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A RADIOCARBON CHRONOLOGY FOR "GROTTE DI PERTOSA" IN CAMPANIA, SOUTHERN ITALY

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ABSTRACT. The Pertosa Caves, today also known as the Pertosa-Auletta Caves, constitute an important karst system in the Campania region (southern Italy). Crossed by the waters of a river that re-emerges on the surface, they have an overall development of about 3 km. Thanks to the width of the entrance, the excellent location along a natural communication route through the mountains and the natural availability of water directly on the site, the initial part of the cavity was frequented by humans, without interruption, from prehistoric times to the Middle Ages. During the protohistory, in particular, the moment of most marked human presence is recorded in the cave. In this phase an extensive pile dwelling system was built on the waters of the underground river. The system was probably created to make the location, subject to frequent flooding, suitable for human settlement. This structure today constitutes an archaeological unicum not only in Italy but throughout Europe. We briefly analyze its general characteristics providing the results of a radiocarbon dating campaign which allowed to assess the occupation phases of the different contexts and the life span of the wooden artifacts, which came to us in a very good state of preservation. Radiocarbon data allowed to assess the chronological range of the human frequentation of the caves and to date the exceptionally well preserved underground pile dwelling system.

KEYWORDS: AMS, caves, Italian Prehistory, Southern Italy, stilt house.

INTRODUCTION

The Caves of Pertosa preserve within them an archaeological site of extraordinary scientific interest (Carucci 1907; Larocca 2010). It was shaped over several thousand years as the result of multiple human activities and it has returned abundant evidence of material culture connected to the various human groups that, from prehistory to medieval times, frequented the cavity (Larocca 2017). Certainly, the particular fortune of the site is the reflection of excellent and advantageous conditions for human settlement such as the large dimensions of the initial underground environment, the good light conditions deriving from the large entrance, the natural availability of fresh water directly on site, the favorable position along the course of the Tanagro River, which is part of an important natural communication route through the Southern Apennine mountain range. All these characteristics made the cavity a privileged resting place for the different human groups who frequented the area (Larocca, 2017).

The advantages of a stable occupation within the so-called "antegrotta" (the first, initial part of the caves) emerged clearly during the protohistoric era, when almost all the underground space available in the first 100 meters of the cavity, along the banks of the underground stream, was equipped with a wooden structure similar to a stilt house (Patroni 1899; Carucci 1907; Breglia and Fiorentino 2017). It was probably used to solve a problem with which humans had to deal recurrently: the swamping of the banks on the sides of the watercourse and, in particular

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moments, perhaps even their temporary submersion. The pile dwelling, artificially raising the passable floor in the initial part of the cavity, made available and fully usable, an area that would otherwise be subject to changing conditions associated with the variability of the water flow of the stream.

For this phase, the importance of the site lies in three main reasons: (i) the very peculiar settlement choice represented by the construction of a pile-dwelling inside an active karst cave; (ii) despite its modest size and the absence of fortifications, the site is well inserted in a wide network of contacts (Acquafredda 2017; Breglia 2020), even on a large scale, and has yielded a considerable amount of valuable metal goods, weapons, ornaments, exotic artifacts and various indicators of wealth (Rellini 1916; Bettelli 2002; Albore Livadie et al. 2004; Lo Schiavo 2010; Larocca et al. 2018); (iii) the dual function of the site which, alongside the evidence of a residential/domestic occupation, shows evidence of cults, probably linked to the sacred nature of the groundwater (i.e., the abandonment of weapons in the watercourse (Rellini 1916; Kilian 1963–1964; De Falco and Larocca 2017) and the ritual deposition of miniature jars in the cracks of the cave walls (Patroni 1899; Carucci 1907; Fuscone 2013).

The good conservation, in the bed of the watercourse, of the edges of the pile dwelling system, led the archaeologists—between 2004 and 2013—to carry out a series of studies and documentation interventions of the surviving evidences (Larocca 2017; Larocca and Breglia 2018). Nevertheless, stratified deposits are generally not preserved in this area, except in rare specific cases where the erosion of the watercourse has not affected the sediments. This creates a situation in which the evidence on the surface (poles, pottery and other finds) constitutes a palimpsest of several occupation phases of the same places, with a consequent apparent chronological flattening. Data from previous excavations in other areas and most of the material culture in the riverbed pointed towards a chronological attribution of the wooden structures to the Bronze Age. However, in the absence of radiometric dates, it was impossible to attribute the structures to a more specific Bronze Age period or to define whether the choice to build on stilts lasted for the entire protohistoric settlement lifespan or not. On the occasion of these fieldworks, therefore, wood was sampled in order to allow following laboratory analyses.

The outcome of these investigations led to the achievement of various results: the identification of the pile dwelling extension, the general characteristics of the wooden structures, the plant species used for the construction of the artifacts and structures (Breglia 2020) and, above all, their chronology.

In this paper we report on the results obtained by radiocarbon dating some of these samples, allowing the assessment of the different frequentation phases of the site.

