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How did the incumbent Mesolithic hunter-gatherers respond to the arrival of Neolithic agro-pastoralists in the Central Mediterranean Basin, as documented in the archaeological record?(1)

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Abstract The transition from the need for humanity to live in symbiosis with nature to being able to change and control it through agriculture and animal husbandry is the seminal moment when demographic growth was no longer constrained by the carrying capacity of natural resources obtained from hunting, fishing, and gathering. Over a little more than ten thousand years, the rupture of these constraints has engendered the exponential growth of humanity and the consequent changes to the natural habitat to which we are witnesses.

This article presents case studies of the varying responses from Late Mesolithic hunter-gatherer communities at four sites and in three regions on the north side of the Central Mediterranean Basin, when confronted with the immigrant Neolithic agro-pastoralists originating from the Fertile Crescent, in the Aegean Basin, the Balkans, Sicily, and the Adriatic, as far as the Adige Valley in the foothills of the Southern Alps.

Keywords: Transition, Mesolithic, Neolithic, Hunter-gatherers, Agro-pastoralists, “Game in the pen”.

1. Introduction

It can be argued that the first premises of the Neolithic way of life in the Middle East are discernible at the site of Ohalo II on the Sea of Galilee, where a settlement of several huts established on its shore, dating from *ca.* 21 ka BC, became visible during a period of particularly low water in the 20th century. Within the settlement, a grinding stone was found, and in the huts, numerous remains of wild plants, some of which were destined to be domesticated.

The domestication of wild cereal grasses was accomplished over several millennia in the Fertile Crescent through selective sowing, with the growing population becoming more sedentary, so that the cereal grain spikelet enclosing the wheat grain eventually remained attached to the stem whilst being harvested. This was achieved by the 10th-9th millennium BC, at which point animal species starting with sheep and goats (with bovines and suids a little later) were being domesticated, with pottery being added still later.

The population growth was aided by sedentism, an assured source of food, and a diet rich in carbohydrates, so that when the climate degraded, it was probably the poorer and low-ranking part of the population that was obliged to migrate and create new settlements, leaving behind most of the attributes of power and belief systems. Those going west overland reached Western Anatolia in the 8th-7th millennia BC, whilst those navigating reached the Aegean Sea as early as the beginning of the 9th millennium BC, crossing into Europe by the 7th millennium BC (e.g. Perrin & Binder, 2014; WHITTLE, 1996).

Some of the consequences of this westward migratory movement into Europe are the subject of this study, which covers an area between the Aegean Sea and the head of the Adriatic Sea, which has been split into 24 separate regions based on the geography (Fig. 1).

(1) This article is largely based on the author’s PhD thesis (Templer, 2016a, 2016b), defended in 2016 at the University of Neuchâtel, Switzerland.

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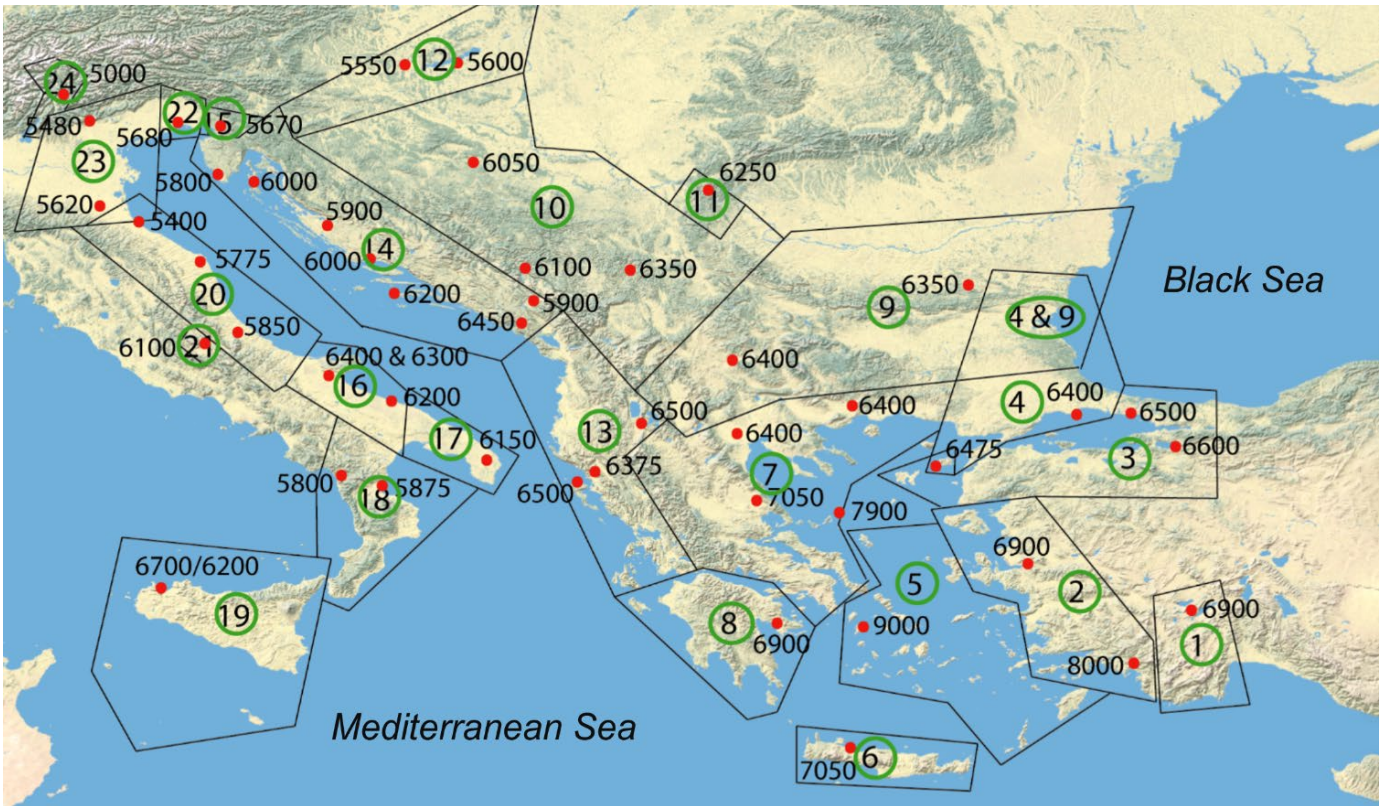


Fig. 1. Study area and 24 regions with calibrated BC dates of first contact with Neolithic migrants.

2. The sites and regions examined in the study area

We will take a closer look at four individual sites (Fig. 2, in green) where contact is attested between the Mesolithic incumbents and the incoming Neolithic migrants, to determine how these contacts evolved on a site-specific basis, followed by three regions (Fig. 2, in red) where these contacts can be seen to evolve on a broader regional basis.

