

## NAVIGARE NECESSE EST, VIVERE NON EST NECESSE: RAZMIŠLJANJA O PRAPOVIJESNOJ PLOVIDBI MEDITERANOM I JADRANOM

Spoznaje o prvim plovnim ekspedicijama Mediteranom u posljednjih su petnaestak godina značajno porasle, kako uglavnom indirektnim dokazima o plovidbi tako i saznanjima kada su one najranije poduzimane. U ovome se radu donosi pregled dosadašnjih spoznaja o najranijoj plovidbi Mediteranom te razmatra kada je do prvih takvih poduhvata moglo doći na Jadranu kao specifičnom dijelu Sredozemnog prostora. Naglašena je problematika plovidbe između italske i hrvatske obale u okvirima pretpostavki kako su te maritimne ekspedicije mogle biti ostvarivane u neolitičkom razdoblju temeljem distribucije opsidijana s Eolskih otoka. Također, navedena su praktična razmišljanja o pitanju uporabe plovila pogonjenih na vjetar u doba kasnog neolitika.

KLJUČNE RIJEČI: *plovidba, prapovijest, Mediteran, Jadran, plovilo, neolitik, trgovina, opsidijan, jedro*

Plovidba morem ima posebno mjesto u živoj tradiciji obalnih naroda Mediterana. Nepredvidljive čudi mora i njihovo savladavanje stvarali su pjesme, mitove i legende, a mornare činili posebnom kategorijom ljudi čija se iskustva ne mogu uspoređivati s „običnim“ životom onih koji ne plove. To se osobito dobro primjećuje kod stanovnika Grčke čija je naglašena otočka razvedenost dovela do toga da je plovidba u svakom smislu značila opstanak i borbu za goli život. Antički grčki i rimski pisci, obilazeći obale i mora, prenoseći legende o mornarima i nemanima, opisuju pojave koje ondje primjećuju. Aristotel tako piše o strujanjima kroz brojne mediteranske tjesnace, Polibije o Bosporu, a Teofrast o ponašanju vjetrova. Nadalje, znameniti „ravnatelj“ Aleksandrijske biblioteke Eratosten također je, kao i Strabon, dao svoja opažanja o moru.<sup>1</sup> Apolonije

## NAVIGARE NECESSE EST, VIVERE NON EST NECESSE: REFLECTIONS ON THE PREHISTORIC SEAFARING IN THE MEDITERRANEAN AND ADRIATIC

In the past fifteen years we have substantially improved our knowledge of the seafaring expeditions in the Mediterranean, based either on the indirect evidence of the navigation or on what we know about the earliest such ventures. This paper presents an overview of what is known about the earliest navigation in the Mediterranean and considers the possible origins of the first such ventures in the Adriatic as a specific part of the Mediterranean. It focuses on the problem of the navigation between the Italic and Croatian coasts, tackling the possibility of such maritime expeditions based on the distribution of the obsidian from the Aeolian Islands. It also ponders on the practical aspects of the use of sailing vessels in the Late Neolithic.

KEYWORDS: *seafaring, prehistory, Mediterranean, Adriatic, vessel, Neolithic, trade, obsidian, sail*

Seafaring has a special place in the living tradition of the coastal nations of the Mediterranean. The whimsical seas and adventures on them have inspired poems, myths and legends, making seafarers a special breed of men whose experience cannot be compared with the “ordinary” lives of “landlubbers”. This particularly went for the Greeks, to whom seafaring meant life and survival due to their well-indented coast and islands. Traveling shores and seas and retelling legends of sailors and sea monsters, the ancient Greek and Roman authors also wrote about what they had seen on their journeys. Aristotle writes about the sea currents in numerous Mediterranean straits, Polybius describes Bosphorus and Theophrastus gives details about winds. Eratosthenes, the famous “director” of the Alexandrian Library, also gives an account of sea; so does Strabon.<sup>1</sup> In his great epic *Argonautica*,

<sup>1</sup> J. MORTON, 2001, 44; T. BILIĆ, 2004, 239-247.

<sup>1</sup> J. MORTON, 2001, 44; T. BILIĆ, 2004, 239-247.

Rođanin u svom značajnom djelu *Pjesma o Argonautima* (Αργοναυτικά) opisuje ponašanje mora pišući o pustolovinama mornara na mitskom Argu u vrijeme potrage za zlatnim runom (Ap.Rhod.Arg. 1-4). Taj višestruko opisivan i opjevan odnos ljudi i mora intenzivno se osjeća i danas. Grčke izreke *Πιστόν γη, απιστον θάλασσα* („Vjerno kopno, nevjerno more“) i *Η θάλασσα 'ναι γαλανή μα ο έρας τή μανρίζει* („More jest modro, ali ga vjetar pretvara u tamu“) naglašavaju promjenjivu sreću mornara i sudbine plovila na moru.<sup>2</sup> Izrekama, Argonautima, Apoloniju, Eratostenu itd. zajednički je nazivnik u ovom slučaju svakako Mediteran. Manje od jednog postotka globalne vodene površine, ali po kulturološkoj ostavštini najzanimljivije i najbogatije more i priobalje na svijetu, gotovo je izoliran, maritimni sustav koji prima vodu, regulaciju temperature, koncentracije soli i druge komponente od Atlantika kao glavnog izvorišta svoje vodene mase. Sastavljen je od dva, gotovo jednaka dijela (zapadni i istočni), koji su razdvojeni otprilike u ravnini Sicilije glasovitim Mesinskim tjesnacem. Struje, čiji smjerovi i intenziteti predstavljaju rezultantu izmjene vode kroz tjesnace, te utjecaji vjetrova i strujanja između svježje vode i temperaturnih tokova neki su od posebno važnih faktora za život na Sredozemlju.<sup>3</sup> Svake sekunde (u godišnjem prosjeku) iz Mediterana ispari više od 115 000 m<sup>3</sup> vode, od koje se samo manji dio (oko četvrtine) nadomjesti rijekama i oborinama. Ostatak izgubljene mase obnavlja se vodom iz Atlantika te djelomično preko Helesponta, odnosno Crnoga mora.<sup>4</sup> Naime, preko Gibraltarskog tjesnaca dolazi golema masa površinske, nešto manje slane vode, koja uzrokuje glavno mediteransko strujanje u smjeru Levanta (istoka) od oko 3 čvora u razdoblju ljetnih mjeseci kada je vaporizacija najintenzivnija (čak i dubinske vode Mediterana kreću se prema istoku) (Sl. 1a). Otprilike sjeverno od Egipta strujanja se podižu k sjeveru i „razbijaju“ pritiskom dotoka vode iz Crnoga mora te o razvedenu obalu grčkih otoka. Ovi čimbenici uvjetuju glavna strujanja Mediteranom u smjeru obrnutom od kazaljke na satu<sup>5</sup> (Sl. 1b).

in which he tells us about the crew of the mythical *Argo* and their quest for the Golden Fleece, Apollonius of Rhodes describes the sea and its phenomena (Ap.Rhod.Arg. 1-4). This frequently described and celebrated relationship between man and sea has been preserved in its full intensity to the present day. Greek sayings *Πιστόν γη, απιστον θάλασσα* (“Faithful earth, unfaithful sea”) and *Η θάλασσα 'ναι γαλανή μα ο έρας τή μανρίζει* (“The sea may be blue, but the wind turns it into darkness”) underline the seafarers’ shifting fortunes and the fate of ships on the high seas.<sup>2</sup> The Mediterranean Sea is certainly what these sayings, Argonauts, Apollonius, Eratosthenes etc. have in common. While accounting for less than one percent of the Earth’s oceans and seas, the Mediterranean and the surrounding region are perhaps the most interesting and – culturally and historically – the richest part of the world. It is an almost isolated maritime system whose water intake, temperature regulation, salt concentration and other components depend on the Atlantic Ocean as the principal source of its water mass. It is made up of two almost identical parts (Western and Eastern Mediterranean), with the well-known Strait of Messina off the coast of Sicily as the approximate dividing line between them. Sea currents (their directions and intensities depending on the water exchange in straits and water temperature differences) and winds are some of particularly important factors affecting the life in the Mediterranean.<sup>3</sup> More than 115,000m<sup>3</sup> of water evaporates from the Mediterranean every second (the annual average), with only small part of it (approx. one quarter) being compensated by rivers and precipitation. The rest of the loss is compensated with the water from the Atlantic Ocean and, to an extent, from the Black Sea via the Hellespont.<sup>4</sup> The huge mass of surface water (of somewhat lower salinity) coming in through the Strait of Gibraltar causes the main Mediterranean current moving eastward (to the Levant) at a speed of around three knots. It happens in summer months, when the evaporation is the most intensive and when even the deep water layer of the Mediterranean moves eastward (Fig. 1a). Somewhere north of Egypt, currents turn to the north and, intercepted by the incoming water from the Black Sea, hit the indented coast of the Greek islands. These are the factors causing the principal Mediterranean currents to flow in an anticlockwise direction<sup>5</sup> (Fig. 1b).

2 S druge strane izreka *Θάλασσα και πῦρ και γυνή κακά ρία* („More, vatra i žena tri su zla“) i hrvatska narodna „Ni u moru mjere, ni u ženi vjere“ stavljaju more uz bok drugoj, po mornarima i moreplovcima, najpromjenjivijoj pojavi u prirodi – ženi.

3 R. A. ROBINSON *et al.*, 2001, 1-2.

4 J. MORTON, 2001, 37; C. BROODBANK, 2006, 202.

5 J. MORTON, 2001, 38-39.

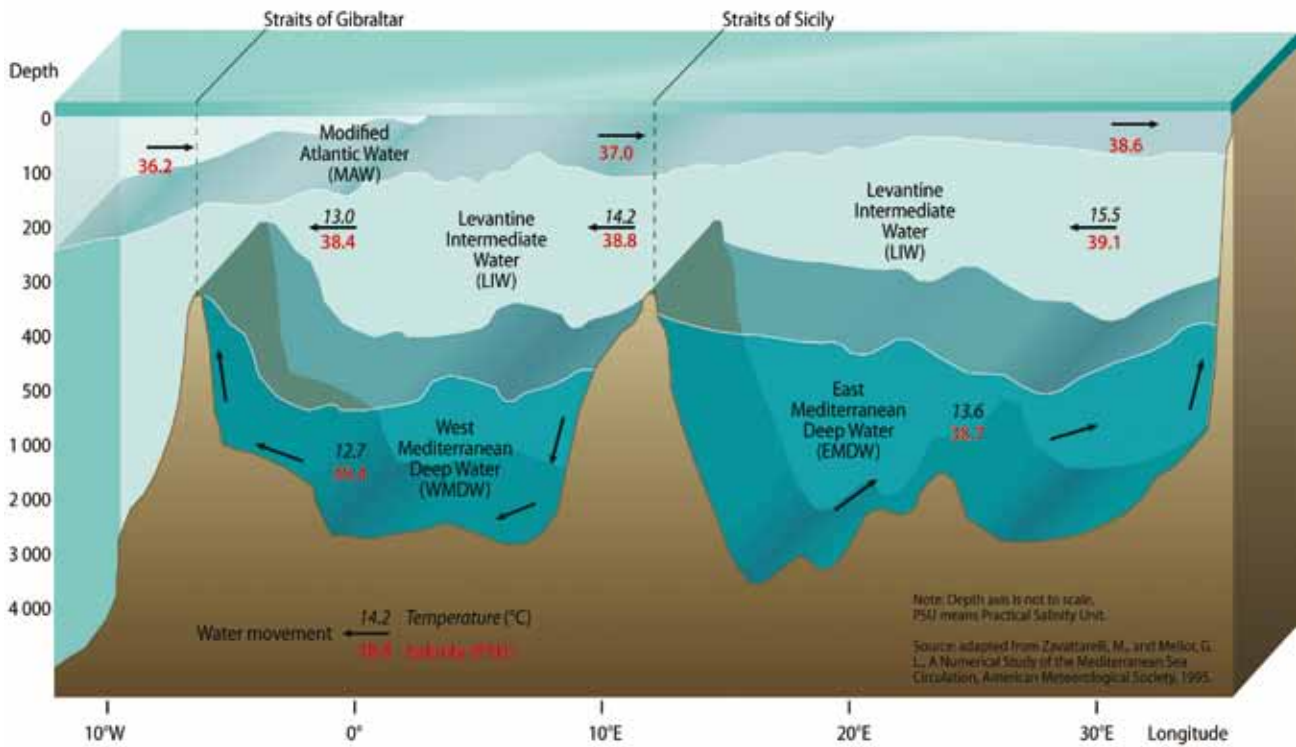
2 On the other hand, the saying *Θάλασσα και πῦρ και γυνή κακά ρία* (“There are three evils: sea, fire and woman”) and its Croatian equivalent compare the sea to the other – according to seafarers – most treacherous thing in the world: the woman.

3 R. A. ROBINSON *et al.*, 2001, 1-2.

4 J. MORTON, 2001, 37; C. BROODBANK, 2006, 202.

5 J. MORTON, 2001, 38-39.

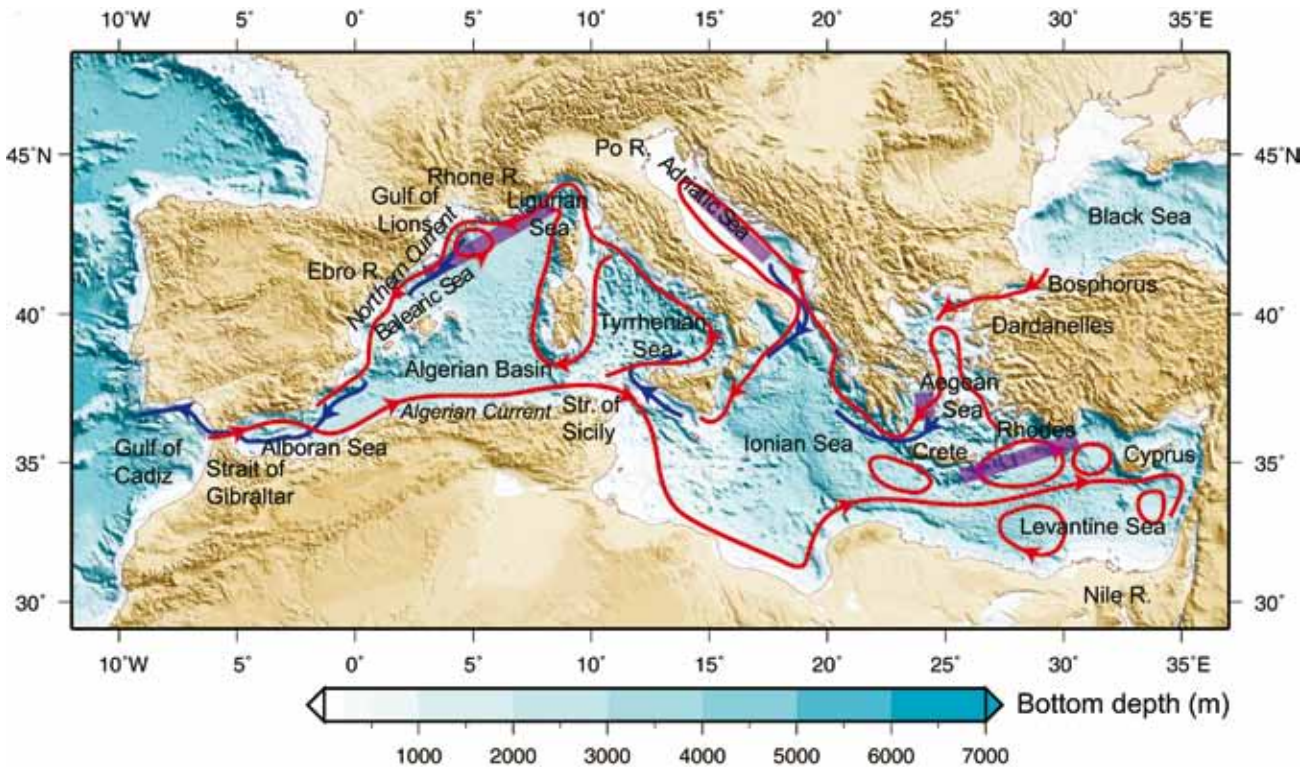
**Mediterranean Sea water masses: vertical distribution**



Sl. 1a. / FIG. 1a.

Prikaz površinskih i dubinskih strujanja u Mediteranu ([http://www.grida.no/graphicslib/detail/mediterranean-sea-water-masses-vertical-distribution\\_d84b](http://www.grida.no/graphicslib/detail/mediterranean-sea-water-masses-vertical-distribution_d84b)).

Surface and deep water currents in the Mediterranean ([http://www.grida.no/graphicslib/detail/mediterranean-sea-water-masses-vertical-distribution\\_d84b](http://www.grida.no/graphicslib/detail/mediterranean-sea-water-masses-vertical-distribution_d84b)).



Sl. 1b. / FIG. 1b.

Shema temeljnih morskih strujanja na Mediteranu (prema A. R. ROBINSON *et al.* 2001; C. MILLOT, I. TAUPIER-LETAGE, 2005). Major currents in the Mediterranean (according to A. R. ROBINSON *et al.* 2001; C. MILLOT, I. TAUPIER-LETAGE, 2005).

