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## l a k e s i d e s e t t l e m e n t s



## The «Culture of Four Lakes». Prehistoric Lakeside Settlements (6<sup>th</sup>-2<sup>nd</sup> mill. BC) in the Amindeon Basin, Western Macedonia, Greece

— Panicos Chrysostomou, Tryfon Jagoulis, Andreas Mäder

In the course of the coal mining operation in the Amindeon region the Florina Ephorate of Antiquities mounted large-scale excavations to investigate several prehistoric wetland settlements. A joint project between the Greek Ministry of Culture and the Zurich Underwater Archaeology (Office of Urbanism, Zurich City) was part-funded by the Swiss Federal Office of Culture. Thanks to the well-preserved timber constructions it will be possible to establish a chronological framework for the Balkan region based on dendrochronological data.

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**Fig. 1**  
Anarghiri XI (Early Neolithic-Early Bronze Age)  
Aerial view of the large-scale excavation at the prehistoric settlement.

*Luftbild der grossflächigen Ausgrabung der prähistorischen Siedlungsstelle.*

*Vue aérienne du vaste chantier de fouilles de l'habitat préhistorique.*

*Veduta aerea del vasto cantiere di scavo dell'insediamento preistorico.*

Greece, famous for its abundant monuments from Classical Antiquity and its significant Mycenaean, Minoan and Cycladic cultures, remains an unknown quantity with regard to the variety, quality and extent of its prehistoric – Neolithic and Bronze Age – antiquities, due mostly to the focus of Greek archaeological research on the study of works of art as evidence of the evolution of «high culture». However, some excavations carried out in the early and mid-20<sup>th</sup> century at several prehistoric settlements throughout northern Greece (Thessaly and Macedonia), followed by more extensive research and publishing in the 1970s-1990s, together with the latest large-scale excavations prompted by big construction projects, set a basis for the study of the almost unknown prehistoric cultures which flourished from the 7<sup>th</sup>-2<sup>nd</sup> millennia BC.

Some of these earliest research attempts were made in the 1930s by Prof. A. Keramopoulos by mounting a number of small-scale excavations at the Neolithic pilefield of Dispilio (Lake Orestis/Kastoria, western Macedonia). A research pro-

ject conducted by the Aristotle University of Thessaloniki since 1992 under the supervision of Prof. G. Hourmouziadis yielded significant evidence concerning the stratigraphic sequence of three major cultural phases radiocarbon dated to c. 5400-2300 BC (late Middle Neolithic-late Early Bronze Age). Initial conclusions concerning the lakeside settlement's diachronic and spatial development and an overall view of the activities of the local prehistoric community are currently on display at the Dispilio Eco-Museum.

### **A short overview of the prehistoric occupation in the region**

A rescue excavations project in the Amindeon Basin launched by the Greek Ministry of Culture, Education and Religious Affairs and run over the past 15 years by the Florina Ephorate of Antiquities initially focused on the systematic survey and trial trenching of an area of approximately

**Fig. 2**  
Aerial view of the Dispilio Pile Dwellings Eco-Museum.

*Luftbild des Dispilio Pile Dwellings Eco-Museum.*

*Vue aérienne du Dispilio Pile Dwellings Eco-Museum.*

*Foto aerea del Dispilio Pile Dwellings Eco-Museum.*



9,000 m<sup>2</sup> on the shores of the region's four lakes (Vegoritits, Petron, Chimaditis and Zazari) and in the Amindeon Coal Mining Zone of the Public Power Corporation S.A. - Hellas. The ambitious project resulted in the discovery and documentation of 54 archaeological sites from prehistoric to late historic periods and brought to light a previously unknown archaeological culture, which was justifiably named «Culture of Four Lakes».