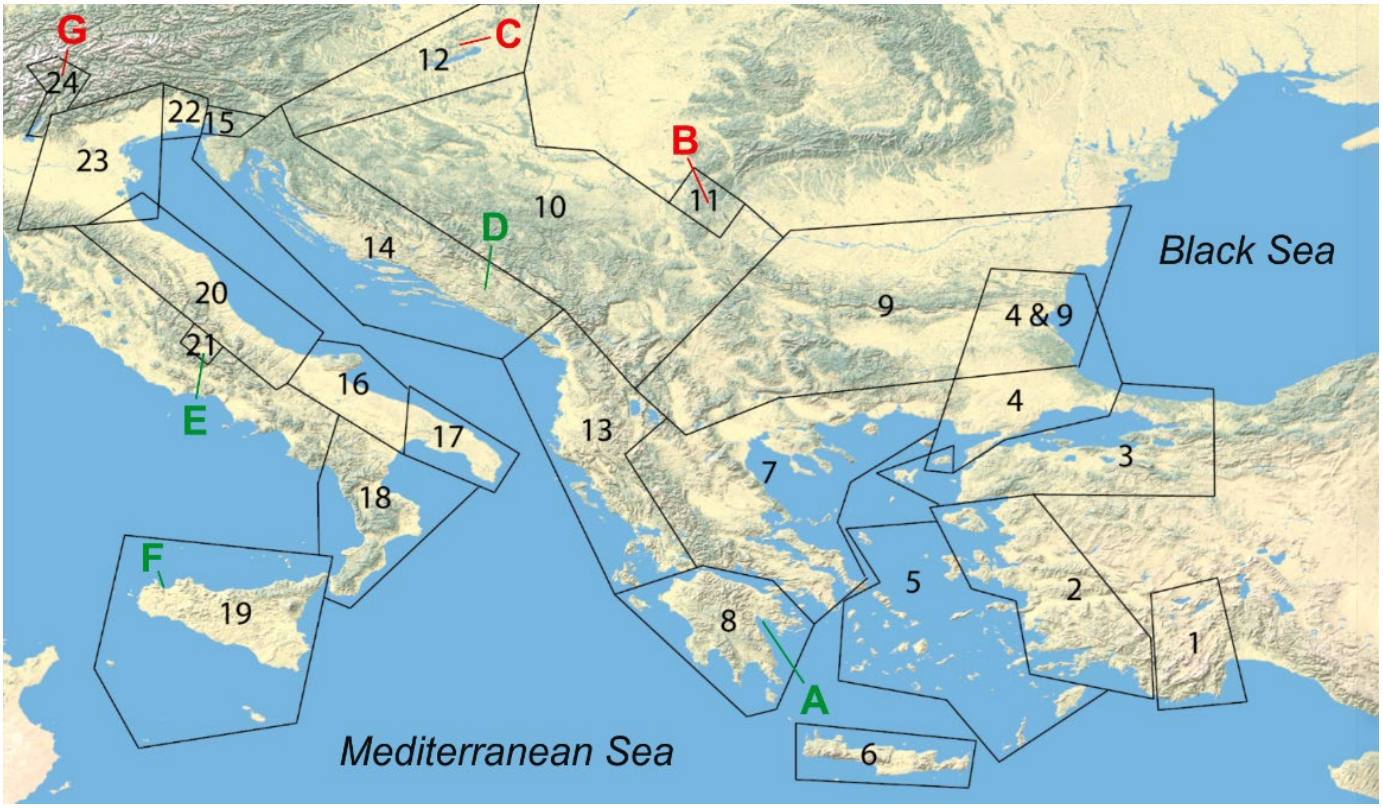


Fig. 2. Sites from east to west: A. Franchthi Cave in the Greek Argolid (Region 8); D. Odmut Cave in Montenegro (Region 14); E. Continenza di Trasacco Cave in the Central Italian Apennines (Region 21); F. Grotta dell'Uzzo in Sicily (Region 19). Regions from east to west: B. Lepenski Vir culture in the river Danube Iron Gates Gorges (Region 11); C. Linear Pottery Culture/Linear Band Kultur (LPC/LBK) Formative Zone in Transdanubia north of Lake Balaton (Region 12); G. Trentino-Alto Adige Valley north of the River Po Valley (Region 24).

3. The Transition Sites

Franchthi Cave (Site A)

Franchthi Cave is the key site in the Argolid for understanding the Transition in the Aegean Basin (Fig. 3). During the Mesolithic, the distance from the sea slowly reduced from 2 to 1 km, with a shrinking coastal plain in between, on which a settlement, now underwater, was established during the Early Neolithic. The site is now lapped by the sea. The cave was occupied almost continuously from the 14th millennium BC until the Neolithic, with varying degrees of intensity. Obsidian from Melos was obtained in the Mesolithic, and first contact with Neolithic migrants is thought to have occurred *ca.* 6900 BC, whilst Neolithic attributes (pottery and ovicaprines) first appear *ca.* 6800 BC, with increasing intensity. These dates are close to the dates currently available for the



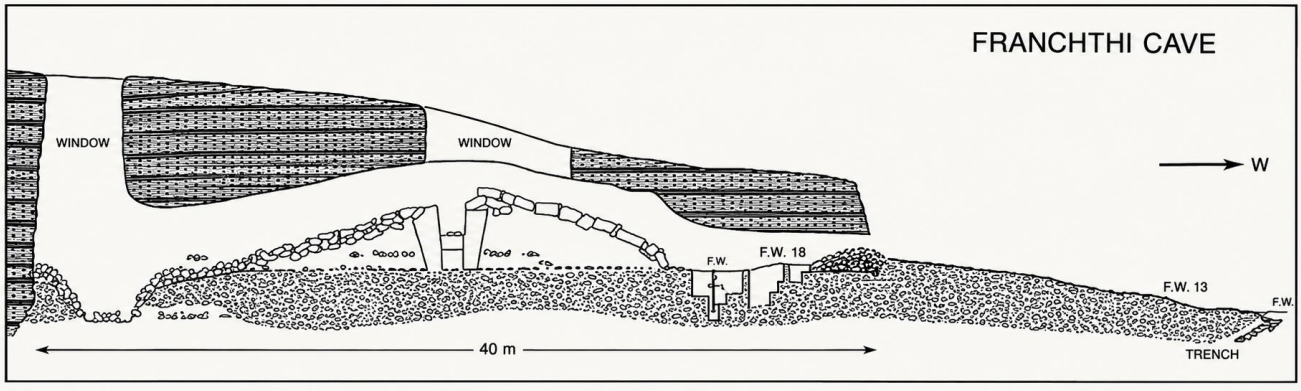


Fig. 4. Schematic longitudinal cross-section through the Franchthi Cave. The scale is approximately correct, without vertical exaggeration. Note the Neolithic midden layer to the top and the pile of rubble under the roof of the cave. (After Forrest, 1970.)

Fig. 3. Franchthi cave (Photo: M. Templer; Drawing: FARRAND, 2000).

Cretan Early Neolithic and several centuries earlier than for the Early Neolithic of Thessaly, which was colonised by different human groups, as corroborated by genetic studies.

There is clearly a change of economic strategy and in lifeways during the Transition, which occurred over several centuries, with:

- The introduction of domesticated plants and animals.
- The occupation outside the cave and on the Paralia (platform in front of the cave).
- The construction of walls on the Paralia.
- External manufacturing activities.
- Personal adornments, textiles, pottery, and diversified bone tools.
- Changes to the lithic technology and tool types, which include sickle blades.
- An open-air settlement near the estuary as well as possibly in front of the Paralia (now underwater).

However, there was also continuity in the Mesolithic lithic traditions whilst importing lithics of Neolithic tradition as finished products, as well as continuity of the Mesolithic burial rites.

The arguments supporting continuity of the autochthonous Mesolithic population through the Transition and into the Early Neolithic, with acculturation taking place over several centuries, are strong, and includes:

- Uninterrupted, if occasional or much reduced, occupation of the cave from the Mesolithic into the Neolithic in the areas excavated.
- Neolithic migrants did not inhabit caves in the Early Neolithic.
- There is a dearth of Neolithic symbolism during the Transition (e.g. ear-studs and statuettes).
- Franchthi Cave was occupied by a largely sedentary Mesolithic group, since fishing equipment is not easily transportable and plant remains indicate multi-season collection.
- The continuity of Mesolithic burial practices inside the cave.
- Continuity in the lithic traditions, both in terms of knapping technology, flake industry, microlithics, geometric armatures, and tool types between the Late Mesolithic and the Transition, and into the Early Neolithic.
- Clear indications that the Transition blade tradition on honey flint and obsidian represents finished products obtained by exchange.
- Continuity of fishing and shellfish collection into the Neolithic, noting that the collection of *Cerithium vulgatum* requires the collector to dive to a depth of approximately 2 m.
- Continuity of hunting into the Transition and Early Neolithic, reducing over time as ovicaprines increased.
- Continuity in the tradition of perforating seashells.
- The collection and probable grinding of wild cereals, which would have conditioned the Mesolithic occupants to adopt cultivated varieties.

The Mesolithic hunter-gatherers were incorporated into the Neolithic lifeways over time. The stratigraphic discontinuities should not be considered as cultural gaps, since at Franchthi, both traditions are represented in the lithics and the faunal assembly during the Transition.

