

The spread of farming in the Eastern Adriatic

Stašo Forenbaher¹, Preston T. Miracle²

¹ Institute for Anthropological Research, Zagreb, Croatia
staso.forenbaher@zg.htnet.hr

² Department of Archaeology, University of Cambridge, UK
ptm21@cam.ac.uk

ABSTRACT – *The beginning of farming in the Adriatic is a topic ripe for a new discussion and synthesis. Several lines of evidence suggest that immigration played a major role in the process. It involved, however, both the actual movement of people and the active participation of the local population, and probably unfolded somewhat differently in different parts of the region. There is provocative evidence that the transition to farming occurred in a two-stage process. There was an initial stage of very rapid dispersal, perhaps by exploratory parties along the coast in the southern Adriatic. During the second stage, the eastern Adriatic littoral was probably colonized by farming communities, while the hinterland remained an agricultural frontier zone.*

IZVLEČEK – *Začetak poljedelstva na području Jadrana je tema, ki omogoča diskusije in nove sinteze. Predstavljamo dokaze, da je glavno vlogo pri procesu igralo priseljevanje. V regiji se je proces odvijal različno, vključeval je tako selitve ljudi, kot tudi aktivno udeležbo lokalnega prebivalstva. Dokazujemo, da se je prehod h kmetovanju odvijal v dvostopenjskem procesu. V prvi stopnji je prišlo do hitre razpršitve, morda izvidnikov, vzdolž obale južnega Jadrana. V drugi stopnji so skupine kmetovalcev verjetno kolonizirale obalne predele vzhodnega Jadrana, medtem ko je zaledje ostalo mejno področje kmetovanja.*

KEY WORDS – *Neolithic; farming; Croatia; Adriatic; colonization*

Introduction

Recent years have witnessed major advances in our understanding of the spread of farming in Europe, through the refinement of theoretical models (e.g. Price 2000; Thomas 1999; Whittle 1996; 2003), through the integration and comparison of archaeological, linguistic, and genetic evidence (e.g. Bellwood & Renfrew 2002; Ammerman & Biagi 2003), and through the characterisation of human diets and population movements by studying stable isotopes in human bones (e.g. Milner et al. 2004; Richards et al. 2003; Price et al. 2002). The eastern Adriatic coast lies along a major route into Central Europe from the southeast, but our state of knowledge about the spread of farming in the region remains relatively undeveloped. Maps offering sophisticated mo-

dels for the spread of farming into Europe can leave the eastern Adriatic region blank (Barker 1985.Fig. 21; Renfrew 1987; Tringham 2000.Fig. 2.1; Whittle 1996.Fig. 8.2; Zvelebil & Lillie 2000.Fig. 3.1) or merge it with one of the neighbouring regions (e.g. Zvelebil & Lillie 2000.Fig. 3.4). In this brief paper we hope to put the eastern Adriatic region 'on the map' through a summarized review of the available evidence and the presentation of a new model of the spread of farming in the region (Fig. 1).

Models for the transition to farming

The transition to farming in Europe has been explained by a wide variety of models, ranging from a com-

pletely autochthonous process where local foragers turn to farming, to a completely exogenous process where foreign farmers migrate into Europe and replace the indigenous population (*Barker 1985; Perles 2001; Price 2000*). Claims for a completely independent domestication of plants and animals in Early Neolithic Europe have been thoroughly refuted on genetic (*Jones 2002.94, 107, 130*), morphological (*Rowley-Conwy 1995; Zohary 1996.143-144*) and taphonomic grounds (*Zilhão 1993*), while models that rely primarily on migrating farmers (e.g. *Ammerman & Cavalli-Sforza 1973; 1984*) are now thought to underestimate the contribution of Mesolithic foragers to the process, whether considered in terms of the modern-day gene pool (e.g. *Richards et al. 1996; Richards et al. 2002; Jones 2002.160-161*) or the indigenous adoption and transmission of parts of the 'Neolithic package' (e.g. *Price 2000; Tringham 2000; Zilhão 2000; Zvelebil 1986; 2002*). The Mesolithic-Neolithic transition can no longer be considered in terms of a simple dichotomy between indigenous adoption and foreign migration.

The major early domesticates were introduced into Europe at the start of the Neolithic. Since the crops could not have spread naturally into Europe, and domestic animals are very unlikely to have done so, we must consider at least some form of population transfer. Zvelebil and Lillie (*2000.62*) have recently listed six different forms of population transfer that may have been important in the transition to agriculture in Europe. We use these processes to frame our discussion of the transition to farming in the Eastern Adriatic; their definition and archaeological signatures are listed in Table 1.

Much of the Adriatic literature still tends to see population change – that is, migration – lurking behind every major change in pottery style, let alone the introduction of the earliest pottery (e.g. *Benac*

1979-1987; Dimitrijević et al. 1998). The migrationist view is echoed in syntheses by Chapman et al. (*1996.259*) and Biagi & Starnini (*1999*), who note the rarity of Late Mesolithic occupation in the region and an abrupt shift from wild to domestic animals at the Mesolithic-Neolithic transition. Others have undermined the unity of the 'Neolithic package' in the region, arguing that there is no necessary association between the appearance of ceramics and domestic plants and animals (*Tringham 1971; Trumpp 1980*). Tringham (*1971*) makes the strongest case for continuity of economic practices and lithic use from Late Mesolithic to Impressed Ware, citing evidence of wild fauna associated with impressed ceramics. More recently, Budja has proposed a model of 'Neolithisation' in the region that acknowledges the acceptance by the autochthonous population of a limited number of innovations, while rejecting any form of migration (*Budja 1993.177; 1996.69; 1999*).