Djelovanja struja i vjetrova ključna su znanja koja su morala biti usvojena da bi planirano putovanje Sredozemljem bilo moguće. Ta znanja možemo shvatiti kao „teorijsku podlogu“ potrebnu da bi bilo koja plovidbena ekspedicija bila sretno i uspješno okončana. Danas je podloga u digitalnim navigacijskim uređajima, no u prošlosti, kao i u sasvim recentno doba, plovidba otvorenim morem ovisila je o iskustvu moreplovca koji je znanje nasljeđivao od prethodnika, usavršavao ga i tako osvajao sve veće udaljenosti od matične luke. Kada odemo dublje u prošlost, u doba prapovijesnih mornara, gotovo je neshvatljiva hrabrost bila potrebna za plovidbu koja je trajala dulje od dnevnog svjetla, od kopna do kopna (ili otoka) koji nemaju vizualni kontakt. Ipak, podatci o istraživanjima dvadesetak godina unazad pokazuju nam da su prvi moreplovci takve smione ekspedicije poduzimali već u paleolitiku.<sup>6</sup>

Mediteran se pokazuje kao jedno od dva mjesta na planetu na kojemu je arheološki evidentna rana prapovijesna plovidba bez koje bi on bio tek „barijera između Afrike i Europe“.<sup>7</sup> Pojava plovidbe koja ima određeni cilj (eksploatacija, kolonizacija i sl.) važan je događaj koji temeljito transformira obale i otoke. Obala iza koje se nalazi prostranstvo mora prestaje biti međa, mističan „kraj kopna“ Afrike, Azije i Europe te postaje medij kojim se kopna povezuju. Stvaranje fizičkih kontakata višestruko se zrcali u gospodarskoj isplativosti koja otvara nova tržišta i izvorišta polagano formirajući trgovačke ili eksploatorske rute koje se vremenom ustaljuju. Kultura, materijalnost i duh često su „s druge strane“ drugačiji od obale s koje se poduzima plovidba, stoga se višestruko povećavaju šanse za unosnu robnu razmjenu. Plovidba je, bez sumnje, prva aktivnost koja je transformirala obale na krajevima triju kontinenata u živu pozornicu kulturnih, tehnoloških i gospodarskih ambicija koje su bile zajedničke svim mediteranskim obalama.<sup>8</sup> I dok se donedavno smatralo da su najstariji naseljenici većine sredozemnih otoka neolitičke skupine kojima su *spiritus movens* uglavnom bila izvorišta sirovina, novija istraživanja upućuju na znatno starije prve plovidbe o čijim motivima u većini slučajeva možemo samo nagađati. Zdrav razum, kako navodi Kotsakis, nalaže da sve ono što

The knowledge of the current and wind action was crucial for navigation in the Mediterranean. This knowledge can be seen as the “theoretical basis” required for the safety and success of any seafaring expedition. The input for this basis is today provided by digital navigation devices, but in the past – as well as until very recently – sailing on the high seas depended on seafarers’ experience inherited from predecessors and improved over time in order to cover ever-farther distances from the home port. When we go further back in time, to the days of ancient mariners, it took mind-boggling courage to set sail on a voyage longer than daylight, to a land or island which was not in sight. And yet, the research carried out some twenty years ago indicates that seafarers undertook such daring expeditions way back in Paleolithic.<sup>6</sup>

The Mediterranean has turned out to be one of the two places on the planet where, based on archaeological evidence, early prehistoric crossings have been established, without which it would be but a “barrier between Africa and Europe”.<sup>7</sup> When the phenomenon of navigation with a predetermined goal (exploitation, colonization etc.) appeared, it was an important event that substantially transformed the coasts and islands. The coast beyond which lied an ocean stopped being a frontier, the mystical *finis terrae* of Africa, Asia and Europe; it became a medium linking land masses. The establishment of physical contacts was reflected in the profitability that created new markets and sources, slowly forming trade or exploitation routes that became stabilized over time. As the culture, material goods and spirit found “on the other side” were often different from the ones on the native shore, chances for a profitable trade increased severalfold. Navigation was, without a doubt, the first activity to transform the shores at the edges of the three continents into a live stage of the cultural, technological and economic ambitions of the entire Mediterranean.<sup>8</sup> Although it was believed until recently that the oldest settlers of most of the Mediterranean islands were the Neolithic groups whose *spiritus movens* were mostly sources of raw materials, the latest research suggests that the first crossings had been undertaken considerably earlier. We can only speculate about their motives. As Kotsakis puts it, common sense tells us that everything that is found on an island and that does not originate from it must have been brought from

6 C. BROODBANK, 2006; G. FERENTINOS *et al.*, 2010; F. T. STRASSER, 2010; F. T. STRASSER, 2011; A. B. KNAPP, 2012.

7 C. BROODBANK, 2006, 199, 208.

8 C. BROODBANK, 2006, 199.

6 C. BROODBANK, 2006; G. FERENTINOS *et al.*, 2010; F. T. STRASSER, 2010; F. T. STRASSER, 2011; A. B. KNAPP, 2012.

7 C. BROODBANK, 2006, 199, 208.

8 C. BROODBANK, 2006, 199.

se na otoku nalazi, a nije izvorno s njega, mora biti odnekuda dovezeno.<sup>9</sup> Slijedom te logike, jedna od najstarijih nedvojbenih plovidbi Sredozemljem jest ona Mesinskim tjesnacem dokazana na gornjopaleolitičkom, nešto više od tridesetak tisuća godina starom lokalitetu Fontana Nuova na jugoistoku Sicilije.<sup>10</sup> Pokreti kasnih neandertalskih skupina iz južne Italije na Siciliju objašnjavaju se kao posljedica tzv. prve flegrejske erupcije<sup>11</sup> koja je doslovno uništila taj prostor.<sup>12</sup> Sasvim je jasno da bilo kakvo naseljavanje otoka pretpostavlja i ranije, kratkoročne plovne ekspedicije koje su bile ključne za prilagodbu na život na otoku, one prilikom kojih se „kovao“ mornarski zanat. Spomenuta plovidba, odnosno njezini direktni tragovi arheološki su redovito nevidljivi, a namjena joj je bila proučavanje potencijala za eksploataciju resursa, kao i za prikupljanje temeljnih podataka o okolišu, stambenim potencijalima itd.<sup>13</sup> U posljednje vrijeme spoznaje o prapovijesnoj plovidbi istočnim Mediteranom potpuno su promijenile koncepte najstarije prošlosti grčkih Sporada, Kiklada, Krete ili Cipra, dakle ključnih sredozemnih otoka i otočja. Mnogi više ne sumnjaju u mogućnost tzv. *ultra-rane* plovidbe,<sup>14</sup> koja seže do neandertalaca ili čak ranijih hominina, dok se gornjopaleolitička uopće ne dovodi u pitanje jer je materijalno dokazana. Otoci Jonskog mora zapadno od Peloponeza pokazuju prve znakove kolonizacije negdje oko 110 000 godina prije sadašnjosti.<sup>15</sup> Pouzdano je utvrđeno da su jonska Itaka, Kefalonija i Zakintos u to vrijeme bili otoci na kojima se nalazi 15 do sada poznatih lokaliteta na otvorenom, iz razdoblja od srednjega paleolitika do mezolitika.<sup>16</sup> Niža razina mora činila je obalu grčkog kopna bližom, što je bio odlučujući čimbenik za prelazak na otoke tijekom posljednjega ledenog maksimuma (oko 18 000 godina prije sadašnjosti). Međutim, valja naglasiti činjenicu da je oko 100 000 godina prije sadašnjosti razina mora

some place else.<sup>9</sup> Following this logic, one of the oldest positively established crossings in the Mediterranean is the one across the Strait of Messina, evidenced at the more than 30,000-year-old Upper Paleolithic site Fontana Nuova in southeastern Sicily.<sup>10</sup> The migrations of late Neanderthal groups from southern Italy to Sicily are explained as a consequence of the so-called First Phlegreian Eruption<sup>11</sup> that annihilated the area.<sup>12</sup> Clearly, the pre-requisite for any organized settlement of an island is to undertake prior short-term expeditions to it, crucial for adaptation to insular life. Such expeditions were used for learning the seafaring trade. The purpose of the abovementioned first crossing (the direct archaeological traces of which are not visible) was to study the potentials for exploitation of resources and to gather basic information on the environment, dwelling possibilities etc.<sup>13</sup> The latest insights into the prehistoric seafaring in the Eastern Mediterranean have substantially changed our perception of the earliest past of the Greek archipelagos Sporades and Cyclades, Crete and Cyprus – the key Mediterranean islands. Many have stopped doubting about the possibility of the so-called *ultra-early* crossings<sup>14</sup> dating back to Neanderthals or even to earlier hominines, while the Upper Paleolithic ones have not been thrown into doubt at all because material evidence for them has been found. On the Ionian Islands, west of the Peloponnesus, traces of the first colonization dating back to approx. 110,000 years before present have been identified.<sup>15</sup> Fifteen open-air sites, ranging from Middle Paleolithic to Mesolithic, have been positively established so far on the Ionian islands of Ithaca, Cephalonia and Zakynthos.<sup>16</sup> Greek mainland was closer at the time due to a lower sea level – a decisive factor for moving to the islands during the Late Glacial Maximum (some 18,000 years before present). However, it should be noted that, around 100,000 years before present, the sea level was only twenty or so meters lower than today, which

9 K. KOTSAKIS, 2008, 52.

10 G. FERENTINOS, 2012, 2167.

11 *Campi Flegrei*, područje iznimne vulkanske aktivnosti, zapadno od Napulja. Grč. *Φλέγω* = izgorjeti. Erupcija o kojoj je riječ datirana je 39.28±110 BP, o čijoj jačini svjedoči podatak da je prilikom erupcije izbačeno oko 200 km<sup>3</sup> eruptivnog materijala.

12 C. BROODBANK, 2006, 207.

13 B. BASS, 1998, 175; A. B. KNAPP, 2010, 79.

14 C. BROODBANK, 2006, 200-205; A. SIMMONS, 2012, 895-896.

15 G. FERENTINOS *et al.*, 2012, 2167; A. SIMMONS, 2012, 895-896.

16 G. FERENTINOS *et al.*, 2012, 2170.

9 K. KOTSAKIS, 2008, 52.

10 G. FERENTINOS, 2012, 2167.

11 *Campi Flegrei*, an exceptionally active volcanic area west of Naples. Greek: *Φλέγω* = to burn out. The eruption in question was dated to 39.28±110 BP. Evidence of its strength is the fact that some 200 km<sup>3</sup> of material were ejected into the atmosphere.

12 C. BROODBANK, 2006, 207.

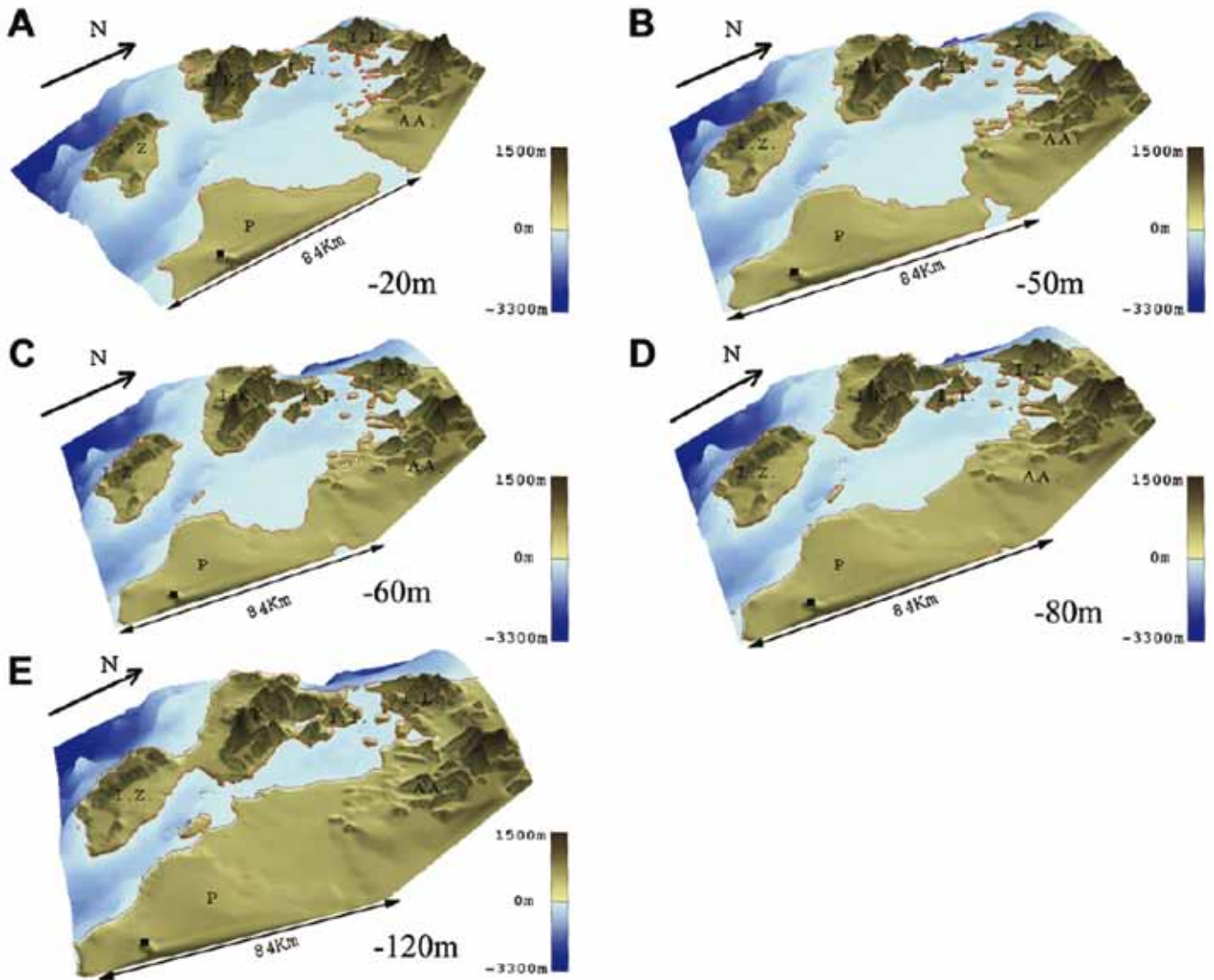
13 B. BASS, 1998, 175; A. B. KNAPP, 2010, 79.

14 C. BROODBANK, 2006, 200-205; A. SIMMONS, 2012, 895-896.

15 G. FERENTINOS *et al.*, 2012, 2167; A. SIMMONS, 2012, 895-896.

16 G. FERENTINOS *et al.*, 2012, 2170.





Sl. 2. / FIG. 2.

3D prikaz morskih dubina i kopnenih masa jonskih otoka tijekom paleolitika. P –Peloponez, IK – Kefalonija, IZ – Zakintos, IL – Lefkada (prema G. FERENTINOS *et al.* 2012, 2174, Fig. 7).

3D illustration of sea depths and Ionian islands' land masses in Paleolithic (P – Peloponnesus, IK – Cephalonia, IZ – Zakynthos, IL – Lefkas) (according to G. FERENTINOS *et al.* 2012, 2174, Fig. 7).

bila samo dvadesetak metara niža od današnje, što znači da su neandertalske skupine morale preploviti samo nešto manju površinu mora od današnje da bi stigle na južne jonske otoke<sup>17</sup> (Sl. 2).

Slična je situacija i s Ciprom. Do prije dvadesetak godina nije bilo pokazatelja koji su trajno naseljavanje tog otoka postavljali u vrijeme starije od 9000 pr. Kr.<sup>18</sup> Dokazi za prve ekspedicije na Cipru prisutni su već iz razdoblja epipaleolitika,<sup>19</sup> a potvrđene

means that the distance the Neanderthal groups had to cover while sailing to the southern Ionian islands was only a bit longer than the present one<sup>17</sup> (Fig. 2).

Similar can be said about Cyprus. Until about twenty years ago there were no indications that the island had been permanently settled before 9000 BCE.<sup>18</sup> The evidence that the first expeditions to Cyprus took place as early as in Epipaleolithic<sup>19</sup> has been confirmed with some thirty radiocarbon dat-

17 G. FERENTINOS *et al.*, 2012, 2174.

18 A. SIMMONS, 2012, 895; D. E. BAR-YOSEF MAYER *et al.* 2015, 412-435.

19 A. B. KNAPP, 2010, 81.

17 G. FERENTINOS *et al.*, 2012, 2174.

18 A. SIMMONS, 2012, 895; D. E. BAR-YOSEF MAYER *et al.* 2015, 412-435.

19 A. B. KNAPP, 2010, 81.

su nizom od tridesetak pouzdanih radiokarbonskih datuma.<sup>20</sup> Čemu su služile? Cipar, iako otok (9252 km<sup>2</sup>), može se iz perspektive tamošnjeg stanovništva, zbog svoje veličine u usporedbi s drugim otocima u Mediteranu (treći otok po veličini), smatrati gotovo kopnom. Jasno je stoga da su ekspedicije imale definiran cilj: testiranje naseobinskih potencijala koji su se arheološki kasnije materijalizirali u ciparskom PPNA, odnosno naseljima Kirokitija, Akrotiri Aetokremnos itd.