SITE DESCRIPTION

The Pertosa Caves open at 263 meters above sea level on the left bank of the Tanagro River, on the eastern slopes of the Alburni Mountains (Figure 1, A). The cavity, from a speleological point of view, constitutes a karst spring returning to the surface the waters of an underground river with variable water flow, between 350 and 600 L/s (Larocca 2010).

The 3-km-long cave consists of three almost parallel branches called, from north to south, the Tourist, the Speleological and the Spring Branch. The first hosts a path open to the public that crosses highly concreted environments with a valuable aesthetic aspect; the second is a pipeline

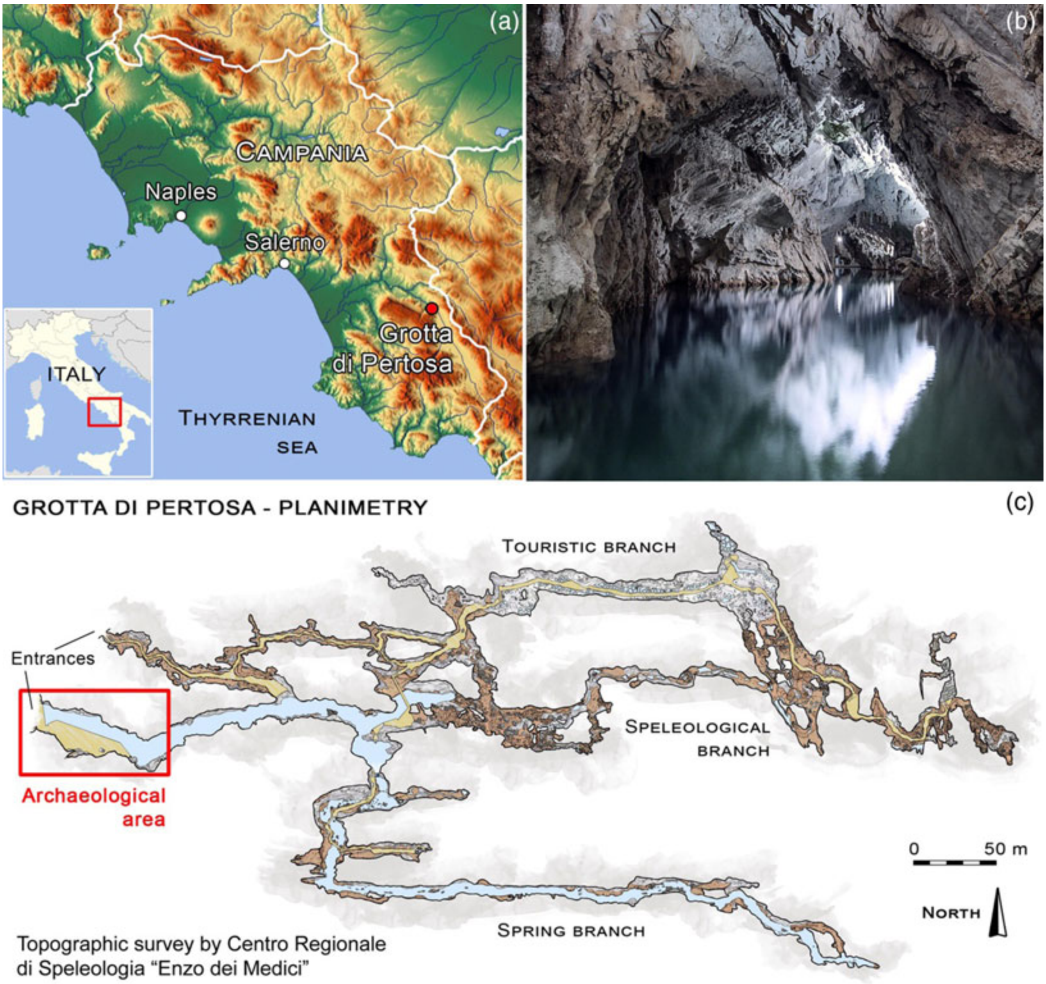

Figure 1 (a) Location of the "Grotte di Pertosa" (edited by F. Breglia). (b) view of one of the cave branches completely flooded by underground stream (photo by P. Ippolito and A. Pilia); (c) Map of the cavity (after Larocca 2010, Tav. I, modified).

characterized by considerable accumulations of mud and collapse deposits; the third is completely invaded by the waters of the underground stream, which flows for about one third of the total development of the cave and finally re-emerges on the surface, rejoining the course of the Tanagro River (Figure 1, B–C).

The area of archaeological interest is located in the first 100 meters of the cavity (Figure 1, C), in immediate contact with the natural entrance to the underground system. Although the entire cavity has been the subject of careful exploration, the evidence of ancient human presence is concentrated exclusively in the aforementioned "*antegrotta*" a transition area between the surface and the underground world. It is here that the archaeological site is preserved, characterized by the remains of the ancient protohistoric pile dwellings, still visible in the silts of the submerged seabed.

