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PROJECT »EARLY FARMING IN DALMATIA«:
DANILO BITINJ 2004–2005

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The Middle Neolithic site Danilo Bitinj was excavated in 2004 and 2005, as part of an interdisciplinary project Early Farming in Dalmatia. The aim of the project is to investigate the spread of farming from western Asia to Mediterranean Europe and its further development, using a regional approach (Central Dalmatia). Besides archaeological excavation, this also includes geomorphological, botanical, zoological, malacological and ethnological investigations. Preliminary results show that the Neolithic inhabitants of the Danilo valley lived in a complex village and were practicing full-time farming.

AIMS OF THE RESEARCH

The *Early Farming in Dalmatia* project is investigating the spread of agriculture from western Asia to Mediterranean Europe and the subsequent development of this new way of life there. We seek greater understanding of these vital processes because they are an important example of how farming expanded from a major centre of inception to the mid latitudes of the rest of the Old World. The coming of agriculture established the economic and social foundations for all later

cultural developments in Europe. Herein lies its significance for archaeology. The Dalmatian coast provides an excellent case study for examining the spread of agriculture because it forms a distinct geographical zone facing the Adriatic Sea, and separated from the interior of south-eastern Europe by the Dinaric Alps. It appears to have participated fully in a presumably largely maritime expansion of farming around the central and western Mediterranean.

In the past much research on the Neolithic in Dalmatia has concentrated on investigating cave sites because they contain evidence of long-term cultural changes (for example NOVAK 1955; ČEČUK – RADIĆ 2005; MARIJANOVIĆ 2005). Such sites are usually located in the karst hills and mountains, places that were unsuitable for agriculture. Consequently, they rarely offer information on the practice of farming. We have decided to investigate two Neolithic open village sites (Danilo Bitinj and Pokrovnik) in relatively rich agricultural zones because they are more likely to yield the kinds of evidence that we seek. The most favourable locations for such sites are in the fertile valleys of central Dalmatia. This region may be contrasted with other sectors of the Dalmatian coast where the mountains fall straight into the sea, leaving little space for farming in the present or the past.

The project is a collaboration between City Museum of Šibenik (represented by M. Menđušić, E. Podrug), City Museum of Drniš (J. Zaninović) and Rochester Institute of Technology, U.S.A. (Dr. A. Moore). Funding is provided by these institutions, Croatian Ministry of Culture, and the National Science Foundation and National Geographic Society, U.S.A. Several other institutions in Croatia, the United States, and the United Kingdom are also participating in the research.

NATURE OF THE FIELD RESEARCH

The project is an interdisciplinary one that aims to increase understanding of the development of farming using a regional approach. This includes archaeological excavation of representative sites, geomorphological investigations, and vegetation surveys, among other methods. We need to understand the nature of the landscape in which farming developed, and how it changed in later millennia under the impact of cultivation and herding.

Our research at Danilo Bitinj (located in Danilo valley, cca 18 km east of Šibenik) began with a ground penetrating radar (GPR) survey of part of the central portion of the site in 2003 (MOORE – MENĐUŠIĆ 2004). In the second season, from 3 June to 8 July 2004, we extended the GPR survey and also excavated one trench at Danilo, Trench A (MENĐUŠIĆ 2005). Then in the third season, 30 May to 16 July of 2005, we extended the excavation of Trench A and dug four more trenches, B, C, D, and E (PODRUG 2007). All the trenches were located towards the middle of the site but were spaced up to 100 m apart in order to enlarge our understanding of the archaeological sequence at Danilo and the nature of the structures there. Most of the trenches were dug in areas where the GPR survey had shown there to be a strong probability of finding significant archaeological features. Besides collecting usual archaeological artifacts, the major aim of the excavation was to recover large samples of plant remains and animal bones from each trench. To this end, we used a total recovery strategy in which all excavated soil was passed through dry sieves (1 cm mesh) and/or the flotation system. Plant remains were recovered through flotation in sieves with a mesh size of 250 microns; the soil residue was then washed in sieves with a 1 mm mesh. This ensured nearly complete recovery of all the economic evidence as well as artifacts.