Kreta je pak od početaka razvoja arheologije kao znanosti sinonim brončanodobne raskoši i bogatstva sa žarišnom točkom u glasovitim nalazištima kao što su Knos i Fest, da ne nabrajamo druge. Počevši s 1900. godinom i iskopavanjima Lorda Evansa, Kreta je oblikovala prve arheološke zamisli i kronologije Egeide, međutim taj se otok u novije vrijeme pokazuje vrlo važnim u spoznajama i o najstarijem moreplovstvu. Više od stotinu godina bilo je potrebno da se na otoku pronađu veće koncentracije prapovijesnih nalazišta, onih znatno starijih od vremena Tezeja i Minotaura. Naime, Američka škola za klasične studije u Ateni pokrenula je opsežan projekt na jugozapadnoj Kreti kojemu je cilj bio pokušati ući u trag najstarijem naseljavanju otoka. Ključno pitanje bilo je jesu li prvi doseljenici došli kopnenim ili morskim koridorom, odnosno kada je planirano transpelagičko putovanje Mediteranom započelo.<sup>21</sup> Na prostoru južne Krete, koja je u geološkom smislu otok od miocena (6 – 5 Ma)<sup>22</sup>, zapadno od zaljeva Mesara otkriveno je 28 lokaliteta s tragovima kamenih izrađevina predneolitičkog razdoblja (20 mezolitičkih i osam paleolitičkih<sup>23</sup>), prvih koji su na otoku bili pouzdano datirani. Nastavkom radova na kartiranju lokaliteta, potpuno iznenađenje bili su tragovi donjopaleolitičkih nalaza.<sup>24</sup> Područja Plakie i Ayos Pavlosa reljefno odgovaraju tadašnjim naseobinskim uzorcima: prepuni su špilja i pripećaka koji se nalaze na blažim ili strmijim uzvisinama s izvorštima površinskih slatkih voda.<sup>25</sup>

ings.<sup>20</sup> What was the purpose of the expeditions? Although an island, Cyprus must have been perceived by the population in that period almost as a mainland due to its size (with an area of 9,252km<sup>2</sup>, it is the third biggest island in the Mediterranean). Clearly, the expeditions had a defined goal: testing the settlement potentials. These potentials would later archaeologically materialize in the Cypriot PPNA – in the settlements of Khirokitia, Akrotiri Aetokremnos etc.

As for Crete – from the beginnings of archaeology as a science it has been a synonym for the Bronze Age luxury and wealth, with Knossos, Phaistos and other well-known sites as the focal points. Starting with 1900 and the excavations carried out by Lord Evans, Crete has helped archaeologists gain the first insight into the Aegean and its chronology. However, since recently, the island has also contributed substantially to our insight into the earliest seafaring. It took more than a hundred years to find large concentrations of prehistoric sites on the island, much older than those from the days of Theseus and the Minotaur. The American School of Classical Studies at Athens has launched a large-scale project in southeastern Crete, aiming to trace to the earliest settlements on the island. The crucial question was if the first settlers came by land or by a sea corridor – in other words, when did the planned pelagic voyage across Mediterranean actually take place.<sup>21</sup> Geologically, Crete became an island in Miocene (6 – 5 Ma).<sup>22</sup> In its southern part, west of Mesara Bay, 28 sites with traces of pre-Neolithic stone structures (20 Mesolithic and 8 Paleolithic ones<sup>23</sup>) have been found. They are the first ones positively dated. When the mapping of the sites continued, archaeologists were very surprised to find traces of Lower Paleolithic.<sup>24</sup> In terms of relief, the areas around Plakia and Ayos Pavlos, correspond to the settlement patterns of that period: they abound with caves and rock-shelters situated on mild or steep slopes on a high ground, close to springs of surface freshwater flows.<sup>25</sup>

20 A. SIMMONS, 2012, 89.

21 F. T. STRASSER *et al.*, 2010, 145.

22 F. T. STRASSER *et al.*, 2011, 553.

23 U nekoliko slučajeva radilo se o položajima koji su obilježeni tragovima i paleolitičke i mezolitičke aktivnosti.

24 F. T. STRASSER *et al.*, 2010, 146.

25 F. T. STRASSER *et al.*, 2010, 151-152.

20 A. SIMMONS, 2012, 89.

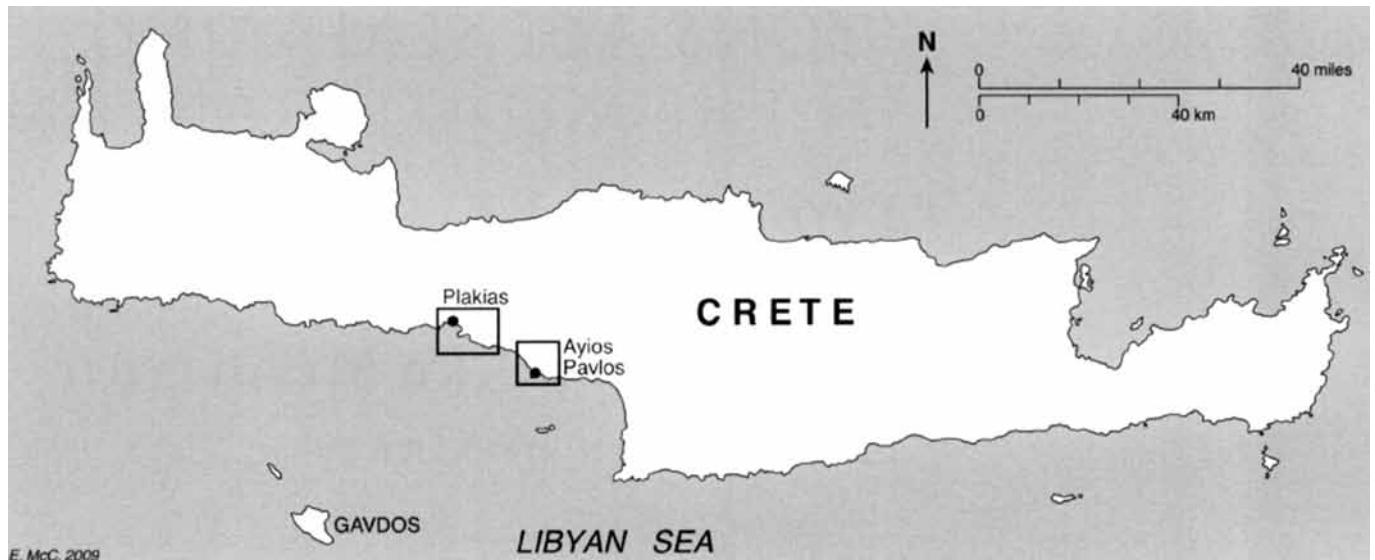
21 F. T. STRASSER *et al.*, 2010, 145.

22 F. T. STRASSER *et al.*, 2011, 553.

23 On several sites, traces of both Paleolithic and Mesolithic activities have been found.

24 F. T. STRASSER *et al.*, 2010, 146.

25 F. T. STRASSER *et al.*, 2010, 151-152.



SL. 3. / FIG. 3.

Kreta s označenim područjem nedavnih intenzivnih rekognosciranja (prema F. T. STRASSER *et al.* 2010, 146, Fig. 1).

Map of Crete with the marked area of recent intensive field surveys (according to F. T. STRASSER *et al.* 2010, 146, Fig. 1).

Mikrolitičke izrađevine na više mezolitičkih lokaliteta (Damnoni 1, Damnoni 3, Schinaria 3 itd.) pokazuju analogije s gornjomezolitičkim i donjomezolitičkim slojevima u Franchthiju u Argolidi (litička faza VII i VIII po Perlès),<sup>26</sup> a datirane su indirektno u razdoblje između 9000 i 11 000 godina prije sadašnjosti.<sup>27</sup> S druge strane, paleotla na nekoliko položaja (Preveli 3, Preveli 7, Timeos Stavros itd.), koja su asocirana s nalazima kamenih izrađevina, sugeriraju starost od oko 130 000 godina.<sup>28</sup> Iako su ovi rezultati na razini prethodnih priopćenja jer podatci još nisu sistematizirani, izvjesno je da je Kreta naseljena u dva veća vala: jedan u razdoblju srednjeg pleistocena, a drugi krajem pleistocena i početkom holocena. U oba slučaja podrijetlo tih populacija treba tražiti vjerojatno na sjevernim obalama Afrike odakle se morem doplovilo do južnih obala Krete u okviru spomenutih istraživačkih ekspedicija kako ih vidi Knapp. Po Strasser *et al.* (2011) pretpostavlja se i kontakt s obala Grčke i Turske.<sup>29</sup> Teško je reći jesu li neolitičke populacije, uključujući i one iz horizonta X u Knosu, zaista bile direktni potomci žitelja iz mezolitika, ali nisu bile ni pioniri naseljavanja Krete čiji antropogeni slojevi datiraju tako

The microliths found on a number of Mesolithic sites (Damnoni 1, Damnoni 3, Schinaria 3 etc.) show analogies with the Upper Mesolithic and Lower Mesolithic layers in Franchthi in Argolis (lithic phases VII and VIII according to Perlès)<sup>26</sup> and are indirectly dated to the period between 9,000 and 11,000 years before present.<sup>27</sup> The paleosoils on some sites (Preveli 3, Preveli 7, Timeos Stavros etc.) – associated with the microliths found – suggest that the microliths could be approx. 130,000 years old.<sup>28</sup> Although these results are as non-definitive as the above mentioned reports (because the data have not been systematized yet), it is now certain that Crete was populated in two major waves: one in the Middle Pleistocene and the other in the Late Pleistocene and Early Holocene. The origin of both of these populations should probably be sought on northern African shores, from where the abovementioned exploratory expeditions (as Knapp sees them) set sail for Crete's southern coast. According to Strasser *et al.* (2011), it is assumed that contacts between Greek and Turkish coasts were also established.<sup>29</sup> It is hard to say whether the Neolithic populations, including the ones from the Horizon X in Knossos, were indeed direct descendants of the Mesolithic inhabitants, but we can say with certainty that

26 F. T. STRASSER *et al.*, 2010, 164.

27 F. T. STRASSER *et al.*, 2010, 170.

28 F. T. STRASSER *et al.*, 2010, 186-187.

29 G. FERENTINOS *et al.*, 2012, 2174.

26 F. T. STRASSER *et al.*, 2010, 164.

27 F. T. STRASSER *et al.*, 2010, 170.

28 F. T. STRASSER *et al.*, 2010, 186-187.

29 G. FERENTINOS *et al.*, 2012, 2174.



duboko u paleolitik. Kreta je stoga sasvim jasan primjer vrlo rane kolonizacije, pa tako i one iz razdoblja neolitika, za koju se donedavno smatralo da je inicijalna kolonizacija otoka. Unatoč velikom broju podataka iz sasvim recentnih istraživanja i brižljivo datiranim slojevima, još smo vrlo daleko od poznavanja socioloških i kulturoloških procesa koji su se na Kreti zbivali krajem osmog tisućljeća pr. Kr.<sup>30</sup> Još važnije pitanje, čini nam se, bilo bi predstavlja li ta kolonizacija jedinstveni, planirani imigrantski val ili je rezultat niza manjih epizoda raspršenih u prostoru i vremenu.<sup>31</sup>

Dok je primjer Cipra sličan Kreti u smislu da su oba otoka masivna kopna za prilike istočnog Mediterana, sjeverna Egeida nema tako velikih otoka. Primjer otoka Gioure<sup>32</sup> značajan je po tome što se otok nalazi sjeveroistočno od Eubeje, sasvim blizu grčkog kopna, a reljef mu je toliko surov da na njemu danas nema ni naselja ni stanovnika. Međutim, u mezolitičkom i neolitičkom razdoblju intenzivno je naseljavana Kiklopova špilja na tome otoku.<sup>33</sup> Prirodnih bogatstava, a ni naseobinskih potencijala otok nema. Dakle, za razliku od Cipra, jedini racionalan razlog za plovidbu i nastanjivanje bio je ribolov. Velika kontinentalna podmorska hrid čiji vrhunac predstavljaju sjeverni Sporadi iznimno je bogata velikim brojem riba. To područje i danas daje gotovo 40 % grčkog ulova ribe,<sup>34</sup> a količina ribljih ostataka u mezolitičkim i neolitičkim slojevima špilje jasno pokazuje da je slično bogatstvo prisutno i u spomenutim razdobljima,<sup>35</sup> pa je to bio pokretač plovidbe u Sporadima. Iz navedenih primjera vidljivo je da razlozi za poduzimanje plovničkih ekspedicija zaista mogu biti vrlo različite prirode: gospodarski, kulturni, trgovački, pa čak i egzistencijalni (Fontana Nuova, Sicilija).

Između Sporada i Krete leži prostor u kojemu je plovidba postala organizirani posao temeljen na čvrstim visoko-akumulativnim gospodarskim osnovama. Na jugu kikladskog arhipelaga leži otok Mel, jedan od najznačajnijih sredozemnih izvorišta opsidijana koji se distribuirao duboko na grčko kopno (Tesalija i Makedonija), preko trgovačke mreže organizirane iz špilje Franchthi.

they were not the pioneer settlers of Crete because the island's anthropogenic layers date so deep in Paleolithic. Crete is therefore a good example of a very early colonization, including the one that took place in Neolithic (the same one that, until recently, was thought to be the initial colonization of the island). Despite the large quantity of data obtained by recent excavations and from carefully dated layers, we are still far from understanding the sociological and cultural processes that took place on Crete in the late 8<sup>th</sup> century BCE.<sup>30</sup> In our opinion, an even more important question is whether this colonization was a single, planned immigrant wave or was it a result of a number of minor episodes dispersed in space and time.<sup>31</sup>

While both Cyprus and Crete are rather large land masses, unlike other islands in the Eastern Mediterranean, there are no such examples in the northern Aegean. The island of Gioura,<sup>32</sup> northeast of Euboea and very close to Greek mainland, is important because, although with a rugged relief that makes it uninhabitable even today, the Cyclops' Cave on it was intensively populated in Mesolithic and Neolithic.<sup>33</sup> The island has no natural resources or settlement potentials. Unlike Cyprus, the only rational reason for crossing to it and settling there would be fishing. The large continental underwater ridge (the Northern Sporades Archipelago being its tips) is very rich in fish. Even today, almost 40% of Greece's catch comes from this area<sup>34</sup> and the quantity of fish remains in the Mesolithic and Neolithic layers of the cave clearly shows that fish was similarly abundant in the said periods.<sup>35</sup> Obviously, it was fishing that induced sailing to the Sporades. The above examples show there are numerous reasons for undertaking seafaring expeditions: economic, cultural, commercial and even existential (Fontana Nuova, Sicily).