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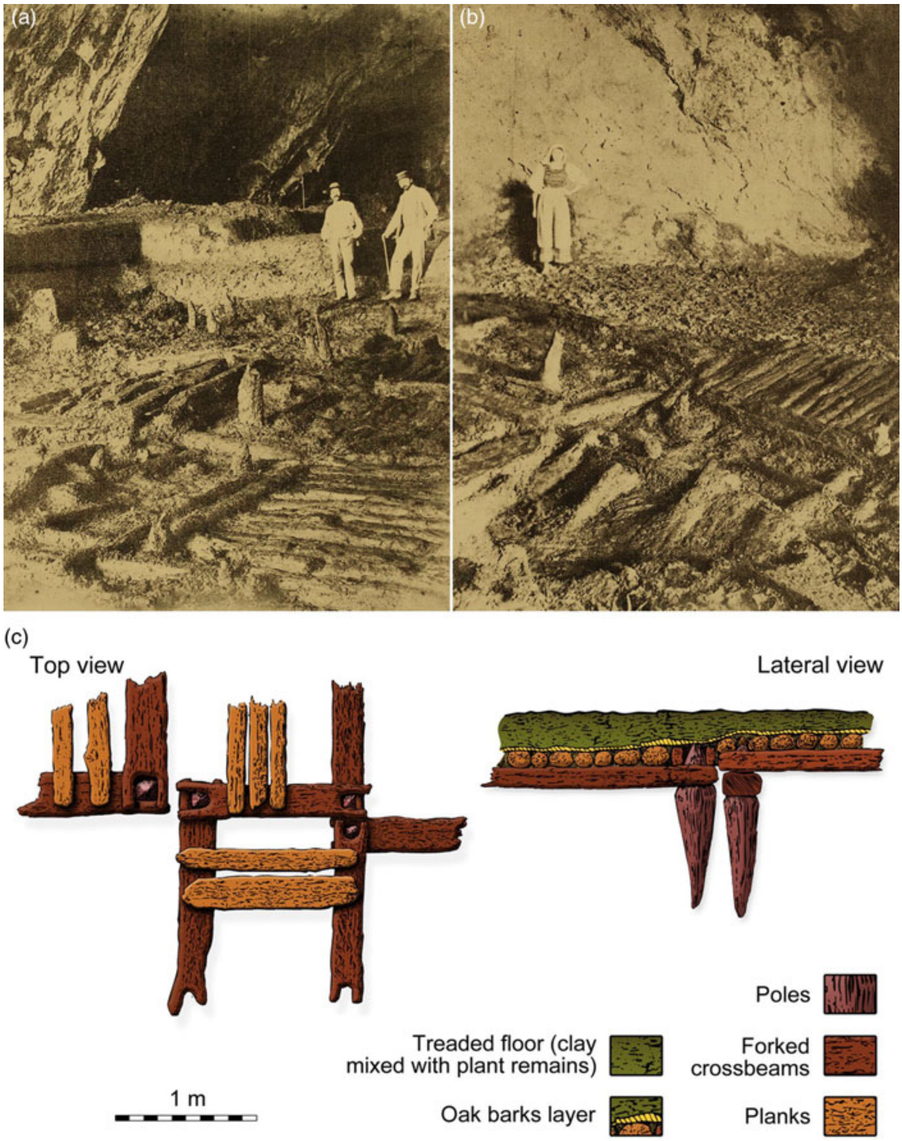

Figure 2 Historical photograph (a) showing the ancient well-preserved wooden structure and (b) the structures brought to light by the excavations carried out by Patroni (after Patroni 1899). (c) graphical reconstruction of the dwelling system (after Patroni 1899, modified).

Archaeological Background

The history of the research in the Pertosa Caves begins in the late nineteenth century when two scholars, Giovanni Patroni and Paolo Carucci, investigated the deposits in the initial portion of the cavity (Larocca 2010, 2017). The first started the excavations in 1898, investigating the bank of the underground stream to a depth of 90 cm and identifying 7 layers rich in archaeological materials, the last of which included an ancient well-preserved wooden structure (Patroni 1899) (Figure 2, A–B). Later the investigations were resumed by Carucci who deepened and extended the previous excavation (Carucci 1907). The latter reached a depth of

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about 3 m and investigated a sequence of eleven layers, the seventh of which corresponded to the already known pile dwelling, while the tenth incorporated a second—and more ancient—pile dwelling.

The investigations by Patroni and Carucci led to the recognition of different phases of human frequentation of the cavity which, albeit with different hiatuses, covered the last six thousand years. The superficial layers, in fact, incorporated materials from the Middle Ages and Hellenistic-Roman periods while, below, lay the layers that can be classified in the protohistoric age, with some sporadic elements referable to the recent Neolithic.

The ceramic finds indicate that the period of most intense occupation of the cave was the middle Bronze Age. The protohistoric attendance however lasted until the early Iron Age (Trucco 1991–1992; Fuscone 2013; Savino et al. 2017). The presence of materials dated to the ancient Bronze Age among those found by Carucci also suggests an older phase (Trucco 1991–1992), perhaps connected to the construction of the deeper pile dwelling structure.