The Neolithic way of life was introduced in the region rather quickly, as documented by the presence of 11 settlements dated to the final centuries of the 7<sup>th</sup> millennium BC, i.e. to the Early Neolithic period (c. 6500-5800 BC). During the subsequent Middle Neolithic (c. 5800-5400 BC) and most of Late Neolithic I (c. 5400-4700 BC), the number of settlements rose to 15 and remained stable until

Late Neolithic II (c. 4700-4500 BC). During the Final Neolithic period (c. 4500-3300/3200) a decrease in settlement density was observed (12 sites). In choosing the locations of these settlements the Neolithic communities showed a steady preference for low plateaus and flat land, with lakeside settlements accounting for half of the sites dated to the beginning of the Late Neolithic period. The sizes of the settlements generally reached the 1.5 hectare mark, with some exceptionally large sites covering 3 to 10 hectares. The most characteristic features of the spatial organisation of the Middle-Late Neolithic dryland sites were post framed or subterranean circular dwellings and concentric ditches around the settlements as seen at Anarghiri XI, XIII and XIIIa.

During the Early and Middle Bronze Ages (c. 3300/3200-1500 BC), the Amindeon Basin witnessed a rapid increase in the number of settlements built on lakeshores or on low hills near marshes and streams. The most significant site from that period was the lakeside settlement of Anarghiri I on Lake Chimaditis, while the dryland settlements of Sotiras V, Anarghiri IXa, XI and XIIIa were enclosed by simple or complex ditches and circular or oval timber palisades.

The Iron Age (c. 1100-550 BC) – a period of population growth in the region – is known from the Pateli (Aghios Panteleimon) Necropolis of Tombs, which was partially excavated in 1898-99 by the Russian Archaeological Institute of Istanbul. The site has been re-excavated since 2001, yielding

Fig. 3  
The Four Lakes region and the most significant excavated sites in the Amindeon Basin.

*Die Four-Lakes-Region mit den wichtigsten Grabungsstellen im Amindeon-Becken.*

*La région des Four-Lakes avec les principaux sites fouillés du bassin de l'Amindeon.*

*La regione di Four Lakes con i principali siti archeologici del bacino di Amindeon.*



- 1 Anarghiri XI
- 2 Anarghiri XIIIa
- 3 Anarghiri XIII
- 4 Anarghiri I
- 5 Sotiras V
- 6 Aghios Panteleimon Necropolis of Tombs
- 7 Anarghiri IXa
- 8 Anarghiri IXb
- 9 Limnochori II
- 10 Anarghiri III
- 11 Anarghiri IV
- 12 Limnochori III
- 13 Rodonas II



Fig. 4  
Aghios Panteleimon.  
Cleaning of archaeological material.  
*Fundreinigung.*  
Lavage du matériel archéologique.  
*Lavaggio dei reperti archeologici.*



Fig. 5  
Aghios Panteleimon.  
Drying and sorting of archaeological material.  
*Trocknen und Sortieren von Funden.*  
Séchage et tri du matériel archéologique.  
*Asciugatura e classificazione dei materiali.*

hundreds of graves organised in 18 tombs. This unique necropolis in the Balkans with its great variety of grave types, special burial customs and numerous high-quality grave goods was used for at least 500 years up to the first half of the 6<sup>th</sup> century BC.

### Rescue excavations in the Amindeon Coal Mining Zone

The rescue excavations project carried out in the Amindeon Coal Mining Zone by the Florina Ephorate of Antiquities is the largest and longest-lasting rescue initiative ever launched by the Greek Ministry of Culture, Education and Religious Affairs. The realisation of the project would never had been possible without funding from the Public Power Corporation S.A. - Hellas and the participation of a large staff of scientists and labourers, including 150 archaeologists, 1100 skilled and unskilled workers, and more than 50 scientific associates from various backgrounds (engineers, draughtsmen, graphic designers, IT specialists, conservators etc.). Over the past three years the Florina Ephorate of Antiquities completed the rescue excavation of the prehistoric settlements of *Anarghiri IXa* and

*XI* (13 hectares in total), and it is now excavating *Anarghiri IXb* and *XIIIa* (9 hectares in total). This large-scale operation and the enormous amount of finds uncovered (more than 50 000 artefacts), required the construction of several storage buildings and laboratories at Aghios Panteleimon measuring a total of 4500 m<sup>2</sup> to facilitate all the tasks that are being carried out by the specialised staff, including the sorting, cleaning, drying, conserving, documenting and storing of the excavated material.

### The prehistoric lakeside settlements

Apart from the project at Dispilio the recent excavations carried out at the prehistoric pile dwellings in the Amindeon Basin are the only such investigations ever undertaken in Greece. They are also among the only research initiatives dealing with wetland sites in the southern Balkans. The *in-situ* detection of waterlogged material dating from c. 5500-2000 BC is extremely important, not only for Greek, but also for European wetland archaeology due to the potential for new results with regard to basic research objectives.