We carried out a survey of the area covered by the site and its vicinity using the standard method of field walking, complemented by the mapping techniques deployed by our geological colleagues. The survey demonstrated that the archaeological site was much more extensive than we

had anticipated, covering an area of perhaps 9 ha. This makes it one of the most extensive Neolithic sites in southern Europe (Figure 1).



Figure 1. View of the Danilo valley from the east. The area covered by the site is within the dashed line.

A major objective of the geomorphological part of the research was to map the Danilo Valley in great detail. A second aim was to understand how the surface topography, soils, and drainage had changed from the Late Pleistocene through the Holocene. This research, undertaken by Professors Robert Giegengack (University of Pennsylvania) and Jennifer Smith (Washington University in St. Louis), and their students, has yielded valuable initial insights.

ARCHAEOLOGICAL RESULTS

Our excavations confirmed that, at least in the areas we investigated, the bulk of the deposits were of the Danilo culture, or Middle Neolithic phase. This accorded with previous research at the site by Josip Korošec (KOROŠEC 1958; 1964) and Marko Menđušić (MENĐUŠIĆ 1993; 1998: 49). We had assumed that we would find broadly similar features to those excavated by Korošec. Our research indicated, however, that the layout of the site was considerably more complex than his results had suggested. Each trench yielded distinct features. In three trenches the earliest occupation consisted of pits dug into the subsoil (Figure 2). In Trench B, however, the earliest feature was a massive ditch. Later, the ditch was filled in and the whole area was covered by a stone pavement covered with abundant remains of habitation debris. In Trench A there were fragmentary stone walls, many hearths and spaces with dense occupation debris. We also found two child burials in this trench. In Trench C we observed traces of rectangular houses as well as stone boundary walls.

Menđušić had excavated a trench in 1992 beside the road that bisects the site. He had found part of a house there so we decided to excavate nearby to try to expand on this information. The earliest occupation in our Trench E was represented by two large, deep pits. In the final phase of use of these pits their rims were delineated with clay walls. Contemporary with this late phase of occupation, a rectangular house was built beside the pit dwelling. Although the clay walls of this



Figure 2. Trench C, from the west. A number of pits have been dug into the marl subsoil (scale 1 m).

structure survived only a few centimeters high, it was possible to determine how it had been built. First, two parallel lines of stakes were set in place 0.2 m apart along the lines of the walls (Figure 3). The tips of these stakes had been trimmed, leaving characteristic impressions in the subsoil (Figure 4). Then brush was forced between the lines of stakes to make a wall. Presumably this structure was held together with withies. Then clay was applied to the surfaces of the wall, and probably added as a binder within the wall itself.

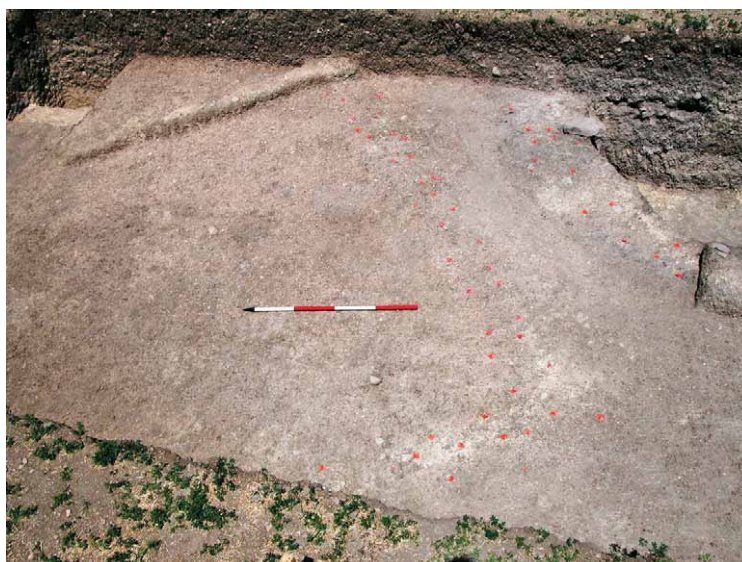


Figure 3. Trench E, from the south. Two lines of stake impressions (marked by labels) in the subsoil under the walls of a house (scale 1 m).

