Early Farming in Dalmatia

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Pokrovnik and Danilo Bitinj: two Neolithic villages in southeast Europe

Andrew Moore, Marko Menđušić, Lawrence Brown, Sue Colledge, Robert Giegengack, Thomas Higham, Vladimir Hršak, Anthony Legge†, Drago Marguš, Sarah McClure, Carol Palmer, Emil Podrug, Kelly Reed, Jennifer Smith and Joško Zaninović

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Cover image: Aerial view of the Danilo Valley, site of Danilo Bitinj in the middle distance, looking southeast (photo Šibenik Museum)

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Preface

The Early Farming in Dalmatia Project began with an invitation. In March 2000 Andrew Moore was visiting the American College of Management and Technology in Dubrovnik, a satellite of his home institution, Rochester Institute of Technology in the USA. Colleagues at the College arranged for him to meet archaeologists in Split who would show him the main Neolithic sites in the region. That intriguing and informative excursion led to a meeting with Marko Menđušić who invited Andrew to join him in a collaborative project. This investigation would undertake a deeper exploration of key issues in the Neolithic and the development of farming in the central Adriatic. Two years later we began the project.

The project was conceived in the aftermath of the Homeland War which had ended a few years before. Archaeologists and other scientists in Croatia wanted to strengthen contacts with their western counterparts in the interests of building intellectual exchanges. For archaeology this meant bringing together the traditional expertise of Croatian archaeologists in the cultural record of their country with the new techniques and perspectives that their guests from abroad could deploy. There was indeed much to do, especially for prehistory. The great sites of the classical world in coastal Croatia, Split, Pula, Vis, Hvar, and others, were well known but the Neolithic sites were scarcely recognized. Maps of the later prehistory of Europe would leave the eastern shore of the Adriatic blank. This was despite the fact that substantial accounts of significant excavations carried out since the Second World War had been published in English and German.[1] This region formed the link between southeast Europe and the central and western Mediterranean. It should therefore have contained sites that could yield vital information for understanding the spread of agriculture and sedentary, village-based societies through the Mediterranean to southern Europe. Our project was intended to fill this void.

We have been joined by other archaeologists and scientists from Croatia, the USA, Britain and elsewhere who have recognized the potential importance of the region for later prehistory. Throughout, our collaborative research has proceeded in a spirit of generous cordiality. All participants have learned from each other: the team experts, skilled professional excavators, and students. Our results thus far demonstrate how productive this approach has been. Already, our project has generated an array of productive inquiries

[1] Korošec 1958-1959, 1964; Novak 1955.

leading to a series of publications and theses at the masters and doctoral levels.[2] It has also stimulated a new generation of international scholars to undertake research on the later prehistory of the region from a variety of innovative perspectives.

A major theme of our investigations has been to understand the human ecology of the earliest farming in Dalmatia and its later development. We have been especially interested in establishing the relationships between the history of the first agricultural villages as revealed by our excavations and the landscapes in which they were located. This context was an ever changing one, with human impact becoming increasingly significant as the Holocene advanced. We have also taken into account the influence of rising sea levels during the early Holocene, a more important element we now realize than we had thought at the outset. Much more needs to be done to expand our research with these perspectives in mind. That will be our task, and that of others, in the years to come.

Of the team that came together for the Early Farming in Dalmatia Project, one of its distinguished members is no longer with us. Tony Legge joined us in the field during several seasons, providing an immediate assessment of the significance of the faunal remains as they were recovered. His untimely death in 2013 was a great loss to us and to the world of archaeozoology.[3] Fortunately, he had completed his initial analysis of the animal bones from Pokrovnik and Danilo, and that research is included in this book.

This account represents a preliminary statement of our research thus far and our initial findings. We intend to pursue our inquiries further and to explore more fully the implications of the data we have recovered. We look forward to that task eagerly, stimulated by the rich insights that we have gained already.

Andrew Moore and Marko Menđušić
Autumn 2017

[2] A partial list has been published in Menđušić and Moore 2013.
[3] His friends and colleagues have compiled a book of essays in his honor, see Rowley-Conwy *et al.* 2017.

Acknowledgments

We express our warm thanks to the institutions that have sponsored our research. In Croatia this includes the Ministry of Culture in Zagreb and the Šibenik and Drniš museums, and in the USA Rochester Institute of Technology (RIT). The funding has come from grants from the National Geographic Society (NGS 7674-04), the National Science Foundation (NSF 0422195), RIT, and the Ministry of Culture in Croatia. The institutions we serve have provided support of various kinds, from travel grants to research facilities. The Research Laboratory for Archaeology and the History of Art, University of Oxford, has obtained nearly all the AMS determinations. Douglas Kennett (The Pennsylvania State University) has provided the others. The project has benefited from the hard work of many helpers from Danilo and Pokrovnik, and the efforts of students from several universities in Croatia, the USA and the United Kingdom. We offer special thanks to Stašo Forenbaher and Timothy Kaiser who read the final draft of this manuscript and offered helpful suggestions for improvement. We extend our deep appreciation to all those mentioned here, and to everyone else who has contributed to the successful continuation of the project.

Background to the research

The development of agriculture continues to be a vital subject of inquiry. It was, after all, the most significant transformation in human economy and society that has ever taken place, and it made possible most subsequent cultural developments. Moreover, the immediate impacts of this new economy on people, social organization, and the environment were profound. Most archaeologists and other scientists who have attempted to elucidate the processes by which this new way of life came into existence have concentrated their attention on the presumed centers of origin, of which the earliest was in western Asia. There are compelling reasons, however, for devoting equal attention to the initial spread of farming from these centers, for this process of diffusion can illuminate more clearly the immediate consequences of the transition to farming than the often lengthy formative phase in the original centers of development. Furthermore, such research can identify the processes of spread themselves, and so help us to address two of the most contentious issues in contemporary archaeology: how were these farming systems constituted, and what were the modes of transmission by which they traveled?[1]

Farming began in western Asia around 13,000 years ago, calibrated,[2] that is towards the end of the Late Glacial. By the mid Holocene it had dispersed through much of the temperate zone of the Old World and into North Africa. Of these episodes, the spread of farming around the Mediterranean and into Europe was as early as any. It is significant for its immediate impacts, certainly, but also because it provided the economic and social prerequisites for the development of the rich cultural complexity of later prehistoric and historic Europe. During the period of farming dispersal much of the Mediterranean Basin formed a single, distinct cultural region for the first time, as demonstrated by the ubiquity on coastal sites of the various kinds of impressed ware and of chipped obsidian tools from carefully selected sources. The rapidity of the spread of farming through the central and western Mediterranean and these indications of extended contact require attention and explanation.[3]

[1] Bellwood 2005: 2, 12; Colledge and Conolly 2007a; Fowler *et al.* 2015; Harris 1996: 7.
[2] Moore *et al.* 2000: 507; Zeder 2008: 11598.
[3] Isern *et al.* 2017

The Early Farming in Dalmatia Project has been designed to investigate the spread of farming to the Adriatic and, in particular, the Dalmatian coast. The Adriatic Basin is important because it forms the bridge between southeast Europe and the lands to the west. The project is intended to serve as a case study of the broader dispersal of this new way of life through the central and western Mediterranean. We are attempting to answer a number of questions, of which the most important may be stated at the outset. First, when did farming reach Dalmatia? Second, how did it get there? Third, what was the nature of this economy? Fourth, what were the climate and landscape like at the time of arrival and how did they influence the development of agriculture? Next, what, if any, were the responses of the local Mesolithic population to the coming of farming? Sixth, what impact did farming have on the region, and what sorts of communities developed there through the Neolithic? We have had considerable success in establishing the nature of the farming economy, the date of its inception, and the character of these early farming communities. Their interactions with the landscape will, however, require substantial further research as the project proceeds.