The construction of a dam at the entrance to the cavity, erected for the hydroelectric exploitation of the waters, led to the complete submergence of the excavation field and the cessation of any research activity for about a century. Only between 2004 and 2013 it was possible to resume field surveys (carried, with three interventions on the ground, by a team of speleo-archaeologists of the C.R.S. "Enzo dei Medici"), carried out in an area of the *antegrotta* never investigated before.

Currently, the archaeological collections from the site are housed in four different Italian museums: the National Archaeological Museum in Naples, the Provincial Archaeological Museum in Salerno, the Museum of Civilizations in Rome (formerly the "Luigi Pigorini" National Prehistoric Ethnographic Museum) and the speleo-archaeological Museum "MIdA 01" in Pertosa.

The Dwelling System: Archaeobotanical Background

There is a substantial difference between the research carried out at the end of the nineteenth century and those carried out in recent times. Indeed the first one concerned the excavation of the earthy bank—a conservative environment where the sedimentation of silt-clayey deposits incorporated the archaeological evidence—while the second case research took place directly in the riverbed: an erosive environment, where for millennia the incessant action of water led to the dislocation or removal of deposits. In the riverbed different areas preserving important remains of the pile dwelling structure have been identified, with very rich accumulations of plant remains. The peculiarities of the two different contexts affected the state of conservation of the remains and, inevitably, the type of evidence found. Along the watercourse the predominant surviving elements are the vertical poles that supported the upper pile dwelling structure, the platform that can be walked on, while the nineteenth-century excavations had brought to light the entire wooden deck, i.e., both the horizontal and vertical parts.

In the so-called "upper pile dwelling" the deck was made of boards placed side by side, which formed the support base for the floors. These boards rested on horizontal beams obtained from young trunks or large branches, at the ends of which there were "Y" openings so that they could fit into the pointed apex of the vertical poles. The latter were robust and deeply embedded in the underlying sediments; each of them providing support for two beams in such a way as to form a square mesh system. The entire structure was covered with a layer of oak bark

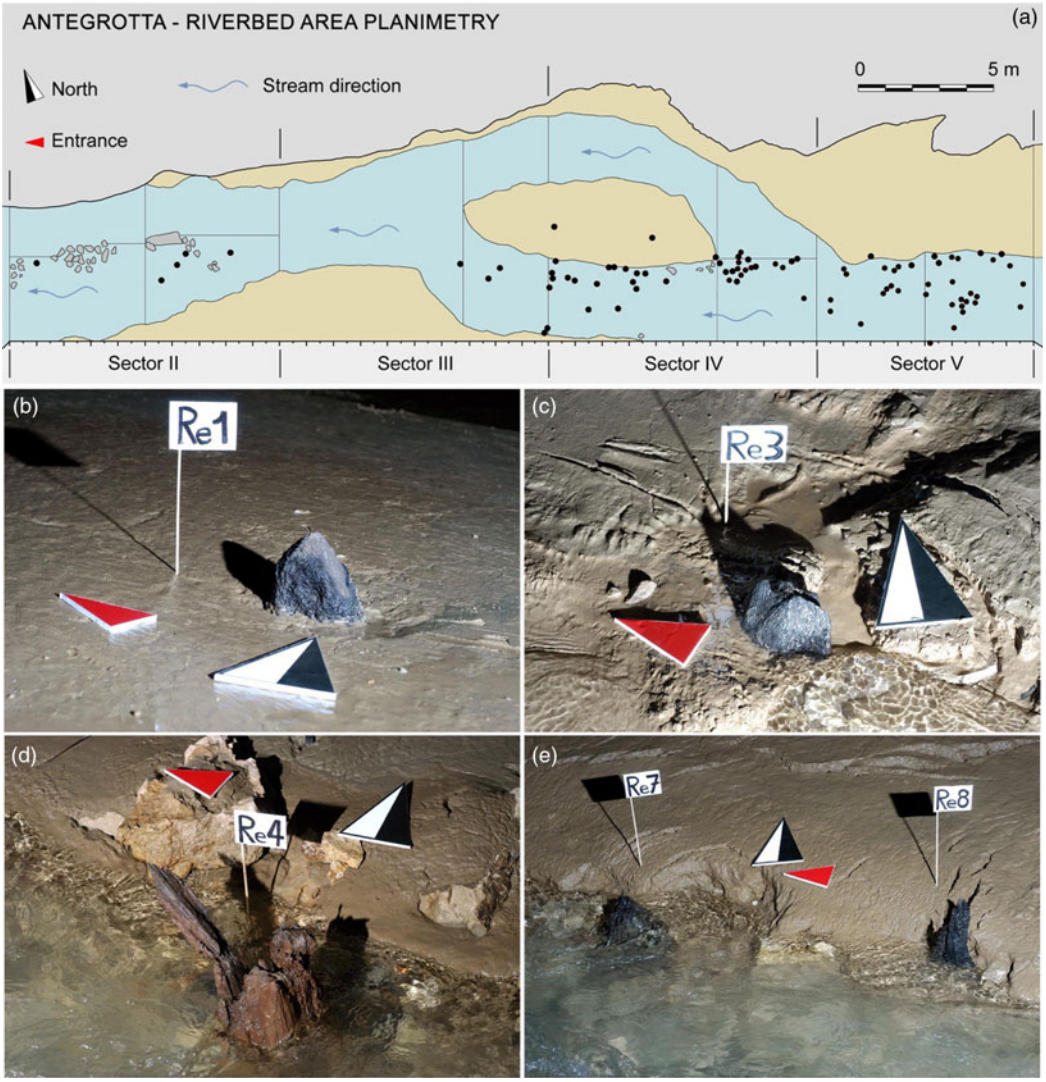

Figure 3 (a) plan of the riverbed with the position of the raised vertical poles, indicated by black dots (elaboration by F. Larocca and F. Breglia). (b–e) some apexes of the vertical poles submitted to radiocarbon dating emerging from the silty deposit of the stream (photo by F. Larocca).