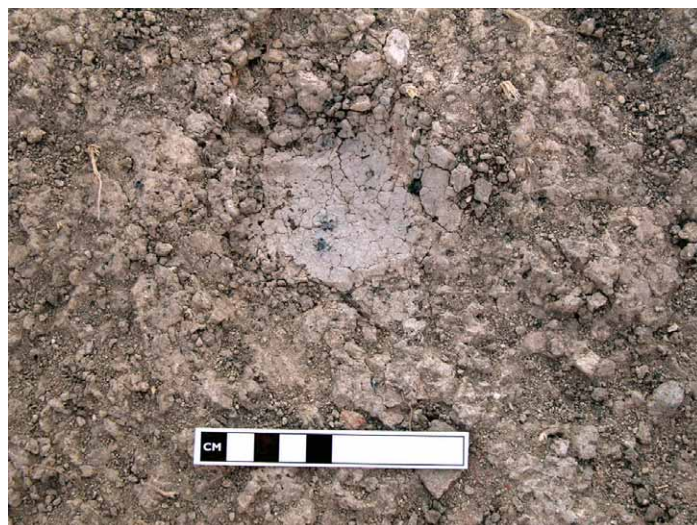


Figure 4. Trench E. A single stake impression in the subsoil under the house wall (scale 10 cm).

By far the largest single category of artifacts was the potsherds. Among these was the typical range of Danilo culture's vessel forms. We found a number of fragments of the »rhytons« with their usual exuberant decoration. Many of the vessels were decorated with incised designs, including the well-known spirals. A few had red or white incrustation in the incised designs. Other categories of artifacts represented in more modest quantities included bone tools, grinding and other stone tools, obsidian, and chipped stone, all typical finds on sites of this kind. The artifacts will require considerable further analysis in the next phase of the project.

EVIDENCE FOR THE ECONOMY OF THE SITE

Professor Anthony Legge (University of Cambridge) was present on site in the 2004 and 2005 seasons. He recorded and analysed the bones as they were excavated, and has provided a preliminary summary of the percentages of animals represented in all levels at Danilo Bitinj. These are given in the following table (2,280 bones identified):

Domestic Species	English	Croatian	Trench A	Trench B	Trench C	Trench E	Total %
<i>Ovis aries</i> , <i>Capra aegagrus</i>	sheep, goat	ovca, koza	81.6	60.0	72.0	83.1	79.4
<i>Bos taurus</i>	cattle	govedo	15.7	32.8	25.0	12.6	17.4
<i>Sus scrofa</i>	pig	svinja	1.3	4.8	0	0	1.4
<i>Canis familiaris</i>	dog	pas	0.9	1.6	0	0	0.7
Wild Species							
<i>Cervus elaphus</i>	red deer	obični jelen	0.5	0.8	3.0	1.0	0.6
<i>Lepus capensis</i>	hare	zec	0	0	0	3.3	0.5

The results largely speak for themselves. The inhabitants exploited domestic animals almost exclusively, and of these sheep and goats were by far the most numerous species.

Dr. Drago Marguš (National Park Krka) has identified specimens of at least 15 species of marine shells from Danilo, a much larger number than hitherto known from Neolithic sites in the region (MARGUŠ – MENĐUŠIĆ – MOORE 2005). By far the most numerous were shells of the edible cockle or cardium shell, *Cerastoderma glaucum*. These were often found in batches as though dumped after cooking. While the total food value of these shells was probably quite modest, they do seem to have been eaten regularly in all phases of occupation. They also demonstrate that the inhabitants made frequent trips to the nearby seashore, the closest one being in Morinje bay, less than 5 kilometers far to the south-west.