It is of course possible and even probable there was also partner exchange and population intermixing with incoming Neolithic migrants (e.g. from Dendra, Corinth, Crete) beginning early in the Transition., which appears to have occurred smoothly over several centuries (e.g. Cullen, 1995; Dilcock, 2001; Demoule & Perlès, 1993; Efstratiou, 1995; Farrand, 2000; Hansen, 2006; King *et al*., 2007; Kozlowski & Kaczanowska, 2009; Perlès, 1986, 1987, 1990, 1999, 2003, 2004).

The Transition probably lasted between 500 and 1000 years. The duration is flexible because of the population continuity and the difficulty in establishing an end-point.

Odmut Cave (Site D)

Odmut Cave, in northern Montenegro, sits at 558 m asl, and is located to the east of the water divide from the Adriatic Sea, *ca.* 150 km to the west, over two gentle passes no more than 1150 m asl (Fig. 4). It sits on the right bank of the upper reaches of the River Piva, which cuts through the Dinaric Alps to eventually join the River Danube at Belgrade via the rivers Drina and Sava, thus providing a communication route to the Starčevo Culture during the Transition.

The SE facing cave, with a 20 m wide porch and its 11 m depth, sits in steep-to terrain totally unsuitable for agriculture. It was occupied between *ca.* 8100-5200 BC without any noticeable breaks.

The cave was the subject of salvage excavation in the early 1970s by McPherron, prior to the construction of the Piva Dam. The numbering of the four metres of stratigraphy is broken into eight levels starting from the bottom up, so that the non-pottery



Fig. 4. A. Odmut Cave (Photo: Mcpherson, 1975). **B**. Odmut Cave, now below bridge over river Piva reservoir. **C**. Piva Canyon downstream from Odmut Cave (Photos: M. Templer).

bearing Levels Ia and Ib are at the base and contained a flake-based lithic industry showing strong affinities with the Romanellian, as also do the Transition Levels IIa and IIb above. These have been quoted by several authors, who also note that there was no hiatus in the occupation between Levels I and II.

From Level IIa, *ca.* 5900 BC, Starčevo pottery begins to appear, whilst the economy is fully Mesolithic. It is only from Level IIb, *ca.* 5700 BC, that domesticated animals appear in small numbers in the faunal assemblage, coinciding with the appearance of Impressed Ware, so that it is unclear from which direction the domesticated animals came, although access from the coast had to be easier (e.g. Biagi & Spataro, 2001, 2002; Borić, 2005a; Chapman & Müller, 1990; Kozlowski & Kaczanowska, 2009; Marijanović, 2007; Srejović, 1989).

What we have at Odmut Cave, in Northern Montenegro, is a Mesolithic settlement located in an area unsuitable for agriculture, with a well-established and successful economy based on the exploitation of terrestrial and aquatic resources. This group had direct and/or indirect exchange contacts to the Adriatic coast 150 km away during the Mesolithic, as attested by the Romanellian influence in the lithic tradition, and downstream to the Danube and at least as far as Bulgaria, 500 km distant, during the Transition. They acquired pottery by exchange from both directions, as well as domesticated animals as 'game in the pen', which supplemented the hunt. They appear not to have substantially altered their lifeways over a period of 800-900 years until the end of the occupation towards the end of the 6th millennium BC, whilst accepting those Neolithic attributes which they found appealing.

Grotta Continenza (Site E)

Grotta Continenza, also known as Grotta Continenza di Trasacco, 720 m asl, sits *ca.* 30 m up from the base of Monte Labrone, near the small town of Trasacco, on the south side of the Fucino Basin in the centre of the Italian Apennines (Fig. 5). The Fucino endoreic basin was covered by a large lake in prehistoric times, reaching the foot of Monte Labrone, which was partially drained in Roman times and completely drained in recent historic times.

The site, with its complex stratigraphy (Fig. 6), was the subject of excavations under R. Grifoni Cremonesi for many years, and these were resumed between 2001 and 2009, with a view to clarifying questions regarding the Transition and Initial/Early Neolithic.

Level 25 and below are Mesolithic and earlier, with a sterile layer before Level 24.

The undated Level 24 above is in all probability Late Castelnovian Mesolithic with a few sherds, suggesting the beginnings of the Transition. The lithic industry contained 22% trapezes and 28% denticulated blades with no Neolithic attributes present.

Level 23 has median dates of 6420 BC and 6125 BC. The Impressed Ware present suggests it is a Transition Level. Level 22 Transition Level has median dates of 6120 BC and 6046 BC. Level 21 Transition Level appears to be undated. Level 20 Transition Level has median dates of 5560 BC and 5545 BC.

In levels 24 to 20, the fauna is predominantly wild with a few ovicaprines as 'game in the pen', confirming that these are Transition Levels.

In Level 20 and above, the industry becomes more obviously a Neolithic blade industry with obsidian from Lipari representing



Fig. 5. A. Grotta Continenza di Trasacco is in the centre at the foot of the escarpment, 30 m up, above the white buildings; **B.** View looking out from the cave over the Fucino Basin with Trasacco to the left (Photos: M. Templer).

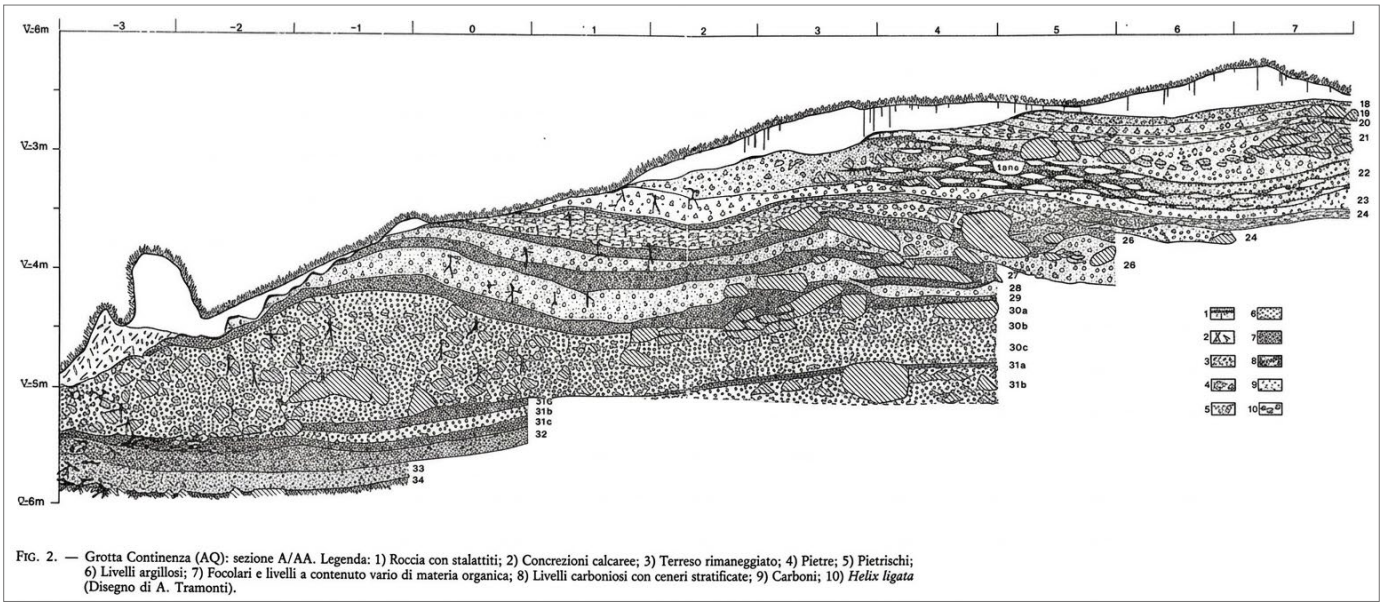


Fig. 2. — Grotta Continenza (AQ): sezione A/AA. Legenda: 1) Roccia con stalattiti; 2) Concrezioni calcaree; 3) Terreso rimaneggiato; 4) Pietre; 5) Pietrischi; 6) Livelli argillosi; 7) Focolari e livelli a contenuto vario di materia organica; 8) Livelli carboniosi con ceneri stratificate; 9) Carboni; 10) *Helix ligata* (Disegno di A. Tramonti).