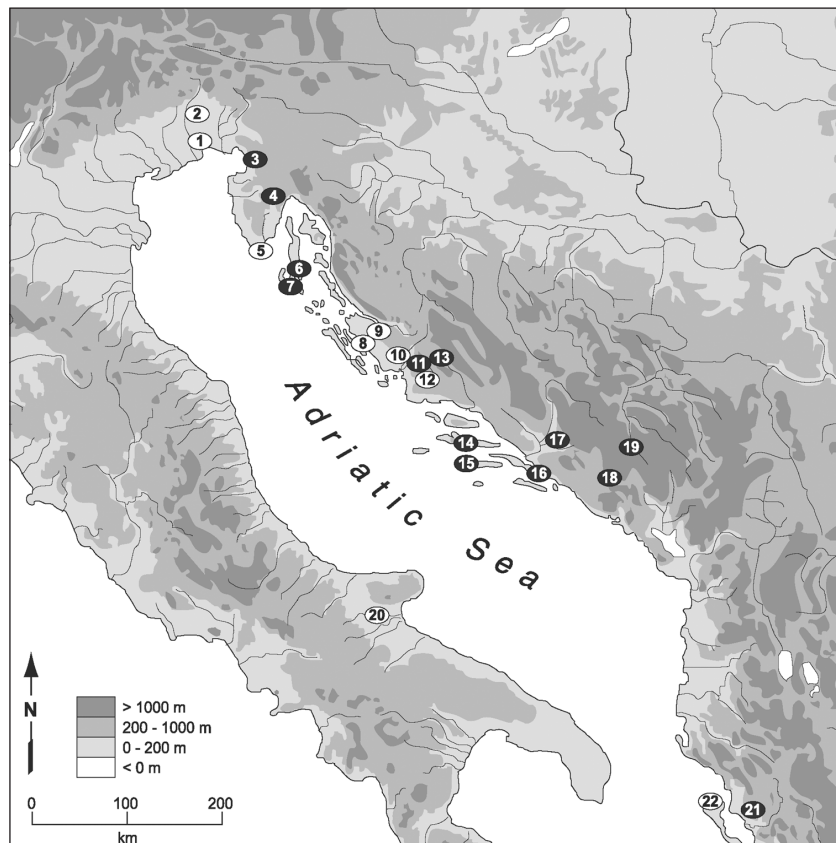


Fig. 1. Some of the sites discussed in the text. Black number on white: open-air sites; white number on black: cave sites. 1. Piancada 2. Sammar-denchia 3. Selected caves of the Triestine Karst (Edera, Mitreo, Benussi, Ciclami, Vlaška) 4. Pupičina 5. Vižula 6. Jami na Sredi 7. Vela spilja (Lošinj) 8. Tinj 9. Smilčić 10. Pokrovnik 11. Škarin Samograd 12. Danilo 13. Gospodska 14. Graščeva 15. Vela Spila (Korčula) 16. Gudnja 17. Zelena pečina 18. Crvena Stijena 19. Odmut 20. Selected open-air sites of the Tavoliere (Masseria Giufredda, Scramella San Vito, Ripa Tetta, Coppa Navigata, Lagnano da Piede, Villa Comunale, Masseria Candelaro, Masseria Santa Tecchia, Masseria Fontanella Ulivetto) 21. Konispol 22. Sidari.

| Process | Description | Archaeological expectations |
|------------------------------|--|---|
| Demic diffusion | Demographic expansion of farming population leads to daughter groups budding off and colonizing new areas. Migration not directional; slow rate of migration. | Full Neolithic package moves; abrupt change; slow spread (1 km/year) |
| Folk migration | Directional movement of population from old area to new. Not necessarily driven by demographic expansion. Similar to leapfrog colonization. | Full Neolithic package moves; abrupt change; rapid spread |
| Elite dominance | Penetration of area by numerical minority who subsequently seize control and impose culture/language on indigenous majority. | Piecemeal adoption of Neolithic package by socially central individuals, perhaps through feasting; gradual change |
| Infiltration | Gradual penetration of new area by small groups/individuals who are subordinate or perform specialist tasks for majority. | Piecemeal adoption of Neolithic package by socially peripheral individuals. |
| Leapfrog colonization | Selective colonization of areas only marginally exploited by indigenous foragers, creating enclave settlements from which further dispersal of farming proceeds. Often movement by seafaring. | Full Neolithic package moves; new settlements separate from Mesolithic; little interaction with indigenous people; abrupt change; rapid spread |
| Individual frontier mobility | Individuals or small groups linked in social/economic exchanges between forager and farming communities. Direction and pace of change depends on existing social frameworks and communication routes and/or those established between forager and farming communities. | Piecemeal adoption of Neolithic package; innovations adopted within existing Mesolithic settlements; much interaction between indigenous and colonizing peoples |

Tab. 1. Expectations of different models of the Neolithization Process. Descriptions and expectations based on Barnett (2000); Zvelebil and Lillie (2000).