Between the Sporades and Crete lies an area where seafaring became an organized enterprise based on solid, highly cumulative economy. The island of Melos in the southern Cyclades was one of the most important sources of obsidian in the Mediterranean. From there it was distributed deep into the Greek mainland (Thessaly and Macedonia) via a trade network organized from Franchthi Cave. The trade between

30 K. KOTSAKIS, 2008, 53.

31 K. KOTSAKIS, 2008, 55-56.

32 U literaturi otok je najčešće nazivan engleskim izgovorom Youra.

33 A. MOUNDREA-AGRAFIOTI, 2003, 131.

34 Podatci iz 1993. godine.

35 J. POWELL, 2003, 173.

30 K. KOTSAKIS, 2008, 53.

31 K. KOTSAKIS, 2008, 55-56.

32 In literature, the island is usually referred to as Youra (using its English spelling).

33 A. MOUNDREA-AGRAFIOTI, 2003, 131.

34 Data for 1993.

35 J. POWELL, 2003, 173.

Trgovina između Argolide i otoka Mela jedna je od najintenzivnijih i svakako najpoznatija trgovačka ruta na Mediteranu. Najkraćim direktnim putem između Argolide, tj. špilje Franchthi i otoka Mela potrebno je prevaliti više od 120 nautičkih milja<sup>36</sup> otvorenog mora, što sasvim sigurno predstavlja izniman pothvat, zahtijeva pomno planiranje i poznavanje uvjeta na moru. Druga, izglednija varijanta te plovidbe, nešto manje zahtjevna, ali gotovo jednako dugačka, bila bi otocima koji imaju međusobnu vizualnu komunikaciju: južnom obalom Argolide do zapadnih Kiklada i uz njih (Kitnos, Serifs) do Mela.<sup>37</sup> Najstariji tragovi opsidijana s tog otoka u špilji Franchthi datirani su u početak 11. tisućljeća prije Krista.<sup>38</sup> Špilja je u tom razdoblju najvjerojatnije bila u povremenoj upotrebi, sezonski od proljeća do jeseni, pružajući boravište jednoj organiziranoj skupini lovaca-skupljača.<sup>39</sup> S intenzitetom života rasla je i maritimna aktivnost stanovnika špilje. U razdoblju gornjega mezolitika pokazuje se velika raznovrsnost prehrane, a posebno je zanimljiva pojava većih količina plavoperajne tune (oko 95 % ukupnog broja ribljih ostataka), i to primjeraka koji su težili oko 200 kg.<sup>40</sup> Osim trgovine opsidijanom, ovi su nalazi vidljiv dokaz iskorištavanja velikih morskih resursa, koji su zahtijevali znalačko baratanje ribolovnim alatima u hvatanju velike ribe kojoj je okruženje uglavnom duboko more. Stoga plovilo na koje se iz mora mogla izvući i u njega ukrcati riba teža od 100 kg a da se ne prevrne svakako nije moglo biti sasvim jednostavne izrade. U njemu je moralo biti mjesta za nekoliko ljudi potrebnih da izvrše taj pothvat, njihovu opremu (minimalno hrana i voda, vesla) te konačno i mjesta za takav tovar. Ideju jednostavnijih plovila kao koncept prihvatljiv za priobalnu i/ili kraću plovidbu podcrtao je Gluščević baveći se pitanjima plovidbe Jadranom.<sup>41</sup> Dakako, takva privreda, odnosno nabava hrane posljedica je okolišnog pritiska na stanovnike. Naime, kopnena masa reducira se uslijed podizanja razine mora nakon posljednjega glacijalnog maksimuma. Skupini koja je zahvaljujući trgovini opsidijanom

Argolis and Melos took place along one of the most intensively used and best known trading routes in the Mediterranean. Taking the shortest direct route from Argolis (Franchthi Cave) to Melos meant covering the distance of more than 120 nautical miles<sup>36</sup> across the open sea. It was certainly a daring feat that required detailed planning and seafaring skills. The alternative, more likely route – somewhat less demanding but almost as long – would be along the islands with mutual visual communication: down the southern coast of Argolis via the Western Cyclades (Kithnos, Serifos) to Melos.<sup>37</sup> The earliest traces of the Melos obsidian in the Franchthi Cave have been dated to the early 11<sup>th</sup> millennium BCE.<sup>38</sup> During that period, the cave was most likely used only temporarily – on a seasonal basis (spring to autumn) – providing shelter to an organized group of hunter-gatherers.<sup>39</sup> The intensity of the maritime activities of the cave's dwellers grew together with the intensity of the life they lived. In Upper Mesolithic, the diet becomes diverse; particularly interesting is the fact that remnants of bluefin tuna dated to this period have been found (accounting for 95 percent of all the fish remnants found). Some specimen weighed as much as 200kg.<sup>40</sup> Together with the obsidian trade, these fins can be taken as visible evidence of exploitation of huge marine resources. Catching such big deep-water fish required a skillful use of fishing tools. Logically, a vessel intended for pulling out and loading fish specimens of 100kg without capsizing could not have had a very simple construction. It had to provide enough room for a few people required for such a venture, their equipment (minimum supplies of food and water, oars) and, finally, room for such a cargo. It was Gluščević who underlined the idea of vessels with a simple construction as a concept acceptable for coastal and/or short open-sea navigation in the context of seafaring in the Adriatic.<sup>41</sup> Naturally, turning to sea for food was a result of the environmental pressure: the land mass gave way to the sea when the sea level rose during the last glacial maximum. Marine resources thus became a necessity for survival of the group that had traded in obsidian. As the trade had made them develop sea-

36 Preko 220 km.

37 Prije nekoliko godina izveden je eksperiment plovidbe čamcem od trske direktnom linijom od Franchthija do Mela za što je posadi čamca na vesla bilo potrebno osam dana plovidbe (zahvaljujemo K. Kotsakis na korisnim podatcima i razmišljanjima o ovom pitanju).

38 T. W. JACOBSEN, 1981, 306; A. SIMMONS, 2012, 896.

39 T. W. JACOBSEN, 1981, 306.

40 T. W. JACOBSEN, 1981, 307.

41 S. GLUŠČEVIĆ, 1994, 15.

36 More than 220km.

37 An experiment carried out a few years ago established that it would take a reed rowboat 8 days to sail the direct line from Franchthi to Melos (we are indebted to K. Kotsakis for the useful information and ideas about the subject).

38 T. W. JACOBSEN, 1981, 306; A. SIMMONS, 2012, 896.

39 T. W. JACOBSEN, 1981, 306.

40 T. W. JACOBSEN, 1981, 307.

41 S. GLUŠČEVIĆ, 1994, 15.

već bila vrlo vješta u plovidbi i navigaciji more i morski resursi postali su nužni za preživljavanje pa im takva prekretnica iz terestrijalne u maritimnu prehranu vjerojatno nije predstavljala izraziti stres. Daljnje naglo napredovanje u plovidbi može se pretpostaviti povećanjem nalaza opsidijana, kamenih sirovina iz Saronskog zaljeva te mramora i drugih egzotičnih materijala u narednim fazama života u špilji Franchthi (od 6000. pr. Kr.).<sup>42</sup> More je u svakom smislu tada postalo ključni čimbenik svakog aspekta njihova života.

Kako je plovidba važna i za same izvorne koncepte neolitizacije (pojavu poljodjelstva), kao što je to slučaj na Argolidi<sup>43</sup> i Cipru<sup>44</sup>, zanimljivo je vidjeti što se zbiva u Jadranu, najvećem rukavcu Sredozemnog mora. Ta se tema obrađuje još od vremena Marchesettija (1876.), preko Boyda i Bernabò Brea do izvanrednog doprinosa Bassa i njegovih radova iz 1998. i 2008. te konačno domaćih autora Radića i Forenbahera. U svom modelu neolitizacije istočne jadranske obale Forenbaher i Miracle sugeriraju dva glavna vala i smjera naseljavanja. Prvi, zanimljiv za našu temu, obuhvaća intenzivno naseljavanje obalom od Otrantskih vrata prema Istri.<sup>45</sup> Takvo kretanje potvrđeno je nizom radiokarbonskih datuma<sup>46</sup> koji uvidom u glavne špiljske lokalitete, odnosno njihove stratigrafije u sjevernom Jadranu pokazuju stanovitu prazninu između mezolitika i neolitika.<sup>47</sup>

Predstavljenim modelom<sup>48</sup> (Sl. 4) može se potvrditi zaključak da je usvajanje keramike na istočnoj jadranskoj obali barem u izvjesnoj mjeri bilo rezultat rane plovidbe i istraživačkih ekspedicija<sup>49</sup>, iako za samu plovidbu nema materijalnih dokaza. Moguće je, iako malo vjerojatno budući da nema materijalnih argumenata,<sup>50</sup> da je neolitički paket koji vidimo u kulturi impresio-keramike mogao putovati i samom obalom u vidu potrage za novim prostorima naseljavanja i resursima, onako kako ih tumači Knapp, na relaciji Gargano – Korčula kako je pak to hipotetizirao Bernabò Brea, a kasnije komentira Bass.<sup>51</sup> Najstariji pokazatelj plovidbe

faring skills, the switch from terrestrial to maritime food was probably not so stressful. Further improvement of seafaring skills can be assumed based on an increase in the finds of obsidian, the lithic raw material from Saronic Gulf and marble and other exotic materials found in the subsequent phases of the life in Franchthi Cave (from 6000 BCE).<sup>42</sup> In every sense, the sea then became the key factor of their life.

Since seafaring is also important for the original concepts of Neolithization (the appearance of agriculture), as was the case with Argolis<sup>43</sup> and Cyprus<sup>44</sup>, it will be interesting to find out what went on at the same time in the Adriatic – the largest channel of the Mediterranean Sea. This has been studied ever since Marchesetti (1876). Boyd and Bernabò Brea also gave their contribution and so did Bass in his outstanding works from 1998 and 2008. Croatian authors Radić and Forenbaher covered the issue, too. In their model of the Neolithization of the eastern Adriatic coast, Forenbaher and Miracle suggest two principal waves and courses of settlement. The first one – of interest for our subject – includes the intensive settlement along the coast from the Strait of Otranto to Istrian Peninsula.<sup>45</sup> Such movement has been confirmed with a series of radiocarbon datings<sup>46</sup> which, providing an insight into the main cave sites and their stratigraphy in northern Adriatic, indicate certain gap between Mesolithic and Neolithic.<sup>47</sup>

The model presented here<sup>48</sup> (Fig. 4) corroborates the conclusion that the adoption of pottery on the eastern Adriatic coast was – at least to an extent – a result of early seafaring and exploratory expeditions,<sup>49</sup> although there is no material evidence for the seafaring itself. It is possible, although not very likely (due to a lack of material evidence),<sup>50</sup> that the Neolithic package evidenced in the impresio-pottery culture could have traveled along the coast during a search for new settlement areas and resources (as Knapp explains them), between Gargano and Korčula (as hypothesized by Bernabò Brea and later commented by Bass).<sup>51</sup> The earliest indica-

42 T. W. JACOBSEN, 1981, 310.

43 T. W. JACOBSEN, 1981.

44 A. B. KNAPP, 2010.

45 S. FORENBAHER, P. MIRACLE, 2005, 514, 519.

46 S. FORENBAHER, P. MIRACLE, 2005, Figure 3.

47 S. FORENBAHER, P. MIRACLE, 2005, 519.

48 S. FORENBAHER, P. MIRACLE, 2005.

49 S. FORENBAHER, P. MIRACLE, 2005, Figure 4.

50 Određenu argumentaciju u smislu materijalnosti predstavljaju keramički modeli plovila iz Grčke.

51 B. BASS, 1998, 167.

42 T. W. JACOBSEN, 1981, 310.

43 T. W. JACOBSEN, 1981.

44 A. B. KNAPP, 2010.

45 S. FORENBAHER, P. MIRACLE, 2005, 514, 519.

46 S. FORENBAHER, P. MIRACLE, 2005, Figure 3.

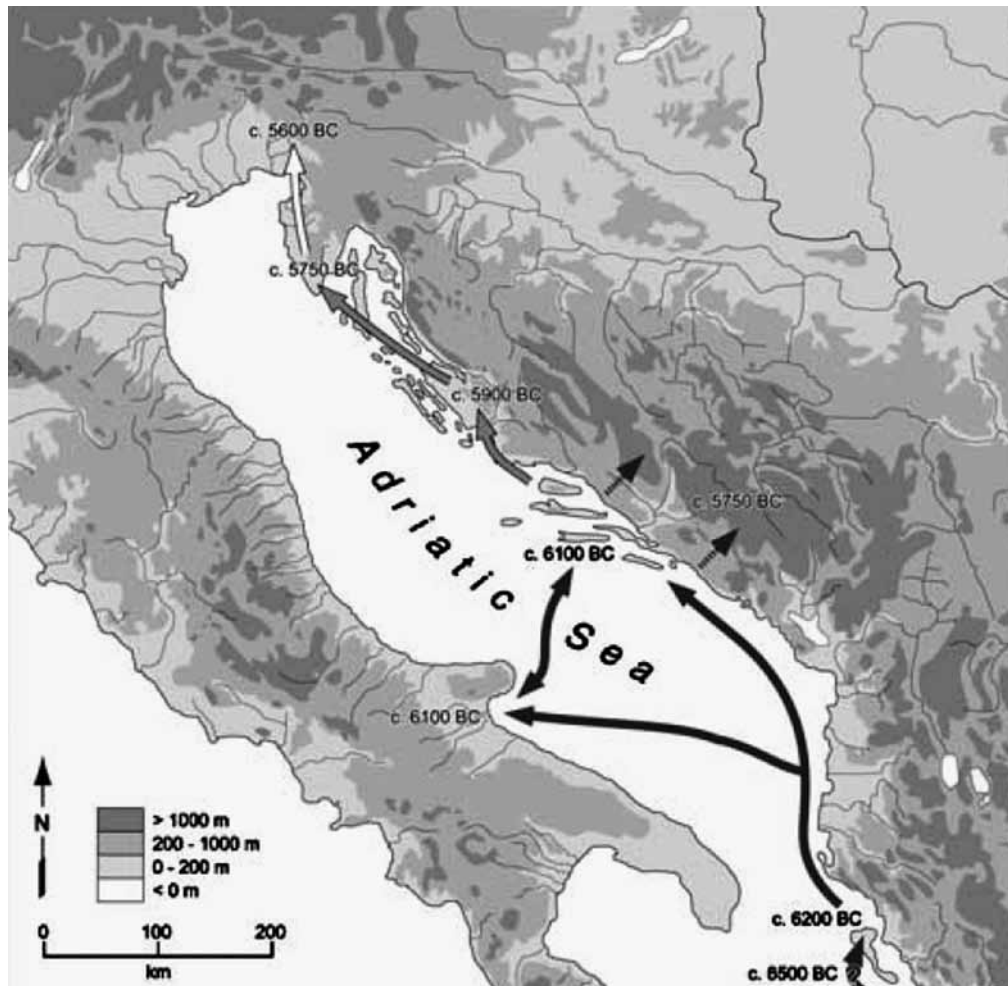
47 S. FORENBAHER, P. MIRACLE, 2005, 519.

48 S. FORENBAHER, P. MIRACLE, 2005.

49 S. FORENBAHER, P. MIRACLE, 2005, Figure 4.

50 The ceramic models of vessels from Greece can be seen as certain material evidence.

51 B. BASS, 1998, 167.



SL. 4. / FIG. 4.

Model širenja neolitizacije na istočnom Jadranu (prema S. FORENBAHER, P. MIRACLE 2005, Fig. 4).

*Model of the spread of Neolithization in Eastern Adriatic (according to S. FORENBAHER, P. MIRACLE, 2005, Fig. 4).*

na transjadranskoj ruti potječe iz Vele Spile, jednog od najvažnijih špiljskih lokaliteta na Jadranu. U mezolitičkom sloju potvrđenom radiokarbonskim datumom otkrivena je skupina dječjih grobova, dok je uz neposrednu blizinu groba 2 otkriven uglučani kamen koji je nesumnjivo vulkanskog podrijetla (srednjozrnati gabrodiorit, Sl. 5).<sup>52</sup> Kao mjesto njegova najvjerojatnijeg podrijetla pretpostavljeni su Brusnik ili Palagruža,<sup>53</sup> odnosno Jabuka<sup>54</sup>. Uglučani kamen nađen pola metra dalje od lubanje djeteta sastavni je dio grobnih priloga, a ne slučajni nalaz izvan zatvorenog konteksta.<sup>55</sup> Radiokarbonska proba kostiju iz groba 2 u okviru  $\pm 2$  točnosti dala

tor of trans-Adriatic navigation comes from Vela Spila, one of the most important cave sites in the Adriatic. A group of children's graves was discovered in the cave's Mesolithic layer (confirmed by radiocarbon dating). A polished rock, undoubtedly volcanic, was discovered in the immediate vicinity of Grave No. 2 (medium-grained gabrodiorite, Fig. 5).<sup>52</sup> The islands of Brusnik or Palagruža<sup>53</sup>, or Jabuka<sup>54</sup> were identified as it likely places of origin. A polished stone found half a meter away from a child's skull belonged to grave goods and was not an accidental find from outside the site context.<sup>55</sup> The radiocarbon analysis of the bones from Grave

52 D. RADIĆ, B. LUGOVIĆ, 2004, 7; D. RADIĆ, 2009, 13.

53 B. ČEČUK, D. RADIĆ, 2005, 62, note 6.

54 D. RADIĆ, 2009, 14.

55 D. RADIĆ, B. LUGOVIĆ, 2004, 8.

52 D. RADIĆ, B. LUGOVIĆ, 2004, 7; D. RADIĆ, 2009, 13.

53 B. ČEČUK, D. RADIĆ, 2005, 62, note 6.

54 D. RADIĆ, 2009, 14.

55 D. RADIĆ, B. LUGOVIĆ, 2004, 8.



SL. 5. / FIG. 5.

Uglačani kamen (gabrodiorit) vulkanskog podrijetla, vjerojatno sa Brusnika ili Palagruže (B. ČEČUK, D. RADIĆ, 2005, 62, bilješka 6).