Our methodological approach is distinctive. From the outset, the project has been designed as a multidisciplinary exercise in ecological research, with significant contributions from geologists, botanists, and physical scientists, as well as from archaeobotanists and archaeozoologists. We have used a comprehensive recovery strategy in our excavations, and wherever possible have deployed up-to-date technologies to aid our investigations. To deepen our understanding of agricultural practices in the Neolithic we have conducted inquiries into traditional farming among local farmers. The inspiration for the project arose from a compelling need to address important issues of concern to archaeology, but the scope is far wider than this. The project is a new departure in approaches to archaeological research in Croatia,[4] and its configuration is unusual among parallel investigations around the Mediterranean and in southern Europe. It represents an expansion of perspectives developed by several of us in research on the early inception of farming in the Euphrates Valley in Syria.[5]

We have known from the time of Childe[6] that farming spread from the Middle East to Europe along two routes, by land up the Danube into central Europe, and by sea around the Mediterranean to the shores of southern Europe. The natures of the agricultural systems that were dispersed and the modes of their transmission have been topics of fierce and continuing debate. Several recently published compendiums provide succinct summaries of these varying points of view.[7] Archaeologists and others who investigate these matters in the Mediterranean Basin and beyond have offered a variety of interpretations of what actually happened. At one extreme are those who have argued that the development of farming in Europe owed very little either to agricultural systems developed elsewhere or to immigrant farmers,[8] views that are heard less often now.[9] Others, while allowing that

[4] Davison *et al.* 2017; Moore and Menđušić 2004; Menđušić and Moore 2013.
[5] Moore *et al.* 2000.
[6] Childe 1957: chapters VI and XIII.
[7] Ammerman and Biagi 2003; Cummings *et al.* 2014; Fowler *et al.* 2015; Price 2000.
[8] Donahue 1992; Whittle 1996: 360-361.
[9] Note, however, Kyparissi-Apostolika 2002, 2007; Marijanović, 2009: 246; and Séfériadès 2002.

the domesticates themselves, both plants and animals, originated in western Asia, consider the spread of farming to have been a patchy affair that depended in part on the responses of indigenous Mesolithic hunter-gatherers to the appearance of this new way of life.[10] They argue, further, that very little of a farming economy was transmitted in the early stages, and that hunting and gathering remained important well into the Neolithic.[11] For the Mediterranean, at least, there is a solidifying body of opinion, based on the substantial accumulation of new data, which supports the view that a mature, subsistence farming system, embracing a suite of domestic crops and animals, was carried along the coast by migrating farmers who established their villages in places favorable for arable agriculture.[12]

That it is possible to advance such varying interpretations is in part because in regions as extensive and environmentally diverse as Mediterranean, central, and northern Europe it would be reasonable to expect that the spread of farming and the interactions between farmers and indigenous foragers would have been complex processes. It is also because many excavators of Neolithic sites have used traditional methods that have not been directed towards recovery of plant and animal remains. One result has been that in the Mediterranean archaeologists have often taken the arrival of pottery as a proxy for the dissemination of farming.[13] This co-occurrence, of the first pottery and the initial stages of farming, on Neolithic sites does seem to reflect what happened, but it tells us nothing about the nature of these early agricultural systems, nor how they were adapted to the varying landscapes of the Mediterranean Basin.

Archaeologists working within Croatia have expressed a similar diversity of views on the inception of farming as their colleagues elsewhere in Europe. The pioneering prehistorian Grga Novak who excavated the key site of Grapčeva spilja on Hvar concluded that the successive Neolithic cultures he documented there were derived from the eastern Mediterranean through maritime contact.[14] That view has largely been superseded by a recognition that the pottery, at least, had its own local history of development. Croatian archaeologists who conduct research on Neolithic sites agree that the plant and animal domesticates originated in western Asia.[15] Nonetheless, some would argue that farming was adopted by the indigenous Mesolithic population, and that hunting and gathering remained an important element of the economy well into the Neolithic.[16] They consider that farming had relatively little impact until later times. Indeed, it is commonly asserted that the natural environment, and the vegetation in particular, remained undisturbed by farming activities until the Bronze Age or even later.[17] These views have been challenged by others who argue that farming took hold quite early in the Neolithic.[18]

[10] Zvelebil and Lillie 2000.
[11] Price 2003: 280-281.
[12] Forenbaher and Miracle 2014; Isern *et al.* 2017; Kaiser and Forenbaher 2016a: 159-160; Zeder 2008; Zilhão 2003.
[13] Barnett 2000: 96.
[14] Novak 1955: 328–329.
[15] Forenbaher and Kaiser 2005: 16.
[16] For example Bass 2008: 258; Batović 1968: 11; Marijanović 2000: 212, 231; Marijanović 2009: 249-251.
[17] Šoštarić 2005: 384-385.
[18] Chapman *et al.* 1996: 259; Forenbaher 1999: 524.

Relatively little research has been carried out on the problem of the development of farming in the Adriatic Basin, so there are simply insufficient data available to address the key issues effectively. Adequate samples of plant remains and animal bones do not exist, and until recently the known radiocarbon dates were too few for precise chronological determinations. This difficulty was compounded by the fact that many of the dates were obtained from charcoal using conventional techniques, rather than samples from short-lived species of plants and animals dated by accelerator mass spectrometry (AMS).

The Neolithic in the Adriatic Basin was preceded by a Mesolithic phase that has yet to be well defined. Few Mesolithic sites have been identified in Dalmatia, making it difficult to understand the nature of human activity there preceding the arrival of agriculture. Some, perhaps many, sites will have been drowned by the continued rise in sea level during the early Holocene,[19] but this is insufficient an explanation for the dearth of known sites. Concentrations of Mesolithic open and cave sites have been discovered in Istria and the adjacent offshore islands in recent, carefully-targeted, surveys.[20] In one of these sites, Pupićina Cave, meticulous excavations have revealed early Mesolithic deposits.[21] The Mesolithic inhabitants of another well-known site, Vela spila on the island of Korčula, derived a good deal of their sustenance from fishing, judging by the abundant bones of mackerel, tuna, swordfish and other species found in the deposits.[22] These discoveries notwithstanding, the record of Mesolithic occupation in Dalmatia is sparse.

In central and southern Europe there appears to have been a significant gap between the latest dates for Mesolithic occupation and the earliest for Neolithic farming settlements.[23] This trend is particularly marked in Mediterranean Europe, including the Adriatic, where the two episodes appear to have been separated by many centuries.[24] The hiatus has been identified at Pupićina Cave for example.[25] This may partly explain the current minimal evidence for Mesolithic occupation in Dalmatia immediately prior to the beginning of the Neolithic and the first agricultural settlements.

[19] Moore 2014.
[20] Komšo 2006.
[21] Miracle and Forenbaher 2006: 456.
[22] Čečuk and Radić 2005: 61-62; Rainsford *et al.* 2014.
[23] Gkiasta *et al.* 2003: 56, 59.
[24] Biagi and Spataro 1999-2000.
[25] Miracle and Forenbaher 2006: 455-458.