Zvelebil and Lillie (2000:68–71) have recently suggested that ‘Neolithisation’ in Dalmatia involved the introduction of pottery into local forager communities during an ‘availability phase’ along the agricultural frontier. Similar models have been proposed by others, although each puts a different degree of emphasis on population movement and local adoption (Barfield 1972:204; Skeates 2000:171–172; Zvelebil 2001:2–6). Zvelebil’s ‘integrationist’ model remains the most elaborate, taking into account social contexts of exchange (subsistence and otherwise) and intermarriage, and their effects on the movement of populations across agricultural frontiers. Before developing a new model for the ‘Neolithisation’ process in the eastern Adriatic, we summarize evidence about the pattern of change in the region.

Farming and pottery in the eastern Adriatic

The recognition of prehistoric farming sites in the eastern Adriatic region traditionally relies on the presence of pottery (e.g. Bagolini & von Eles 1978:46; Batović 1979; Chapman & Müller 1990:128, 132; Müller 1994; Skeates 2000:171; Sordinas 1969:407), although such a simplified approach overlooks the possibility of hunter-gatherer groups obtaining pottery through exchange or adoption (Budja 2001:40, 41). Over a decade ago, Chapman and Müller (1990:132) concluded that in Dalmatia, an integra-

ted Neolithic ‘package’ consisting of four critical innovations – domesticated plants and animals, ceramics, and polished stone – was identifiable only at lowland open air sites. However, a reduced version of the Neolithic ‘package’ – domesticated animals, pottery and prismatic blade technology – is well attested at a much larger number of sites, many of which are caves, throughout the eastern Adriatic region. By contrast, convincing evidence of domesticated animals or pottery in Mesolithic contexts is extremely rare. It follows that, although far from perfect, pottery is still the most useful ‘proxy measure’ for exploring the spatial and temporal spread of farming in the eastern Adriatic.

Recent work in caves shows some variety in the type of contact. The appearance of pottery may be associated with assemblages dominated by wild taxa (Crvena Stijena, Odmu, Zelena pećina, Mala Triglavca); in other caves there is a fairly even representation of wild and domestic taxa (Edera, Konispol, Azzura, Zingari), while domestic animals dominate the assemblages in a third group of caves (Pupićina, Mitreo, Podmol, Vela spila, Spila Nakovana; for references and detailed discussion, see Forenbaher & Miracle 2006; Miracle & Pugsley 2006). Seeds of domesticated plants have not been reported from any of the recently excavated caves where the use of flotation to recover plant remains was standard prac-

tice. This holds true not only for Early Neolithic levels of those sites, but also for all later periods, when the cultivation of domesticated plants is not in doubt. Caves are rarely located near major tracts of arable land, but are often conveniently positioned for herders – either at, or on the way to, seasonal pastures. Such a contrast between open-air and cave sites has important implications for the process of ‘Neolithisation’ in the region.

The Mesolithic/Neolithic ‘gap’

A number of well-documented and dated northern Mediterranean sequences show a hiatus between the Mesolithic and Neolithic occupations of at least several centuries, if not several millennia (Biagi and Spataro 2000.48; Pluciennik 1997). The timing and duration of this Mesolithic-Neolithic gap is not synchronous, but varies widely from site to site. To examine this pattern in greater detail, we briefly discuss sequences from six sites in the Eastern Adriatic (Fig. 2, Tab. 2).

In the Triestine Karst and Istria, the age difference between the youngest Mesolithic and oldest Neolithic dates at Pupičina Cave, Edera, and Ciclami is from 1100 to 1800 years. The similarity in timing and duration of the stratigraphic gaps is striking, at first glance suggesting that caves were not being visited by Late Mesolithic bands in this area, because of a change in settlement pattern, depopulation, or both. Other evidence, however, argues against a simple demographic explanation. Nine sites from the Triestine Karst are reported to contain evidence of Late Mesolithic occupation (Montagnari Kokelj 1993.74). Furthermore, at Benussi, there is a sequence of three radiocarbon dates associated with Late Mesolithic assemblages (Montagnari Kokelj 1993.70), the youngest of which overlaps the oldest Neolithic dates from Edera and Pupičina at 2 s.d. Late Mesolithic people were clearly in the region immediately prior to the first appearance of Neolithic pottery.

In the south, only three sites have dated Late Mesolithic and Early Neolithic components. Taken at face value, dates from Odmuť Cave (Marković 1985; Srejović 1974) show a continuity of occupation from the latest Mesolithic to the earliest Neolithic. There are, however, problems with both the dates and the stratigraphy of Odmuť (Forenbaher & Miracle 2006), and there may, in fact, be a gap between those layers with pottery and those without pottery of at least 300 years. At Konispol Cave, the dates suggest a gap of some 130 years between the latest Mesolithic and earliest Neolithic dates (Harrold et al. 1999), but the stratigraphy and fauna fill this gap (Russell 1998; Schuldenrein 1998). The open air site of Sidari provides provocative evidence of an in situ adoption of ceramics by indigenous Mesolithic people (Perlès 2001). There is no stratigraphic break between the latest Mesolithic and the earliest Neolithic horizon, and the latter contains abundant plain ceramics, stone tools made using a ‘Mesolithic’ technology, and some sheep/goat. There is, however, a significant sterile layer between this ‘earliest Neolithic’ and ‘Early Neolithic’ (Impressed Ware) occupation of the site (Sordinas 1969).