*Medium-grained gabrodiorite of volcanic origin, probably from Brusnik or Palagruža (B. ČEČUK, D. RADIĆ, 2005, 62, note 6).*

je rezultat 7070. – 6760. prije Krista (Wk – 24217, 8004±41).<sup>56</sup> Temeljem makroskopskih i mikrofiziografskih pokazatelja pokazalo se da artefakt pokazuje najveću sličnost sa sekundarno deponiranim uzorkom oblutka nađenim na obali Palagruže. Važno je naglasiti da Palagruža nije vulkanski otok, već se pretpostavlja da uzorak potječe iz neke od obližnjih vulkanskih podmorskih hridi.<sup>57</sup> Također valja napomenuti da je dokaz ekspedicija na otvorenije more očit i u nalazima ribljih kostiju krupnijih vrsta riba otvorenijeg mora poput tuna, sabljarki i dupina,<sup>58</sup> slično kako na to upućuju i nalazi iz pećine Franchthi u Grčkoj.<sup>59</sup> Budući da se Palagruža nalazi na udaljenosti od 43 milje od Vele Spile, što je više od pola udaljenosti od Gargana do Korču-

No. 2 dated them (with  $\sigma 2$  accuracy) back to the period between 7070 and 6760 BCE (Wk – 24217, 8004±41).<sup>56</sup> Based on macroscopic and microphysiographic indicators, it turned out that the artifact bears a strong resemblance to a pebble found on the coast of Palagruža as a secondary deposit. It should be underlined here that, since Palagruža is not a volcanic island, the pebble must have come from one of the nearby underwater rocks.<sup>57</sup> It should also be noted that the bones of large open-sea fishes such as tuna, swordfish and dolphin found on the site can also be seen as evidence of open-sea expeditions,<sup>58</sup> as is the case with the finds from Franchthi Cave in Greece.<sup>59</sup> Since Palagruža is 43 miles away from Vela Spila – more than half the distance

56 D. RADIĆ, 2009, 13, 14.

57 D. RADIĆ, B. LUGOVIĆ, 2004, 16.

58 B. ČEČUK, D. RADIĆ, 2005, 53; D. RADIĆ, 2009, 15.

59 T. W. JACOBSEN, 1981, 307-309.

56 D. RADIĆ, 2009, 13, 14.

57 D. RADIĆ, B. LUGOVIĆ, 2004, 16.

58 B. ČEČUK, D. RADIĆ, 2005, 53; D. RADIĆ, 2009, 15.

59 T. W. JACOBSEN, 1981, 307-309.



le, taj se nalaz sa sigurnošću uzima kao pouzdani dokaz mezolitičke plovidbe na Jadranu. Nadalje, distribucija impreso-keramike po jadranskim otocima također upućuje na međuotočnu (i priobalnu) plovidbu u ranome neolitiku.<sup>60</sup> Međutim, kako zaista dokazati plovidbu bez direktnih materijalnih dokaza za njezino postojanje? Kada govorimo o Jadranu, najstariji i najočitiji razlog može biti duge plovidbe jest opet trgovina opsidijanom, u ovom slučaju liparskim. Plovna ruta koja ide i Jadranom dio je jednog od dva najkompleksnija maritimna trgovačka sustava Sredozemlja: distribucija opsidijana s Lipara i Mela, a jedna od posljedica tih aktivnosti je širenje neolitika.<sup>61</sup> Budući da su izvorišta opsidijana u središnjem Mediteranu (Pantelleria, Palmarola, Sardinija i Lipari) od početka holocena isključivo otoci, trgovina opsidijanom u neolitiku, isto tako, isključivo je maritimni poduhvat.<sup>62</sup> Nasuprot tim čvrstim činjenicama, o samoj plovidbi ne znamo ništa jer direktnih dokaza o dimenzijama brodova i tehnologiji brodogradnje opet nemamo. Plovna ruta, ako pretpostavimo da se u cijeloj dužini odvijala morskim putem, vjerojatno je išla od Lipara, Mesinskim tjesnacem, južno od Kalabrije i onda od Apulije prema Garganu, Palagruži do Sušca, Korčule i Pelješca (oko 550 NM), kao glavne spona prema kopnu i unutrašnjosti zaleđa rijekom Neretvom.<sup>63</sup> Put je navigacijski vrlo „jednostavan“: uz obalu južne Italije i od Gargana prema otocima koji se nalaze na liniji koja vodi ravno prema ušću Neretve na istočnojadranskoj obali. Jednostavna je stoga jer kada se napusti talijanska obala kao orijentacija služe otoci koji su između sebe maksimalno udaljeni 29 milja, dakle kao u slučaju plovidbe iz Franchthija prema Melu, imaju vizualni kontakt. Ovdje valja također pretpostaviti mogućnost da se dio te trgovine mogao odvijati djelomično i talijanskim kopnom. U tom slučaju treba pretpostaviti kompleksnu mrežu razmjene i „više ruku“ koje su u njoj sudjelovale. S Lipara se teret trebao prvo dopremiti plovilom do Kalabrije ili Kampanije, gdje je potom kopnenim putem trebalo prevaliti barem dvjestotinjak kilometara (u slučaju Kalabrije i više) do Gargana. Nakon Gargana ponovo se sve trebalo pretovariti na plovilo kojim se je opet valjalo otisnuti prema istočnojadranskoj obali, što

between Gargano and Korčula – this find is considered as reliable evidence of Mesolithic-period seafaring in the Adriatic. The distribution of the impreso pottery across Adriatic islands is also an indicator of interinsular (and coastal) navigation in Early Neolithic.<sup>60</sup> However, how should we positively prove such navigation without direct material evidence? When we talk about the Adriatic, the oldest and most obvious reason for possible sea-going ventures is – again – the trade in obsidian. In this case, the one from the Lipari Islands. The sea trade route that also includes the Adriatic is part of the two most complex maritime trading distribution systems in the Mediterranean: the distribution of obsidian from the Lipari and from Melos. One of the consequences of this activity was the expansion of the Neolithic achievements.<sup>61</sup> Since obsidian in the central Mediterranean could only be found on places which had been islands since Holocene (Pantelleria, Palmarola, Sardinia and the Lipari), the trade in it in Neolithic was necessarily a maritime affair.<sup>62</sup> Despite these hard facts, we know nothing about the navigation itself due to a lack of evidence of the size of the ships and shipbuilding technology of the day. If we assume that the trade route was a maritime one throughout its length, it probably started on the Lipari Islands, ran via the Strait of Messina, then south of Calabria, from Apulia to Gargano Peninsula, continuing to Sušac, Korčula and Pelješac (approx. 500 nautical miles) and then proceeding towards the mainland and into the hinterland along the River Neretva.<sup>63</sup> The leg stretching along southern Italy and from Gargano via the islands to the mouth of the Neretva on the eastern Adriatic coast can be characterized as “simple” because, when one leaves the Italian coast, the islands can be used as orientation due to a short distance between them (not exceeding 29 miles) which enables constant visual contact – like in the case of the route from Franchthi Cave to Melos. We can also assume here that the trade route partly ran across the Italian mainland. This would imply a complex exchange network and “multiple hands” that took part in it. A cargo would first have to be transported by a vessel to Calabria or Campania and then at least two hundred kilometers (in case of Calab-

60 D. RADIĆ, 2009, 18.

61 H. FARR, 2006, 86.

62 H. FARR, 2006, 88.

63 D. RADIĆ, 2002a, 22, 23.

60 D. RADIĆ, 2009, 18.

61 H. FARR, 2006, 86.

62 H. FARR, 2006, 88.

63 D. RADIĆ, 2002a, 22, 23.

je logistički vrlo zahtjevna organizacija. Prevoziti gospodarski prihvatljivu i praktičnu količinu kamena navedenim kopnenim dijelom Apeninskog poluotoka prilično je zahtjevan napor koji vjerojatno podrazumijeva i nove troškove. U tom smislu opravdano je pretpostaviti, ukoliko se već plovi, a s Lipara se moralo, da je konceptualno gledano ipak ekonomičnije bilo oploviti južnu Italiju i krenuti prema Palagruži i dalje, prema Veloj Spili i obali. Ovo putovanje energetski je višestruko zahtjevnije, logistički značajno jednostavnije, ali i oko 150 milja dulje.<sup>64</sup> Međutim, ovdje dolazimo do pitanja kako se nakon napuštanja talijanskog priobalja plovilo orijentiralo. Onima koji plove otvorenim morem najvažnije je naći prirodne orijentire: otoke, stijene i sl.<sup>65</sup> Od Gargana do Palagruže kao sljedeće „stanice“ na putu udaljenost je pedesetak kilometara. Ukoliko je osoba koja gleda prema horizontu na točki od dva metra iznad mora (stajanje u plovidlu), udaljenost u kilometrima do vidljivog horizonta dobiva se umnoškom visine pogleda i faktora 13, dakle:  $2 \text{ m} \times 13 = 26 \text{ km}$ . U našem primjeru treba uračunati visinu Vele Palagruže kao najviše točke otočja koja iznosi 92 metra. Izračun pokazuje da će se Palagruža vidjeti iz daljine od nešto manje od 40 km.<sup>66</sup> Tu svakako valja naglasiti da se u izračunu radi o idealnim uvjetima pri čemu nije uzeta u obzir prisutna refrakcija svjetla u atmosferi uzrokovana temperaturnim varijacijama zraka neposredno nad morem itd. Dakle, u idealnim atmosferskim uvjetima za dnevno svjetla s obale Gargana Palagruža se može vidjeti, ali ako su oni samo malo lošiji, taj vizualni kontakt nestaje. Kod plovila niskog gaza treba također uzeti u obzir otklon (*drift*) koji uzrokuje skretanje s idealnog kursa,<sup>67</sup> u našem slučaju ulijevo od Palagruže na putu od Gargana (Sl. 6). Slična razmišljanja i modele za plovidbu po jadranskim otocima predstavio je Bass još 1998. godine.<sup>68</sup>

ria even more) by land to Gargano. At Gargano it would be loaded onto a vessel again and then transported to the eastern Adriatic coast. In terms of logistics, it required a complex organization. Transporting a profitable quantity of stone along this Apennine Peninsula land route was a demanding venture that probably required additional costs. In this respect, it is justified to assume that, if one had to travel by sea – and one had to in case of the Lipari Islands – economically it made more sense to travel around southern Italy and then turn to Palagruža and beyond, to Vela Spila and the coast. While much simpler logistically, this voyage would consume much more energy and was approx. 150 miles longer.<sup>64</sup> However, the question here is what kind of orientation was used at the open sea after leaving the Italian coast. For seafarers, the most important landmarks are the natural ones: islands, rocks etc.<sup>65</sup> As the next “stop” from Gargano, Palagruža is some fifty kilometers away from that peninsula. If a person observing the horizon stands on a vessel, two meters above sea level, the distance from the visible horizon can be obtained by multiplying the height of the observer’s eyes with factor 13. In this case:  $2\text{m} \times 13 = 26\text{km}$ . In our example, the height of Vela Palagruža – the highest point of the islands – is 92 meters. The calculation tells us that Palagruža would be visible from somewhat less than 40km.<sup>66</sup> We must point out that the calculation used here applies to ideal conditions, not taking into account the refraction of light in the atmosphere due to temperature variations of the air immediately above the sea surface etc. Thus, in ideal atmospheric conditions in daylight, Palagruža can be seen from Gargano’s coast. However, if the conditions worsen even slightly, the visual contact is not possible. For shallow draft vessels we should also take into account the drift causing a vessel to sheer off the ideal course<sup>67</sup> – in our case, to the left of Palagruža on the way from Gargano (Fig. 6). Bass presented similar reflections on sailing the Adriatic islands and gave similar models for it way back in 1998.<sup>68</sup>

64 Nemoguće je pretpostaviti kojom se rutom, bilo kopnenom ili morskom, putovalo, stoga ovu pretpostavku treba uzeti kao hipotetičku rutu.

65 B. KIRIGIN *et al.*, 2009, 137.

66 Kalkulacija izvršena s pomoću *online* kalkulatora na [www.cactus2000.de](http://www.cactus2000.de).

67 H. FARR, 2008, 95, Fig. 8.

68 B. BASS, 1998.

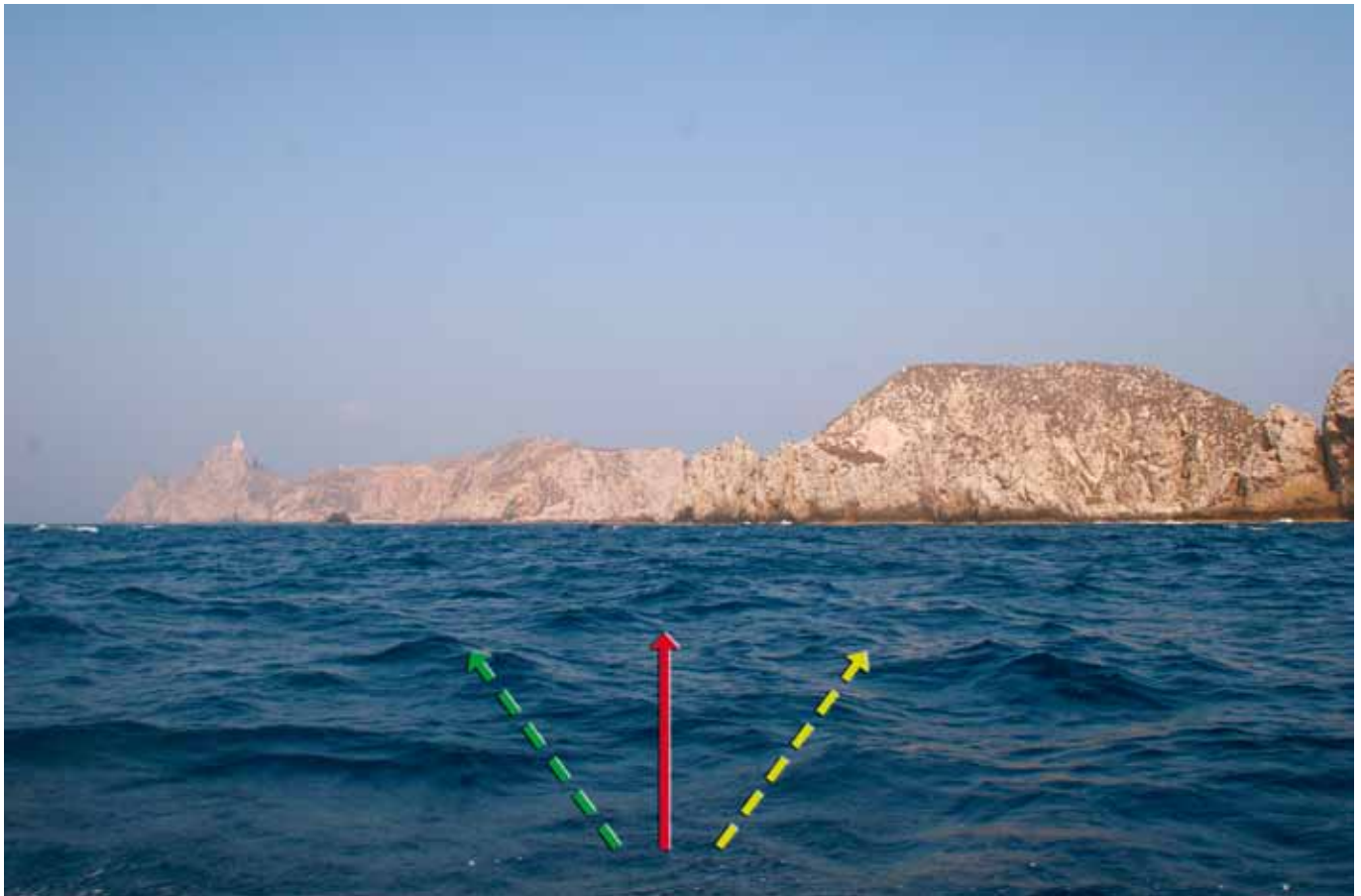
64 Since it is impossible to know the exact land or sea route that was in use, the described route is only hypothetical.

65 B. KIRIGIN *et al.*, 2009, 137.

66 The calculation was made using the *online* calculator on [www.cactus2000.de](http://www.cactus2000.de).

67 H. FARR, 2008, 95, Fig. 8.

68 B. BASS, 1998.



SL. 6. / FIG. 6.

Prikaz smjera otklona (*drifta*) gledano od Gargana prema Palagruži. Crvena strelica prikazuje idealnu rutu smjera plovidbe prema središtu otoka kao orijentiru, a zelena strelica otklon koji će plovilo zanositi ulijevo, stoga plovilo treba upravljati udesno (žuta strelica) da se poništi efekt otklona (modificirano prema H. FARR, 2008, 95, Fig. 8, foto: M. Burić).

