup>

These observations are further augmented by a rather extensive program of chemical analyses done not only for Troy but also for the Troad. The NAA results tell us something interesting about both the organization of pottery production and the site hierarchy of the region. In terms of Anatolian Grey Ware, Troy appears to be a major producer and exporter from the very beginning of Troy VI. It is, however, soon followed by the coastal site of Limantepe-Larisa in the SW part of the Troad, which developed its own production of both Anatolian Grey Ware and Tan Ware, with a distinctive chemical composition and more compact fabrics, and had already started to build up its own markets by the end of Troy VI Early. Whereas Troy seems to have been supplying most of the sites in the northern Troad, Limantepe-Larisa targeted those in the south. Interestingly, sites along the Dardanelles were supplied by both Troy and Limantepe-Larisa. Sites situated geographically in between, such as Bozköy-Hanay Tepe, drew upon both production centers though each also seems to have produced small quantities of

24 A. AKARCA, "Troas'ta aşağı Kara Menderes ovası çevresindeki şehirler," *Belleten* XLII-165 (1978) 1-52; R. ASLAN, G. BIEG, P. JABLONKA and P. KRÖNECK, "Die mittel- bis spätbronzezeitliche Besiedlung (Troia VI und Troia VIIa) der Troas und der Gelibolu-Halbinsel. Ein Überblick," *Studia Troica* 13 (2003) 165-213; J. M. COOK, *The Troad. An Archaeological and Topographic Study* (1973).

25 S.W.E. BLUM, D. THUMM-DOĞRAYAN and M. THATER, "Die Besiedlung der Troas vom Neolithikum bis zur beginnenden Mittleren Bronzezeit: Chronologische Sequenz und Siedlungsstruktur," in PERNICKA, ROSE and JABLONKA (*supra* n. 1); P. PAVÚK and C. SCHUBERT, "Die Troas in der Mittel- und Spätbronzezeit," in PERNICKA, ROSE and JABLONKA (*supra* n. 1).

26 For Blegen Shapes A57, A58, A61, A62 see BLEGEN, CASKEY and RAWSON (*supra* n. 3) 45-48, fig. 292a; P. PAVÚK, "Troia VI and VIIa. The Blegen Pottery Shapes: Towards a Typology," *Studia Troica* 12 (2002) 40-47.

27 J. DRIEHAUS, "Prähistorische Siedlungsfunde in der unteren Kaikosebene und an dem Golfe von Çandarlı," *Istanbuler Mitteilungen* 7 (1957) 76-101, esp. fig. 7; D.H. FRENCH, "Prehistoric Sites in Northwest Anatolia II: The Bahkesir and Akhisar/Manisa Areas," *Anatolian Studies* 19 (1969) 41-98, esp. figs. 16-19; S. GÜNEL, "Vorbericht über die mittel- und spätbronzezeitliche Keramik von Liman Tepe," *Istanbuler Mitteilungen* 49 (1999) 41-82, esp. figs. 16: 28, 20: 48 and 50.

28 The only major exception, even with its own production of Tan Ware, is Limantepe-Larisa, on the southeast coast of the Troad. ASLAN *et al.* (*supra* n. 24) 185-187, fig. 23; PAVÚK and SCHUBERT (*supra* n. 25).

their own. There is evidence from various sites of small local production of pottery styles other than Grey Ware, thus reinforcing the changing site hierarchy as communities looked outside for specific needs.<sup>29</sup>

All the surveys have yielded one more interesting observation concerning the second millennium. Very few sites were identified further inland, that is in the middle Scamander Valley, and virtually none in its upper part. Whereas the Trojan teams indeed did not penetrate these areas, John Cook and his collaborators did, and even though they have identified numerous sites from the Roman period, they have found only one from the second millennium.<sup>30</sup> An investigation into soil-erosion is necessary in order to determine whether this is the cause for the low visibility of sites.

Nevertheless, the middle Scamander seems to be the home of another production centre, and a very specialized one at that. NAA investigations by Peter Greave and Lisa Kealhofer show that the majority of pithoi from Troy are not locally made, and an independent petrographic analysis by Mustafa Kibaroglu and Diane Thumm-Doğrayan indicates that they could in fact originate from the area of Ezine.<sup>31</sup> Unfortunately, pithoi from sites other than Troy have not been sampled yet, so we cannot state the supply radius of the Ezine workshop.

### Climate impact

Local palaeoclimate proxies are rare and mainly available for the earlier Holocene. Local effects of global Holocene climate fluctuations are therefore mostly unknown for the Aegean region.<sup>32</sup> From the mid-Holocene onwards, local climate signals can be considerably superposed by human impact as concerns the composition of the vegetation, because anthropogenic impact and aridification can produce the same patterns and are thus hardly discernible in the palynological record. In general, global forcing may be attributed to solar activity<sup>33</sup> which has been reconstructed for the Holocene and which may have led to drier episodes until around 2000 BC, between 1450–1300 BC, and from 1050 BC onwards, which corresponds to Troy IV, VI Late and the EIA. The first two of these three episodes correlate to Bond events<sup>34</sup> no. 3 and 2 and the global rapid climate change as reconstructed by team of P. Mayewski.<sup>35</sup> In the Aegean Sea there is a peak of cooler conditions around 1400 BC.<sup>36</sup> A low stand of the sea level in the Troad has been documented around 1500 BC, with an increase from about 1100 BC,<sup>37</sup> which corresponds to Late Troy VI and most of Troy VII.