Dr. Susan College (University of London), archaeobotanist, and her student Kelly Reed were also present on the site during the excavation. They have identified most of the charred seeds recovered in flotation. The more significant of these for the economy are listed in the following table:

Species	English	Croatian	Number of fragments
<i>Triticum monococcum</i>	einkorn	jednozrna pšenica	193
<i>Triticum dicoccum</i>	emmer	dvoznica pšenica	25
<i>Triticum aestivum</i>	free-threshing wheat	obična pšenica	3
<i>Hordeum sativum</i>	hulled barley	ječam	66
<i>Avena</i> sp.	oats	zob	6
<i>Linum usitatissimum</i>	flax	lan	8
<i>Lens</i> sp.	lentil	leća	2
<i>Lathyrus sativus</i>	grass pea	sjetvena kukavičica (sjetvena graholika)	3
<i>Rubus fruticosus</i>	blackberry	kupina	308
<i>Pistacia</i> sp.	pistachio	pistacija	4

The results confirm that at least three species of domestic wheat and one of barley were cultivated at Danilo, as well as an array of pulses and other plants. Some wild fruits and nuts were also collected.

While still preliminary, the evidence from the animal bones and plant remains indicates that the inhabitants of Danilo were full-time farmers, growing a range of crops and maintaining flocks and herds of domestic animals. Their use of wild plants and animals appears to have been minimal. Thus, at least by the Middle Neolithic the inhabitants of this valley in central Dalmatia were practicing full-scale farming based largely on species that had been domesticated much earlier in western Asia and brought in from there.

ACCELERATOR RADIOCARBON DATES

An important objective of the project is to obtain a comprehensive set of accelerator radio-carbon (AMS) dates for Danilo. This will help us establish the chronology of the site itself and, by extension, contribute to building a firm timetable for the development of farming in central Dal-

matia. We plan to obtain at least two dates from each of the main trenches excavated. The samples for dating are composed of a single identified charred seed or bone from a domestic plant or animal, whenever possible. This serves two purposes, to document the occurrence of these domesticates at Danilo, and to date the levels from which each sample derives. Our collaborator in this exercise is the Radiocarbon Laboratory of the University of Oxford. Thus far, the Oxford Laboratory has provided five AMS dates, given in the table below:

Trench	Level	Sample Material (all domestic species)	Laboratory Number	Date BP	CalBP @ 95.4% confidence	CalBC @ 95.4% confidence
A	17	<i>Ovis</i> (sheep), right calcaneum	OxA-14449	6,284 ± 40	7,159–7,275	5,341–5,330 5,323–5,206 5,176–5,141 5,115–5,078
A	31	<i>Triticum dicoccum</i> (emmer), charred grain	OxA-15764	6,226 ± 37	7,253–7,010	5,310–5,190 5,180–5,060
A	46	<i>Triticum dicoccum</i> (emmer), charred grain	OxA-15681	6,180 ± 34	7,158–7,019	5,230–5,010
B	24	<i>Triticum monococcum</i> (einkorn), charred grain	OxA-15680	5,987 ± 35	6,931–6,737	4,990–4,780
E	14	<i>Triticum monococcum</i> (einkorn), charred grain	OxA-15765	6,245 ± 39	7,262–7,019	5,320–5,200 5,180–5,060

The dates indicate that a mixed farming way of life was firmly established in the Danilo valley 7,000 years ago. In all probability, it began well before that.

These dates also begin to resolve one other question. We now know that Danilo was a very extensive site. It would be reasonable to assume, however, that the actual area inhabited at any one time had been much smaller than the entire spread of occupation debris, and that the focus of the settlement had moved horizontally. Korošec himself suggested as much based on the results of his own excavations. Our results from trenches often dug quite close to his, reveal that the prehistoric inhabitants had created different structures in each area investigated. Furthermore, the sequences of occupation in each trench also varied. It follows that there are at least two explanations for the patterns we have observed. The nature of the occupation at the site may have changed over time. Or perhaps the different structures encountered in the various trenches were in use at approximately the same time, but the layout of the site was more complex than anticipated.