Inception of the project

In March 2000, during a visit to Danilo Bitinj and Pokrovnik, Menđušić, then Senior Curator for Prehistory in the City Museum of Šibenik, invited Moore to undertake an archaeological project with him that would focus on the Neolithic. Two years elapsed before Moore could take up this generous invitation. Then, in 2002 we began to design and implement a longer-term collaborative research project that would renew investigation of the Neolithic in Dalmatia with a special emphasis on improving our understanding of the development of farming there. We visited Neolithic sites and museums with collections of Neolithic material from Istria in the north to Split in the south. While highly informative, this exercise soon indicated to us that the few sites with the potential to answer questions of interest to us lay in northern Dalmatia. It is there that we have concentrated our efforts.

Our collaboration was intended to combine the rich archaeological knowledge of our Croatian colleagues, especially for the later prehistory of Dalmatia, with the ecological perspective espoused by the American and other international participants.[26] Our Croatian colleagues possessed a profound understanding of the natural history of the region that has been of special value to the project. A further aim was to deploy a broad array of advanced technological investigative techniques to address the questions we wished to resolve. Among these were ground penetrating radar (GPR) for site survey, and AMS dating. The project is sponsored by the Šibenik Museum, Drniš Museum, and Ministry of Culture in Croatia and Rochester Institute of Technology (RIT) in the USA. Numerous other bodies in Croatia, the USA and other countries have since joined in supporting the research (see the Acknowledgments).

South of the Istrian Peninsula the Adriatic coast of Croatia consists of an intermittent coastal strip backed by the formidable massif of the Dinaric Alps. For most of their 400 km length the front range of these karst mountains falls straight into the sea. In northern Dalmatia, from Zadar to Split, there lies a 40 km-wide zone of narrow valleys and hills between the Adriatic and the looming presence of Mount Dinara itself on the eastern horizon. The floors of these valleys contain rich soils that are heavily cultivated today. Offshore, a chain of over 1,000 islands and islets runs parallel to the entire length of the coast and extends half way across the Adriatic. Small, outlying islands provide intervisible landfalls as far as

[26] Menđušić and Moore 2013.

the Italian coast. Dalmatia is thus open to the sea but separated from inland Europe by the Dinaric range, and this circumstance has affected the cultural development of the region far back in time.[27]

Much of the research on the later prehistory of Dalmatia in recent decades has taken place on the islands. There have been extensive surveys of Hvar, Brač, and a number of smaller islands.[28] An important excavation of the deeply stratified deposits at Vela spila on Korčula[29] and investigations of a number of sites on outlying islands[30] give an indication of the scope of this research. On the islands and on the mainland, archaeologists investigating the later prehistory of the eastern Adriatic have preferred to excavate caves and rockshelters.[31] This is because these sites provide evidence of long-term cultural changes. However, they suffer from systemic bioturbation by humans and wild fauna, causing mixing of the deposits. Many of the caves and shelters are located in the karstic hills and mountains in places unsuitable for farming, though they have been used on occasion by pastoralists. Consequently, they have little to tell us about the development of agriculture in the region. In contrast, we decided to investigate open village sites in areas that are heavily farmed today because they were more likely to yield the kinds of evidence we sought. The most promising sites were in the fertile valleys of northern Dalmatia, particularly those in the Šibenik region.

Selection of Danilo and Pokrovnik

We decided at the outset that the most efficient way to proceed would be to choose sites that had been occupied in more than one phase of the Neolithic because we wished to ascertain how economy and culture had changed through time. Furthermore, the sites selected should offer good preservation of organic material, mainly animal bones and charred plant remains, as well as artifacts. This was essential if we were to recover adequate samples to address questions of agricultural development. It followed that such sites would have been excavated before.

These criteria were sufficiently stringent that our choice proved to be limited. Happily two sites, Danilo Bitinj and Pokrovnik, met our needs (Figure 1). Danilo Bitinj[32] was located 8 km inland from the present-day coastline, at the center of a 6 km long valley (Figure 2). This valley is heavily cultivated today in a mixed farming regime that includes cereals, vines, fruit trees, olives and hay with some sheep, cattle, pigs and poultry. Danilo Bitinj, or Danilo for short, was an extensive settlement and the typesite for the Middle Neolithic in Dalmatia (Figure 3). Excavations there by Korošec in the 1950s had yielded animal bones, marine shells and impressions of cereal grains in daub.[33] Thus, the site contained organic material that would aid in economic analysis. Pokrovnik was in the next valley inland, some 18 km from the coast. It lay in an embayment at the foot of a range of hills; to the west the land

[27] Violich, F. 1998: 76-77.
[28] Gaffney and Kirigin (eds.) 2006; Gaffney *et al.* 1997; Stančič *et al.* 1999.
[29] Čečuk and Radić 2005.
[30] Forenbaher 1999, (ed.) 2009, 2018; Forenbaher and Kaiser 2005.
[31] Kaiser and Forenbaher 2012, 2016b; Miracle and Forenbaher (eds.) 2006; Novak 1955; Čečuk and Radić 2005; Marijanović 2005.
[32] Bitinj is the name given to the well that is a conspicuous feature in the center of the Danilo Valley.
[33] Hopf 1964.

opened onto an undulating plain with another ridge on the horizon (Figure 4). The open ground in front of the site was cultivated as at Danilo while the hills behind were used for rough grazing. Pokrovnik was less extensive than Danilo but was known to contain relatively deep deposits of the Early and Middle Neolithic with preservation of organic material.[34] It thus complemented the sequence from Danilo. As the two sites were in different locations, it would be possible to compare their cultural and economic sequences to see if this had had any effect on the way of life of their inhabitants. We conducted a GPR survey of Danilo in 2003 and excavated there in 2004 and 2005. Our research at Pokrovnik began with a GPR survey in 2004, followed by excavations in 2006. Concurrently, our colleagues in geology and botany began their investigations of the geomorphology and vegetation of the region, research that is continuing. Following the conclusion of the excavations, we have begun an intensive study of the artifacts from both sites. Some initial results of those analyses are reported here.