With these parameters in mind, we may assume that climate change may have had an impact on the Troad during Troy IV, Late Troy VI, and eventually during Troy VIIb, although the degree of such an impact is unknown. From Troy VI onwards human transformations of the vegetation may also have played a role.

29 PAVÚK and SCHUBERT (*supra* n. 25).

30 COOK (*supra* n. 24) 363-374, fig. 18-19.

31 P. GRAVE, L. KEALHOFER, P. HNILA, B. MARSH, C. ASLAN, D. THUMM-DOĞRAYAN and W. RIGTER, "Cultural Dynamics and Ceramic Resource Use at Late Bronze Age/Early Iron Age Troy, Northwestern Turkey," *Journal of Archaeological Science* 40-4 (2013) 1760-1777; M. KIBAROĞLU and D. THUMM-DOĞRAYAN, "Trojan Pithoi: A Petrographic Approach to Provenance and Production Technique of Bronze Age Storage Vessels from Troy," *Journal of Applied Clay Science* (in print).

32 See S. RIEHL and E. MARINOVA, "Mid-Holocene Vegetation Change in the Troad (W Anatolia): Man-made or Natural?" *Vegetation History and Archaeobotany* 17 (2008) 297-312 and references therein.

33 H. WANNER, J. BEER, J. BÜTIKOFER, T.J. CROWLEY, U. CUBASCH, J. FLÜCKIGER, H. GOOSSE, M. GROSJEAN, F. JOOS, J.O. KAPLAN, M. KÜTTEL, S.A. MÜLLER, I.C. PRENTICE, O. SOLOMINA, T.F. STOCKER, P. TARASOV, M. WAGNER and M. WIDMANN, "Mid- to Late Holocene Climate Change: An Overview," *Quaternary Science Reviews* 27 (2008) 1791-1828.

34 G. BOND, B. KROMER, J. BEER, R. MUSCHELER, M.N. EVANS, W. SHOWERS, S. HOFFMANN, R. LOTTI-BOND, I. HAJDAS and G. BONANI, "Persistent Solar Influence on North Atlantic Climate During the Holocene," *Science* 294 (2001) 2130-2136.

35 P. MAYEWSKI, E. ROHLING, C. STAGER, W. KARLEN, K. MAASCHA, D. MEEKER, E. MEYERSON, F. GASSE, S.v. KREVELD, K. HOLMGREN, J. LEE-THORP, G. ROSQVIST, F. RACK, M. STAUBWASSER, R. SCHNEIDER and E. STEIG, "Holocene Climate Variability," *Quaternary Research* 62 (2004) 243-255.

36 E. ROHLING, P. MAYEWSKI, A. HAYES, R.H. ABU-ZIED and J.S.L. CASFORD, "Holocene Atmosphere-ocean Interactions: Records from Greenland and the Aegean Sea," *Climate Dynamics* 18 (2002) 573-592.

37 I. KAYAN, "Holocene Geomorphic Evolution of the Beşik Plain and Changing Environment of Ancient Man," *Studia Troica* 2 (1992) 79-92.

Stable carbon isotope analysis which is used as an independent tool to directly trace drought signals in ancient cereals grown in semi-arid to arid regions may, with reservation, also be useful in some areas of the Mediterranean.<sup>38</sup> These earlier investigations suggest that values below 17‰  $\Delta^{13}\text{C}$  can be considered indicative of a moderate to strong drought-stress on the plant during its grain-filling period.<sup>39</sup> Roughly half of the measurements from Troy VIIb fall into a range between 17-15‰, thus signaling a certain drought stress on barley during this phase (Pl. XXXIIIa). Troy IV and Troy VI Late produced some values typical for moderate drought stress, although most measurements do not show this signal. Unfortunately, no measurements are available currently for Troy VIIa. Early Troy VI suggests favorable growing conditions for cereal crops without any drought stress signal.

### Summary of the evidence

**Troy IV** was a time of modest settlement and limited foreign contacts. Archaeobotanical data suggests a risk-buffering economy through the diversification and intensive exploitation of areas in the river valleys. Stable carbon isotope ratios in cereals indicate a slight drought stress which may have been related to the 4.2 ky BP global climate fluctuation and is likely in relation with decreased oak pollen values. The archaeological evidence suggests that **Troy V** continued the developments observed for Troy IV, with important changes of the archaeological culture taking place at some time around the turn to Troy VI Early. However, preliminary archaeozoological results suggest that economic transformations already began during Troy V.