The AMS date from Trench B may indicate that the deposits there are slightly later than elsewhere, but there seems no need as yet to insist on this. Otherwise, the dates overall suggest that the deposits in each trench were laid down at approximately the same time. Thus, the dates tend to support the view that different activities were being carried out across the site contemporaneously. This suggests that patterns of activities and, perhaps, social organization were more varied than we would have anticipated for a Neolithic village. A further preliminary observation may be offered. It looks as though the sequence of occupation in each trench built up over a brief period of a few centuries. Only further dating, and careful analysis of the artifacts, can resolve this issue. We have submitted more samples for dating to the Oxford Laboratory and will report on the results when they are available.

GEOMORPHOLOGICAL RESEARCH

Giegengack and Smith conducted a comprehensive reconnaissance of the Danilo valley and were able to arrive at a preliminary determination of its recent geological history. We quote from their field report:

»The Danilo valley is one of the few depressions in central Dalmatia that is today drained, in part, by a network of surface streams. Dabar, a small stream that flows into the Adriatic south of Šibenik, has cut headward through the ridge that bounds the Danilo valley along its south-western margin, and now drains the floor of the valley. Thus, rain that falls on the ridges adjacent to the valley and on the floor of the valley itself flows across the valley floor in a network of ill-defined tributaries to the Dabar stream; water that is not lost to the cavernous subsurface drainage leaves the Danilo valley via the meandering canyon of the Dabar. The two main tributaries of the Dabar run along the south-west margin of the valley, at the base of the slopes formed across the valley floor by accumulation of alluvial sediment carried off the ridge along the north-east margin of the valley.

For most of its history, the Danilo valley has been a depression being filled by sediment carried off the north-east ridge (and to a lesser extent, off the south-west ridge) by short streams draining those ridges. While all the sediment was retained within the valley, the water that carried that sediment to the valley floor escaped the depression via subsurface drainage. At the moment that the Dabar breached the ridge that defines the valley to the south-west and began to carry surface runoff directly to the Adriatic, the landscape within the valley was converted from one of accumulating sediment to one characterized by stream erosion, however subtle. In the years since it first breached the valley, the stream Dabar has carried away an unknown thickness of alluvial sediment, exposing in the process the sediment enclosing the Danilo site, and cut its principal channels into bedrock along the south-west margin of the valley.«

These preliminary observations help to explain the sedimentary history of the Danilo valley, and why the surface of the site of Danilo Bitinj is exposed and actively eroding away. Much remains to be learned, however, about the detailed development of the surface geology of the valley before, during, and after the occupation of Neolithic Danilo. This will help to explain the location of the site and the agricultural system itself.

CONCLUSION

The 2004 and 2005 seasons at Danilo Bitinj were most successful in that we achieved all our immediate objectives. The initial results confirm that by the Middle Neolithic the many inhabitants of the site were living in a very extensive village that clearly dominated the region. The different activities represented in each of the trenches suggest that the organization of the site was unusually complex, reflecting perhaps some variations in social arrangements. The inhabitants were apparently full-time farmers who raised a range of cereals, pulses and other crops, and also maintained flocks of sheep and herds of cattle. These agricultural activities would have had a severe impact on the surrounding landscape.

The project is achieving such significant results because it represents a most happy, and effective collaboration of scientists from Croatia, the U.S.A. and elsewhere.