*Direction of the drift when observing Palagruža from Gargano. The red arrow shows the ideal course towards the island's central part, also used as a landmark, and the green arrow shows a vessel's anticipated leftward drift, requiring such vessel to navigate to the right (yellow arrow) to compensate the drift (modified H. FARR, 2008, 95, Fig. 8, photo by M. Burić).*

Iako je konkretna plovna ruta, ako se uistinu nje plovilo, sasvim očita, pitanje je kako se plovilo, kojim pogonom i koliko je plovilo moralo biti veliko da bi prevozilo teret ljudi, vode, hrane i komercijalnog tereta (opsidijan). Slijedom uvjeta na moru, prvenstveno odnosom priobalne i plovidbe otvorenim morem, valjalo bi napustiti donekle romantične ideje o krajnje jednostavnoj splavi ili priručno sklopljenom čamcu, unatoč spoznajama koje nam dolaze arheološkim eksperimentima s krfskom papirelom i Monoxylylon I i II.<sup>69</sup> Za to je više razloga. Veslanje kao pogon, kako se najčešće sugerira,<sup>70</sup> ekstremno

Although the said route – if it was used at all – seems logical, the question is what was the navigation like, what propulsion was used for it and how big vessels had to be in order to transport people, water, food and commercial cargo (obsidian). Given the conditions at sea and the differences between coastal and open-sea navigation, we should abandon somewhat romantic ideas about very simple rafts or makeshift boats, despite the insight obtained from experimenting with the Corfu *papyrella* and Monoxylylon I and II.<sup>69</sup> There are a number of reasons for this. Using oars as propulsion, as it is often suggested<sup>70</sup> is an extremely

69 R. TICHÝ, 1999.

70 H. FARR, 2006, 90.

69 R. TICHÝ, 1999.

70 H. FARR, 2006, 90.

je naporna aktivnost.<sup>71</sup> Od svih modernih sportova veslanje po jedinici vremena zahtijeva daleko najveću potrošnju energije (osobno priopćenje, Pavle Mikulić, Kineziološki fakultet, Sveučilište u Zagrebu) i pitke vode koja je morala biti nadomještena iz zaliha u brodu.<sup>72</sup> Ograničen prostor (i vrijeme) za konzumiranje hrane u plovilu na kojem je bilo nekoliko ljudi također je stavka koja mora biti uzeta u obzir jer se mogla konzumirati samo hrana koja je prikladna za navedene uvjete.<sup>73</sup> Primjera radi, pokušajmo pretpostaviti posadu broda koja prevozi 10 kg opsidijana s Lipara u Velu Spilu na Korčuli. Čovjeku za temeljno funkcioniranje organizma treba oko 1720 kcal dnevno (tzv. BMR *Basal Metabolic Rate*). Za umjeren tempo veslanja u trajanju od 6 sati (iako je sasvim sigurno da su veslali i više) prosječno se potroši oko 2000 kcal, što zbrojeno iznosi da u danu u kojem se veslalo 6 sati i nije se radilo ništa drugo imamo potrošnju od 3700 kcal kojima valja pribrojiti oko 200 kcal koje se troše za pretvorbu hrane u energiju. Dakle, 3900 kcal. Nemoguće je naravno znati čime su se za to vrijeme hranili, ali za primjer ćemo uzeti kalorične suhe smokve kao energetske okvir koji im je svakako bio dostupan. Da bi se nadomjestilo oko 4000 kcal potrebno je oko 2 kg suhih smokvi, a tomu treba nadodati još ključnih 4 l vode, što je ukupna masa od oko 8 kg po osobi, odnosno 24 kg za sve veslače.<sup>74</sup> Također valja istaknuti da od Gargana do Korčule nema mogućnosti obnavljanja rezervi vode.<sup>75</sup> U tome smislu znakovit

arduous activity.<sup>71</sup> Of all modern sports, rowing requires by far the highest consumption of energy per time unit (personal information, Pavle Mikulić, Faculty of Kinesiology, University of Zagreb) and fresh water that had to be stored on the vessel.<sup>72</sup> The limited space (and time) for consumption of food in a vessel carrying several people was also the aspect that had to be taken into account because only the food suitable for such conditions could have been used.<sup>73</sup> For example, let us picture the crew of a ship transporting 10kg of obsidian from the Lipari Islands to Vela Spila on Korčula. A man needs approx. 1,720kcal per day for basic functioning of his organism (so called *Basal Metabolic Rate*, BMR). Six hours of rowing with a moderate tempo (although it is certain they had to row even longer) requires 2,000kcal on average. If nothing else has been done during the day except six hours of rowing, it amounts to 3,700kcal. We should add to this sum another 200kcal required for turning food into energy. All together, it is 3,900kcal. Obviously, we cannot know what their diet was at the time, but we can take as an example the highly calorific dry figs as a source of energy certainly available to them. Around 2kg of dry figs would be required to compensate for the loss of approx. 4,000kcal. If we add to it the very important 4 liters of water, we have a mass of 8kg per person, or 24kg for all the oarsmen.<sup>74</sup> We should also point out here that no fresh water can be obtained between Gargano and Korčula.<sup>75</sup> Important

71 Prvo veslanje preko Atlantika izveli su F. Samuelsen i G. Harbo 1896. godine. Prevalili su put od New Yorka do Sicilije prešavši 6020 km za nešto više od 55 dana, što znači da im je prosječna brzina na ukupnom putu bila 4,54 km/h. Kada bismo tu brzinu uzeli za prosjek, put od Gargana u Italiji do Vele Spile na Korčuli (122 km) trajao bi 27 sati. Ta brojka naravno implicira istu brzinu tijekom cijeloga putovanja, uključujući noć itd., tako da je za pretpostaviti da bi ovom kalkulacijom putovanje trajalo dulje. O veslanju između Gargana i Vele Spile i utrošku vremena potrebnog za taj poduhvat vidjeti dalje tekst.

72 Prosječan preporučeni unos vode (AI) u umjerenj klimi za odraslog muškarca iznosi oko 3 l dnevno (<http://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/water/art-20044256>).

73 Npr. jedna sušena smokva ima oko 50 kalorija, gotovo dvostruko više od prosječne kriške bijelog kruha bez korice (kalkulirano s pomoću <http://www.caloriecount.com/calories-figs-dried-uncooked-i9094>). Odrasli muškarac od 40 godina koji radi uredski posao, s prosječnim fizičkim aktivnostima treba nešto manje od 2000 kalorija dnevno (prema [www.calorieking.com](http://www.calorieking.com)). Ta se energetska količina višestruko povećava intenzivnom aktivnošću kao što je veslanje.

74 Za pomoć i stručne konzultacije o nutricionizmu najtoplije zahvaljujemo kolegi Zvonimiru Šataliću s Prehrambeno-biotehnološkog fakulteta u Zagrebu.

75 Sušac je, kako mu ime govori, otok bez vode, iako se nakon oborina mogu naći povremene lokve (osob. priop. D. Radić).

71 The first ones to row across the Atlantic were F. Samuelsen and G. Harbo. In 1896, they covered 6,020km from New York to Sicily in around 55 days. It means their average speed was 4.54km/h. If we apply the same average speed to the route from Gargano, Italy to Vela Spila on the island of Korčula (122km), the voyage would take 27 hours – provided, of course, that the speed is maintained throughout the journey, day and night. We can therefore assume that, using this calculation, the voyage must have lasted longer than that. More on the rowing from Gargano to Vela Spila and the time it requires is said below.

72 The average recommended intake of water (AI) in a moderate climate for an adult man is approx. 3 liters per day (<http://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/water/art-20044256>).

73 For example, one dried fig has approx. 50 calories, almost twice as much as an average slice of white bread without crust (calculation made using <http://www.caloriecount.com/calories-figs-dried-uncooked-i9094>). An adult man of 40 years of age, having an office job and performing average physical activities, needs a bit less than 2,000 calories per day (according to [www.calorieking.com](http://www.calorieking.com)). The quantity of energy required for an activity like rowing is several times that much.

74 We would like to extend our gratitude to our colleague Zvonimir Šatalić from the Faculty of Food Technology and Biotechnology in Zagreb for his assistance and expert consultations on nutrition.

75 The island of Sušac has its name with good reason (“suh” means “dry” in Croatian) because there is no water there, although short-lasting puddles can be found after rain (personal information, D. Radić).

je eksperiment plovidbe Monoxyton II pri kojem je u izdubljenom deblu drveta, rađenom po uzoru na takav nalaz iz jezera Bracciano u Italiji, jedanaesteročlana posada veslala od Sicilije do Portugala. Pokazalo se da se uz obalu može bez problema ploviti u jednostavnom plovilu od izdubljena drveta, onako kao je to spominjao Gluščević. Zanimljivo je vidjeti utrošak vremena potrebnog za pojedine rute. Npr. za etapu „srednja Italija“ bilo im je potrebno 3 dana tijekom kojih su prevalili ukupno 90 km za oko 24 sata veslanja, što je oko 3,74 km po satu, dok je za sličnu rutu „Italija – Francuska“ od 282 km bilo potrebno malo više od 83 sata, što je prosjek od 3,39 km po satu.<sup>76</sup> Međutim, valja naglasiti da je plovidba bila obavljena uz obalu, tijekom danjeg svjetla pri čemu nisu bili potrebni ni navigacija ni poznavanje orijentacije u plovidbi otvorenim morem bez vidljivih orijentira u prostoru. Sličan eksperiment krenuo je 2000. godine iz Vela Luke. Grupa veslača iz toga grada odveslala je u jednostavnom čamcu<sup>77</sup> s posadom od 4 + 1 osobe od Korčule do Gargana (70 milja) i za to im je bilo potrebno dvadeset sati neprekidna veslanja. Iako neki od sudionika ovog podviga svjedoče da se Jadran može preveslati „s jednim dobrim sendvičem“, što su oni tom prilikom doslovno učinili, znanost drugačije govori o utrošku energije potrebne za ovakav put koji se opetovano poduzima, a koji je samo dio onoga što je potrebno prevaliti od Lipara do Korčule. Dakako, ako pretpostavimo naš hipotetički „model“ da se cijelim navedenim putem plovilo.<sup>78</sup> Iz svega rečenog proizlazi da je veslanje na cijeloj toj dionici od oko 550 milja ekstremno visok napor i putovanje koje posadu dovodi do ruba gladovanja. Taj je napor, međutim, mogao biti i jest opravdan trgovinom visoko vrijednom sirovinom kao što je opsidijan. Budući da se u trenutku uznapredovale trgovine na relaciji Lipari – Korčula (Sušac) Mediteranom plovi već 100 000 godina, valja razmisliti o mogućnosti da je pogon tih plovila ipak mogao biti i vjetar. Nalaz koji se često koristio u raspravama o ranoj plovidbi Jadranom je i keramički ulomak iz Grapčeve špilje na Hvaru i

in this respect is the experimental voyage of Monoxyton II: an 11-member crew rowed a boat made from a hollowed tree trunk from Sicily to Portugal. The boat was modeled on a similar find from Lake Bracciano in Italy. It turned out a simple dugout boat could navigate along the coast without problems, as Gluščević claimed. It is interesting to find out how much time would it take for specific routes. For example, it took them three days to cover the “Central Italy” leg of the route, during which they would make around 90km per 24 hours (3.74km per hour). It took them 83 hours to travel the 282km-long “Italy – France” leg (3.39km per hour on average).<sup>76</sup> However, it should be noted that the voyage took place along the coast in daylight, requiring neither navigational skills nor orientation at open seas with no landmarks in sight. A similar experiment was made in 2000, when a group of oarsmen from Vela Luka (a crew of 4+1) rowed 70 miles from Korčula to Gargano in a plain boat.<sup>77</sup> It took them 20 hours of constant rowing. Although some of the participants claim that one can cross Adriatic Sea by rowing “with but a single sandwich” – which they did – science tells us otherwise when it comes to consumption of energy required for repeated voyages like this one, not to mention for covering the much longer Lipari – Korčula distance. Of course, if we apply our hypothetical “model” which implies constant rowing along the way.<sup>78</sup> All the above indicates that rowing the entire distance of approx. 550 miles required extreme efforts of a crew always on the verge of starvation. The efforts could have been – and are – on the account of the trade in a high-quality raw material such as obsidian. Since seafaring in the Mediterranean had been 100,000 years old in the days of the intensive trade on the Lipari – Korčula route, we should consider the possibility that the vessels used for it were using wind after all. One find that has often been referred to in the debates on the early seafaring in the Adriatic is a pottery fragment from Grapčeva Cave on Hvar and its older interpretation. The cave’s re-

76 R. TICHÝ, 1999, 39, 61, 121.

77 Brod na vesla bio je dugačak 7 m i širok 1,6 m.

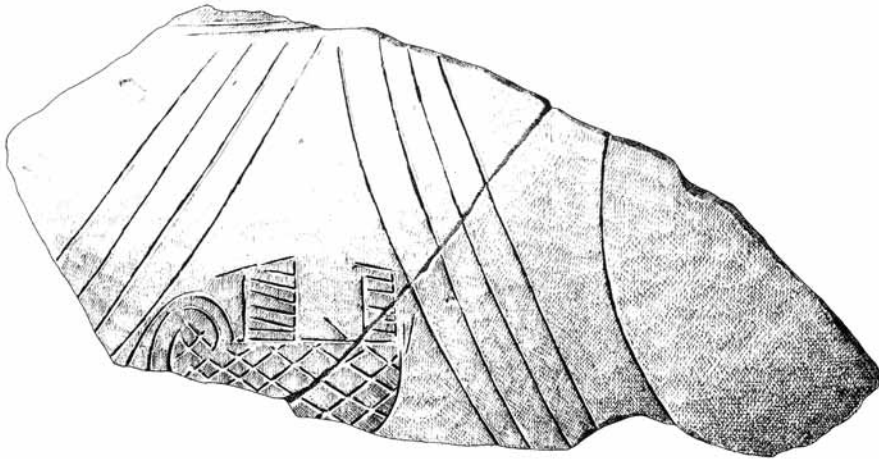
78 Sudionik ovog poduhvata, načelnik općine Vela Luka Tonči Gugić, ispričao nam je da je posadi znatno veći problem predstavljala psihička barijera nego sam fizički napor. Ipak, nepovoljni vjetrovi pred samom talijanskom obalom gotovo su doveli do odustajanja. Za vrijeme puta posada nije ništa pojela, a zajedno su popili tek nekoliko litara vode. Putovanju su prethodile višemjesečne pripreme. Gugić kaže da bi uz pomoć jedra taj put bio prevaljen za upola manje vremena. O ekstremnim naporima na ovom eksperimentu svjedoči sam Gugić koji kaže da na takvo putovanje ne bi išao drugi puta (osob. priop. T. Gugić).

76 R. TICHÝ, 1999, 39, 61, 121.

77 The rowboat was 7m long and 1.6m wide.

78 Mayor of Vela Luka, Tonči Gugić, who took part in this adventure, told us that psychological strain was a much bigger problem for the crew than the physical one. Still, adverse winds off the Italian coast almost made them give up. The crew had nothing to eat during the voyage and all of them together drank only a few liters of water. It took them several months of preparations for the adventure. Gugić says it would take them twice less time if they used a sail. Evidence of the extreme efforts required for such trip is Gugić’s comment that he would never repeat such a trip again (personal information, T. Gugić).





Sl. 7a. / FIG. 7a.

Plovilo urezano na fragment keramike hvarske kulture, Grapčeva špilja, Hvar (prema T. TEŽAK-GREGL, 1998, Sl. 35).

*Vessel carved in a pottery fragment belonging to the Hvar Culture, Grapčeva Cave, Hvar (according to T. TEŽAK-GREGL, 1998, Fig. 35).*

njegova starija interpretacija. Riječ je o poznatom nalazu na kojemu je, kako to pretpostavlja istraživač špilje G. Novak, prikazano plovilo s jedrima (Sl. 7a).

Orijentacija fragmenta posude je s motivom u donjem djelu iz kojega Novak u svojoj izvornoj publikaciji, gdje je fragment prvi puta objavljen, interpretira nalaz kao nedvojbeni crtež plovila,<sup>79</sup> kako to kasnije prenose i drugi autori,<sup>80</sup> ali, istini za volju, neki i negiraju. Jedan od prvih koji je ponudio drugačiju interpretaciju toga urezanog motiva je J. Korošec.<sup>81</sup> U svome tekstu o utjecaju urezanih motiva danilske na hvarsku kulturu dotakao se tog problema na način da naglašava činjenicu da se kod tog fragmenta ne može sa sigurnošću tvrditi njegova ispravna orijentacija jer nisu sačuvani dijelovi posude koji bi upućivali na to što je njezin gornji, a što donji kraj. Ako se fragment gleda tako da se motiv nalazi na gornjoj strani, on zaista ne upućuje na impresiju plovila, već može predstavljati noge, trup, rep i vjerojatni falus neke „potpuno neodredive“ životinje.<sup>82</sup> Međutim, jednako tako, ako se

searcher G. Novak believes that this well-known find shows a vessel with sails (Fig. 7a).

The interpretation of the motif, however, depends on its orientation: whether the fragment with it belonged to the lower or upper part of the bowl. In the original publication where the fragment was first described, Novak claims it is beyond doubt that it depicts a vessel.<sup>79</sup> Other authors also mention it subsequently,<sup>80</sup> but – truth be told – some of them oppose it. One of the first to offer a different interpretation of the engraved motif was J. Korošec.<sup>81</sup> In his text on the impact of Danilo culture on Hvar culture, he tackles the problem by underlining the fact that the fragment's correct orientation cannot be positively established because no parts of the bowl indicating its upper and lower sides, respectively, have been preserved. If the fragment is observed in such way that the motif is on its upper side, it really suggests no vessel; instead, it could be interpreted as legs, body, tail and – probably – phallus of some “completely indeterminate” animal.<sup>82</sup> However, if the fragment is

79 G. NOVAK, 1966, T. CXCIV, 40, 55, 208.

80 B. BASS, 1998, 165; T. TEŽAK-GREGL, 1998, 109; N. PETRIĆ, 2002, 13-14.

81 J. KOROŠEC, 1957.

82 J. KOROŠEC, 1957, 7. Jedan od autora teksta (M. B.) anketirao je kod grupe ljudi (nasumično odabranih) urezani crtež s fragmenta. Uzorak ankete bio je na šestero djece (6 – 10 godina starosti) i devetero odraslih. Svi ispitanici izjasnili su se da se radi o motivu plovila, a pri motivu rotiranom za 180° da se radi o prikazu slona, osim u jednom slučaju kada je jedno dijete od anketiranih u eksperimentu „prepoznalo“ ulaz u garažu. Ovo iznosimo kao mali eksperiment i ilustraciju, nikako kao znanstveni argument.