Fig. 6. Grotta Continenza Stratigraphy with Mesolithic, Transition and Neolithic levels at top, showing how the anthropic sedimentation filled the cavity (From: Bevilacqua, 1994 in Grifoni Cremonesi *et al.*, 2011).

3.8% of the assemblage. There were some 2 m of deposits containing Impressed Ware, as well as burials, with a lithic technology continuing to initially use the Mesolithic microburin technique. The suggestion is that the cave was used for Neolithic burials (e.g. Barra *et al.*, 1990; Cassoli *et al.*, 1987; Giampietri, 1996; Grifoni Cremonesi, 1998, 2003a, 2003b; Grifoni Cremonesi *et al.*, 2011; Grifoni Cremonesi & Radi, 2014; Skeates, 2003; Usala, 2011).

The earliest open-air Neolithic settlement of Colle Santo Stefano has been estimated to have been established *ca.* 6100 BC in the Fucino Basin. If an earlier date is accepted as the earliest date for Neolithic attributes in Grotta Continenza, then the Transition can be estimated to have lasted 600 years or more.

Grotta dell'Uzzo (Site F)

Grotta dell'Uzzo is a large cave, 60 m asl facing north-east, halfway along the eastern side of Capo San Vito, facing the Gulf of Castellammare on the north-east coast of Sicily (Fig. 7). The brow is 40 m high, the is almost equally wide, and the maximum depth not substantially different. It is about two hours' walk from the coastal plain, along the escarped coastline, with steep hills rising to over 1000 m asl. The lower sea level would have made land communications along the coast easier during the Mesolithic and Transition. The cave faces a steep fan at the base of an almost vertical gully, unsuitable for agriculture but acceptable for grazing, with natural springs, some of which are now below sea-level. The coastal shelf would have been used for the collection of marine molluscs.

Grotta dell'Uzzo is the most important pre-Neolithic site in Sicily as well as one of the key sites in the Mediterranean Basin,



Fig. 7. Grotta dell'Uzzo (Photos: M. Templer).

with its 5 m deep stratigraphies stretching from the Epipalaeolithic, through the Mesolithic and the Transition into the Neolithic. The excavations undertaken between 1973 and 1978, under Tusa and Piperno, have been the subject of numerous partial reports, but no monograph.

The most complete sequences covering the Holocene were found in Trenches F and M beyond the brow with up to 5 m of deposits (Fig. 8A).

During the first half of the 8th millennium BC (Trench F, Cuts 21-19), the occupation was mostly during the winter and into early spring, based on the evidence from the δ18O values, which change dependent on water temperature. During the second half of the 8th millennium BC, the occupation became year-round, with hunting representing almost 90% of the protein diet, with marine resources the balance. In the first half of the 7th millennium, aquatic resources increased to 12%.

Coarse undecorated sherds, possibly from a single pot, appeared ca. 7000 BC in cut 15, probably attesting contacts with the Capsian Culture in North Africa, with pressure debitage appearing at about the same date. Impressa pottery first appears in the first half of the 7th millennium in cut 12 dated after 6500 BC, with pre-Stentinello pottery *ca.* 6200 BC.

Early in the 6th millennium BC, ovicaprines and dog appear, with cattle and suids also present by 5850 BC. The progressive increase in domestic fauna is clearly visible in figure 8B.

The first evidence for cereals appears *ca.* 5650 BC, possibly imported initially. The occupation decreases over time, and the site appears to have been converted into a pen, with a wall built across the mouth *ca.* 5500 BC.

During the second half of the 6th millennium, the occupation is episodic. Domestic herbivores increase to between 50% and 75% of the faunal assemblage, with wild herbivores reducing to no more than 10%, with the balance made up of aquatic resources (e.g. Binder *et al.*, 2012; Collina, 2009; Costantini *et al.*, 1987; Leighton, 1996, 1999; Mannino *et al.*, 1997; Marconi, 1994; Piperno *et al.*, 1980a; Piperno *et al.*, 1980b; Perrin & Binder, 2014; Tagliacozzo, 1997; Tusa, 1997).

It is probable that the Mesolithic occupants of Grotta dell'Uzzo, who underwent the Transition over a period of over 700 years, between a date earlier than 6200 BC with the presence of Impressa pottery, attesting to contacts with Neolithic migrants, and *ca.* 5500 BC, by when the occupants had probably established a settlement on the coastal plain at the base of Capo San Vito, where they could practise agriculture – although proof of this has yet to be discovered.

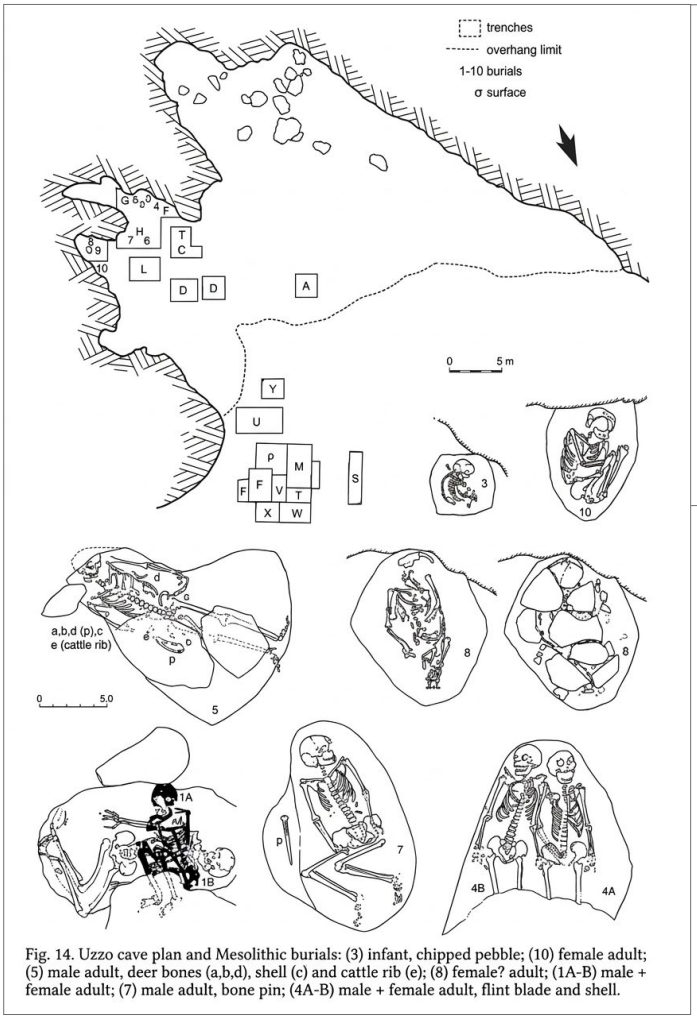


Fig. 14. Uzzo cave plan and Mesolithic burials: (3) infant, chipped pebble; (10) female adult; (5) male adult, deer bones (a,b,d), shell (c) and cattle rib (e); (8) female? adult; (1A-B) male + female adult; (7) male adult, bone pin; (4A-B) male + female adult, flint blade and shell.

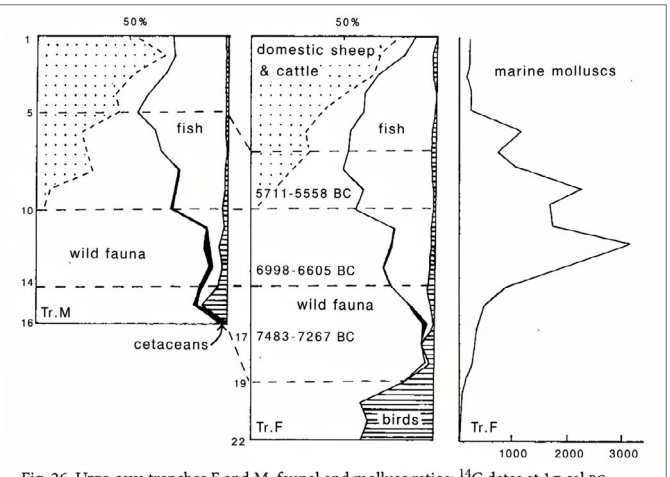


Fig. 26. Uzzo cave trenches F and M, faunal and mollusc ratios; ^{14}C dates at 1σ cal.BC

Fig. 8 – A. Grotta dell'Uzzo plan and excavation pits. **B.** Faunal assemblages over time from pits F and M (From: Leighton, 1999, copied from Cassoli *et al.*, 1987).