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SAŽETAK

PROJEKT »RANO POLJODJELSTVO I STOČARSTVO U DALMACIJI«:
DANILO BITINJ 2004 – 2005

Arheološka iskopavanja na neolitičkom nalazištu Danilo Bitinj, provedena 2004. i 2005. godine, dio su projekta *Early Farming in Dalmatia* koji se ostvaruje u suradnji Muzeja grada Šibenika, Gradskog muzeja Drniš i Rochester Institute of Technology (USA), sa sudjelovanjem i brojnih stručnjaka iz drugih institucija iz Hrvatske, SAD-a i Velike Britanije. Projekt je interdisciplinaran, te podrazumijeva arheološka, botanička, zoološka, malakološka, geomorfološka i etnološka istraživanja. Cilj je dati nove i potpunije podatke o širenju poljodjelstva i stočarstva iz zapadne Azije u europski dio Sredozemlja koristeći se regionalnim pristupom (srednja Dalmacija), te daljnjem postupnom lokalnom razvoju novog, neolitičkog načina života. Kako je naglasak istraživanja dat ekonomiji neolitičkog naselja, osim klasičnog iskopavanja uz praćenje arheološke stratigrafije, korištene su i metode suhog prosijavanja, te flotacije iskopane zemlje, radi prikupljanja što većeg i raznovrsnijeg broja uzoraka biljnog i životinjskog porijekla.

Prema rezultatima dosadašnjih istraživanja segmenata nalazišta i rekognosciranja šireg prostora uokolo bunara-vrela Bitinj, proistječe da je srednjoneolitičko selo zauzimalo mnogo veću površinu od dosad pretpostavljene, oko 9 hektara. Nakon georadarskog snimanja terena (2003. i 2004. godine), otvoreno je 5 sondi (A, B, C, D, E), na mjestima koja su nakon iskopavanja J. Korošeca (1953. i 1955. godine) i M. Menđušića (1992. godine) ostala neistražena. U svim su sondama otkriveni ostaci stambenih prostora ili prostora druge namjene: najraniji horizont obuhvaćaju kompleksi kružnih jama i jaraka ukopanih u žutu zdravicu, nakon čega u vertikalnoj stratigrafiji slijede mlađi ostaci kamenih pravocrtnih temelja zidova, temelji pravokutne nastambe načinjene konstrukcijom kućnog lijepa (sa ostacima kružnih udubljenja od kolaca i pojačanjem od nabijene gline), popločenja od nepravilnih lomljenaca i brojna vatrišta. U sondi A otkrivena su i dva dječja

ukopa. Obilje pokretnog materijala (keramika, kremeno i kameno oruđe, koštane alatke i dr.) ima karakteristike srednjeg neolitika, odnosno danilske kulture.

Geomorfološkim istraživanjima svrha je ispitati karakter i potencijal tla, odnosno krajolika na kojem je došlo do razvoja poljodjelstva i stočarstva, kao i utjecaj i promjene koje je neolitička privreda imala na širi prostor koji je naselju gravitirao. Prema rezultatima arheozooloških analiza, proistječe da gotovo 99 % sakupljenih kostiju pripada uzgojenim, domaćim životinjama. Arheobotanički uzorci također upućuju da su, u pogledu biljnog dijela ishrane, glavnu ulogu imale domesticirane vrste (3 vrste pšenice, ječam, mahunarke). Nadalje, identificirano je 15 vrsta morskih školjka, među kojima u velikom postotku prevladava jestiva srčanka (*cardium*). Kalibrirani AMS datumi 5 uzoraka iz različitih sondi i stratigrafskih jedinica nude vremenski raspon od svega nekoliko stoljeća (oko 5300–5000. g. prije Krista), s iznimkom uzorka iz sonde B (južni rub naselja) koji je malo kasniji.

Iako preliminarni, dosadašnji rezultati projekta donijeli su nekoliko važnih zaključaka. Stanovnici Danilskog polja su tijekom srednjeg neolitika živjeli u prostranom naselju koje je vjerojatno dominiralo širim područjem. Raznolikost stambenih i drugih struktura ustanovljenih u svim sondama, a datiranih u relativno kratak vremenski period, ukazuje da je organizacija naselja bila neobično kompleksna. Nadalje, stanovnici su prakticirali poljodjelstvo i stočarstvo u punom opsegu, oslanjajući se tek u minimalnom postotku na lov i sakupljanje divljih plodova.

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