Until today, eight permanent pile dwellings have been documented, while for 19 lakeshore settle-



**Fig. 6**  
Limnochori II (Late Neolithic I)  
Clay house model from the destruction layer representing a two-storey pile dwelling.

*Das Modell eines Lehmhauses aus der Zerstörungsschicht zeigt ein zweistöckiges Pfahlbauhaus.*

*Modèle en argile d'une maison sur pilotis à deux étages, découvert dans les niveaux de démolition.*

*Modello in argilla di un edificio su palafitte a due piani proveniente da uno strato di demolizione.*

**Fig. 7**  
Limnochori II (Late Neolithic I)  
Part of the pile field with wooden construction elements.

*Teil des Pfahlfelds mit Konstruktionsteilen aus Holz.*

*Une partie des pieux et des éléments de construction en bois.*

*Settore del campo di pali con elementi costruttivi di legno.*

ments there were indications that the dwellings were situated in the lake at least at certain times. Most of these were located on the northern shore of Lake Chimaditis, while three of them were situated in the marshes created by the lake spilling over into the adjacent plain.

The prehistoric site of *Limnochori II* (c. 5500-3300/3200 BC) represents the earliest known attempt of Neolithic farmers to settle in a typical wetland environment. In the lowest Middle Neolithic layers (c. 5500-5400 BC) and dispersed throughout the entire settlement area (6.5 hectares) several wooden construction elements associated with Neolithic dwellings were unearthed (vertical piles, upper parts of structures). During Late Neolithic I (c. 5400-4700 BC), the settlement occupied an extended strip of land on the lakeshore, with the anthropogenic deposits of this phase consisting of a thick layer of organic material and two successive burnt destruction horizons. The lakeside structures in the upper archaeological deposit (c. 5000-4800 BC) were either organised in clusters of three or more dwellings on raised platforms or they were individual two-storey houses. The good preservation also allowed us to reconstruct the internal layouts of these dwellings and to raise hypotheses concerning the use of space and the Neolithic household organisation. During the final

Neolithic periods (c. 4700-3300/3200 BC) the settlement was reduced to a dryland mound consisting of successive anthropogenic deposits.

Two burnt layers and the wooden floor of a pile dwelling as well as numerous piles came to light in the lowest waterlogged layers of the lakeside settlement of *Anarghiri III* (c. 5300-4000 BC). The excellent preservation of the material allowed us to reconstruct two-storey buildings and their interior constructions and domestic artefacts on one hand, whilst facilitating the identification of spatial arrangements with regard to various household activities on the other. The upper storeys and attics of the dwellings were used as living quarters and areas of domestic activity, as attested to by hearths and ovens, grinding stones and large vessels for storing and preparing food, while the lower storeys with plastered floors were used to house the livestock. Right next to one of the ovens fragments of two female figurines came to light, which probably constituted the top parts of a clay house model. A plastered floor of a circular house was unearthed in the upper Final Neolithic dryland layers (c. 4500-3300/3200 BC), while the layers directly beneath the modern surface yielded a post-built house with two rooms.

After the settlements mentioned had been abandoned two new lakeside settlements were built



**Fig. 8**  
Anarghiri III (Late Neolithic I)  
Destruction layer of the upper floor of a two-storey pile dwelling.

*Zerstörungsschicht des oberen Stocks eines zweistöckigen Pfahlbaus.*

*Couche de démolition de l'étage supérieur d'une maison sur pilotis.*

*Strato di demolizione del piano superiore di una casa a due piani su palafitte.*

**Fig. 9**  
Anarghiri IXb (Late Neolithic-Early Bronze Age)  
Aerial view of the ongoing excavation on the edge of the Coal Mining Zone.