To summarize, three of six sites with dated sequences (Ciclami, Pupičina, and Odmuť) show a stratigraphic break and temporal gap between the Mesolithic and Neolithic. At Edera there is a temporal gap of about 1100 years, but not a stratigraphic break. The two sites (Konispol and Sidari) with dated stratigraphic evidence of continuity come from the southern

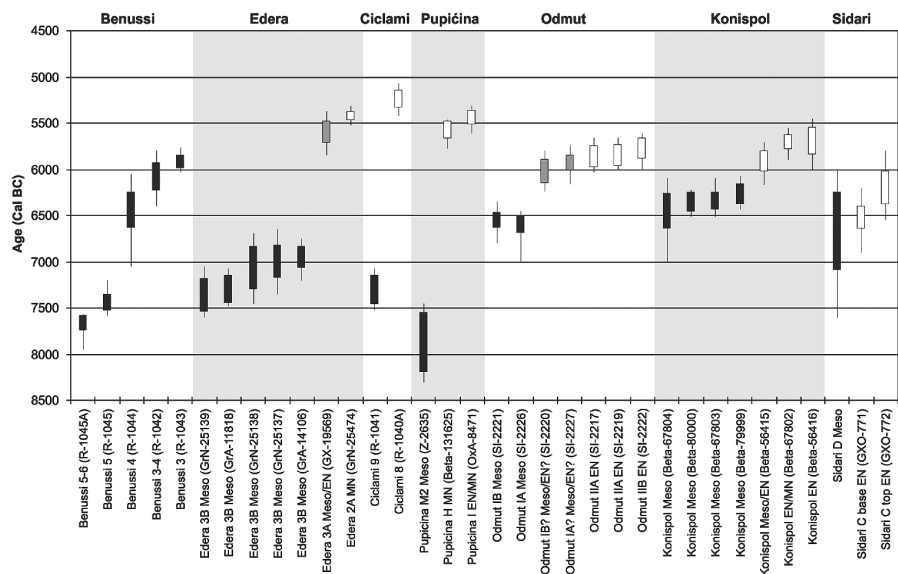


Fig. 2. Calibrated radiocarbon dates from sites with Late Mesolithic (Benussi) or Mesolithic and Neolithic assemblages in the Triestine Karst, Istria, Montenegro, Albania, and Corfu. Black symbols: Mesolithic; grey symbols: uncertain association; white symbols: Neolithic pottery.

| Site and context | Lab no. | bp | s.d. | Cal BC 1 s.d. range | | Cal BC 2 s.d. range | | Attribution | Ref. |
|------------------|------------|------|------|---------------------|------|---------------------|------|-------------|------|
| Benussi 5–6 | R-1045A | 8650 | 70 | 7750 | 7580 | 7950 | 7570 | Mesolithic | 1 |
| Benussi 5 | R-1045 | 8380 | 60 | 7540 | 7350 | 7580 | 7200 | Mesolithic | 1 |
| Benussi 4 | R-1044 | 7620 | 150 | 6640 | 6250 | 7050 | 6050 | Mesolithic | 1 |
| Benussi 3–4 | R-1042 | 7230 | 140 | 6240 | 5920 | 6400 | 5800 | Mesolithic | 1 |
| Benussi 3 | R-1043 | 7050 | 60 | 5990 | 5840 | 6030 | 5770 | Mesolithic | 1 |
| Edera 3B | GrN-25139 | 8350 | 120 | 7550 | 7180 | 7600 | 7050 | Mesolithic | 2 |
| Edera 3B | GrA-11818 | 8250 | 50 | 7450 | 7140 | 7480 | 7080 | Mesolithic | 2 |
| Edera 3B | GrN-25138 | 8110 | 90 | 7310 | 6830 | 7450 | 6700 | Mesolithic | 2 |
| Edera 3B | GrN-25137 | 8060 | 70 | 7180 | 6820 | 7350 | 6650 | Mesolithic | 2 |
| Edera 3B | GrA-14106 | 8045 | 40 | 7080 | 6830 | 7200 | 6750 | Mesolithic | 2 |
| Ciclami 9 | R-1041 | 8260 | 60 | 7460 | 7140 | 7520 | 7080 | Mesolithic | 3 |
| Pupićina M3 | z-2635 | 8710 | 170 | 8200 | 7550 | 8300 | 7450 | Mesolithic | 4 |
| Odmut IB | SI-2221 | 7720 | 85 | 6640 | 6460 | 6800 | 6350 | Mesolithic | 5 |
| Odmut IA | SI-2226 | 7790 | 70 | 6690 | 6500 | 7000 | 6450 | Mesolithic | 5 |
| Odmut IB | SI-2220 | 7150 | 100 | 6160 | 5890 | 6230 | 5800 | Mesolithic? | 5 |
| Odmut IA | SI-2227 | 7080 | 85 | 6020 | 5840 | 6160 | 5740 | Mesolithic? | 5 |
| Konispol | Beta-67804 | 7630 | 140 | 6650 | 6260 | 7000 | 6100 | Mesolithic | 6 |
| Konispol | Beta-80000 | 7550 | 80 | 6470 | 6250 | 6510 | 6220 | Mesolithic | 6 |
| Konispol | Beta-67803 | 7510 | 90 | 6440 | 6250 | 6510 | 6100 | Mesolithic | 6 |
| Konispol | Beta-79999 | 7410 | 80 | 6390 | 6160 | 6430 | 6080 | Mesolithic | 6 |
| Sidari D | | 7770 | 340 | 7100 | 6250 | 7600 | 6000 | Mesolithic | 7 |

References: 1. Montagnari Kokelj 1993; 2. Biagi & Spataro 2000; 3. Biagi & Voytek 1994; 4. Miracle 2001; 5. Srejšović 1974; 6. Harrold et al. 1999; 7. Sordinas 1969.