laying at the base of a beaten made of clay mixed with plant elements such as broom, reeds, and ferns (Patroni 1899) (Figure 2, C). This pattern was not observed in the entire area: in some areas, in fact, different techniques and characteristics have been recognized that suggest the existence of several construction phases.

Recent research, on the other hand, has shed light on the spatiality of the evidence, attesting that wooden structures were built on the entire *antegrotta*, in an area of about 600 m^2 (Breglia and Fiorentino 2017; Breglia 2020). The survey of the area also made it possible to discriminate at least two distinct groupings of poles, one closer to the entrance, the other more internal (Figure 3, A).

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Forty-six piles (sampled directly in the riverbed, Figure 3, B–E) and 22 horizontal structural elements, coming almost exclusively from the excavation of Patroni and relevant to the upper pile dwelling, were analyzed from an archaeobotanical point of view by microscopic observation of the wood anatomy (Breglia and Fiorentino 2017; Breglia 2020). As far as the wood raw materials used for the construction of the structures are concerned, archaeobotanical investigations unequivocally identified a selection of deciduous oaks (*Quercus type robur*) and semi-deciduous oaks (*Quercus type cerris*). These two groups of taxa were recognized overall in 91.2% of cases: in particular 70.6% is represented by deciduous oaks (34 posts and 14 horizontal elements) and 20.6% by semi-deciduous oaks (9 poles and 5 horizontal elements). The remaining elements represent a small part of the total: the evergreen oaks (*Quercus suber group*) 4.4% (2 poles and 1 horizontal element), the yew (*Taxus baccata*) 1.5% (only one pole) while it was not possible to determine two horizontal components (2.9%).

Oak species (*Quercus spp.)* produces an excellent wood, resistant, elastic, and heavy (Giachi et al. 2003). It has good durability even in immersion conditions, thanks to the high tannins content (Gale and Cluter 2000). The main mechanical characteristics are compressive strength, tensile strength and durability even in alternating wet/dry situations. In addition to the mechanical properties, oak wood is easy to work (Nardi Berti 2006), especially by splitting, following the direction of the large parenchymatic rays (Giordano 1981). This technique is well attested in the analysed sample, recognized both on the horizontal structural elements and on some vertical poles.

Considering the temperate climatic zone and the piedmont altitudinal belt, it is plausible that a large coverage of mixed temperate forest was present near the site. This type of forest is dominated, in the tree layer, by oaks which are among the most common trees in the temperate belt. On the basis of the microclimatic characteristics of exposure and soil drainage, populations of deciduous, semi-deciduous or evergreen oaks may prevail locally, which in any case must have been widely available, then as now (Breglia and Fiorentino 2017).

MATERIALS AND METHODS

Some of the samples selected for archaeobotanical analyses were submitted to radiocarbon dating (Table 1). Six poles were sampled, five of which from Sectors IV–V and one from Sector II. Two horizontal structural elements preserved at the National Archaeological Museum in Naples were also selected for dating. It is to be underlined that "old wood effect" cannot be ruled out in this case, considering the wood species (oak). Although this could potentially badly impact the achieved accuracy of the chronological reconstruction, short living species were not available as alternative samples (Kim et al. 2019). In any case to try to mitigate the impact of this effect, the outer rings were always selected for the analyses.

In addition, four other samples from sector VI were selected, where a well-preserved layer rich in plant remains was identified, which revealed evident traces of cereal processing and consumption of fruit and wild plants; some caryopsis of *Triticum dicoccum* and a grape seed (*Vitis vinifera*) were taken from it and submitted to radiocarbon dating. Finally, a large trunk of wood was collected a short distance away, in a secondary position and half-buried by modern sediments, interpreted as a waste of ancient carpentry work. All the samples were dated by AMS (Accelerator Mass Spectrometry) at the Centre of Applied Physics, Dating and Diagnostics at the University of Salento (Calcagnile et al. 2019).

Table 1 Summary of the analyzed samples and obtained conventional radiocarbon ages.