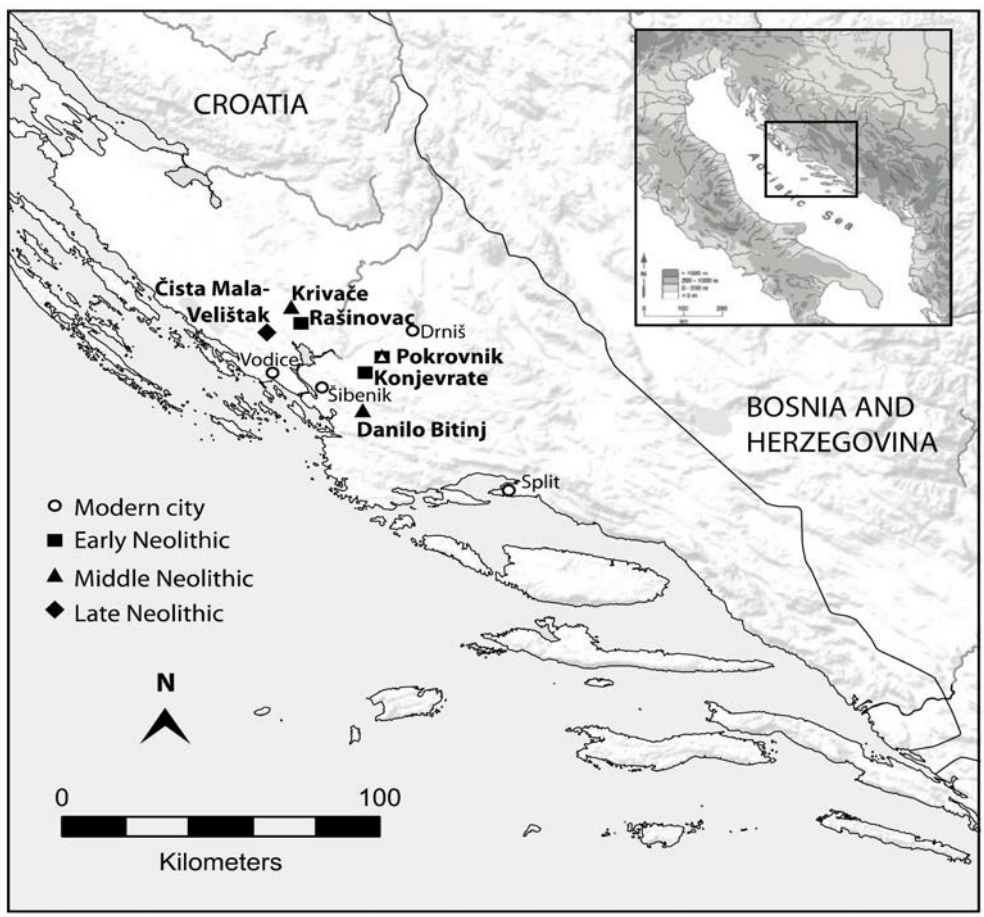

Figure 1. Location map of Pokrovnik and Danilo, and other key sites mentioned in the text.

[34] Menđušić 1998: 52-55.

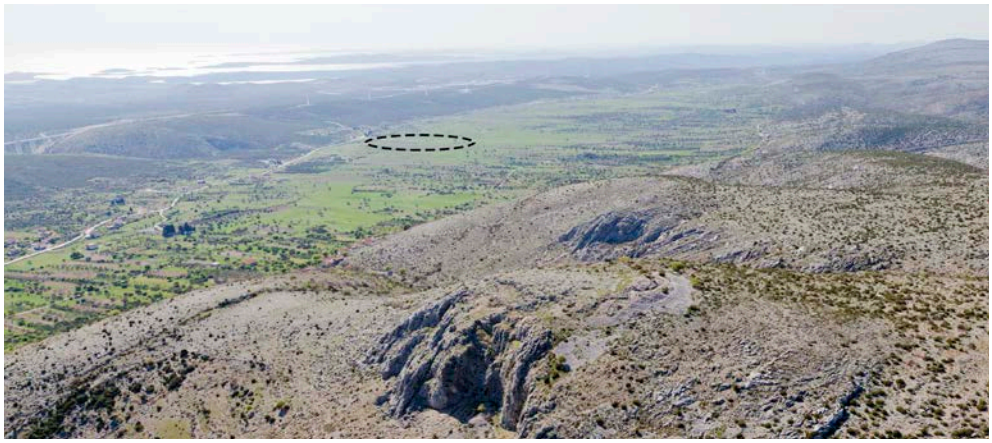

Figure 2. Aerial view of the Danilo Valley looking west. The site of Danilo Bitinj is in the middle distance; the Adriatic Sea is visible on the horizon (photo Šibenik Museum).

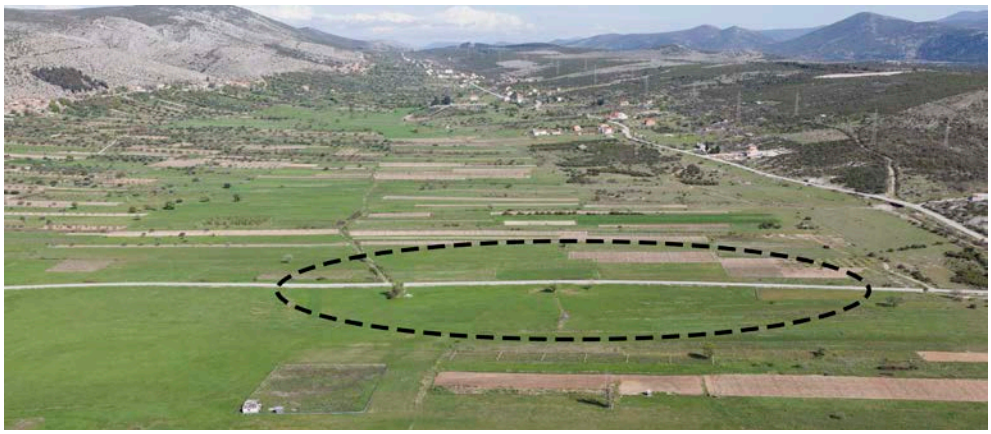

Figure 3. Aerial view of the site of Danilo Bitinj, looking southeast (photo Šibenik Museum).

Figure 4. View of the site of Pokrovnik from the northeast. The Pećina spring is in the grove of hackberry trees to the left of center.

History of research at Danilo Bitinj and Pokrovnik

The area surrounding the spring and well named Bitinj in the Danilo Valley was known to be a prehistoric site long before the first excavation there, due to the numerous surface finds uncovered by local villagers in their vineyards. In the summer of 1951 Professor Duje Rendić Miočević, the excavator of the nearby Roman villa, placed a small test trench in the vicinity of the Bitinj well in order to examine the precise location and character of the site. The trench gave positive results with a large quantity of finds, especially pottery fragments of an unknown prehistoric culture.[35] It was clear that this site merited more attention.

Danilo Bitinj was excavated by Professor Josip Korošec in the summers of 1953 and 1955, under the aegis of the Yugoslavian Academy of Science and Art and in collaboration with Ivan Marović, Curator of Prehistory at the Archaeological Museum of Split, and Frano Dujmović, Director of the City Museum of Šibenik. It was one of the first excavations of a Neolithic site in Dalmatia and perhaps the most extensive excavation of a Neolithic village in the Adriatic region to date. Korošec opened three large trenches on three strip fields, and a set of smaller test trenches in neighboring land parcels. A total area of around 2,500 m2 was explored and part of a much larger settlement revealed. Between humus and sterile subsoil, the average thickness of the cultural layers ranged from 0.60-1.00 m. Korošec found no traces of dwellings except isolated fragments of burned daub wall with wattle impressions. He identified a simplified vertical stratigraphy, which should be attributed to the pioneer character of his excavation methods. The only structures revealed were circular or irregularly shaped pits dug into the subsoil. But finds were numerous: besides stone, flint and bone artifacts the most intriguing was the pottery assemblage. This included vessel shapes and techniques of ornamentation that differed from other eastern Adriatic Neolithic cultures known at that time. Korošec named this new assemblage the Danilo culture, and placed it in the Middle Neolithic.[36]

[35] Korošec 1952.
[36] Korošec 1958-1959.

In the several decades that have followed, intensive research into the Neolithic, both on open area and in cave sites, has shown that the Danilo culture and its local variants covered most of the eastern Adriatic coast and its hinterland.[37]

The next excavation at Danilo was undertaken in 1992 by Menđušić. Part of the site was endangered by construction work surrounding the resurfacing of the cross-valley road. In a salvage excavation Menđušić opened two trenches measuring around 60 m^2 in area. This time, irregularly preserved traces of a floor of a dwelling, a hearth and many fragments of house daub were found, besides a large quantity of pottery and other small finds.[38]

The Neolithic site in the village of Pokrovnik was discovered in 1979 during tractor plowing in the vineyards, close to the Pećina spring at the foot of the hill topped by the church of Sveti Mihovil (Saint Michael) (Figure 4). Immediately after, in the summer of 1979, Professor Zdenko Brusić, then Curator of Prehistory in the City Museum of Šibenik, conducted a partial rescue excavation. He opened seven trenches of varying dimensions on three strip fields. In total, he explored an area of 114 m^2. As the depth of the trenches varied from 0.45 to 2.05 m from the subsoil to the modern land surface, so did the thickness of the Early and Middle Neolithic layers; in the deepest trenches these were correspondingly substantial, that is about 1 m each. Besides a large quantity of small finds, Brusić also found traces of hearths and drystone walls. Results of the pottery analyses revealed that Pokrovnik contained substantial deposits of Early Neolithic ("*Impresso*" or Impressed Ware culture) and Middle Neolithic (Danilo culture) and, based on a small number of pottery fragments in the surface layers, a Late Neolithic (Hvar culture) phase also.[39]

There were no further excavations at the site until we began work in 2006.