4. The Transition Regions

Lepenski Vir Culture (Region 11)

Lepenski Vir is the eponymous name for the Late Mesolithic culture in the 100 km-long Iron Gates Gorges, where the River Danube cuts a passage between the Dinaric Alps on the western Serbian bank and the Carpathians on the eastern Romanian bank. The river banks are steep-to along the entire length of the Gorges to their exit in the Ključ, where a hydroelectric dam has been built, creating a reservoir upstream, drowning the archaeological sites (Fig. 9).

The site of Lepenski Vir OAS (open-Air Site), as well as the numerous other sites in the Gorges, was discovered prior to the dam construction. The site is in the Upper Gorges, some 7 km downstream from Padina OAS, about 1 km upstream from the Boljetinska Canyon where the boulders were collected for the 'boulder art', and 3 km upstream from Vlasac OAS. The wide river terrace, now underwater, on which the settlement sat, faced a whirlpool and the Treskavac Mountain on the far bank, which is symbolised in the trapezoidal huts. The remains of the earliest occupation with trapezoidal structures have been moved to a museum above the site (Figs. 10 and 11).

The Region was ecologically well endowed for fishing, hunting and collecting, but totally unsuitable for agriculture, so that when the Starčevo Culture Neolithic migrants arrived in the broader region, they did not venture into the Iron Gates Gorges, whilst making contacts with the Mesolithic occupants.

First contact is attested at the end of Lepenski Vir Phase I *ca.* 6200 BC, when a few sherds appear. During Phase II, 6200-5900 BC, Neolithic attributes progressively appear with pottery, polished stone and flint followed by domesticated animals about 100 years later. The Region contains the largest concentration of burials in the Central Mediterranean Basin, and a few Starčevo-type burials appear in crouched positions at the end of this Phase I, suggesting partner exchanges. There follows a period of abandonment at the end of Phase II during the '6200 BC event'. Phase III, *ca.* 5900-5500 BC covers the period until the site is finally abandoned; during Phase III, domestic fauna represents no more than 27% of the faunal assemblage; in its early stages, semi-dugout structures of irregular shape appear, replaced in the later stages by above-ground quadrangular structures with wattle-and-daub. The trapezoidal structures also continued in use until the site was abandoned. Imported flint rapidly increased in importance with the added presence of obsidian, and the lithic technology becomes Neolithic. In the later stages (Lepenski Vir IIIb), clay quadrangular tables/altars, zoomorphic figurines, cylindrical amulets with stylised bovine heads appear, as well as horseshoe ovens. Starčevo-type burials in a contracted lateral position become more prevalent, confirmed by DNA analyses as partner exchanges, whilst the Mesolithic burial traditions continue in parallel. This and many of the other Lepenski Vir Culture sites in the Iron Gates Gorges are abandoned *ca*. 5500 BC, with no indication as to what occurred

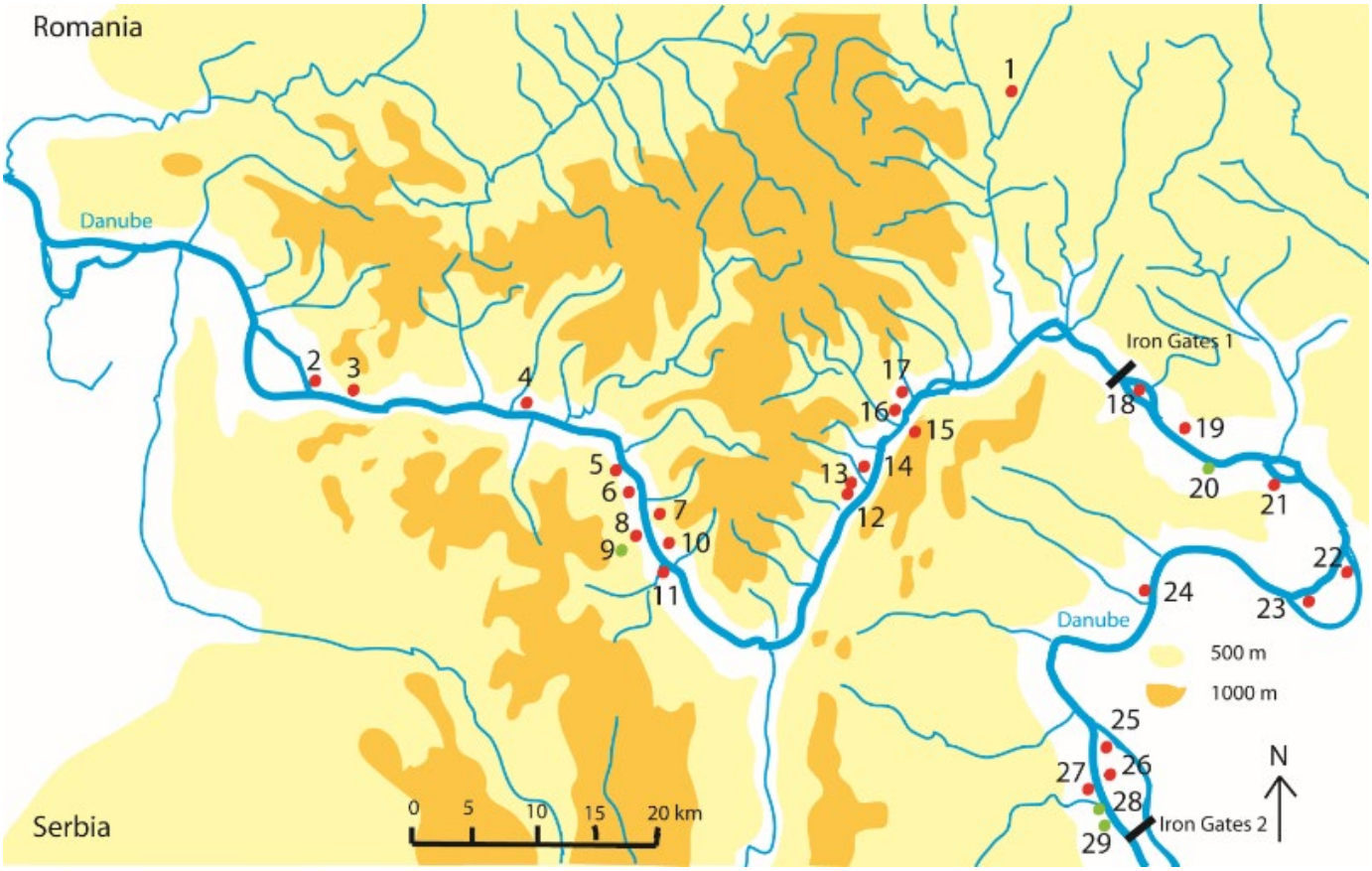


Fig. 9. Late Mesolithic and Early Neolithic sites during the Transition in the Iron Gates Gorges. Red dots: Mesolithic/Transition sites; Green dots: Neolithic/Transition sites. 1. Băile Herculane; 2. Privod; 3. Alibeg; 4. Vodneac; 5. Padina; 6. Stubica; 7. Ilişova; 8. Lepenski Vir; 9. Aria Babi; 10. Izlaz; 11. Vlasac; 12. Cuina Turcului; 13. Climente I and Climente II; 14. Veterani Cave and Veterani Terrace; 15. Hajdučka Vodenica; 16. Icoana; 17. Răzvrăta; 18. Ostrovu Banului; 19. Schela Cladovei; 20. Donje Butorke; 21. Ajmana; 22. Ostrovu Corbului - North; 23. Ostrovu Corbului - south; 24. Velesnica; 25. Ostrovu Mare Km 875; 26. Ostrovu Mare km 873; 27. Kula; 28. Knjepište; 29. Kamenički Potok.

to the population (e.g. Antonović, 2008; Bonsall, 2006, 2007, 2008; Bonsall *et al.*, 2004, 2008a, 2008b; Borić, 1999, 2002, 2005a, 2005b, 2005c, 2005d, 2007, 2011, 2015; Borić & Dimitrijević, 2007; Boroneanţ, 1999; Chapman, 2001; Cook *et al.*, 2002; Garašanin & Radovanović, 2001; Greenfield, 2008; Radovanović, 2000; Radović & Stefanović, 2013; Whittle, 1996).