Tab. 2. Radiocarbon dates associated with Mesolithic assemblages from the Triestine Karst, Istria, Montenegro, Albania, and Corfu.

edge of the Adriatic. How might we explain the recurrent gap in cave stratigraphies? Its time-transgressive nature, as well as the thick Late Mesolithic levels at several sites in both the northern and southern Adriatic, argue against a climatic cause of region-wide reduced sedimentation or erosion. In the Northern Adriatic the first pottery users visited caves that had long been abandoned. This abandonment more likely reflects a shift in settlement pattern (from caves to open air sites) than a decrease in population during the Late Mesolithic. In the two dated sequences from the south, in contrast, there appears to be a continuity of occupation from the Mesolithic to Neolithic; and pottery use appears to have been incorporated into a pre-existing strategy. We suspect that this geographic contrast in the continuity of occupation from the Mesolithic to Neolithic may correlate with a contrast in the processes involved in the adoption of pottery and farming in the two regions.

The introduction of pottery into the Adriatic

Since Chapman and Müller's (1990) discussion of the pattern of radiocarbon dates for the Eastern Adriatic

Neolithic, there has been a slow but steady accumulation of radiometric dates from secure contexts (Fig. 3, Tab. 3). The basic pattern that they identified still holds; after the initial appearance of pottery on Corfu at the mouth of the Adriatic at ca. 6500 Cal BC, dates become progressively younger as one moves up the coast towards the northeast to the head of the Adriatic, where pottery makes its first appearance 1000 years later at about 5500 Cal BC.

Poorly fired, mostly plain pottery appears just south of the Straits of Otranto around 6500 BC (Sordinas 1969, 401, 406, note 14). It is roughly contemporaneous with, or only slightly later than, the earliest pottery found elsewhere in Greece (Perlès 2001, 94–95). Around (or soon after) 6200 BC, a characteristic pottery style known as Impressed Ware emerges somewhere on the northern Ionian coast (possibly, on Corfu), and then spreads rapidly into the immediate hinterland (Albania), up the Adriatic to southern Dalmatia, and to southeastern Italy (Sordinas 1969; Skeates 2000). Over the next few centuries, Impressed Ware spreads deeper into the Adriatic, reaching northern Dalmatia by around 5900 BC,