Whereas at the beginning of the second millennium Troy was possibly just one among several similar settlements, it soon develops into one of the major centers during the course of **Troy VI Early**. This is also a time of increased foreign contacts. Archaeobotanical data seem to reflect a specialization in the production of grain (barley and emmer wheat) which probably grew under favorable climatic conditions as indicated by stable carbon isotope ratios in barley grains. An increase in settlement density and likely an increase in population numbers can be postulated for this phase.

This situation continues into **Troy VI Middle**, by which time a certain settlement hierarchy developed within the Troad. Troy has obviously supplied other sites with pottery. The existence of any actual economic, cultural or political control by Troy over any other sites is not clear from the archaeological record, but is possible. Given the fact that, for example, the ceramic production of Limantepe-Larisa copies the typological development at Troy almost 1:1, it is worth considering questions about direct dependency of Limantepe upon Troy, which would have also eventually strengthened Troy's role as an important political player as far as the southern coastal Troad.

At Troy itself, the first monumental architecture was erected towards the end of the VI Middle sub-period and the most impressive constructions dating to **Troy VI Late** (14<sup>th</sup> c. BC). Houses in the citadel were most probably two-storied and large (for example, the Pillar House was 349 m<sup>2</sup>).<sup>40</sup> Such constructions afforded considerable amounts of good quality timber. There is also some evidence that the ditch around the Lower Town was accompanied by a palisade on its inner side. If there was such a palisade, it would have had a length of over 1.5 km, which means 3.000 to 5.000 trees were used, depending on their thickness.<sup>41</sup> This, together with the construction activity in the citadel, could have had a man-made impact on landscape changes in the vicinity of Troy as is suggested by the palynological record from Kesik Bay, since oak was probably the most important building material.<sup>42</sup>

38 S. RIEHL, "Climate and Agriculture in the Ancient Near East: A Synthesis of the Archaeobotanical and Stable Carbon Isotope Evidence," *Vegetation History and Archaeobotany* 17 (2008) 43-51; S. RIEHL, R.A. BRYSON and K. PUSTOVOYTOV, "Changing Growing Conditions for Crops during the Near Eastern Bronze Age (3000-1200 BC): The Stable Carbon Isotope Evidence," *Journal of Archaeological Science* 35 (2008) 1011-1022.

39 Calibration has been conducted according to J.P. FERRIO, J.L. ARAUS, R. BUXÓ, J. VOLTAS and J. BORT, "Water Management Practices and Climate in Ancient Agriculture: Inference from the Stable Isotope Composition of Archaeobotanical Remains," *Vegetation History and Archaeobotany* 14 (2005) 510-517 and [http://web.udl.es/usuaris/x3845331/AIRCO2\\_LOESS.xls](http://web.udl.es/usuaris/x3845331/AIRCO2_LOESS.xls)

40 BLEGEN, CASKEY and RAWSON (*supra* n. 3) 219-243, figs. 465-467.

41 P. PAVÚK, work in progress.

42 RIEHL, MARINOVA and UERPMANN (*supra* n. 18).

The archaeobotanical evidence presented here is generally quite surprising in the case of the developed Late Bronze Age. The spectrum of cultivated and wild plants is to a certain degree similar to other periods, with the exception of the phase VIIa. In the context of the organization of the Mycenaean palace-states it was postulated that specialization in agricultural production should be one of the most important features of the economy.<sup>43</sup> Troy VI Late was undoubtedly a hierarchically organized society and was always considered as the acme of the cultural development of the site in the second millennium BC, and as such its economy must have been, to a certain degree, centrally managed. However, the archaeobotanical data suggest diversification with the appearance of new crop taxa and evenness in ubiquities, instead of specialisation. Such arguments have been used previously to indicate a “risk buffering” economy.<sup>44</sup> Nevertheless, specific for Troy VI Late is the increase of traces of maquis and woodland vegetation, that may be interpreted in favour of activities across the wider settlement area, such as increased transhumance practices.

**Troy VIIa** is the time of new strategies: different foci within the crop spectrum and the increased cultivation of cereals in comparison with Troy VI Late, high ubiquity of grape, change in the localization of exploited areas, as well as a new system of storage. Up to this point, this period of time has been interpreted in two different ways: as a continuation of the prosperity of Late Troy VI, or as the beginning of a crisis. The small-scale and tight architecture in the citadel, as well as the large amounts of storage, could indeed indicate a certain stress in the society. Simultaneously, archaeobotanical data speak for a balanced economy. The dominance of wild plants typical for areas not in the direct vicinity of water sources suggests that crop cultivation and other activities took place in drier areas, like the low plateau, in comparison with other periods.