[37] Batović 1979: 524-526.
[38] Menđušić 1993, 1998.
[39] Brusić 1979; Brusić 2008; Menđušić 1995: 18-23; Menđušić 1998: 52-54; Menđušić 2005: 90-92.

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We have been joined by other archaeologists and scientists from Croatia, the USA, Britain and elsewhere who have recognized the potential importance of the region for later prehistory. Throughout, our collaborative research has proceeded in a spirit of generous cordiality. All participants have learned from each other: the team experts, skilled professional excavators, and students. Our results thus far demonstrate how productive this approach has been. Already, our project has generated an array of productive inquiries

[1] Korošec 1958-1959, 1964; Novak 1955.

leading to a series of publications and theses at the masters and doctoral levels.[2] It has also stimulated a new generation of international scholars to undertake research on the later prehistory of the region from a variety of innovative perspectives.

A major theme of our investigations has been to understand the human ecology of the earliest farming in Dalmatia and its later development. We have been especially interested in establishing the relationships between the history of the first agricultural villages as revealed by our excavations and the landscapes in which they were located. This context was an ever changing one, with human impact becoming increasingly significant as the Holocene advanced. We have also taken into account the influence of rising sea levels during the early Holocene, a more important element we now realize than we had thought at the outset. Much more needs to be done to expand our research with these perspectives in mind. That will be our task, and that of others, in the years to come.

Of the team that came together for the Early Farming in Dalmatia Project, one of its distinguished members is no longer with us. Tony Legge joined us in the field during several seasons, providing an immediate assessment of the significance of the faunal remains as they were recovered. His untimely death in 2013 was a great loss to us and to the world of archaeozoology.[3] Fortunately, he had completed his initial analysis of the animal bones from Pokrovnik and Danilo, and that research is included in this book.

This account represents a preliminary statement of our research thus far and our initial findings. We intend to pursue our inquiries further and to explore more fully the implications of the data we have recovered. We look forward to that task eagerly, stimulated by the rich insights that we have gained already.

Andrew Moore and Marko Menđušić
Autumn 2017

[2] A partial list has been published in Menđušić and Moore 2013.
[3] His friends and colleagues have compiled a book of essays in his honor, see Rowley-Conwy *et al.* 2017.

Acknowledgments

We express our warm thanks to the institutions that have sponsored our research. In Croatia this includes the Ministry of Culture in Zagreb and the Šibenik and Drniš museums, and in the USA Rochester Institute of Technology (RIT). The funding has come from grants from the National Geographic Society (NGS 7674-04), the National Science Foundation (NSF 0422195), RIT, and the Ministry of Culture in Croatia. The institutions we serve have provided support of various kinds, from travel grants to research facilities. The Research Laboratory for Archaeology and the History of Art, University of Oxford, has obtained nearly all the AMS determinations. Douglas Kennett (The Pennsylvania State University) has provided the others. The project has benefited from the hard work of many helpers from Danilo and Pokrovnik, and the efforts of students from several universities in Croatia, the USA and the United Kingdom. We offer special thanks to Stašo Forenbaher and Timothy Kaiser who read the final draft of this manuscript and offered helpful suggestions for improvement. We extend our deep appreciation to all those mentioned here, and to everyone else who has contributed to the successful continuation of the project.

Background to the research

The development of agriculture continues to be a vital subject of inquiry. It was, after all, the most significant transformation in human economy and society that has ever taken place, and it made possible most subsequent cultural developments. Moreover, the immediate impacts of this new economy on people, social organization, and the environment were profound. Most archaeologists and other scientists who have attempted to elucidate the processes by which this new way of life came into existence have concentrated their attention on the presumed centers of origin, of which the earliest was in western Asia. There are compelling reasons, however, for devoting equal attention to the initial spread of farming from these centers, for this process of diffusion can illuminate more clearly the immediate consequences of the transition to farming than the often lengthy formative phase in the original centers of development. Furthermore, such research can identify the processes of spread themselves, and so help us to address two of the most contentious issues in contemporary archaeology: how were these farming systems constituted, and what were the modes of transmission by which they traveled?[1]

Farming began in western Asia around 13,000 years ago, calibrated,[2] that is towards the end of the Late Glacial. By the mid Holocene it had dispersed through much of the temperate zone of the Old World and into North Africa. Of these episodes, the spread of farming around the Mediterranean and into Europe was as early as any. It is significant for its immediate impacts, certainly, but also because it provided the economic and social prerequisites for the development of the rich cultural complexity of later prehistoric and historic Europe. During the period of farming dispersal much of the Mediterranean Basin formed a single, distinct cultural region for the first time, as demonstrated by the ubiquity on coastal sites of the various kinds of impressed ware and of chipped obsidian tools from carefully selected sources. The rapidity of the spread of farming through the central and western Mediterranean and these indications of extended contact require attention and explanation.[3]

[1] Bellwood 2005: 2, 12; Colledge and Conolly 2007a; Fowler *et al.* 2015; Harris 1996: 7.
[2] Moore *et al.* 2000: 507; Zeder 2008: 11598.
[3] Isern *et al.* 2017

The Early Farming in Dalmatia Project has been designed to investigate the spread of farming to the Adriatic and, in particular, the Dalmatian coast. The Adriatic Basin is important because it forms the bridge between southeast Europe and the lands to the west. The project is intended to serve as a case study of the broader dispersal of this new way of life through the central and western Mediterranean. We are attempting to answer a number of questions, of which the most important may be stated at the outset. First, when did farming reach Dalmatia? Second, how did it get there? Third, what was the nature of this economy? Fourth, what were the climate and landscape like at the time of arrival and how did they influence the development of agriculture? Next, what, if any, were the responses of the local Mesolithic population to the coming of farming? Sixth, what impact did farming have on the region, and what sorts of communities developed there through the Neolithic? We have had considerable success in establishing the nature of the farming economy, the date of its inception, and the character of these early farming communities. Their interactions with the landscape will, however, require substantial further research as the project proceeds.