79 G. NOVAK, 1966, T. CXCIV, 40, 55, 208.

80 B. BASS, 1998, 165; T. TEŽAK-GREGL, 1998, 109; N. PETRIĆ, 2002, 13-14.

81 J. KOROŠEC, 1957.

82 J. KOROŠEC, 1957, 7. One of the text's authors (M. B.) requested a group of randomly selected persons to identify the carving on the fragment. The sample of respondents included six children (6-10 years of age) and nine adults. They all said the motif represented a vessel. When rotated by 180°, they claimed it was an elephant – except in one case: one child “recognized” a garage door in it. This little experiment is mentioned here as an illustration, by no means as a scientific argument.

fragment okrene za 180° da je motiv na donjoj strani, plovilo opet postaje „izglednije“. Korošec nije *a priori* odbacio Novakovu interpretaciju broda, već samo ponudio „doslovno“ drugi kut gledanja na fragment, odnosno motiv.<sup>83</sup> „Potpuno neodredivu“ životinju pokušao je „odrediti“ C. Ihde koji naglašava hvarsku keramiku sličnom s onom iz prostora Mediterana<sup>84</sup> blizu sjevernoafričke obale<sup>85</sup> te tvrdi kako se na ovom prikazu radi o slonu<sup>86</sup> te govori o povezivanju prostora od sjeverne Afrike do istočne obala Jadrana i njegova zaleđa. Mišljenje se temelji uglavnom na onome što Radić u radu iz 2002. godine interpretira kao zoomorfne prikaze (o čemu će biti riječi u donjim redcima), a Ihde tumači kao prikaze slonova (uz Grapčevu špilju autor navodi i Krivače kod Šibenika). Iako spomenuti urezani motiv može podsjećati na plovilo, valja istaknuti da postoje točke koje su u samome konceptu crteža donekle problematične. Npr. „plovilo“ je prikazano s dva jedra. Dok je ono koje je smješteno bliže pramcu „logično“ postavljeno, problematičan je smještaj drugoga jedra koje se nalazi sasvim na krmi. Nadalje, između njih se nalazi urezana linija koja bi u tom slučaju trebala predstavljati ručku, odnosno polugu kormila (falus kod interpretacije J. Korošca pri pogledu iz suprotne rotacije), što bi upućivalo na iznimnu kompleksnost u brodogradnji i tehnološka rješenja koja ipak trebamo smatrati nedostižnima u neolitiku. Tehnološki zanimljiv bio bi i sam pramac koji zavinut i podignut ima obilježja napredne gradnje prikladne za plovidbu otvorenim morem. Međutim, zavinut i podignut prednji dio plovila ima npr. već spomenuta papirela, plovilo koje je bilo u značajnoj upotrebi na Krfu, dok ih danas više nema.<sup>87</sup> Na Novakovu tezu o brodu oslanja se i N. Petrić koji je, jedini od nama poznatih kolega, svojevremeno dotični fragment držao u ruci (usm. priop. N. Petrić). Oštro je kritizirao Ihdeovo mišljenje naglašavajući da se radi o plovilu s jedrom i „brodskom kućicom“, komentirajući Ihdeovu ideju rečenicom: „kakve smo tek onda imali brodove kad su mogli prevoziti slonove“.<sup>88</sup> S druge strane, vrlo argumentiranu kritiku prikaza broda na hvarskom fragmentu dao je D. Radić u već spo-

turned 180° - so that the motif is on the lower side – a vessel again becomes the “more likely” interpretation. Korošec did not *a priori* discard Novak’s interpretation of a ship, he merely offered – literally – another angle for observing the fragment and its motif.<sup>83</sup> C. Ihde tried to determine the “completely undeterminable” animal. Noticing the Hvar pottery’s similarity with the one from the Mediterranean,<sup>84</sup> near the North African coast,<sup>85</sup> he claims the motif depicts an elephant,<sup>86</sup> which makes him speculate about the connections between Northern Africa and Eastern Adriatic and its hinterland. His opinion is mostly based on what Radić in his 2002 work interprets as zoomorphous figures (more of which will be said below) and what Ihde sees as representations of elephants (mentioning not just Grapčeva Cave, but also Krivače site near Šibenik). Although the abovementioned carved motif may remind of a vessel, it should be noted that some points in the motif’s concept are rather problematic. For example, the “vessel” is shown with two sails. While the one closer to the bow is positioned “rationally”, the position of the second one, back on the stern, raises questions. In addition, the carved line between them should then represent the tiller (the phallus – in J. Korošec’s interpretation if viewed when rotated 180°), indicating a very complex challenge for shipbuilders and the technological solutions that can safely be considered unattainable in Neolithic. The bow itself would then be interesting from the technological point of view because, being curved and raised, it would manifest the characteristics of an advanced design suitable for venturing open seas. However, even the abovementioned papyrella – a vessel that was in a regular use on Corfu but is now gone – also had a curved and raised bow.<sup>87</sup> N. Petrić, the only one known to us who actually held the fragment in his hand (personal information, N. Petrić), also draws on Novak’s thesis about the ship. He strongly criticized Ihde’s opinion, pointing out that it was a vessel with a sail and a “small deckhouse”, commenting Ihde’s idea with the following sentence: “What ships must we have had if they could transport elephants”.<sup>88</sup> On the other hand, D. Radić gave a very reasoned criticism of the depiction of a vessel on the

83 J. KOROŠEC, 1957, 7.

84 C. IHDE, 1995, 72, Fig: 8.

85 C. IHDE, 1995, 54, 67, 86.

86 C. IHDE, 1995, 54, 55 itd.

87 C. MARANGO, 2001, 740, 741; H. TOMAS, 2016, 373-374, Sl. 426.

88 N. PETRIĆ, 2002, 13-14 bilješka 3.

83 J. KOROŠEC, 1957, 7.

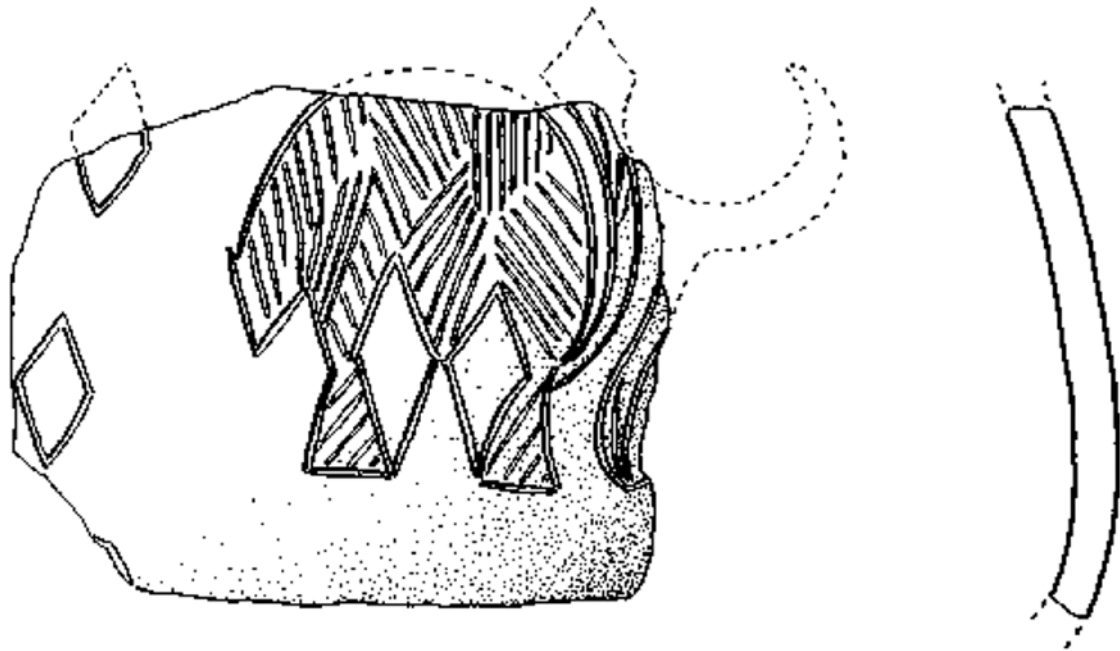
84 C. IHDE, 1995, 72, Fig: 8.

85 C. IHDE, 1995, 54, 67, 86.

86 C. IHDE, 1995, 54, 55 etc.

87 C. MARANGO, 2001, 740, 741; H. TOMAS, 2016, 373-374, Sl. 426.

88 N. PETRIĆ, 2002, 13-14 bilješka 3.



Sl. 7b. / FIG. 7b.

Prikaz fantastične životinje iz Lisičića, prikaz stilski slični fragmentu sa Sl. 8 (prema D. RADIĆ, 2002, T2, br. 3).

*Depiction of a fantasy animal from Lisičići, similar in style to the fragment on Figure 8 (according to D. RADIĆ, 2002, T2, No. 3).*

menutom radu iz 2002. godine. Uspoređujući keramičke nalaze iz kasnoga neolitika s više lokaliteta (hrvatski otoci, zaleđe, središnja Bosna; područje koje opisuje i Ihde), uočio je redovitost pojave stiliziranih zoomornih prikaza i ispravno ih atribuirao kao fantastične prikaze, po njemu, iz kultno-magijske sfere.<sup>89</sup> Iako se veći dio od desetak ulomaka o kojima autor govori može stilski argumentirano povezati, ulomak iz Grapčeve špilje u tome smislu pokazuje minimalan odklon. Ipak, mora se reći da „Radićeve fantastične životinje“ i „Novakov brod“ u svakom smislu pokazuju dovoljno sličnosti temeljem kojih se prikazani „brod“ ipak treba svrstati u repertoar fantastičnih životinja koje se pojavljuju na keramici hvarske kulture (Sl. 7b).

Vratimo se nakratko na papirelu. Redovitost i količina opsidijana koji se pojavljivao u slojevima pećine Franchthi inicirale su zanimljiv spomenuti pokus u kojemu je korištena rekonstrukcija papirele dužine 5,75 m za putovanje od Atike do Mela.<sup>90</sup> Papirela je isplovila u listopadu 1988., putovanje se odvijalo tijekom petnaestak dana, od kojih se sedam

Hvar fragment in his earlier mentioned 2002 work. Comparing the Late Neolithic pottery from several sites (Hvar and the surrounding islands, hinterland, Central Bosnia; the same area Ihde describes), he noticed the regular appearance of stylized zoomorphic depictions and correctly attributed them as fantasy illustrations – in his opinion, related to the sphere of cult and magic.<sup>89</sup> While most of the dozen fragments the author discusses can be interconnected in terms of style, the Grapčeva Cave fragment shows a minimal departure in this respect. Just the same, we should say that “Radić’s fantasy animals” and “Novak’s ship” show enough similarities that make one conclude that the “ship” should, after all, be included in the repertoire of the fantasy animals appearing on the Hvar culture pottery (Fig. 7b).

Let us go back to the papyrella for a moment. The quantities of obsidian in Franchthi Cave and the regularity of its occurrence inspired the interesting abovementioned experiment, in which a 5.75m-long reconstructed papyrella sailed from Atica to Melos.<sup>90</sup> The papyrella put out to sea in October 1988.

89 D. RADIĆ, 2002b, 24.

90 N. KLEISIARIS, S. BAKAS, S. SKARMINTZOS, 2014, 102.

89 D. RADIĆ, 2002b, 24.

90 N. KLEISIARIS, S. BAKAS, S. SKARMINTZOS, 2014, 102.



SL. 8. / FIG. 8.

Keramički disk s prikazom broda s dva jarbola (prema R. CARTER, 2006, Fig. 4).

*Ceramic disc with a depiction of a two-mast ship (according to R. CARTER, 2006, Fig. 4).*

provelo u plovidbi, odnosno veslanju.<sup>91</sup> Valja naglasiti da se nije putovalo direktnom linijom po otvorenu moru, već od otoka do otoka sve do Mela, što je znatno manje zahtjevno kako za konstrukciju broda tako i za veslače. Kada spominjemo prikaze plovila, vrlo rani prikaz broda s dva jarbola, kako ga tumače autori, dolazi s lokaliteta H3 na sjeveru Perzijskog zaljeva (Kuvajt), jednog od šezdesetak nalazišta na tom području koji svjedoče o intenzivnoj neolitičkoj trgovini između Mezopotamije i Zaljeva u periodu Ubaid 2/3 (iza 5000. godine pr. Kr.). Crtež broda na keramičkom disku, stilski potpuno različit od onoga iz Grapčeve špilje, po autorima svjedoči o dvama jedrima na plovilu iz neolitičkoga doba<sup>92</sup> (Sl. 8).<sup>93</sup>

The voyage took fifteen days, seven out of which was spent rowing.<sup>91</sup> It should be noted here it was not a straight route across open sea; instead, they zigzagged from island to island all the way to Melos, which was less demanding for both the ship's structure and oarsmen. As regards the depictions of vessels, a very early depiction of a ship with two masts – as the authors interpret it – comes from the H3 site on the northern tip of Persian Gulf (Kuwait), one of the sixty sites in the area serving as evidence of an intensive Neolithic trade between Mesopotamia and Gulf in the Ubaid 2/3 period (after 5000 BCE). In the authors' opinion, the drawing of a ship on a ceramic disc, of a style completely different from the one from Grapčeva Cave is evidence of two sails on a vessel from the Neolithic period<sup>92</sup> (Fig. 8).<sup>93</sup>

91 H. TOMAS, 2016, 374.

92 R. CARTER, 2006, 53.

93 Na lokalitetu, pored spomenutog diska, postoji još nalaza koji govore o tadašnjoj navigaciji kao što su ostatci bitumenske impregnacije oplata, keramički model broda itd. (R. CARTER, 2006, 53-57).

91 H. TOMAS, 2016, 374.

92 R. CARTER, 2006, 53.

93 In addition to the disc, there are other finds on this site witnessing the navigation of those days, such as the remainders of the bitumen-impregnated ship planking, a ceramic model of a ship etc. (R. CARTER, 2006, 53-57).



Sl. 9. / FIG. 9.

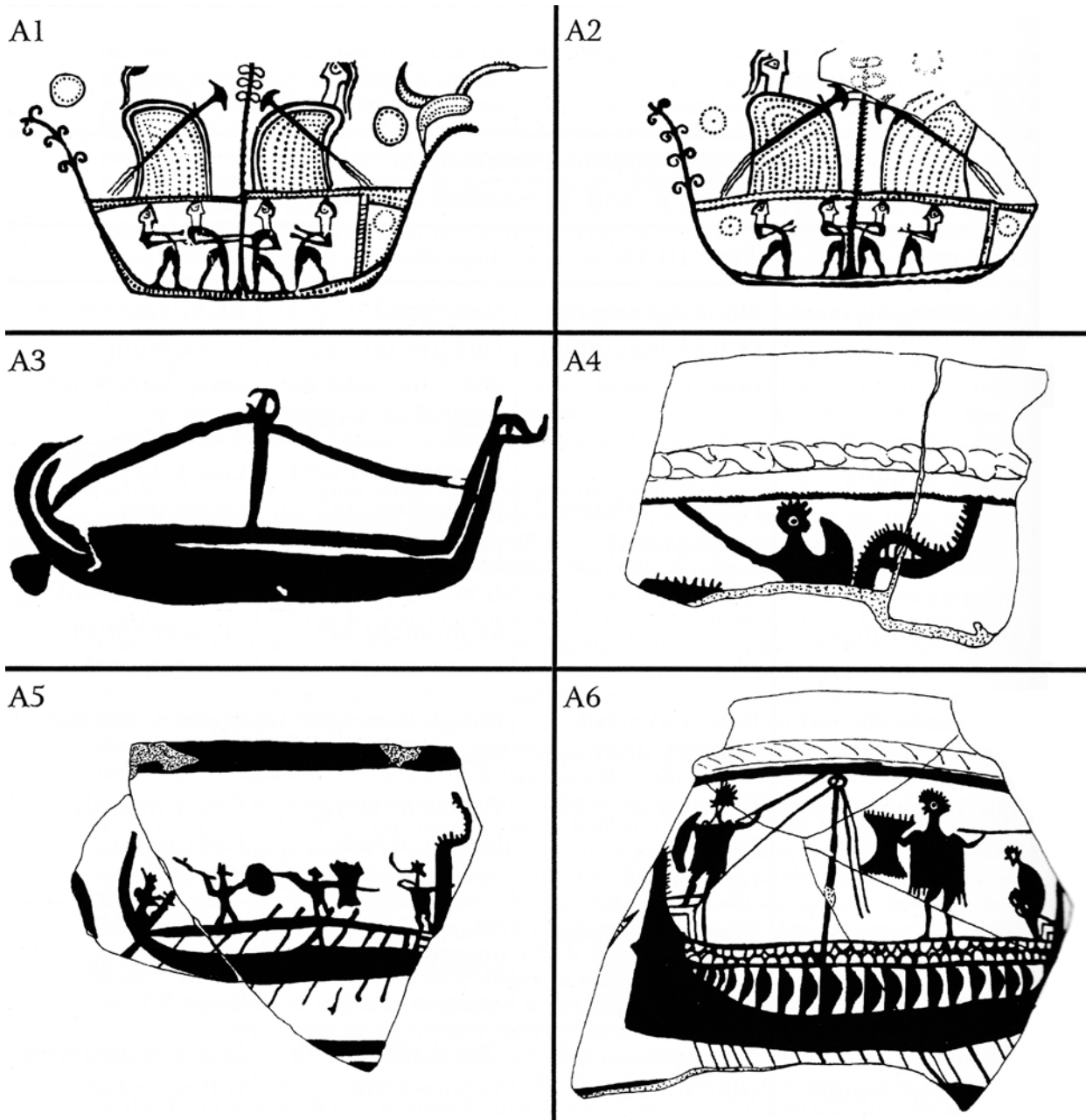
Prikaz broda s veslima na tzv. tavi iz nekropole Chalandriani, otok Siros (Kikladi) (prema H. TOMAS, 2016, 244 i 245). Primjer na slici vjerojatno je najpoznatija kikaladska tava s urezanim plovilom kao glavnim motivom, međutim ukrašavanje brodom na tim predmetima nije rijetko, tako da ih je samo na ovome otoku otkriveno desetak (J. E. COLEMAN, 1985, 198, Sl. 5).