*Luftbild der laufenden Ausgrabung am Rand der Kohlenabbauzone.*

*Vue aérienne de la fouille en cours, en bordure d'une mine de charbon.*

*Veduta aerea dell'area in corso di scavo ai margini di una miniera di carbone.*



nearby. The settlement of *Limnochori III* (1.2 hectares) was occupied for at least 500 years (c. 4500-4000 BC) and was eventually abandoned following a conflagration. The excavated structures were organised in rows on a single raised platform thereby facilitating the movement from one dwelling to the other. Interesting information concerning the social structure within the settlement was gleaned from the presence and density of domestic structures (round hearths and ovens) organised in groups within the dwellings. Despite the rather small size of *Anarghiri IV* (less than 0.6 hectares) and the limited research carried out so far, human activity has been shown to have lasted more than 5000 years (early 4<sup>th</sup> millennium BC-late Byzantine period).

The size of the lakeside settlement *Anarghiri I* (15 hectares) makes it rather unique amongst the local Bronze Age sites. The settlement was destroyed by a conflagration during its first phase (c. 2000 BC) and its ruins were flooded by Lake Chimaditis. The destruction layer yielded numerous vessels, a bronze knife, stone tools, a wooden plough, remains of wattle and daub and other organic material. Besides the lakeside settlements, there were also settlements near or in the marshy area that had formed due to Lake Chimaditis flooding the land. *Anarghiri IXa* was established in the early 5<sup>th</sup> mil-

lennium BC at the foot of a low mound of 0.6 hectares in size. The excavation uncovered an oval wooden palisade and a destruction layer of a two-storey pile dwelling dating from the second half of the 5<sup>th</sup> millennium BC. The tripartite ground floor of the house contained *in-situ* thermal structures (hearth, oven), a clay box with spindle whorls, a vast amount of ceramic vessels of different sizes, grinding stones, stone tools etc.

Located in the same wetland area and only 130 m to the southwest, *Anarghiri IXb*, inhabited in the early 5<sup>th</sup> millennium, was oval in shape and approximately 2.8 hectares in size, with dwellings either built on platforms or raised on piles in the lake. Rather unique were three wooden trackways (one of them preserved over a stretch of 90 m) unearthed on the eastern edge of the settlement, which served either as moorings for log boats or as connections between the settlement and the opposite lakeshore. In the subsequent Neolithic periods (c. 4700-3300/3200 BC) the settlement became a dryland site characterised by several successive burnt destruction layers.

Although the settlement of *Rodonas II* was situated in a different marshy environment 2 km north of *Anarghiri IXb*, it was established at exactly the same time (early 5<sup>th</sup> millennium BC) and was occupied for more than 6000 years, with its lowest waterlogged

Fig. 10  
Limnochori II (Final Neolithic) (left)  
Anthropomorphic vessels.  
Anarghiri XIIIa (Early Neolithic) (right)  
Female figurine «Thinker of  
Anarghiri».

*Anthropomorphe Gefässe.  
Frauenstatuette «die Denkerin von  
Anarghiri».*

Récipients anthropomorphes.  
Figurine féminine «La penseuse  
d'Anarghiri».

*Recipienti antropomorfi.  
Statuetta femminile «la pensatrice di  
Anarghiri».*



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Fig. 11  
Anarghiri XIIIa (Late Neolithic)  
Wooden pestle.

*Stößel aus Holz.*

Pilon en bois.

*Pestello di legno.*



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layer rich in organic material, tools, and diagnostic pottery.

Apart from the waterlogged materials unearthed in the wetlands of the Amindeon Basin, the whole spectrum of human activity is represented in a wide range of artefacts manufactured using several techniques and varying raw materials.

Most of the archaeological material recovered was pottery, which during the earliest Neolithic periods in the Amindeon Basin was decorated, either with simple or more elaborate white linear motifs on a red surface or with fingernail imprints. During the Middle Neolithic new vessel shapes and decoration techniques (bitumen and barbotine ware) were introduced. The communication between the local Neolithic communities and those in Pelagonia and Thessaly appears to have intensified at that time, as documented by the increasing presence of common decorative motifs. Quite interesting is the appearance during the late 6<sup>th</sup> millennium of a special local pottery type with characteristic «silver-like» burnished surfaces, while imported Dimini pottery – or its local imitation – has been found at Anarghiri III and Anarghiri XI. Besides the usual stone, bone and antler tools, a number of wooden artefacts – including a logboat, a pestle, fragments

of digging tools, hafts, jewellery etc. – found in the region's lakeside settlements are unique for Greek prehistoric research. Furthermore, numerous artefacts and practices – clay human and animal figurines, jewellery, pottery decorations, stamps, clay tablets with «proto-writing» signs and burials – confirm the existence of a complex «world of ideas» that existed at various socioeconomic levels of the local prehistoric communities.