No.	Lab ID	Description	Position	Taxon	^{14}C age (BP)
1	LTL4162A	Vertical pole	Sector IV	*Quercus robur* type	3064 ± 45
2	LTL4163A	Vertical pole	Sector V	*Quercus robur* type	3132 ± 45
3	LTL4164A	Vertical pole	Sector V	*Taxus baccata*	3061 ± 45
4	LTL4165A	Vertical pole	Sector V	*Quercus robur* type	2977 ± 50
5	LTL4166A	Vertical pole	Sector V	*Quercus robur* type	3165 ± 45
6	LTL19888A	Vertical pole	Sector II	*Quercus robur* type	389 ± 45
7	LTL19886A	Horizontal element	Naples Museum	*Quercus robur* type	3348 ± 45
8	LTL19887A	Horizontal element	Naples Museum	*Quercus robur* type	2835 ± 45
9	LTL19889A	Caryopsis	Sector VI	*Triticum dicoccum*	3092 ± 45
10	LTL19885A	Seed	Sector VI	*Vitis vinifera*	3049 ± 45
11	LTL4168A	Horizontal element	Sector VI	*Quercus robur* type	3264 ± 40
12	LTL4167A	Waste	Sector VI	*Quercus robur* type	2998 ± 45

Sample Processing

Selected samples showed a good preservation status and they were analyzed at CEDAD (Centre of Applied Physics, Dating and Diagnostics), Department of Mathematics and Physics "Ennio de Giorgi", University of Salento by using the AMS beamline and based on a 3 MV Tandetron accelerator (Mod. HVEE 4130 HC) (Calcagnile et al. 2005). The samples were processed according to standard procedures as detailed in D'Elia et al. (2004). In particular all the samples were observed at the optical microscope in order to highlight and mechanically remove macro-contaminants and select the portion (typically 30–50 mg) of the samples more suitable for the following chemical processing. It consisted in the AAA (acid-alkali-acid) treatment which was performed by applying alternate acid (HCl), base (NaOH) and acid (HCl) intended to remove exogenous sources of carbon. The good preservation status of the samples suggested not to follow more selective and aggressive sample processing procedures such as cellulose extraction. Indeed, authors have demonstrated that acid-base-acid (ABA) is well suitable for reliable results, while circumventing wood loss during chemical dissolution, especially for samples with ages well above the radiocarbon limit Santos and Ormsby (2013).

The purified sample material was then dried at 60°C and sealed in pre-evacuated quartz tubes ($< 10^{-4}$ mbar) together with silver wool and copper oxide. The samples were then combusted at 900°C for 4 hr and then the released CO_2 recovered and cryogenically purified at the sample processing lines of the laboratory (D'Elia et al. 2004). The purified carbon dioxide was then converted at 600°C to solid graphite by using high purity H_2 as reducing agent and Fe powder as catalyst. Reaction water was removed during the process by a water trap kept at –40°C with a cold finger. All the samples yielded ~1 mg of graphite which is considered optimal for the following AMS measurement.

The extracted graphite was pressed in the Al target holders AMS ion source. Carbon isotopic ratios were then measured with the AMS system by comparing the beam currents (for ^{12}C and ^{13}C stable isotopes) and the ^{14}C ionization events in the GIC (Gas Ionization Chamber) obtained for the samples with those obtained with IAEA C6 sucrose standards used for normalization. The measured $^{14}C/^{12}C$ isotopic ratios were, after correction for isotopic fractionation and processing and machine blank, used to calculate the conventional radiocarbon ages according to Stuiver and Polach (1977).

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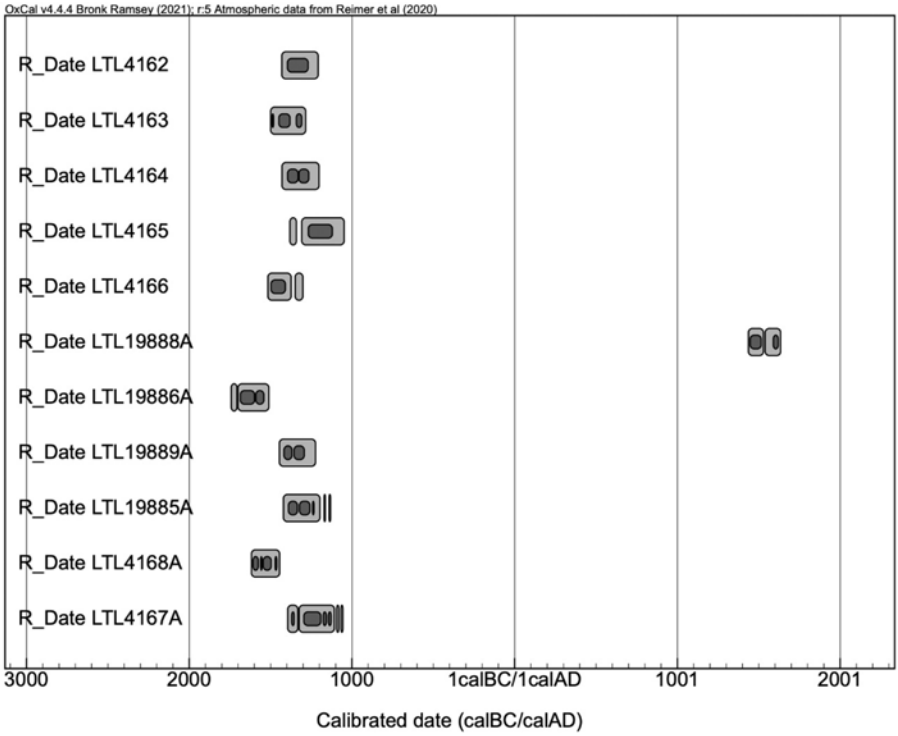

Figure 4 Calibration of radiocarbon ages for the analyzed samples.