| Site and context | Lab no. | bp | s.d. | Cal BC 1 s.d. range | | Cal BC 2 s.d. range | | Attribution | Ref. |
|---|-------------|------|------|---------------------|------|---------------------|------|------------------------|------|
| CORFU | | | | | | | | | |
| Sidari C bottom | GXO-771 | 7670 | 120 | 6650 | 6400 | 6900 | 6200 | Plain ware | 1,2 |
| Sidari C top | GXO-772 | 7340 | 180 | 6390 | 6020 | 6550 | 5800 | Impressed Ware | 1,2 |
| TAVOLIÈRE | | | | | | | | | |
| Masseria Giufredda | MC-2292 | 7125 | 200 | 6220 | 5790 | 6400 | 5600 | Impressed Ware | 3 |
| Scramella S. Vito | R-350 | 7000 | 100 | 5990 | 5770 | 6060 | 5660 | Impressed Ware | 3 |
| Scramella S. Vito | R-351 | 6540 | 65 | 5610 | 5390 | 5620 | 5360 | Impressed Ware | 3 |
| Ripa Tetta | Beta-47808 | 6890 | 60 | 5840 | 5710 | 5890 | 5640 | Impressed Ware | 3 |
| Coppa Navigata | OxA-1475 | 6880 | 90 | 5850 | 5660 | 5980 | 5620 | Impressed Ware | 3 |
| Coppa Navigata | OxA-1474 | 6850 | 80 | 5800 | 5640 | 5900 | 5560 | Impressed Ware | 3 |
| Lagnano da Piede | UB-2271 | 6790 | 255 | 5980 | 5470 | 6300 | 5200 | Impressed Ware | 3 |
| Lagnano da Piede | UCLA-2148 | 6700 | 100 | 5720 | 5530 | 5790 | 5470 | Impressed Ware | 3 |
| Villa Comunale | MC-2291 | 6750 | 220 | 5880 | 5470 | 6200 | 5250 | Impressed Ware | 3 |
| Masseria Candelaro | OxA-3684 | 6640 | 95 | 5630 | 5480 | 5730 | 5380 | Impressed Ware | 3 |
| Masseria Candelaro | OxA-3685 | 6510 | 95 | 5610 | 5360 | 5630 | 5300 | Impressed Ware | 3 |
| Masseria S. Tecchia | BM-2414 | 6520 | 70 | 5610 | 5370 | 5620 | 5320 | Impressed Ware | 3 |
| Mass. Font. Olivetto | BM-2415 | 6490 | 150 | 5620 | 5310 | 5750 | 5050 | Impressed Ware | 3 |
| ALBANIA | | | | | | | | | |
| Konispol | Beta-56415 | 7060 | 110 | 6030 | 5710 | 6170 | 5800 | Impressed Ware | 10 |
| Konispol | Beta-67802 | 6830 | 80 | 5790 | 5560 | 5890 | 5630 | Early/Middle Neolithic | 10 |
| Konispol | Beta-56416 | 6800 | 140 | 5840 | 5450 | 6000 | 5550 | Impressed Ware | 10 |
| MONTENEGRO (SOUTHERN HINTERLAND) | | | | | | | | | |
| Odmut IIA | SI-2217 | 6985 | 100 | 5980 | 5660 | 6030 | 5740 | Starčevo | 9 |
| Odmut IIA | SI-2219 | 6955 | 100 | 5970 | 5660 | 6010 | 5730 | Starčevo | 9 |
| Odmut IIB | SI-2222 | 6900 | 100 | 5890 | 5620 | 5990 | 5660 | Impressed Ware | 9 |
| Odmut IIB | z-412 | 6740 | 130 | 5740 | 5510 | 5900 | 5350 | Impressed Ware | 9 |
| Odmut IIB | SI-2223 | 6530 | 80 | 5610 | 5380 | 5630 | 5320 | Impressed Ware | 9 |
| SOUTHERN DALMATIA | | | | | | | | | |
| Gudnja I | GrN-10315 | 7170 | 70 | 6160 | 5920 | 6220 | 5880 | Impressed Ware | 4 |
| Gudnja I | GrN-10314 | 6935 | 50 | 5850 | 5730 | 5980 | 5710 | Impressed Ware | 4 |
| Gudnja II | GrN-10311 | 6560 | 40 | 5610 | 5470 | 5620 | 5420 | Impressed Ware–Danilo | 4 |
| Gudnja III | GrN-10313 | 6520 | 40 | 5530 | 5380 | 5610 | 5370 | Danilo | 4 |
| Gudnja III | GrN-10312 | 6415 | 40 | 5470 | 5320 | 5480 | 5310 | Danilo | 4 |
| Vela Spila VI bottom | z-1967 | 7300 | 120 | 6330 | 6010 | 6420 | 5910 | Impressed Ware | 5 |
| Vela Spila VI middle | z-1968 | 7000 | 120 | 5990 | 5740 | 6200 | 5600 | Impressed Ware | 5 |
| Grapčeva 1400 | Beta-103488 | 7030 | 60 | 5990 | 5840 | 6020 | 5740 | Impressed Ware | 6 |
| NORTHERN DALMATIA | | | | | | | | | |
| Gospodska C | z-579 | 7010 | 90 | 5990 | 5790 | 6030 | 5710 | Impressed Ware | 7 |
| Škarin Samograd I | HD-12094 | 6750 | 60 | 5715 | 5620 | 5740 | 5530 | Plain ware | 7 |
| Škarin Samograd I | HD-11773 | 6740 | 50 | 5720 | 5560 | 5730 | 5550 | Plain ware | 7 |
| Škarin Samograd II | HD-11950 | 6780 | 50 | 5720 | 5635 | 5750 | 5560 | Impressed Ware | 7 |
| Škarin Samograd II | HD-11952 | 6600 | 100 | 5630 | 5470 | 5720 | 5360 | Impressed Ware | 7 |
| Pokrovnik I | ? | 7000 | 100 | 5990 | 5770 | 6060 | 5660 | Impressed Ware | 7 |
| Pokrovnik II | z-895 | 6300 | 150 | 5470 | 5060 | 5550 | 4850 | Danilo | 7 |
| Pokrovnik II | HD-12842 | 6290 | 65 | 5360 | 5080 | 5470 | 5050 | Danilo | 8 |
| Tinj I | GrN-15236 | 6980 | 160 | 6000 | 5710 | 6250 | 5550 | Impressed Ware | 7 |
| Tinj I | GrN-15237 | 6670 | 260 | 5850 | 5300 | 6200 | 5000 | Impressed Ware | 7 |
| Tinj I | GrN-15238 | 6280 | 210 | 5480 | 4990 | 5650 | 4700 | Impressed Ware | 7 |
| ISTRIA AND THE TRIESTINE KARST | | | | | | | | | |
| Vižula | HD-12093 | 6850 | 180 | 5970 | 5560 | 6200 | 5400 | Impressed Ware | 7 |
| Vižula | HD-11733 | 6140 | 70 | 5210 | 4950 | 5300 | 4850 | Impressed Ware | 7 |
| Ciclam Layer 8 | R-1040A | 6300 | 50 | 5340 | 5140 | 5420 | 5070 | Danilo/Vlaška | 11 |
| Edera Level 3a | GX-19569 | 6700 | 130 | 5720 | 5480 | 5850 | 5370 | Plain ware | 12 |
| Edera Level 2a | GX-19568 | 6615 | 390 | 6000 | 5050 | 6400 | 4600 | Danilo/Vlaška | 12 |
| Edera Level 2a | GrN-23129 | 6590 | 100 | 5630 | 5470 | 5710 | 5360 | Danilo/Vlaška | 13 |
| Edera Level 2a | GrN-25474 | 6480 | 40 | 5480 | 5370 | 5520 | 5320 | Danilo/Vlaška | 13 |
| Edera Level 2a | GX-19567 | 6445 | 210 | 5650 | 5050 | 5750 | 4850 | Danilo/Vlaška | 12 |
| Edera Level 2a | GX-19022 | 6305 | 285 | 5550 | 4850 | 5800 | 4500 | Danilo/Vlaška | 12 |
| Pupčićina Horizon I | z-2575 | 6600 | 240 | 5740 | 5300 | 6000 | 4950 | Danilo/Vlaška | 14 |
| Pupčićina Horizon I | OxA-8471 | 6495 | 60 | 5520 | 5360 | 5610 | 5320 | Danilo/Vlaška | 15 |
| Pupčićina Horizon H | Beta-131625 | 6680 | 100 | 5670 | 5480 | 5780 | 5460 | Danilo/Vlaška | 15 |
| Pupčićina Horizon H | Beta-131624 | 6270 | 120 | 5370 | 5050 | 5500 | 4850 | Danilo/Vlaška | 15 |