The unprecedented scale of research carried out at prehistoric lakeside settlements in the Amindeon Basin and the resulting unique body of evidence concerning the significant «Culture of Four Lakes», prompted us to develop a collaboration with institutions abroad that specialise in wetland archaeology. Our aim is to fulfil the highest standards for the preservation, documentation and study of this valuable archaeological material.

#### Collaboration project Greece-Switzerland

In the spring of 2014 the Scientific Supervisor of the rescue excavations project, Dr. Panicos Chrysostomou, initiated a joint project with the Zurich Underwater Archaeology. The *Project for*

*the rescue, conservation and documentation of wooden and other organic artefacts from the prehistoric lakeside settlements in Amindeon, Florina, Western Macedonia, Greece*, co-funded by the rescue excavations project and the Swiss Federal Office of Culture, was defined as a sub-project in the context of the ongoing archaeological rescue excavations in Amindeon. The project is geared towards the transfer of knowledge, including best practice concerning the excavation, documentation and processing of wooden finds and samples. The expertise of the Zurich Underwater Archaeology helped us to optimise the sampling strategy, the recovery and storage of samples, and the maintenance of a database and highlighted the potential of dendroarchaeology being applied to the Greek pile dwellings. Several meetings took place in Switzerland and Greece bringing together archaeologists from both countries.

### Perspectives

More than fifty years of modern research have highlighted the great potential of the numerous waterlogged archaeological sites for the early prehistory of Central Europe. Thanks to the unique value of their well-preserved organic layers, artefacts and wooden structures the pile dwellings were declared Unesco World Heritage in 2011. However, pile dwellings are not a phenomenon limited to Central Europe: Equivalent archaeological sites can be found in the Balkan region and northern Greece as the excavations carried out at Dispilio and in the Amindeon region show. Their waterlogged state implies the same potential to enhance the research into prehistoric cultures in the Balkans as the circumalpine pile dwellings have for the study of Central European prehistory. Because of the many cultural influences from south-eastern Europe the preserved organic remains are highly important for the understanding of the cultural and natural history of Central Europe and for its economic history and chronology. That is why they also play an

important role for the Neolithic lakeside settlements of Switzerland.

In 2015 a scientific meeting took place in Amindeon under the heading *Balkan and Central European Lakeside Settlements – Sharing old and new archaeological data*. The meeting brought together different scientists involved in pile-dwelling research in Greece, Albania, F.Y.R.O.M., Slovenia, Germany and Switzerland. Although the meeting was intended as the final act of the cooperation project dealing with the 2014 excavations, it was at the same time the starting point of intensified scientific exchange.

Given the high potential of the Greek and Balkan prehistoric wetland sites the aim has to be to develop a supraregional dendrochronological framework connecting the archaeological data of Central European and Balkan prehistory. In a first step the sampling strategy developed as part of the cooperation project is being implemented in the 2015 excavation at Anarghiri IXb with the objective of measuring as many pile samples as possible; the construction of an absolutely dated local dendrochronological curve will be the first milestone to bridge the gap between the prehistory of Central Europe and the Balkans.

### Zusammenfassung

Die prähistorischen Fundstellen Griechenlands sind noch kaum bekannt. In den letzten 15 Jahren entdeckte das Ephorate of Antiquities Florina in der Region Amindeon, Westmazedonien anlässlich von Rettungsgrabungen insgesamt 54 Fundstellen: Die ältesten datieren ins 7. Jahrtausend v.Chr. (Frühneolithikum), gefolgt von mittel-, spät- und endneolithischen sowie bronzezeitlichen Siedlungen. Jüngst begann man im Zusammenhang mit dem Kohleabbau mit der Ausgrabung mehrerer Feuchtbodensiedlungen aus der Zeit um 5500-2000 v.Chr., welche zur sog. «Culture of Four Lakes» gehören (Limnochori II und III; Anarghiri I, III, IV, IXa, IXb; Rodonas II). Bereits konnten zehntausende von Funden in gigantischen