## Conclusions

At the present state of the research it is difficult to interpret the information concerning Troy VI Late and VIIa. As already mentioned, the archaeobotanical results for the phase Troy VI Early may point to some specialization in grain production, but this result must be considered with caution since the number and the volumes of samples were small. Additionally, the data from the next phase, Troy VI Middle, are missing, so we cannot say if this trend continued or not. Regardless, the period of Troy VI Late seems to represent the traditional diversified crop spectrum. This may be a result of the overexploitation of resources during the most intensive time of development, at the turn of Troy VI Middle and Late. We might thus be witnessing a monumental but exhausted Late Troy VI, or perhaps the Trojan elite introduced new strategies for resource management and the mobilization of surplus other than specialization in grain production. One possibility is the intensive animal husbandry of sheep, cattle, or horses.<sup>45</sup> If the economic system during the phase Troy VI Late overcame some turbulence, the dramatic increase of storage facilities in Troy VIIa might be the reaction, and could testify to a desire for hedging in case of food shortages, or an intention to gain increased control over surplus.

The gradual depopulation of the Troad during the phase VI Late and the eventual nucleation of habitation at Troy, possibly also at a handful of other larger sites in the Troad, might be due either to a slightly drier climate or to some social factors. In any case, this trend seems to continue into Troy VIIa. Amongst the important desiderata for future research are

43 P. HALSTEAD, “Agriculture in the Bronze Age Aegean: Towards a Model of Palatial Economy”. in B. WELLS (ed.), *Agriculture in Ancient Greece* (1992) 105-117.

44 This conforms with the archaeological, preliminary archaeozoological, and archaeobotanical data in the case of Troy IV, as well as archaeological and archaeobotanical data in the case of Troy VIIb.

45 The last one has always been postulated by M. Korfmann; see, for example, M. KORFMANN and P. ZIDAROV, “Trensenknebel in Troia,” in H.-P. WOTZKA (ed.) *Grundlegungen. Studien zur europäischen und afrikanischen Archäologie für M. K. H. Eggert* (2006) 677-690. The importance of textile production based on sheep breeding was also assumed: R. BECKS and M. GUZOWSKA, “On the Aegean-type Weaving at Troia,” *Studia Troica* 14 (2004), 101-116; E. VÖLLING, “Die durchlochten Tonobjekte in der Berliner Sammlung,” in M. WEMHOFF, D. HERTEL and A. HÄNSEL (eds.), *Heinrich Schliemanns Sammlung Trojanischer Altertümer – Neuverlage*, vol. 1 (2008) 227-270. The final evaluation of archaeozoological data will show if this proposition is correct or not.



an intensive survey that would allow for the reconstruction of the settlement hierarchy and larger-scale archaeobotanical and palynological investigations in the area. However, the data that is already available does allow for some preliminary observations. With the potential agricultural areas in mind (Pl. XXXIIIb),<sup>46</sup> one could ask which settlements may have had the function of secondary centers controlling fertile areas in the lower Scamander plain. In the north, in the area between Dümrek and the Dardanelles, there is one good candidate – Işıldak Tepe, a multileveled settlement with evidence for habitation in all previously discussed phases (Troy VIb/c to VI Late/VIIa).<sup>47</sup> However, there is nothing like this in the south. From a topographical point of view, the tell settlement at Hanay-Tepe, excavated by Frank Calvert, would lend itself as a very good candidate for such a secondary center, but it was most probably not inhabited after the Troy VI Middle period. The same is also true for Kumtepe close to the west coast, excavated by both Blegen and Korfmann.<sup>48</sup> As for Beşik-Tepe, the last of the previously postulated secondary centers around Troy, judging by the latest graves from the cemetery it is possible that the associated settlement ceased to exist at the beginning of Troy VIIa.<sup>49</sup> It is tempting to see this development as a result of some synoikismos due to the growing dimensions and importance of the primary center of Troy itself.

The time after the collapse of Late Bronze Age culture around 1200 BC is characterized by general impoverishment and by the introduction of new Balkan elements in the material culture. Agricultural production contains elements of diversification again, main activities return to the vicinity of the valley, and there is indication of drought stress in the  $\delta^{13}\text{C}$  record of cereal grains.