Conventional radiocarbon ages were then converted to calendar ones by using the OxCal Ver 4.3 package (Bronk Ramsey et al. 2001) and the IntCal20 calibration curve for atmospheric data (Reimer et al. 2020).

RESULTS

The results obtained on the analyzed samples are given in Table 1 and are expressed as conventional radiocarbon ages in years BP. The results of calibration are shown in Figure 4 where dark and light grey areas represent one standard and two standard deviations calibrated time ranges. Radiocarbon data show that all the samples (except one) refer to a chronological horizon spanning from the 17th to the 11th centuries BC. This allows to ascertain the substantial homogeneity of the dating in agreement with the evidence of the material culture indicating that the phase of greatest use of the cavity was in the Middle III and in the Recent bronze ages. Indeed, the life of the site starts at least from an initial moment of the Middle Bronze Age and continues until the beginning of the early Iron Age, highlighting a rather long and articulated protohistoric frequentation of the cave spanning from the 17th to the 11th centuries BC.

The only discordant element with this chronological framework is a pole located in Sector II, in an isolated position with respect to the others, which is dated in the late medieval/modern age and certainly represents the indication of some other structure built in the ante-cave for currently unknown reasons.

CONCLUSIONS

We have presented the results of the radiocarbon dating campaign carried out on samples selected from the wooden structures recovered in the "Pertosa" caves in Southern Italy. Radiocarbon data allowed to assess the wide chronological range of the human frequentation of the caves and of the exceptionally well preserved underground pile dwelling system. The obtained results are well in agreement with what was expected on the base of archaeological analysis except for one of the samples which gave a much younger age probably associated with Middle Ages wooden structures. Further studies are already planned to increase the number of available data, enhance the achieved resolution, and better reconstruct the different occupation phases.

REFERENCES

Albore Livadie C, Bietti Sestieri AM, Marzocchella A. 2004. Testimonianze del Bronzo Recente in Campania. In: Cocchi Genik D, editor. L"età del bronzo recente in Italia, Atti del Congresso Nazionale (Lido di Camaiore, 26–29 ottobre 2000), M. Baroni, Viareggio. p. 481–490.

Acquafredda P, Larocca F, Pallara M. 2017. Manufatti litici dalle ricerche 2013. Aspetti tipologici e petroarcheometrici. In: Larocca F, editor. Tra pietra e acqua. Archeologia delle grotte di Pertosa-Auletta. Studi e ricerche 2004–2016, Fondazione MIdA, Pertosa (SA). p. 86–105.

Bettelli M. 2002. Italia meridionale e mondo miceneo. Ricerche su dinamiche di acculturazione e aspetti archeologici, con particolare riferimento ai versanti adriatico e ionico della penisola italiana, All"Insegna del Giglio, Firenze.

Breglia F. 2020. Il sito palafitticolo ipogeo di Grotta di Pertosa (SA) nell'età del Bronzo: ricerche archeobotaniche. Doctoral dissertation (University of Salento, 2020).

Breglia F, Fiorentino G. 2017. La palafitta protostorica. Indagini archeobotaniche. In: Larocca F, editor. Tra pietra e acqua. Archeologia delle grotte di Pertosa-Auletta. Studi e ricerche 2004-2016, Fondazione MIdA, Pertosa (SA). p. 40–55.

Bronk Ramsey C. 2001. Development of the radiocarbon calibration program. Radiocarbon 43(2A):355–363. doi: 10.1017/S0033822200038212

Calcagnile L, Quarta G, D'Elia M. 2005. High resolution accelerator-based mass spectrometry: precision, accuracy and background. Applied Radiation and Isotopes 62(4):623–629.

Calcagnile L, Maruccio L, Scrimieri L, delle Side D, Braione E, D'Elia M, Quarta G. 2019. Development and application of facilities at the Centre for Applied Physics, Dating and Diagnostics (CEDAD) at the University of Salento during the last 15 years. Nuclear Instruments and Methods in Physics Research B 456:252–256.

Carucci P. 1907. La grotta preistorica di Pertosa (Salerno). Contribuzione alla Paletnologia, Speleologia ed Idrografia, Riedizione 1985, Napoli.

D'Elia M, Calcagnile L, Quarta G, Rizzo A, Sanapo C, Laudisa M, Toma U, Rizzo A. 2004. Sample preparation and blank values at the AMS radiocarbon facility of the University of Lecce. Nuclear Instruments and Methods in Physics Research B 223–224:278–283.

De Falco M, Larocca F. 2017. Il luogo sacro. Aspetti e caratteri dell"utilizzo cultuale della cavità. In: Larocca F, editor. Tra pietra e acqua. Archeologia delle grotte di Pertosa-Auletta. Studi e ricerche 2004–2016, Fondazione MIdA, Pertosa (SA). p. 120–135.