References: 1. Sordinas 1967; 2. Sordinas 1969; 3. Skeates 2000; 4. Chapman 1988; 5. Čečuk & Radić 2001; 6. Forenbaher & Kaiser 1999; 7. Chapman & Muller 1990; 8. Biagi & Voytek 1994; 9. Marković 1985; 10. Harrold et al. 1999; 11. Gilli & Montagnari Kokelj 1992; 12. Biagi 1995; 13. Biagi & Spataro 2000; 14. Miracle 1997; 15. Miracle & Forenbaher 2006.

Tab. 3. Radiocarbon dates associated with Neolithic pottery assemblages from Corfu, the Tavoliere, Albania, Montenegro, Dalmatia, Istria, and the Triestine Karst.

unique to the region. The presence of only parts of the 'Neolithic package' and their appearance within an existing Mesolithic site suggests adoption through social interaction and exchange - probably 'individual frontier mobility' (Tab. 1). These cultural novelties were not moving between Mesolithic populations. Neither pottery nor domestic animals are present only 35 km away across the Strait of Corfu in Late Mesolithic layers dating to ca. 6500-6200 BC at Konispol Cave. It is only with the appearance of Impressed Ware that the Neolithic starts to move in the region.

The earliest radiometrically dated Impressed Ware appears at Sidari Layer C top at about 6200 BC. There is little indication, however, of cultural continuity between this and the underlying Layer C base; there is a major stratigraphic and chronological gap (ca. 300 years) between them. Impressed Ware at Sidari is associated with the full suite of domestic animals and other changes in lithic technology and typology (Perlès 2001.49-50). The identity of the inventors of Impressed Ware style remains elusive. Were they from the indigenous population, who perhaps acquired or invented new pottery making techniques during the several centuries when they were not occupying the site, or were these new immigrant agropastoralists from the southeast, who brought pottery with them? We doubt that there will be a satisfactory answer to this question any time soon. Rather, we think it is more productive to try to understand how and why Impressed Ware started to move.

The coastal distribution of Impressed Ware sites and their presence on most of the eastern Adriatic islands, including a number of isolated islets far from the mainland (Bass 1998; Forenbaher 1999), indicates clearly that maritime communication was the key ingredient of its dispersion. Seafaring was not necessarily a Neolithic invention. There is indirect evidence of pre-Neolithic (11th Millennium BC) seafaring from Franchthi Cave (Perlès 2001.28, 35), as

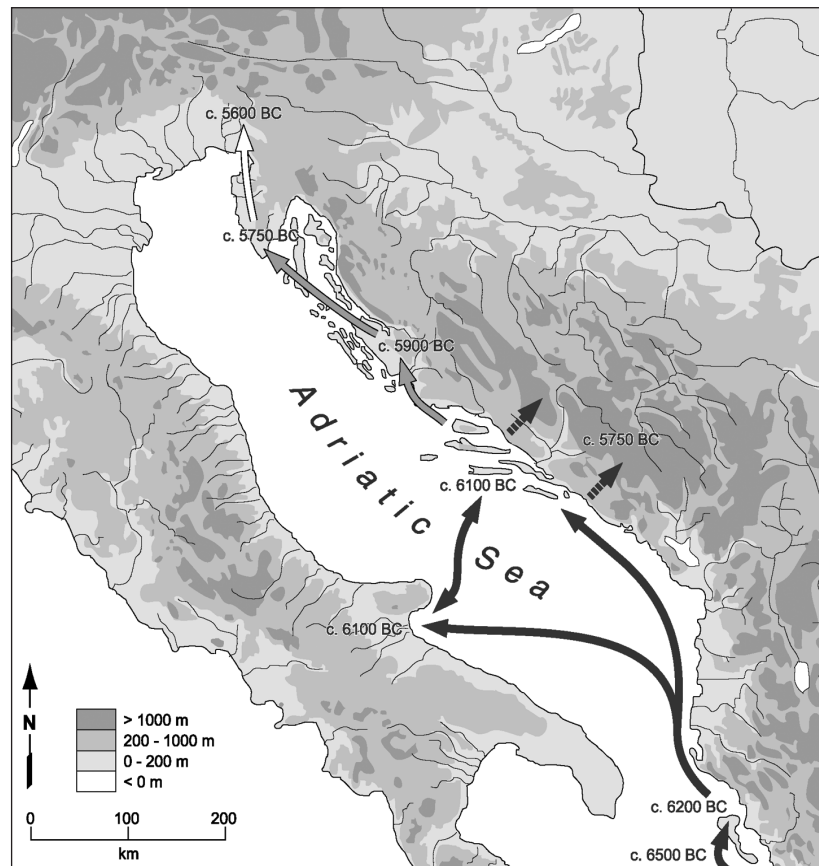


Fig. 4. Model of the spread of farming and herding in the Eastern Adriatic region. Black, solid lines: first phase of rapid 'leapfrog colonization' associated with Impressed Wares. Grey lines: second phase of slow 'agropastoral expansion' associated with Impressed Wares. White lines: third phase of 'agropastoral expansion' associated with Danilo/Vlaška pottery. Black, dashed lines: adoption of herding and farming through 'individual frontier mobility'.

well as the Mesolithic colonisation of Corsica and other Mediterranean islands during the early Holocene (Costa et al. 2003).