Our methodological approach is distinctive. From the outset, the project has been designed as a multidisciplinary exercise in ecological research, with significant contributions from geologists, botanists, and physical scientists, as well as from archaeobotanists and archaeozoologists. We have used a comprehensive recovery strategy in our excavations, and wherever possible have deployed up-to-date technologies to aid our investigations. To deepen our understanding of agricultural practices in the Neolithic we have conducted inquiries into traditional farming among local farmers. The inspiration for the project arose from a compelling need to address important issues of concern to archaeology, but the scope is far wider than this. The project is a new departure in approaches to archaeological research in Croatia,[4] and its configuration is unusual among parallel investigations around the Mediterranean and in southern Europe. It represents an expansion of perspectives developed by several of us in research on the early inception of farming in the Euphrates Valley in Syria.[5]

We have known from the time of Childe[6] that farming spread from the Middle East to Europe along two routes, by land up the Danube into central Europe, and by sea around the Mediterranean to the shores of southern Europe. The natures of the agricultural systems that were dispersed and the modes of their transmission have been topics of fierce and continuing debate. Several recently published compendiums provide succinct summaries of these varying points of view.[7] Archaeologists and others who investigate these matters in the Mediterranean Basin and beyond have offered a variety of interpretations of what actually happened. At one extreme are those who have argued that the development of farming in Europe owed very little either to agricultural systems developed elsewhere or to immigrant farmers,[8] views that are heard less often now.[9] Others, while allowing that

[4] Davison *et al.* 2017; Moore and Menđušić 2004; Menđušić and Moore 2013.
[5] Moore *et al.* 2000.
[6] Childe 1957: chapters VI and XIII.
[7] Ammerman and Biagi 2003; Cummings *et al.* 2014; Fowler *et al.* 2015; Price 2000.
[8] Donahue 1992; Whittle 1996: 360-361.
[9] Note, however, Kyparissi-Apostolika 2002, 2007; Marijanović, 2009: 246; and Séfériadès 2002.

the domesticates themselves, both plants and animals, originated in western Asia, consider the spread of farming to have been a patchy affair that depended in part on the responses of indigenous Mesolithic hunter-gatherers to the appearance of this new way of life.[10] They argue, further, that very little of a farming economy was transmitted in the early stages, and that hunting and gathering remained important well into the Neolithic.[11] For the Mediterranean, at least, there is a solidifying body of opinion, based on the substantial accumulation of new data, which supports the view that a mature, subsistence farming system, embracing a suite of domestic crops and animals, was carried along the coast by migrating farmers who established their villages in places favorable for arable agriculture.[12]

That it is possible to advance such varying interpretations is in part because in regions as extensive and environmentally diverse as Mediterranean, central, and northern Europe it would be reasonable to expect that the spread of farming and the interactions between farmers and indigenous foragers would have been complex processes. It is also because many excavators of Neolithic sites have used traditional methods that have not been directed towards recovery of plant and animal remains. One result has been that in the Mediterranean archaeologists have often taken the arrival of pottery as a proxy for the dissemination of farming.[13] This co-occurrence, of the first pottery and the initial stages of farming, on Neolithic sites does seem to reflect what happened, but it tells us nothing about the nature of these early agricultural systems, nor how they were adapted to the varying landscapes of the Mediterranean Basin.

Archaeologists working within Croatia have expressed a similar diversity of views on the inception of farming as their colleagues elsewhere in Europe. The pioneering prehistorian Grga Novak who excavated the key site of Grapčeva spilja on Hvar concluded that the successive Neolithic cultures he documented there were derived from the eastern Mediterranean through maritime contact.[14] That view has largely been superseded by a recognition that the pottery, at least, had its own local history of development. Croatian archaeologists who conduct research on Neolithic sites agree that the plant and animal domesticates originated in western Asia.[15] Nonetheless, some would argue that farming was adopted by the indigenous Mesolithic population, and that hunting and gathering remained an important element of the economy well into the Neolithic.[16] They consider that farming had relatively little impact until later times. Indeed, it is commonly asserted that the natural environment, and the vegetation in particular, remained undisturbed by farming activities until the Bronze Age or even later.[17] These views have been challenged by others who argue that farming took hold quite early in the Neolithic.[18]

[10] Zvelebil and Lillie 2000.
[11] Price 2003: 280-281.
[12] Forenbaher and Miracle 2014; Isern *et al.* 2017; Kaiser and Forenbaher 2016a: 159-160; Zeder 2008; Zilhão 2003.
[13] Barnett 2000: 96.
[14] Novak 1955: 328–329.
[15] Forenbaher and Kaiser 2005: 16.
[16] For example Bass 2008: 258; Batović 1968: 11; Marijanović 2000: 212, 231; Marijanović 2009: 249-251.
[17] Šoštarić 2005: 384-385.
[18] Chapman *et al.* 1996: 259; Forenbaher 1999: 524.

Relatively little research has been carried out on the problem of the development of farming in the Adriatic Basin, so there are simply insufficient data available to address the key issues effectively. Adequate samples of plant remains and animal bones do not exist, and until recently the known radiocarbon dates were too few for precise chronological determinations. This difficulty was compounded by the fact that many of the dates were obtained from charcoal using conventional techniques, rather than samples from short-lived species of plants and animals dated by accelerator mass spectrometry (AMS).

The Neolithic in the Adriatic Basin was preceded by a Mesolithic phase that has yet to be well defined. Few Mesolithic sites have been identified in Dalmatia, making it difficult to understand the nature of human activity there preceding the arrival of agriculture. Some, perhaps many, sites will have been drowned by the continued rise in sea level during the early Holocene,[19] but this is insufficient an explanation for the dearth of known sites. Concentrations of Mesolithic open and cave sites have been discovered in Istria and the adjacent offshore islands in recent, carefully-targeted, surveys.[20] In one of these sites, Pupićina Cave, meticulous excavations have revealed early Mesolithic deposits.[21] The Mesolithic inhabitants of another well-known site, Vela spila on the island of Korčula, derived a good deal of their sustenance from fishing, judging by the abundant bones of mackerel, tuna, swordfish and other species found in the deposits.[22] These discoveries notwithstanding, the record of Mesolithic occupation in Dalmatia is sparse.

In central and southern Europe there appears to have been a significant gap between the latest dates for Mesolithic occupation and the earliest for Neolithic farming settlements.[23] This trend is particularly marked in Mediterranean Europe, including the Adriatic, where the two episodes appear to have been separated by many centuries.[24] The hiatus has been identified at Pupićina Cave for example.[25] This may partly explain the current minimal evidence for Mesolithic occupation in Dalmatia immediately prior to the beginning of the Neolithic and the first agricultural settlements.

[19] Moore 2014.
[20] Komšo 2006.
[21] Miracle and Forenbaher 2006: 456.
[22] Čečuk and Radić 2005: 61-62; Rainsford *et al.* 2014.
[23] Gkiasta *et al.* 2003: 56, 59.
[24] Biagi and Spataro 1999-2000.
[25] Miracle and Forenbaher 2006: 455-458.

Inception of the project

In March 2000, during a visit to Danilo Bitinj and Pokrovnik, Menđušić, then Senior Curator for Prehistory in the City Museum of Šibenik, invited Moore to undertake an archaeological project with him that would focus on the Neolithic. Two years elapsed before Moore could take up this generous invitation. Then, in 2002 we began to design and implement a longer-term collaborative research project that would renew investigation of the Neolithic in Dalmatia with a special emphasis on improving our understanding of the development of farming there. We visited Neolithic sites and museums with collections of Neolithic material from Istria in the north to Split in the south. While highly informative, this exercise soon indicated to us that the few sites with the potential to answer questions of interest to us lay in northern Dalmatia. It is there that we have concentrated our efforts.

Our collaboration was intended to combine the rich archaeological knowledge of our Croatian colleagues, especially for the later prehistory of Dalmatia, with the ecological perspective espoused by the American and other international participants.[26] Our Croatian colleagues possessed a profound understanding of the natural history of the region that has been of special value to the project. A further aim was to deploy a broad array of advanced technological investigative techniques to address the questions we wished to resolve. Among these were ground penetrating radar (GPR) for site survey, and AMS dating. The project is sponsored by the Šibenik Museum, Drniš Museum, and Ministry of Culture in Croatia and Rochester Institute of Technology (RIT) in the USA. Numerous other bodies in Croatia, the USA and other countries have since joined in supporting the research (see the Acknowledgments).