Peter PAVÚK  
Magda PIENIAŻEK  
Simone RIEHL

46 P. KRÖNNECK in ASLAN *et al.* (*supra* n. 24) 202-205, fig. 37.

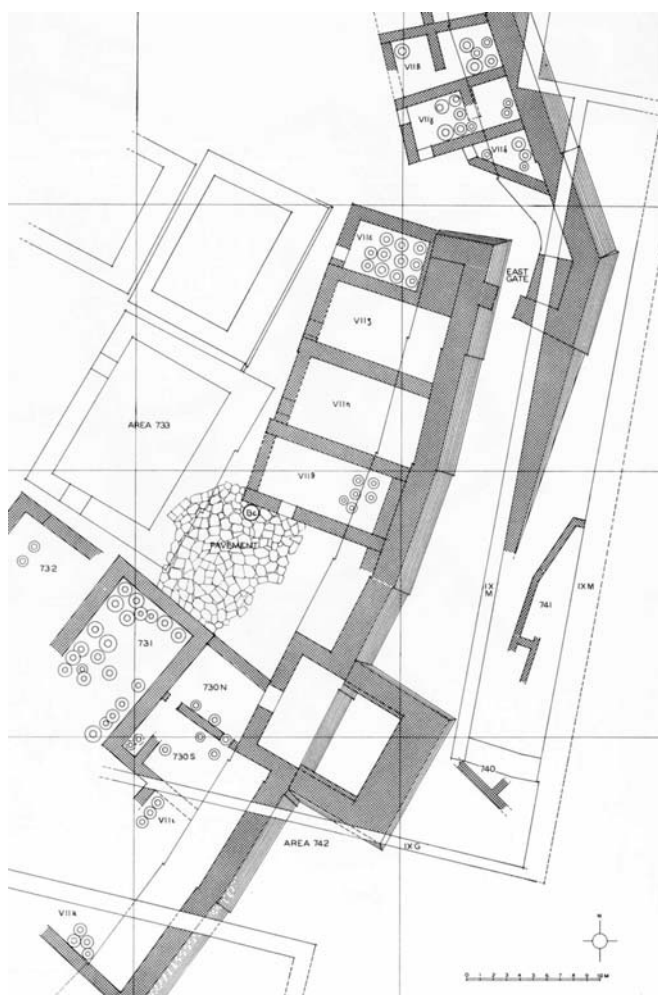
47 Işıldak Tepe: ASLAN *et al.* (*supra* n. 24) 170, fig. 3, with further references. PAVÚK and SCHUBERT (*supra* n. 25).

48 Hanay Tepe and Kumtepe: ASLAN *et al.* (*supra* n. 24) 171-174, figs. 6-9, with further references. PAVÚK and SCHUBERT (*supra* n. 25).

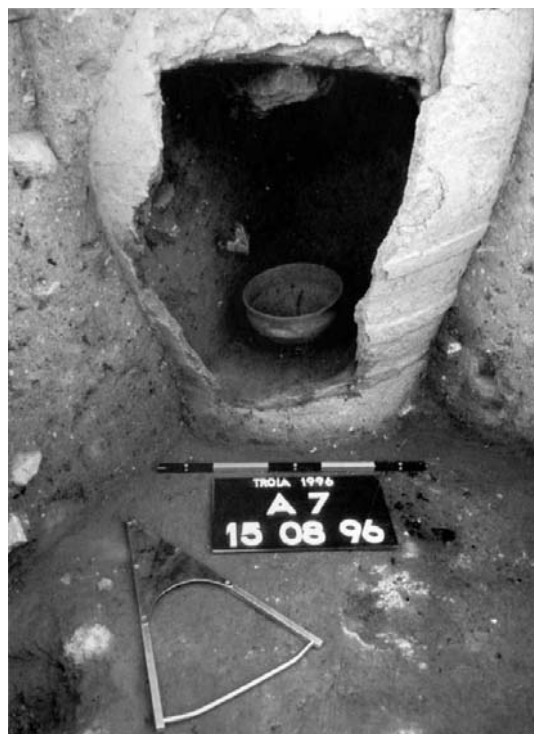
49 M. BASEDOW, *Beşik-Tepe. Das spätbronzezeitliche Gräberfeld* (*Studia Troica Monographien* 1, 2000) 148-150; PAVÚK and SCHUBERT (*supra* n. 25).

## LIST OF ILLUSTRATIONS

- Pl. XXXa Troy VIIa. Houses with pithoi in the eastern part of the citadel (after BLEGEN, BOULTER, CASKEY and RAWSON [*supra* n. 3] fig. 338).
- Pl. XXXb Troy VIIa. Pithos mouths and lids thereof, sunk originally under the floor of the room VIIθ (after BLEGEN, BOULTER, CASKEY and RAWSON [*supra* n. 13] fig. 120).
- Pl. XXXc Troy VIIa. Pithos from the so called Terrace House in the Lower Town with a dipper fallen at the bottom *in situ* (after BECKS, RIGTER and HNILA [*supra* n. 14] fig. 15).
- Pl. XXXIa Troy IV to VIIb. Crop ubiquity: Percentage ubiquity of crop taxa in the different Troy phases.
- Pl. XXXIb Troy IV to VIIb. Wild plant proportions: Proportions of wild plant units grouped according to ecological criteria.
- Pl. XXXIIa Western Troad. Map of known Middle and Late Bronze Age sites.
- Pl. XXXIIb Numbers of ceramic finds by site and phase (as defined for Troy) stemming from the new survey by Troy-Project (after PAVÚK and SCHUBERT [*supra* n. 25])
- Pl. XXXIIIa Troy IV to VIIb. Stable carbon isotopes: Stable carbon isotope values of barley grains from different Troy phases.
- Pl. XXXIIIb Lower Scamander Plain in the Late Bronze Age (after KRÖNNECK in ASLAN *et al.* [*supra* n. 24] fig. 37).