The radiocarbon dates indicate that Impressed Ware and domestic animals took less time to move almost 500 km up the Adriatic to the Middle Dalmatian islands than they took to move 35 km across the Strait of Corfu to Konispol Cave. The former pattern is compatible with the model of 'leapfrog maritime colonisation' by small seafaring communities (Zilhão 1993.37, 50; Zvelebil 2001.5), although the lack of dated open-air sites (permanent villages) associated with the earliest Impressed Ware in the southern Adriatic undermines the fit. We may have early Neolithic 'colonists' without evidence of their colonies. Without more information about the Late Mesolithic in the coastal region it is difficult to exclude an alternative hypothesis: that local Mesolithic foragers acquired pottery and other innovations, and then dispersed them by sailing up and down the Adriatic.

Beyond the coastal strip in the southern Adriatic and Albania, Impressed Ware and other innovations were introduced through contact between agricultural and hunter-gatherer groups. Radiocarbon dates suggest a piecemeal adoption of parts of the 'Neolithic package' at Konispol, Odmut, Crvena Stijena, and Zelena pećina, slightly after the initial spread of Impressed Ware up the Adriatic. Some of these sites are located in areas unsuitable for agriculture, in remote parts of the hinterland separated from the coast by high mountain ranges; others overlook valleys with good agricultural potential. Only at Konispol do we have detailed enough data to discuss the process of adoption of pottery and domestic animals. Russell (1998:149) suggests that cattle were relatively important in the transitional assemblages at Konispol and that these animals may have been provided to the hunter-gatherer inhabitants as bride-wealth. Cattle and other domestic animals may have also been important in feasts. Without further information about the social contexts of consumption and use of food and pottery, the process by which these novel resources were adopted by the Mesolithic hunter-gatherers remains vague. For the time being, a variant of Individual Frontier Mobility would appear to be the most likely process.

After 6000 BC, Impressed Ware made its way up the northern Adriatic, reaching southern Istria by ca. 5750 BC. Along the way, our Impressed Ware potters started to live in open-air sites that look like more permanent villages. Faunal assemblages, whether from caves or open-air sites, are dominated by domestic animals. Direct evidence about plant foods is scarce, although site locations show a preference for land suitable for agriculture. Although the evidence is patchy at best, we suggest that it is only at this time that we have the assembly of the entire 'Neolithic package'.

Why did the pace of pottery adoption change after 6000 BC? The northern Adriatic may have supported larger and more successful groups of native hunter-gatherers, who resisted the immigration of farmers. Some evidence for this model comes from the large number of Mesolithic sites at the head of the Adriatic, and the delay in the appearance of agriculture in the region. On the other hand, the relative population densities might have been reversed (relatively lower in the north and higher in the south), suggesting that social leveling mechanisms in relatively small indigenous populations in the northern Adriatic undermined the acquisition and spread of prestige items like pottery and domestic animals. Re-

gardless of whether Impressed Ware was carried by migrating farmers or passed among resident hunter-gatherers, the density and social organization of Late Mesolithic people is key to our understanding of the process.

A two-stage model of dispersal

We are thus proposing a two-stage model for the dispersal of Impressed Ware, in which there is an initial stage of pioneer exploration followed by a later stage of colonization (Fiedel & Anthony 2003). The first stage occurs rapidly and is limited to the islands and the coastal strip of the southern Adriatic. Rather than establishing permanent settlements, these people may have made short-term, seasonal camps in caves and the open-air. They apparently brought domestic animals with them, and may have seeded islands with flocks in anticipation of future visits. The Impressed Ware 'pioneers' rapidly explored the southern Adriatic, establishing contacts with indigenous hunter-gatherer groups in the hinterland, and probably relying on these native groups as a source of information and perhaps marriage partners. The initial Impressed Ware occupations at Vela Spila and Gudnja may be evidence of these first 'scouts'.

During the second phase of Impressed Ware expansion, settled farmers became established. There was less reliance on native hunter-gatherers for information and other resources, and in any case, those that held on in the region had probably been decimated by the loss of personnel to farming, disease, through marriage, or conflict. Exceptions might have been the hinterland of Montenegro, where important elements of the foraging lifestyle continued into the Middle Neolithic (Crvena Stijena) or even Late Neolithic (Odmut). Farming eventually reached the head of the Adriatic about 5600 BC, now associated with Middle Neolithic Danilo/Vlaška pottery.

Conclusion

Archaeological evidence suggests that immigration played a major role in the introduction of farming into the eastern Adriatic. This is not to say that this was a one-sided affair in which indigenous foragers were passive recipients. It must have been a complex process that involved both the actual movement of people and the active participation of the local population. There is no reason to believe that this process unfolded along identical lines throughout the region. There is provocative evidence that the transition to farming occurred in a two-stage pro-

cess. An initial stage of very rapid dispersal, perhaps by exploratory parties along the coast in the southern Adriatic, was followed by a second stage, during which the eastern Adriatic littoral was probably colonized by enclave-forming farming communities. The hinterland, and perhaps also parts of the coast, remained an agricultural frontier zone for a while.

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