South of the Istrian Peninsula the Adriatic coast of Croatia consists of an intermittent coastal strip backed by the formidable massif of the Dinaric Alps. For most of their 400 km length the front range of these karst mountains falls straight into the sea. In northern Dalmatia, from Zadar to Split, there lies a 40 km-wide zone of narrow valleys and hills between the Adriatic and the looming presence of Mount Dinara itself on the eastern horizon. The floors of these valleys contain rich soils that are heavily cultivated today. Offshore, a chain of over 1,000 islands and islets runs parallel to the entire length of the coast and extends half way across the Adriatic. Small, outlying islands provide intervisible landfalls as far as

[26] Menđušić and Moore 2013.

the Italian coast. Dalmatia is thus open to the sea but separated from inland Europe by the Dinaric range, and this circumstance has affected the cultural development of the region far back in time.[27]

Much of the research on the later prehistory of Dalmatia in recent decades has taken place on the islands. There have been extensive surveys of Hvar, Brač, and a number of smaller islands.[28] An important excavation of the deeply stratified deposits at Vela spila on Korčula[29] and investigations of a number of sites on outlying islands[30] give an indication of the scope of this research. On the islands and on the mainland, archaeologists investigating the later prehistory of the eastern Adriatic have preferred to excavate caves and rockshelters.[31] This is because these sites provide evidence of long-term cultural changes. However, they suffer from systemic bioturbation by humans and wild fauna, causing mixing of the deposits. Many of the caves and shelters are located in the karstic hills and mountains in places unsuitable for farming, though they have been used on occasion by pastoralists. Consequently, they have little to tell us about the development of agriculture in the region. In contrast, we decided to investigate open village sites in areas that are heavily farmed today because they were more likely to yield the kinds of evidence we sought. The most promising sites were in the fertile valleys of northern Dalmatia, particularly those in the Šibenik region.

Selection of Danilo and Pokrovnik

We decided at the outset that the most efficient way to proceed would be to choose sites that had been occupied in more than one phase of the Neolithic because we wished to ascertain how economy and culture had changed through time. Furthermore, the sites selected should offer good preservation of organic material, mainly animal bones and charred plant remains, as well as artifacts. This was essential if we were to recover adequate samples to address questions of agricultural development. It followed that such sites would have been excavated before.

These criteria were sufficiently stringent that our choice proved to be limited. Happily two sites, Danilo Bitinj and Pokrovnik, met our needs (Figure 1). Danilo Bitinj[32] was located 8 km inland from the present-day coastline, at the center of a 6 km long valley (Figure 2). This valley is heavily cultivated today in a mixed farming regime that includes cereals, vines, fruit trees, olives and hay with some sheep, cattle, pigs and poultry. Danilo Bitinj, or Danilo for short, was an extensive settlement and the typesite for the Middle Neolithic in Dalmatia (Figure 3). Excavations there by Korošec in the 1950s had yielded animal bones, marine shells and impressions of cereal grains in daub.[33] Thus, the site contained organic material that would aid in economic analysis. Pokrovnik was in the next valley inland, some 18 km from the coast. It lay in an embayment at the foot of a range of hills; to the west the land

[27] Violich, F. 1998: 76-77.
[28] Gaffney and Kirigin (eds.) 2006; Gaffney *et al.* 1997; Stančič *et al.* 1999.
[29] Čečuk and Radić 2005.
[30] Forenbaher 1999, (ed.) 2009, 2018; Forenbaher and Kaiser 2005.
[31] Kaiser and Forenbaher 2012, 2016b; Miracle and Forenbaher (eds.) 2006; Novak 1955; Čečuk and Radić 2005; Marijanović 2005.
[32] Bitinj is the name given to the well that is a conspicuous feature in the center of the Danilo Valley.
[33] Hopf 1964.

opened onto an undulating plain with another ridge on the horizon (Figure 4). The open ground in front of the site was cultivated as at Danilo while the hills behind were used for rough grazing. Pokrovnik was less extensive than Danilo but was known to contain relatively deep deposits of the Early and Middle Neolithic with preservation of organic material.[34] It thus complemented the sequence from Danilo. As the two sites were in different locations, it would be possible to compare their cultural and economic sequences to see if this had had any effect on the way of life of their inhabitants. We conducted a GPR survey of Danilo in 2003 and excavated there in 2004 and 2005. Our research at Pokrovnik began with a GPR survey in 2004, followed by excavations in 2006. Concurrently, our colleagues in geology and botany began their investigations of the geomorphology and vegetation of the region, research that is continuing. Following the conclusion of the excavations, we have begun an intensive study of the artifacts from both sites. Some initial results of those analyses are reported here.

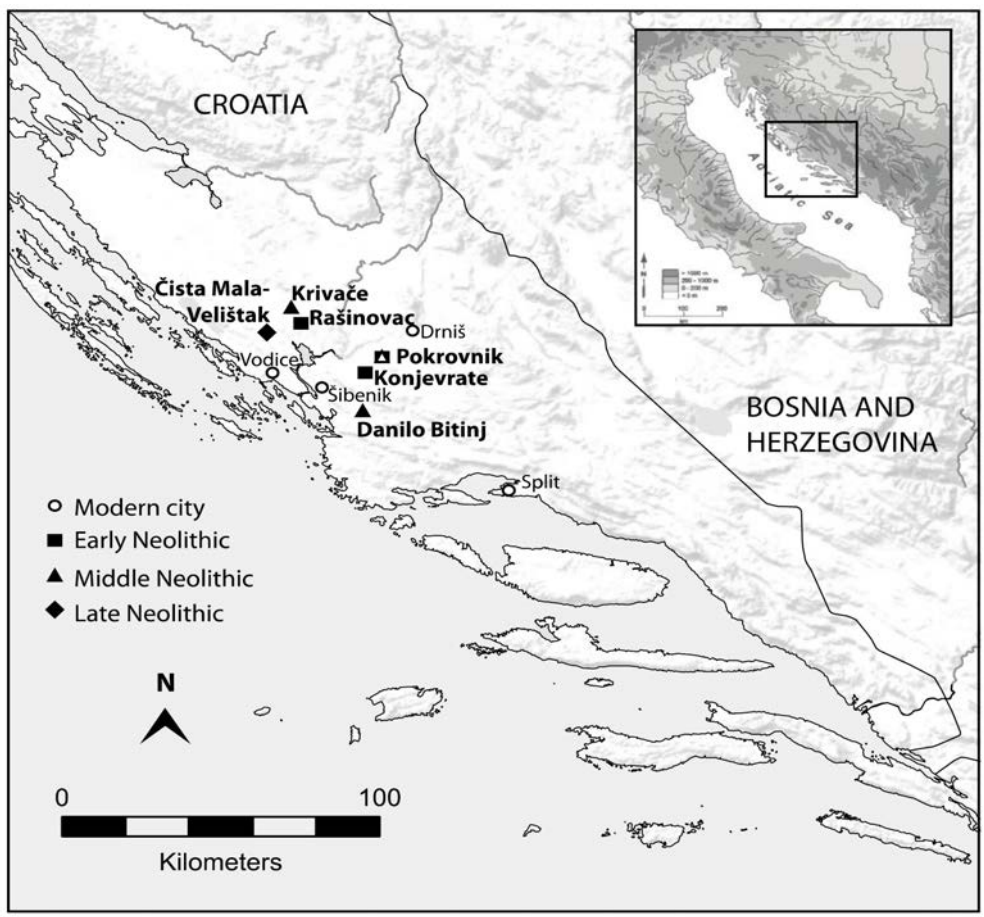

Figure 1. Location map of Pokrovnik and Danilo, and other key sites mentioned in the text.