The Transition in the Iron Gates Gorges occurred over a period of *ca.* 700 years, without any evidence for agriculture, when the sites were abandoned *ca.* 5500 BC.



Fig. 10. A. Lepenski Vir I trapezoidal structures in the Museum above the site (now underwater); **B.** Treskavac mountain on opposite bank; **C.** Boulder fishface sculpture (Photos: M. Templer)



Figure 10.12. Trapezoidal buildings with carefully laid plaster floors, stone-bordered 'hearths', and other stone fixtures are a conspicuous feature of Lepenski Vir. In this example so-called altars – large tabular stones with artificially ground hollows in the upper surface – can be seen set into the floor behind the hearth and adjacent to the near side of the building. Such buildings began to be erected on the site during the Final Mesolithic around 6300 cal BC, but their construction continued throughout the Early Neolithic between 6000 and 5500 cal BC, when pottery and farming were introduced to the region (© Archaeological Institute, Beograd).

Fig. 11. Lepenski Vir trapezoidal hut with hearth and altar (From: Archaeological Institute, Belgrade)

Transdanubia LPC/LBK Formative Zone (Region 12)

The Starčevo Culture Neolithic migrants reached the region of lake Balaton in Southern Hungary, sometime after 5700 BC, during their 'Classical' or 'Late' phase, having intermingled with the autochthonous Mesolithic peoples during their progress across the Carpathian Basin (Fig. 12). They found the region north of the lake to be occupied by Mesolithic hunter-gatherers, who exploited the red radiolarite from the Bakony Mountains, with the best-known extraction site of Szentgál, distributing the product over distances of up to 400 km, which increased to almost 1000 km after the arrival of the Neolithic settlers. The Mesolithic population had already learned to intensify the growth of hazel through forest clearance by burning, to favour the growth of this forest-edge species, evidenced by the increase in *Corylus avellana* pollen, initially from 10% to 30% and later to over 50%, which possibly predisposed them to the Neolithic life-ways.

The 'Central European-Balkanic Agro-Ecological Barrier' (CEB AEB), marked the maximal northward expansion of the First Temporal Neolithic (FTN) (Starčevo-Körös-Kris complexes). This boundary was not only climatic and vegetational, but also geological (rock-bed and soil conditions), and required a period of adaptation for the crops and domestic animals, so that the advance of the Neolithic marked a pause in this Region.

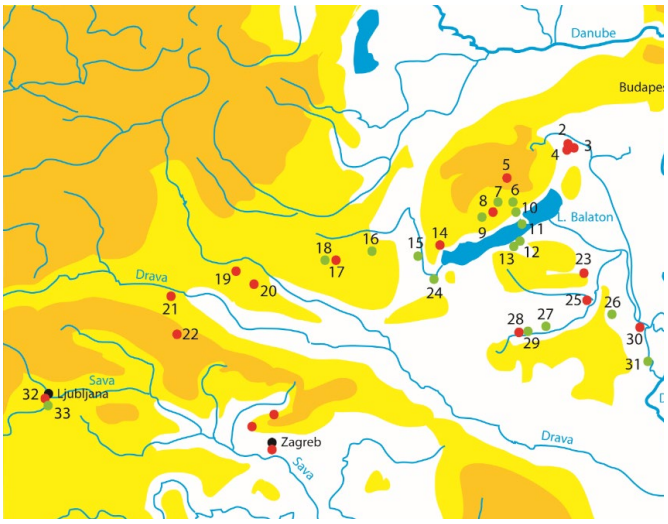


Fig. 12. Late Mesolithic and Early Neolithic sites during the Transition in the broader region of Lake Balaton/Transdanubia. Red dots: Mesolithic/Transition sites; Green dots: Neolithic/Transition sites. 1. Sződliget-Pec & Sződliget-Vác; 2. Nádasdladány; 3. Csór-Meritöpuszta; 4. Sárrét Basin; 5. Szentgál Mine; 6. Balatonfüred-Arács; 7. Vöröstó; 8. Vázsony Basin; 9. Mencshely; 10. Aszófő; 11. Tihany-Apáti; 12. Balatonszárszó-Kis-erdei-dűlő; 13. Balatonlelle; 14. Keszthely; 15. Sármellék I & II; 16. Gellénháza-Városrét; 17. Szentgyörgyvölgy; 18. Szentgyörgyvölgy-Pityerdomb; 19. Velika Pećina; 20. Vindija Pećina; 21. Špehovka; 22. Apnarjeva Jama; 23. Belecska; 24. Vörs-Máriaasszony-Sziget; 25. Regöly-2; 26. Medina; 27. Dombóvár-Kapospart; 28. Kaposhomok; 29. Regöly-1; 30. Szekszárd-Palánk; 31. Alsónyék-Bátaszék; 32. Breg; 33. Resnik Canal.

The Formative and Earliest LPC/LBK (Linear Pottery Culture/Linearbandkeramic) culture, is evidenced by:

- The LPC/LBK evolved from a fusion of the Mesolithic and Starčevo populations over many generations.
- The Formative LPC/LBK pottery is very similar to the Starčevo pottery but evolved into the new pottery style during the Earliest LPC/LBK.
- The knapped lithic industries have Mesolithic affinities in the Earliest LPC/LBK. Neither Sauveterrian, nor Castelnovian lithics, are attested in the Transdanubian Mesolithic, and the non-standard Mesolithic lithic technology was transmitted to the Formative LPC/LBK.
- The location of the Earliest LPC/LBK sites around the shoreline of Lake Balaton were coeval with the Starčevo sites in the lake Balaton Region, as well as further west. In the Early LPC/LBK, the sites tend to move upland.
- The development and construction of the typical LPC/LBK longhouses and the establishment of settlements, one of the earliest being Szentgyörgyvölgy-Pityerdomb (Fig. 12, no. 18), coupled to demographic growth.
- A relatively high incidence of the hunt, as well as of fishing.
- A readiness to scission and 'move-on' attitude, not anchored in the fixed habitat.
- A slash and burn agriculture – then move on.
- The adaptation of lifeways to a Central European/non-Mediterranean environment.
- Local copies of Starčevo cult devices, particularly of animal figurines, whilst the anthropomorphic ones were abandoned.
- Disposal of the deceased in a manner closer to that of the Mesolithic, with ochre.

In addition, DNA tests indicate that some 80% of the Thessalian Neolithic population was made up of Neolithic migrants, which reduced to 50% in Transdanubia, with additional reductions on the Rhine, even if local variations have been noted.

There are 65 recorded settlements around Lake Balaton, in or close to the marshland near the then-shoreline, many of which are hypothesised to have been occupied by ex-hunter-gatherers in the process of acculturation, in areas unsuitable for agriculture, although horticulture was possibly practiced (e.g. Bánffy, 2000, 2004, 2005, 2006, 2008; Bánffy *et al.*, 2007a, 2007b; Bánffy & Oross, 2010; Bánffy & Sümegi, 2011; Divišová, 2011; Eichmann *et al.*, 2010; Gronenborn, 2009; Kalicz, 2005; Kemenczei, 2005; Kertész, 2002; Mateiciucová, 2010; Mester *et al.*, 2014; Oross & Bánffy, 2009; Otte, 2001; Sümegi & Kertész, 2001; Zvelebil *et al.*, 2010).

The integration of the Mesolithic and Neolithic populations led to the creation of the LPC/LBK culture over a period of approximately 200 years between 5700-5500 BC, at which date it began its expansion north of the Alps into the Great European Plain as a fully-formed culture.