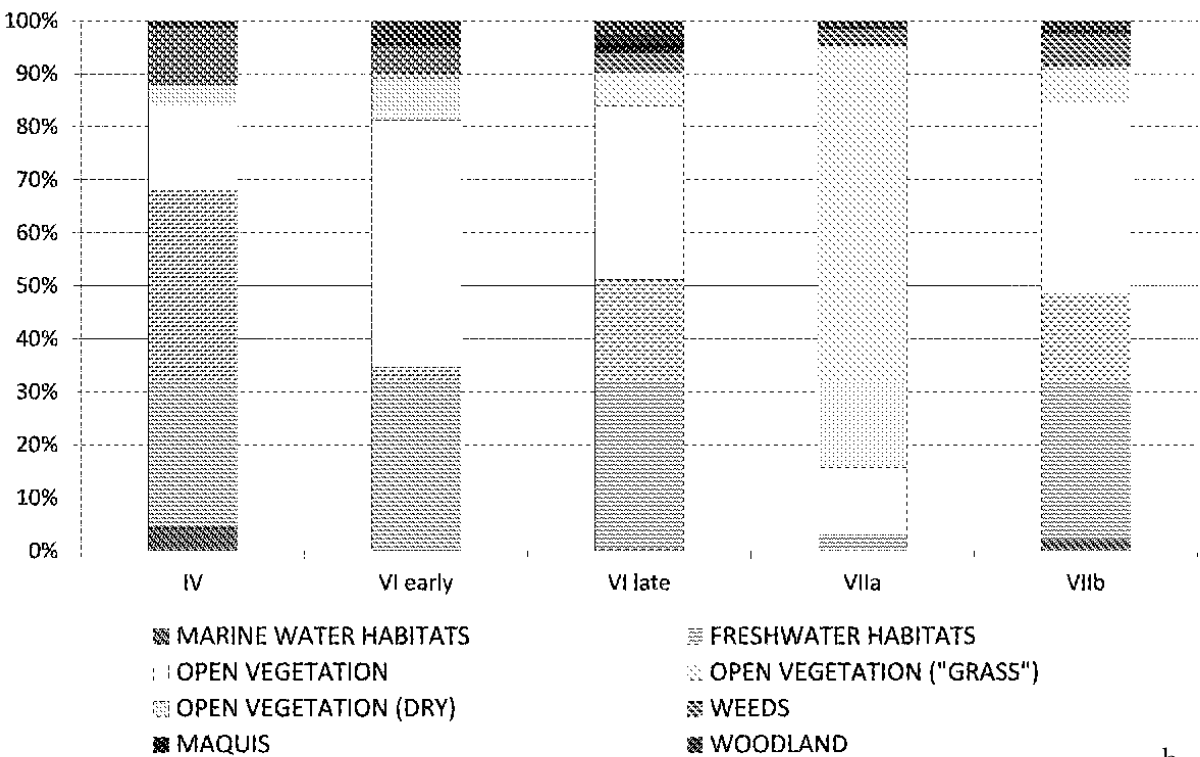
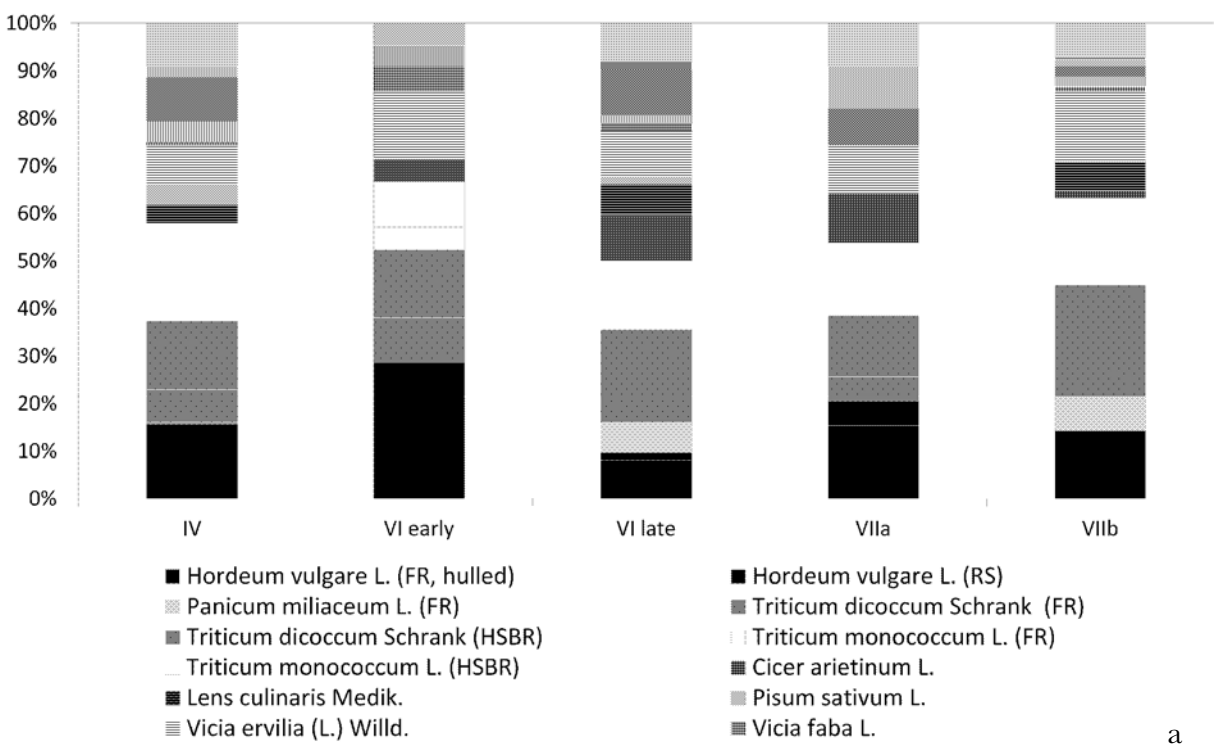
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