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### Picture credits

Ephorate of Antiquities Florina (Figs. 1, 3-12); K. Kotsakis, Dispilio Excavations (Fig. 2)

Grossgrabungen mit weit über 1000 Mitarbeitern geborgen und dokumentiert werden. In diesem Zusammenhang initiierte das griechische Kulturministerium ein Kooperationsprojekt mit der Unterwasserarchäologie Zürich (Stadt Zürich, Amt für Städtebau) unter dem Titel «Project for the rescue, conservation and documentation of wooden and other organic artefacts from the prehistoric lakeside settlements in Amindeon, Florina, Western Macedonia, Greece», welches vom Bundesamt für Kultur (BAK) finanziell unterstützt wurde. Die gut erhaltenen Holzstrukturen, allem voran die tausenden von Pfählen, werden es in Zukunft erlauben, in Zusammenarbeit mit den umliegenden Ländern ein dendrochronologisches Gerüst für den Balkan aufzubauen. █

### R é s u m é

*Les sites préhistoriques grecs sont encore à peine connus, mais au cours des quinze dernières années, l'Ephorate of Antiquities Florina, dans la région d'Amindeon, à l'ouest de la Macédoine, a repéré pas moins de 54 occupations grâce à des fouilles de sauvetage. Les plus anciennes remontent au 7<sup>e</sup> siècle av. J.-C. (Néolithique ancien), puis elles se répartissent tout au long du Néolithique moyen, récent et final, jusqu'à l'âge du Bronze. Récemment ont débuté les fouilles, en lien avec l'exploitation d'une mine de charbon, de plusieurs habitats en milieu humide datés entre environ 5500 et 2000 av. J.-C., appartenant à la culture dite des «Four Lakes» (Limnochori II et III; Anarghiri I, III, IV, IXa, IXb; Rodonas II). Des dizaines de milliers d'objets viennent d'être mis au jour au cours d'interventions gigantesques, documentés et prélevés avec l'aide de plus de 1000 collaborateurs. Dans ce contexte, le ministère grec de la Culture a instauré une collaboration avec la section zurichoise d'archéologie subaquatique (Stadt Zürich, Amt für Städtebau), intitulée Project for the rescue, conservation and documentation of wooden and other organic arte-*

facts from the prehistoric lakeside settlements in Amindeon, Florina, Western Macedonia, Greece, *projet soutenu financièrement par l'Office fédéral de la culture. Bien conservées, les structures en bois, en particulier les milliers de pilotis, permettent de mettre en place l'ossature des datations dendrochronologiques pour les Balkans, en collaboration avec les pays voisins de la Grèce.* █

### R i a s s u n t o

I siti preistorici della Grecia sono ancora oggi in gran parte sconosciuti. Nel corso degli ultimi anni, l'Ephorate of Antiquities Florina ha portato alla luce 54 nuovi luoghi di ritrovamento in occasione di scavi di emergenza nella regione di Amindeon, nella Macedonia occidentale. Le scoperte più antiche si datano al VII millennio a.C. (Neolitico antico) seguite da insediamenti risalenti al Neolitico medio, tardo e finale, così come all'età del Bronzo. In tempi recenti, in concomitanza con dei lavori di estrazione del carbone, sono state condotte numerose indagini in insediamenti situati in zone umide datati al 5500-2000 a.C. appartenenti alla così detta «Culture of Four Lakes» (Limnochori II e III; Anarghiri I, III, IV, IXa, IXb; Rodonas II). Ad oggi sono stati recuperati e documentati decine di migliaia di reperti rinvenuti durante degli scavi di grande estensione a cui hanno partecipato oltre 1000 collaboratori. In questo contesto il Ministero della cultura greco ha instaurato una cooperazione con l'Archeologia subacquea zurighese (Unterwasserarchäologie Zürich Stadt Zürich, Amt für Städtebau), finanziato dall'Ufficio federale della cultura (UFC), dal titolo «Project for the rescue, conservation and documentation of wooden and other organic artefacts from the prehistoric lakeside settlements in Amindeon, Florina, Western Macedonia, Greece». Le strutture lignee rinvenute, in particolare le migliaia di pali, consentiranno in futuro, in collaborazione con i paesi confinanti, di elaborare una dendro-cronologia per i Balcani. █