Fuscone A. 2013. Grotta Pertosa: prima nota sui materiali ceramici del Bronzo Tardo e Primo Ferro dagli scavi "Patroni". In: Brancato R, Busacca G, Massimino M, editors. Archaeology in progress. Il cantiere dell'archeologia di domani. Atti del convegno, Catania, 23–26 maggio 2013. p. 60–70.

Gale R, Cutler D. 2000. Plants in archaeology. Kew: Westbury and Royal Botanic Gardens.

Giachi G, Lazzeri S, Macchioni N, Mariotti Lippi M, Paci S. 2003. The wood of "C" and "F" Roman ships found in the ancient harbour of Pisa (Tuscany, Italy): the utilisation of different timbers and the probable geographical area which supplied them. Journal of Cultural Heritage 4(4):269–283.

Giordano G. 1981. Tecnologia del legno. Volume 1, 2nd edition. Torino.

Kilian K. 1963–1964. La raccolta Carucci nel Museo Provinciale di Salerno. In: "Apollo", nn. III-IV, dicembre 1963-gennaio 1964. p. 63–78.

Kim J, Wright DK, Hwang J et al. 2019. The old wood effect revisited: a comparison of radiocarbon dates of wood charcoal and short-lived taxa from Korea. Archaeological and Anthropological Sciences 11: 3435–3448. doi: 10.1007/s12520-018-0766-8

Larocca F. 2010. Le grotte dell'Angelo a Pertosa. Il sistema sotterraneo e il giacimento archeologico, Fondazione MIdA, Pertosa (SA).

Larocca F. 2017. Le esplorazioni archeologiche dall'Ottocento ai giorni nostri. In: Larocca F, editor. Tra pietra e acqua. Archeologia delle

Grotte di Pertosa-Auletta. Studi e ricerche 2004–2016, Fondazione MIdA, Pertosa (SA). p. 10–27.

Larocca F, Breglia F. 2018. Grotte di Pertosa (Salerno). Un contesto archeologico sommerso in ambiente sotterraneo. In: Capulli M, editor. Il patrimonio culturale sommerso. Ricerche e proposte per il futuro dell"archeologia subacquea in Italia (Atti del V Convegno nazionale di archeologia subacquea „Archeologia Subacquea 2.0" Udine, 8–10 settembre 2016) Forum, Udine.

Larocca F, Laino A, Carloni D 2018. Armi per le acque sacre? Il caso delle Grotte di Pertosa in Campania. In: Catacchio N, editor. Armarsi per comunicare con gli Uomini e con gli Dei, Le armi come strumenti di attacco e di difesa, status symbol e dono agli Dei, XIII Incontro di Studi Preistoria e Protostoria in Etruria (Valentano, Pitigliano, Manciano, 9–11 settembre 2016), vol. I, Centro Studi di Preistoria e Protostoria, Milano. p. 293–308.

Lo Schiavo F. 2010. Le fibule dell"Italia meridionale e della Sicilia dall'età del bronzo recente al VI sec a.C., in Präistorische Bronzefunde, XIV, 14, Franz Steiner Verlag, Stuttgrat.

Nardi Berti R. 2006. La struttura anatomica del legno ed il riconoscimento dei legnami italiani di più corrente impiego, CNR – IVALSA.

Patroni G. 1899. Caverna naturale con avanzi preistorici in provincia di Salerno, Monumenti Antichi della Reale Accademia dei Lincei IX. p. 545–616.

Reimer P, Austin W, Bard E, Bayliss A, Blackwell P, Bronk Ramsey C. et al. 2020. The IntCal20 Northern Hemisphere radiocarbon age calibration curve (0–55 cal kBP). Radiocarbon 62(4):725–757. doi: 10.1017/RDC.2020.41

Rellini U. 1916. La caverna di Latronico e il culto delle acque salutari nell"Età del Bronzo, in "Monumenti Antichi della Reale Accademia dei Lincei", vol. XXIV, cc. 461–630 e tavv. I-II, Ulrico Hoepli, Milano.

Santos G, Ormsby K. 2013. Behavioral variability in ABA chemical pretreatment close to the ^{14}C age limit. Radiocarbon 55(2):534–544. doi: 10.1017/S0033822200057660

Savino ML, Fico D, Pennetta A, De Benedetto GE. 2017. La ceramica dell'Età del Bronzo, nuove acquisizioni dalle ricerche 2013. In: Larocca F, editor. Tra pietra e acqua. Archeologia delle grotte di Pertosa-Auletta. Studi e ricerche 2004–2016, Fondazione MIdA, Pertosa (SA). p. 56–69.

Stuiver M, Polach HA. 1977. Discussion: reporting of ^{14}C data. Radiocarbon 19(3):355–363.

Trucco F. 1991–1992. Revisione dei materiali di Grotta Pertosa, in Rassegna di archeologia, 10, Congresso "L'età del Bronzo in Italia nei secoli dal XVI al XIV a.C.", Viareggio 26-30 ottobre 1989, Firenze. p. 472–479.