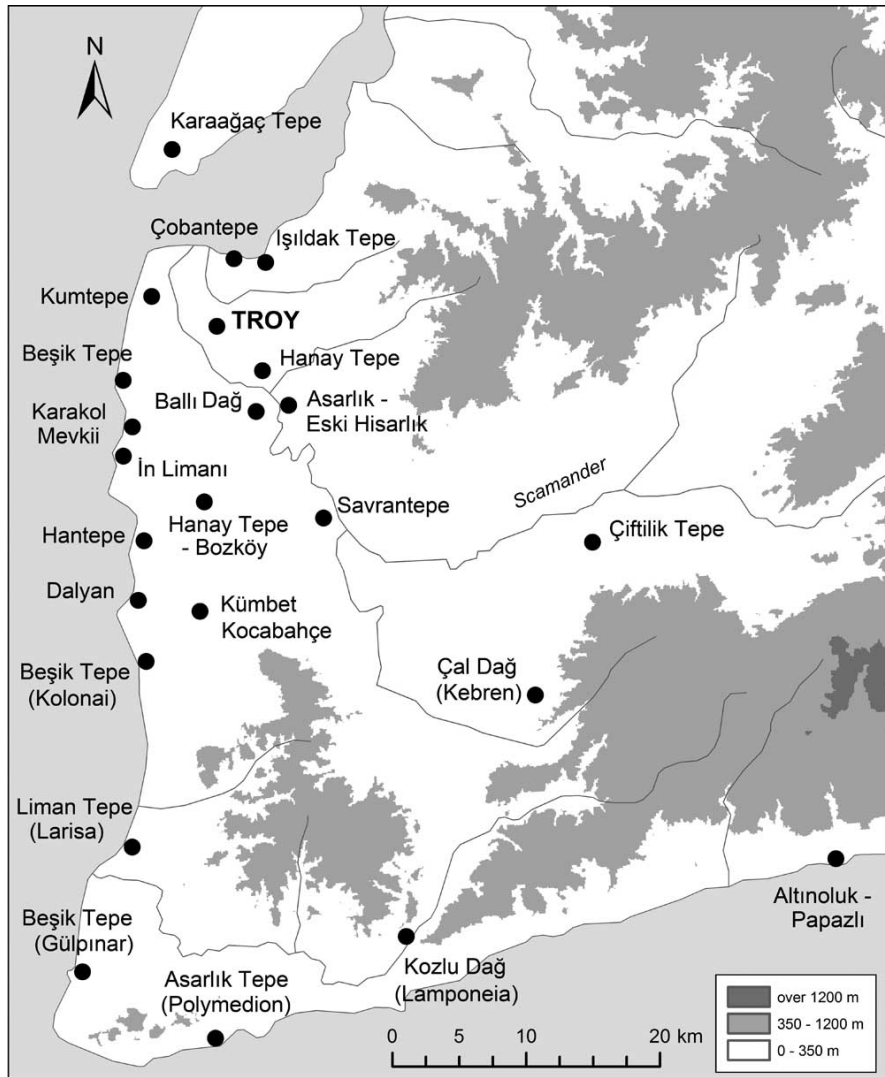
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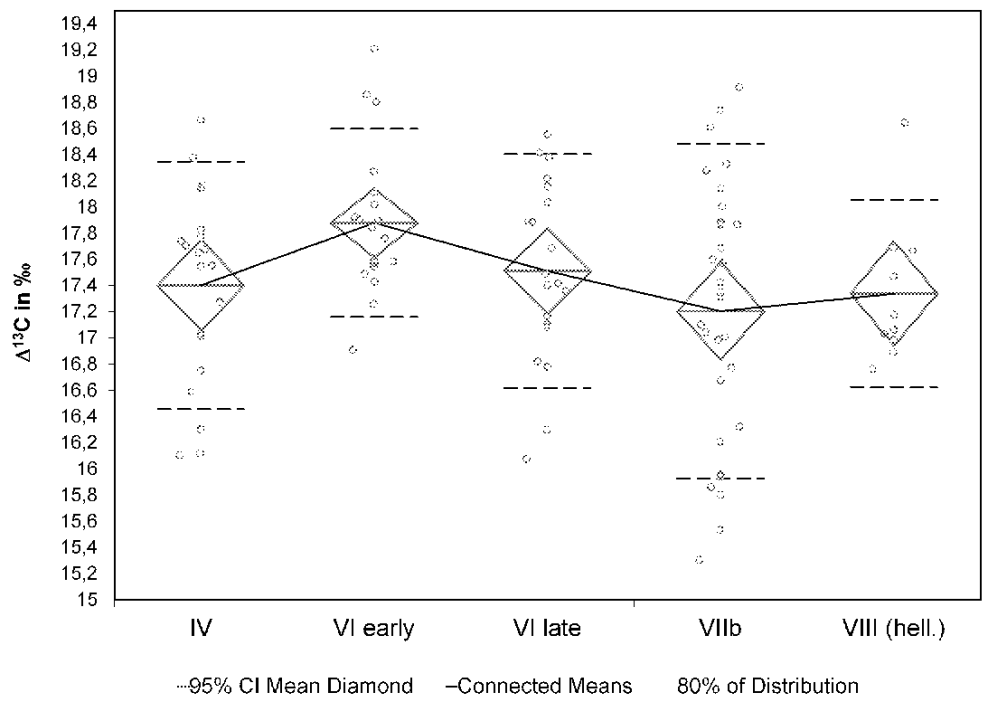