Trentino-Alto Adige Valley (Region 24)

The River Adige flows out of the Adige Valley into the River Po Valley through a narrowing valley north of Verona and then flows parallel to the river Po to the top of the Adriatic Sea. The valley of the River Adige is one of the major valleys dissecting the Alpine chain from north to south and constitutes one of the easiest pathways across the Alps. The valley, formed by glacial underscoring during the Pleistocene glacial advances, interfering with the tectonic uplift, is bordered by steep and vertical walls. During the Late Glacial and Early Holocene, frost shattering and gravitational processes created a series of talus and debris cones, which were used by the Late Mesolithic population (Fig. 13).

Near Trento, bedrock is reached some 620 m below the current land surface (435 m asl), indicative of the scouring effect of the numerous glacial periods. At Trento, the LGM (Last Glacial Maximum) surface is only 200 m below the current land surface, the top 150 m being composed of lacustrine and fluvial sediments, which sit on top of 50 m of glacial deposits. At the LGM, the glacier was *ca*. 1500 m thick at Trento and extended down to the plain of the River Po. During the post-glacial, as the glacier retreated, sedimentation was intense, reaching as much as 13.4 cm a year during the Early Dryas. The valley floor during the Allerød interstadial was some 130 m below that of today, and as the Alpine glaciers melted and retreated, a lake formed, with a maximum depth of 267 m, which extended 130 km, covering the valley floor from Ceraino in the province of Verona, as far as Bolzano in the province of Trentino-Alto Adige. Sedimentation continued at a high rate during the Late Pleistocene and Early Holocene, so that by the beginning of the Holocene, the lake began to break up into smaller units, wetlands and marshes, which became a rich habitat for fauna. This largely explains the attraction of the Adige Valley during the Late Mesolithic and Transition, as against the Valley of the Brenta further east, with its rapid water-flow.

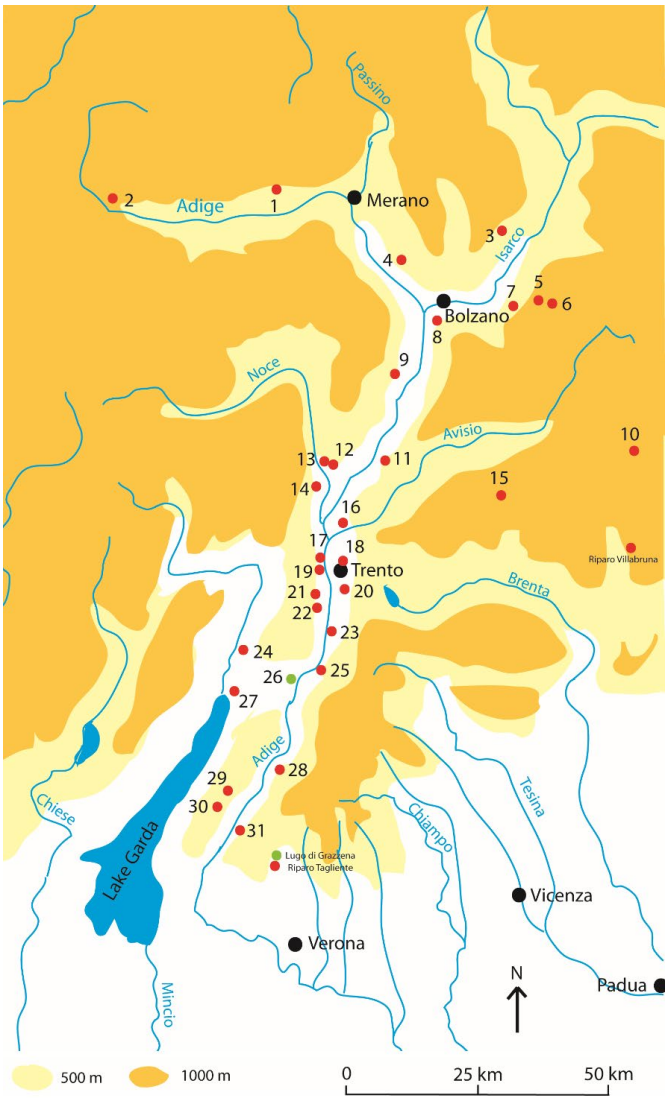


Fig. 13. Late Mesolithic and Early Neolithic sites during the Transition in the Trentino Alto Adige Valley. Red dots: Mesolithic/Transition sites; Green dots: Neolithic/Transition sites. 1. Castel Juvale; 2. Coel di Tarces; 3. Villandro-Plunacker; 4. Terlano Meitingerhof; 5. Val Dona; 6. Plan de Frea IV; 7. Aica di Fiè; 8. San Giacomo; 9. Malga Romeno; 10. Colbricon; 11. Dos de la Forca; 12. Mezzocorona-Borgonuovo; 13. Mezzocorona-Dos de la Forca; 14. Nogarole; 15. Lago delle Buse; 16. Vatte di Zambana; 17. Riparo di Pradestel; 18. Riparo Gaban; 19. La Vela; 20. Riparo Madonna Bianca; 21. Doss Trento; 22. Romagnano III; 23. Acquaviva di Besenello; 24. Riparo di Moletta Patone di Arco; 25. Paludei; 26. Isera-Torbiera; 27. Prè Alta; 28. Ala Le Corone; 29. Fontana de La Teia; 30. Riparo Monte Terlago; 31. Riparo Soman.

During the Pre-Boreal, Boreal and Early Atlantic, the mixed oak forest expanded to mid altitudes and the tree-line rose above the present-day level during the Boreal, to reach some 150-200 m above that presently prevailing. This rising tree-line substantially reduced the upland prairies so that the Castelnovian Mesolithic hunters progressively abandoned hunting camps at altitudes above *ca*. 1800 m asl, where their Sauveterrian forebears had set up numerous camps from which to hunt the ibex, which was one of their prey of predilection. The high-altitude hunting camps thus tend to disappear by the Early Atlantic Mesolithic, as the hunters-gatherers focussed on woodland species and the resources from the valleys.

The wealth of resources available in this Region attracted the hunter-gatherers from the Late Pleistocene, and the sites in the Adige Valley, which between them attest to an uninterrupted occupation of the territory into the Neolithic, unless it be for a period during the '6200 BC event', have produced remains of large game (red and roe deer, chamois, ibex and wild boar), birds, fish, water turtle and fresh-water molluscs.

In the Early Atlantic, the number of known sites in the Pre-Alpine hill areas and on the plains of the Veneto and Friuli increases, whilst few are known for the Boreal and fewer for the Pre-Boreal, and it is these Terminal Mesolithic hunter-gatherers of the Southern Alps, as well as those living in the Adige Valley, who came into contact with the Neolithic migrants.

The low-altitude sites in the Adige Valley, which continue in use into the Transition, have given rise to the Transition (or Early Neolithic, as it is often called) culture known as the Gaban Culture, which was first defined by B. Bagolini and P. Biagi in 1987, after the eponymous site of Riparo Gaban RS above Trento (Fig. 14).

The Neolithic was in the River Po Valley by *ca*. 5600 BC at Fiorano Modenese OAS (eponymous site for the Initial Neolithic Fiorano Culture) and Lugo di Romagna OAS, a little later; by *ca*. 5000 BC the Fiorano Culture Neolithic migrants were operating the Lugo di Grezzana flint extraction site in the Lessini Mountains north of Verona, close to the access point to the Alto Adige Valley.

The Late Mesolithic occupants of the Trentino-Alto Adige valley showed little interest in the Neolithic way of life and its material attributes for *ca.* 500 years and the earliest-known fully Neolithic settlement is that of Villandro-Plunacker OAS north of Bolzano, where agriculture is attested *ca.* 4500 BC, with a lithic industry strongly influenced by the Castelnovian tradition. Some 500 years later, the site became a VBQ (Square-Mouthed Pottery Culture) site.

The two key sites for following the Transition are those of Romagnano III RS, some 5 km south of Trento, on the right bank of the River Adige, and Riparo Gaban RS, in a glade which would have been deeper than at present, up a small lateral valley some 100 m above the valley-floor, on the left bank of the River Adige and about 3 km north of Trento.