[34] Menđušić 1998: 52-55.

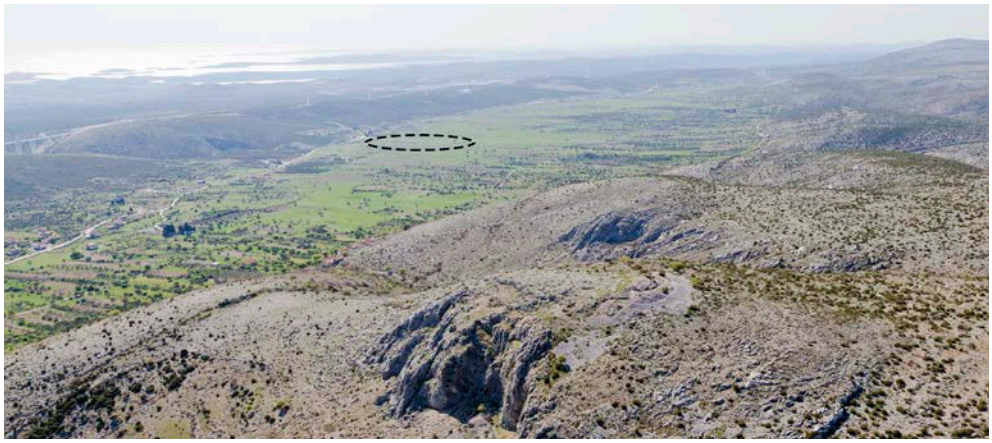

Figure 2. Aerial view of the Danilo Valley looking west. The site of Danilo Bitinj is in the middle distance; the Adriatic Sea is visible on the horizon (photo Šibenik Museum).

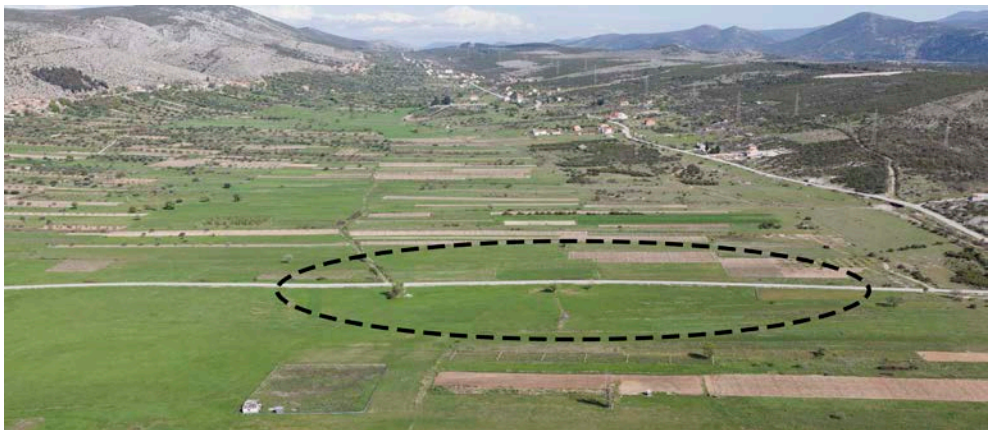

Figure 3. Aerial view of the site of Danilo Bitinj, looking southeast (photo Šibenik Museum).

Figure 4. View of the site of Pokrovnik from the northeast. The Pećina spring is in the grove of hackberry trees to the left of center.

History of research at Danilo Bitinj and Pokrovnik

The area surrounding the spring and well named Bitinj in the Danilo Valley was known to be a prehistoric site long before the first excavation there, due to the numerous surface finds uncovered by local villagers in their vineyards. In the summer of 1951 Professor Duje Rendić Miočević, the excavator of the nearby Roman villa, placed a small test trench in the vicinity of the Bitinj well in order to examine the precise location and character of the site. The trench gave positive results with a large quantity of finds, especially pottery fragments of an unknown prehistoric culture.[35] It was clear that this site merited more attention.

Danilo Bitinj was excavated by Professor Josip Korošec in the summers of 1953 and 1955, under the aegis of the Yugoslavian Academy of Science and Art and in collaboration with Ivan Marović, Curator of Prehistory at the Archaeological Museum of Split, and Frano Dujmović, Director of the City Museum of Šibenik. It was one of the first excavations of a Neolithic site in Dalmatia and perhaps the most extensive excavation of a Neolithic village in the Adriatic region to date. Korošec opened three large trenches on three strip fields, and a set of smaller test trenches in neighboring land parcels. A total area of around 2,500 m2 was explored and part of a much larger settlement revealed. Between humus and sterile subsoil, the average thickness of the cultural layers ranged from 0.60-1.00 m. Korošec found no traces of dwellings except isolated fragments of burned daub wall with wattle impressions. He identified a simplified vertical stratigraphy, which should be attributed to the pioneer character of his excavation methods. The only structures revealed were circular or irregularly shaped pits dug into the subsoil. But finds were numerous: besides stone, flint and bone artifacts the most intriguing was the pottery assemblage. This included vessel shapes and techniques of ornamentation that differed from other eastern Adriatic Neolithic cultures known at that time. Korošec named this new assemblage the Danilo culture, and placed it in the Middle Neolithic.[36]

[35] Korošec 1952.
[36] Korošec 1958-1959.

In the several decades that have followed, intensive research into the Neolithic, both on open area and in cave sites, has shown that the Danilo culture and its local variants covered most of the eastern Adriatic coast and its hinterland.[37]

The next excavation at Danilo was undertaken in 1992 by Menđušić. Part of the site was endangered by construction work surrounding the resurfacing of the cross-valley road. In a salvage excavation Menđušić opened two trenches measuring around 60 m^2 in area. This time, irregularly preserved traces of a floor of a dwelling, a hearth and many fragments of house daub were found, besides a large quantity of pottery and other small finds.[38]

The Neolithic site in the village of Pokrovnik was discovered in 1979 during tractor plowing in the vineyards, close to the Pećina spring at the foot of the hill topped by the church of Sveti Mihovil (Saint Michael) (Figure 4). Immediately after, in the summer of 1979, Professor Zdenko Brusić, then Curator of Prehistory in the City Museum of Šibenik, conducted a partial rescue excavation. He opened seven trenches of varying dimensions on three strip fields. In total, he explored an area of 114 m^2. As the depth of the trenches varied from 0.45 to 2.05 m from the subsoil to the modern land surface, so did the thickness of the Early and Middle Neolithic layers; in the deepest trenches these were correspondingly substantial, that is about 1 m each. Besides a large quantity of small finds, Brusić also found traces of hearths and drystone walls. Results of the pottery analyses revealed that Pokrovnik contained substantial deposits of Early Neolithic ("*Impresso*" or Impressed Ware culture) and Middle Neolithic (Danilo culture) and, based on a small number of pottery fragments in the surface layers, a Late Neolithic (Hvar culture) phase also.[39]

There were no further excavations at the site until we began work in 2006.

[37] Batović 1979: 524-526.
[38] Menđušić 1993, 1998.
[39] Brusić 1979; Brusić 2008; Menđušić 1995: 18-23; Menđušić 1998: 52-54; Menđušić 2005: 90-92.