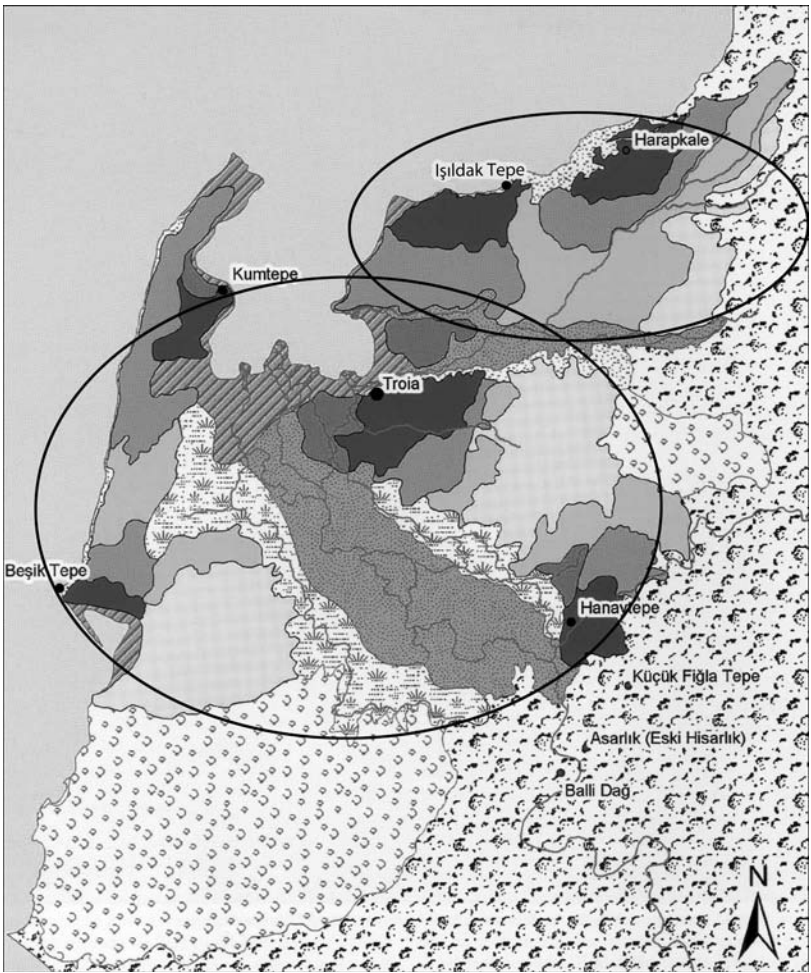
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Site	Phase 1	Phase 2	Phase 2/3	Phase 3	Phase 3/4	Phase 4/5	Phase 4/5?	Phase 6?	Σ
	<i>Early Troy VI</i>		<i>Middle VI</i>		<i>Late VI/VIIa</i>			<i>VIIb</i>	
Asarlık – Eski Hisarlık						5		x?	5
Asarlık Tepe (Polymedion)		5	1	3	2		1		12
Ballı Dağ				1	1	2		x?	4+x
Bozköy-Hanay Tepe	6	14	9	10	28	3	3	1	74
Çobantepe		2	3	1	2	2		2	12
Hanay Tepe (Calvert Farm)		5		1	5	1			12
Hantepe	3	2		2	2				9
İn Limanı		1		2	7				10
Işıldak Tepe		4	6	6	2	5			23
Karakol Mevkii					3				3
Beşik Tepe (Kolonai)			5		8	5			18
Kozlu Dağ (Lamponeia)			4						4
Kumtepe - Babafingo	1		2		5	1	1		10
Liman Tepe (Larisa)	8	24		10	14	22		1	79
Savranetepe			3		2		1		5
<b>Summa:</b>	<b>18</b>	<b>57</b>	<b>33</b>	<b>36</b>	<b>81</b>	<b>46</b>	<b>6</b>	<b>4</b>	<b>280</b>

b



a



b