Sherds of Impressed Ware and Fiorano Ware were found at Romagnano III RS dated possibly prior to 5000 BC, whilst the knapped lithics suggest progressive Neolithic influences with the appearance of blade-based debitage with faceted knapping core platforms, increasing laminarity, increasing size of the tools and increasing number of trapezes, which reach their maximum *ca.* 5000 BC. There is, however, no evidence for domestic animals, or for agriculture during the occupation, which lasted well into the first half of the 5th millennium BC.

The east-facing Riparo Gaban RS is 30 m wide, 6 m high and 4 m deep: it was occupied almost continuously from the Sauveterrian Mesolithic until the Bronze Age. The Transition/ Early Neolithic is referred-to as the Gaban Culture. The 7 m of anthropic deposits were initially excavated between 1971 and 1979 under Bagolini, and after 1982 in five different sectors by a combination of Bagolini, Broglio, and Kozlowski, with Dalmeri and Lanzinger; in the mid 2000-2010 period it was investigated to further clarify the site formation processes, and today the site is being re-excavated. The earlier excavations used horizontal artificial spits, so that, given the natural north-south incline in the shelter, these could contain levels stretching over several centuries and be further disturbed by later pits and post-holes. Between 5500-5000 BC, the lithics, suffused with the Castelnovian tradition, become progressively more 'Neolithic', with a blade-based technology using indirect percussion on unipolar cores and the appearance of new tools such as Ripabianca burins and rhomboids, indicative of contact with Neolithic migrants. The bone tools also continue the Mesolithic tradition. The earliest pottery is of Impressed Ware, appearing prior to 5000 BC, after which Vhò and Fiorano pottery appears. Domestic animals (ovicaprines and suids) only appear with assurance in the archaeological record in the later 'Early Neolithic' (read 'Transition') during the second half of the 5th millennium, progressively becoming significant, with the added presence of cereals, querns and grindstones, as the site is described as transitioning to the Square-Mouthed Pottery Culture (e.g. Angelucci & Bassetti, 2009; Alessio *et al.*, 1984; Bazzanella *et al.*, 2000, 2001; Biagi, 2001; Biagi & Spataro, 2002; Bisi *et al.*, 1987; Broglio, 1980, 1984; Coltorti *et al.*, 2009; Dalmeri & Lanzinger, 2001; Dalmeri *et al.*, 2008; Ferrari *et al.*, 2001a, 2001b; Gazzoni, 2010; Gehlen, 2010; Malone, 2003; Pedrotti, 2001, 2009; Perrin, 2006; Pessina, 2007).



Fig. 14. Riparo Gaban (Photo: M. Templer).

In the Trentino Alto Adige Valley, the availability phase of the Neolithic begins *ca.* 5000 BC. Due to the relatively dense occupation of the valley by the autochthonous Mesolithic population, who benefited from the rich environment, the Neolithic migrants did not penetrate into the valley to settle, since, with its wetlands, it was probably also not propitious for agriculture. There were contacts, as evidenced by the slow acceptance of pottery and new lithic technologies, but domestic animals are only attested in the latter part of the 5th millennium, with evidence for agriculture towards the end of the millennium. The Transition can therefore be estimated to have lasted up to a millennium.

During the recent Meso 2025 convention in Ferrara, a field trip was organised to Trento and Riparo Gaban RS, where excavations were in progress. I asked the excavator at the end of the visit whether he thought the Neolithic occupation was by Neolithic migrants or by acculturated hunter-gatherers. His answer was an unequivocal 'Neolithic migrants' which his assistant instantly contradicted by expressing her conviction that they were acculturated hunter-gatherers.

5. Discussion and Concluding Remarks

The arrival of Neolithic migrants at a given site or Region is an event, whilst the Transition from Mesolithic life-ways to Neolithic ones is a process. The duration of this process is almost invariably hard to quantify with precision from the archaeological record, but can last a millennium or longer.

To label a Mesolithic site or Region 'Neolithic' when Neolithic attributes (often pottery) first appear in the archaeological record is a nonsense as well as an academic aberration. The event marks the beginnings of the process of acculturation, whilst not negating that there can be fully Neolithic sites as well as Mesolithic sites in Transition in close proximity. No two sites or Regions where this process can be followed in the archaeological record will be the same, whether in terms of how the process evolved, or its duration.

The first arrival of the Neolithic way of life in Europe, if we exclude the Aegean Islands, is *ca.* 7000 BC in Greece, with the arrival of Anatolian Neolithic migrant farmers at sites such as Sesklo Magoula in the plain of Thessaly, who navigated across the Aegean Sea. Other Neolithic migrants followed a land route across the north of the Aegean Basin, and it took some 2000 years for the first premises of the Neolithic farming way of life to reach the Adige Valley north of the Lombardy Plain. These migrants arrived in waves via overland routes and by navigating round the coast of the Northern Mediterranean Basin, and as they moved westward and northwards, they encountered the autochthonous Mesolithic hunter-gatherers.

This paper has reviewed how different hunter-gatherer groups reacted to the arrival of farming with agriculture and domestic animals, and their new material attributes (e.g., pottery and polished stone axes), whether through direct or indirect contact, at four sites and in three regions. There is little evidence for violent confrontation, partly due to the fact that the Neolithic migrants tended to create permanent settlements on relatively unpopulated low-lying land suitable for agriculture, whilst the Mesolithic hunter-gatherers tended to be mobile and prefer higher land where they could survey the movement of wild fauna and find caves or rock-shelters.

There is little doubt that the Mesolithic inhabitants almost invariably found certain Neolithic material attributes attractive, particularly pottery, which is often the first Neolithic attribute to appear in the archaeological record. If the gender of Neolithic migrants was predominantly male, then partner exchanges probably occurred, helping to consolidate friendly relations, and DNA studies confirm this practice. Whilst the integration of males is possible, both the Mesolithic and Neolithic societies tended to be patrilocal, so that it was often the females who moved, and this is evidenced in the Iron Gates Gorges; DNA studies of Neolithic migrants in the Western Mediterranean also confirm the admixture of hunter-gatherer DNA accumulated through the generations as their predecessors moved across the basin.

Caring for domestic animals is a lot easier than practicing agriculture and only impinges marginally on mobility. Low percentages of domestic fauna are often evidenced at hunter-gatherer sites in Transition, and I refer to this as 'game in the pen' since these represent insurance against a poor hunt and empty stomachs, for a minimal effort.

It is clear that all the Mesolithic hunter-gatherers eventually transition to the farming way of life, although how this happened in many cases cannot be fully ascertained, since they often disappear from the archaeological record before the Transition is completed.

The estimated beginnings and durations of the transitions we have examined are as follows:

- Franchthi Cave: 500-1000 years from *ca.* 6800 BC, with the cave occupants eventually moving to an open-air site where agriculture could be practiced.
- Odmut Cave: 800-900 years from *ca.* 5900 BC, after which the site occupants disappear from the archaeological record.
- Grotta Continenza di Trasacco: *ca.* 600 years from *ca.* 6100 BC, after which the site becomes more clearly Neolithic.
- Grotta dell'Uzzo: Over 700 years from *ca.* 6500 BC, after which the occupants move elsewhere, and the site gets to be used as an animal pen.
- Lepenski Vir Culture: *ca.* 700 years from *ca.* 6200 BC. The several sites in the upper gorges were abandoned after *ca.* 5500 BC, before agriculture is attested.

— Transdanubia LPC/LBK Formative Zone: Starčevo Culture Neolithic migrants arrived in the region of Lake Balaton *ca.* 5700 BC and merged with the populous Mesolithic peoples in the area to create the Formative LPC/LBK culture, which after *ca.* 200 years, by 5500 BC, was fully formed and expanded northwards into the North European Plain.

Trentino-Alto Adige Valley: The Neolithic arrived in the Po Valley by *ca.* 5600 BC and was at the gates of the valley shortly afterwards, but the numerous Mesolithic incumbents showed little interest until c 5000 BC. Domestic animals began to appear *ca.* 4500 BC and the Neolithic was only established near the end of the millennium, so that the Transition can be said to have lasted *ca.* 1500 years.

From the above, it is clear that whilst the Mesolithic gave way to the Neolithic, there is no single explanatory model for the processes involved, unless it be Albot & Albot (A Little Bit of This and a Little Bit of That).

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