*Depiction of a ship with oars on the so called Chalandriani necropolis pan (from the island of Syros in the Cyclades) (according to H. TOMAS, 2016, 244 i 245). The example illustrated here represents probably the best known Cycladian pan with a carved vessel as the main motif. However, similar motifs on such objects were not rare: a dozen of them have been discovered on this island alone (J. E. COLEMAN, 1985, 198, Fig. 5).*

Ne ulazeći dalje u analogije iz tako udaljenih područja, iako su ovi argumenti na nivou čistih indicija, može se reći da jednostavan koncept pogona na vjetar u neolitičkom razdoblju nije nemoguć. Na Mediteranu, okruženju u kojem je plovilo jedan od važnih faktora života, kako u ribolovu tako i u trgovini, plovi se već, kako rekosmo, stotinu tisuća godina. U Egeidi oko 2800. godine pr. Kr. postoje već prave galije (Sl. 9), a oko 2000. godine pr. Kr. i one na kojima su prikazani ratnici, veslači, jedra i roba kojom se trguje (Sl. 10).

Without resorting to analogies with such distant regions – although the arguments are but circumstantial evidence – one can say that the simple concept of wind power was not impossible in the Neolithic period. In the Mediterranean, where sea vessels are one of the major factors of life, fishing and trade, people have sailed for one hundred thousand years. In the Aegean, the first true galleys (Fig. 9) can be traced back to around 2800 BCE and the first ones depicted with warriors, oarsmen, sails and merchandise for trading are dated back to around 2000 BCE (Fig. 10).





Sl. 10. / FIG. 10.

Jedan primjer mikenskih galija, tip V, A1 – A3, A5, A6 (prema M. WEDDE, 1999, T. LXXXVIII).

*Specimen with a Mycenaean galley, type V, A1 – A3, A5, A6 (according to M. WEDDE, 1999, T. LXXXVIII).*

Što je onda s prapoviješću koja seže u razdoblje neolitika? Tako razvijena plovila egejskih kultura, odnosno njihova brodograditeljska rješenja, vjerojatno nisu rezultat samo tih naprednih civilizacija, već plod postupnog razvoja brodograditeljskih i navigacijskih znanja iz znatno ranijih razdoblja. Od *ultra-ranih* neandertalskih ekspedicija do početka trgovine opsidijanom na Jadranu prošlo je dovoljno vremena dostatnog za otkriće pogona na vjetar, iako za to nemamo pouzdanih materijalnih dokaza. Međutim, modela plovila imamo na više točaka u Grčkoj: iz srednjega neolitika potječe ukrašeni arte-

Then what about the prehistory that extends way back to Neolithic? The Aegean vessels of such level of development and their design were probably not the achievement of these advanced civilizations alone, but rather of the gradual development of ship-building and seafaring knowledge from much earlier periods. The time that elapsed from the *ultra-early* Neanderthal expeditions to the beginning of the obsidian trade in the Adriatic was long enough for putting wind power to use, although there is no material evidence to it. However, models of vessels can be found on several sites in Greece: the decorated ar-

fakt koji bi mogao prikazivati čamac iz izdubljenog drveta otkriven u Knosu,<sup>94</sup> a po tom pitanju važan je i keramički model plovila iz Tsanglija,<sup>95</sup> oba bez indicija da su mogli imati konstrukciju za jedro, dok Gimbutas spominje „upotrebu plovila na jedra od 6. tis. pr. Kr. potvrđenu urezanim prikazima na keramici“.<sup>96</sup>

Trgovačka ekspanzija kojoj svjedočimo u neolitiku posvuda na mediteranskom području, uključujući i nalaze eolskog opsidijana u Hrvatskoj, sasvim je sigurno doba kada treba pretpostaviti značajan brodograđevni napredak, u prvome redu stoga jer su to zahtijevali intenzitet i ekonomska isplativost trgovine. Silna količina toga materijala koja se i danas nalazi na površini otoka Sušca također je pokazatelj intenzivne distribucije, a morao je biti dopreman brodovima koji su stoga morali biti kompaktni i čvrsti za sav teret koji, kako smo vidjeli u našem hipotetičkom modelu, nije bio zanemariv. Također, valja pretpostaviti i relativnu redovitost plovidbe na toj relaciji s obzirom na količinu nalaza opsidijana na Sušcu, Veloj Spili, ali i u zaleđu istočnojadranske obale. Rasprava o sofisticiranosti maritimne tehnologije u neolitiku uvelike je uvjetovana opsidijanom kao materijalom koji je, za očekivati i pretpostaviti, jedan od glavnih razloga za organiziranu plovidbu, pa tako i razvoj brodogradnje, što je već naglašeno. Činjenica jest da je trenutno najstariji direktni dokaz plovidbe po otvorenom moru na Zapadnom Mediteranu nalaz tek iz drugog tisućljeća prije Krista s lokaliteta Pignataro di Fuori baš na obali otoka Lipara. Navedeni datum indirektno pokazuje koliko je neizvjesno pretpostavljati jedrenje više od tri tisuće godina ranije.<sup>97</sup> Tome u prilog govori Tykotova misao u vezi s opsidijanskom trgovinom, ovoga puta sa Sardinije u smjeru južne Francuske: „Sardinian obsidian could have reached southern France by several routes directly from the Monte Arci supply zone; via Corsica; or via Tuscany and Liguria. The first and second choices would suppose much greater confidence and capability in open water crossings than most scholars are willing to credit to Neolithic sailors“.<sup>98</sup> Nedavno objavljena sjajna analiza Freunda i Batista na 79 neolitičkih lokaliteta s nalazima opsidijana na potezu od Sardinije do južne Francuske daje vrlo indikativne argumente za

tifact probably depicting a dug-out boat, discovered in Knossos<sup>94</sup>, dates back to Neolithic; the ceramic vessel model from Tsangli<sup>95</sup> is also important in this respect. For either of the two there are no indications of a sail structure. Gimbutas, however, mentions the “use of sailing vessels as of the 6<sup>th</sup> millennium BCE, evidenced by their carved depictions on pottery”.<sup>96</sup>

The trade expansion visible throughout the Neolithic Mediterranean, including the Aeolian obsidian finds in Croatia, is certainly the period when a significant progress in shipbuilding must have taken place, primarily because the intensity and profitability of the trade so required. The huge quantities of this material that are still found on the island of Sušac are also evidence of its intensive distribution. It must have been transported aboard ships that were compact and durable because of the cargo that – as we could see in our hypothetical model – was far from negligible. We should also presume that the traffic along the route was regular, given the quantity of obsidian on Sušac, in Vela Spila, in the Eastern Adriatic hinterland and in Central Bosnia. The discussion about the level of development of maritime technology in Neolithic is largely based on obsidian as the material that was – expectedly and presumably – one of the main reasons for organized navigation and the development of shipbuilding. The fact is that the oldest known direct evidence of open-sea navigation in the Western Mediterranean – the one from Pignataro di Fuori site on the coast of the Lipari Islands – dates back only to the second millennium BCE. The said dating indirectly shows the dubiousness of the assumption that sails were used more than three thousand years earlier.<sup>97</sup> This is supported by Tykot’s opinion about the obsidian trade between Sardinia and southern France: “Sardinian obsidian could have reached southern France by several routes directly from the Monte Arci supply zone; via Corsica; or via Tuscany and Liguria. The first and second choices would suppose much greater confidence and capability in open water crossings than most scholars are willing to credit to Neolithic sailors”.<sup>98</sup> The recently published analysis of 79 Neolithic sites with obsidian finds on the route between Sardinia and Southern France, carried out by Freund and Batist, offers very indicative arguments in favor of open-sea navigation.

94 C. MARANGO, 2001, 744.

95 C. MARANGO, 2001, 743, Fig. 7-8.

96 M. GIMBUTAS, 1982, 18.

97 K. P. FREUND, Z. BATIST, 2014, 364.

98 R. H. TYKOT, 1996, 55.

94 C. MARANGO, 2001, 744.

95 C. MARANGO, 2001, 743, Fig. 7-8.

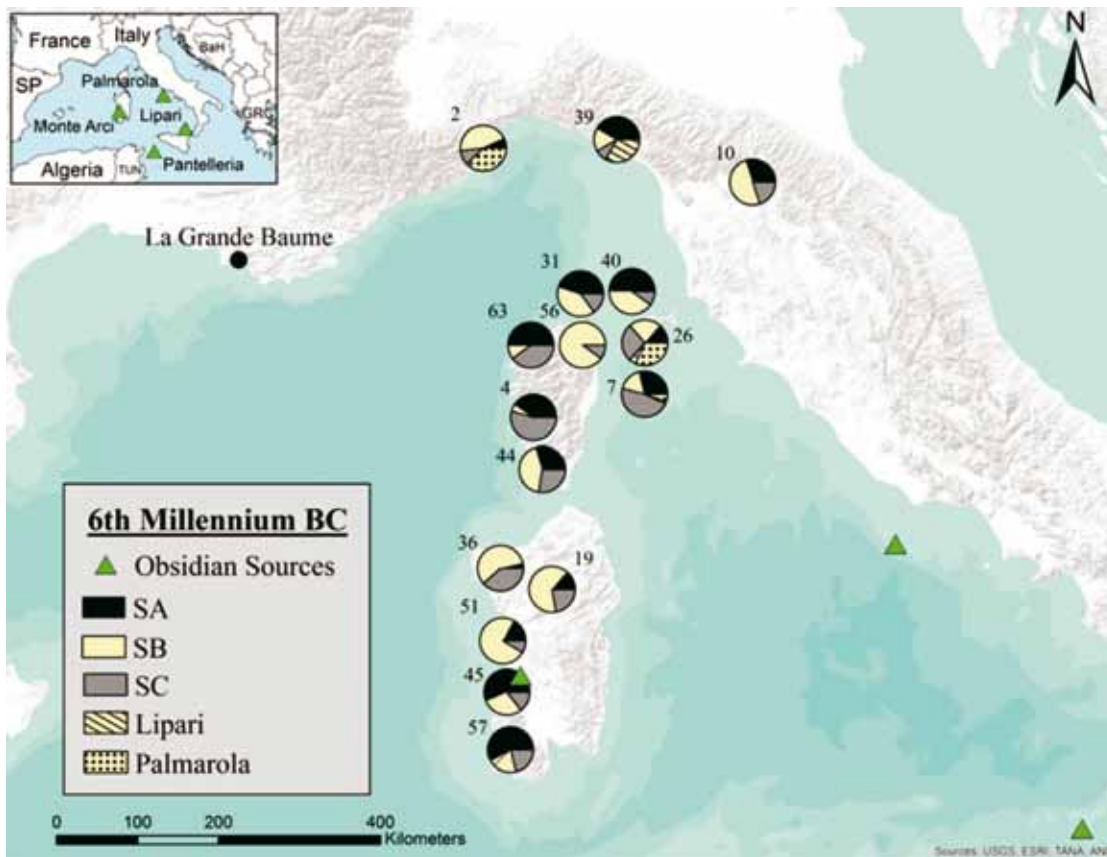
96 M. GIMBUTAS, 1982, 18.

97 K. P. FREUND, Z. BATIST, 2014, 364.

98 R. H. TYKOT, 1996, 55.

plovidbu otvorenim morem. Dok učestalost opsidijana na tom području tijekom 6 tisućljeća pr. Kr. vrlo jasno ide u prilog Renfrewovoj „down-the-line“ distribuciji italskim kopnom, situacija tijekom 5. i 4. tisućljeća pr. Kr. vrlo zorno pokazuje moguće direktne kontakte Korzike i južne Francuske, gdje je Korzika polazišna točka plovidbe i transporta sardinijskog materijala. U tom razdoblju izrazito se povećava broj nalaza SA tipa opsidijana u južnoj Francuskoj, dok on gotovo potpuno nedostaje na italskim obalnim lokalitetima kao što su glasovite Arene Candide, kako je to vidljivo na prikazanim modelima<sup>99</sup> (Sl. 11 – 13).

While the frequency of obsidian in that area in the 6<sup>th</sup> millennium BCE very clearly supports Renfrew’s down-the-line distribution along the Italic mainland, the situation in the 5<sup>th</sup> and 4<sup>th</sup> millennia BCE graphically shows possible direct contacts between Corsica and Southern France, with Corsica being the starting point of the route and for the transport of the Sardinian material. The number of finds of the obsidian of SA type is markedly increased in Southern France in that period. Conversely, it is almost non-existent on the Italic coastal sites such as the well-known Arene Candide, as illustrated on the models shown here<sup>99</sup> (Figs. 11 – 13).



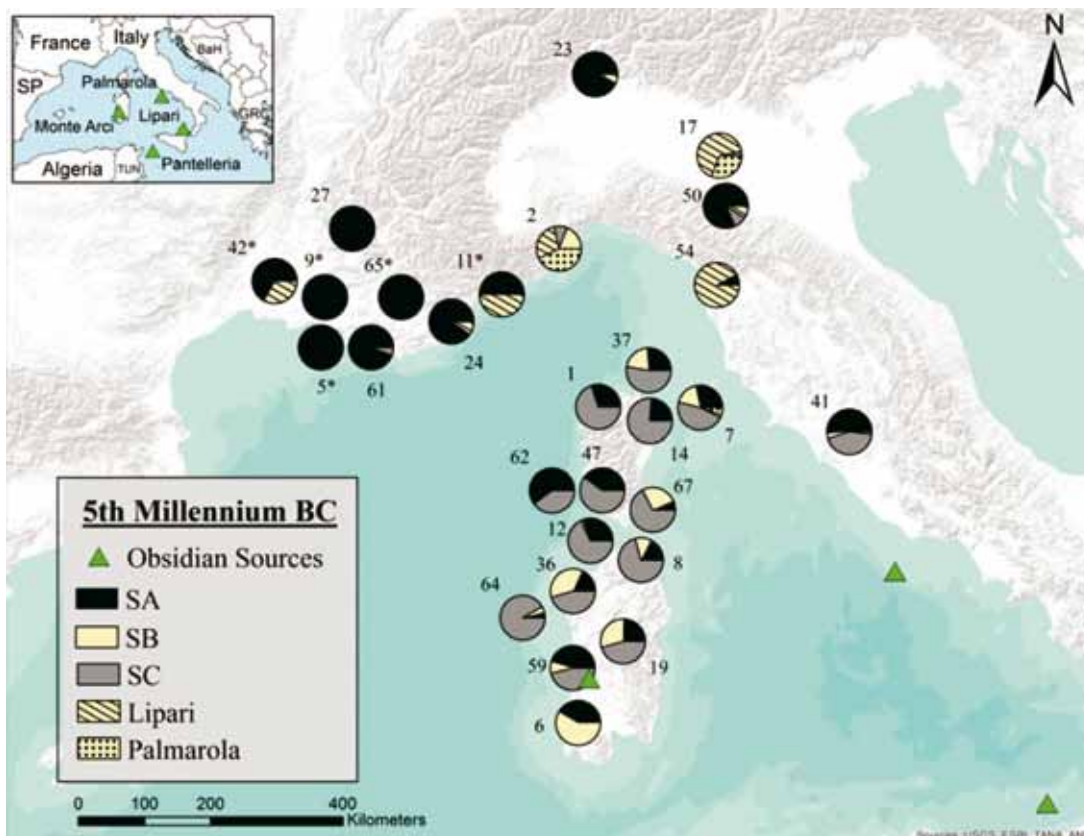
Sl. 11. / FIG. 11.

Frekvencije pojave opsidijana tijekom 6. tis. pr. Kr. na potezu Sardinija – Korzika – sjeverna Italija – južna Francuska (SA, SB i SC su kemijski ustanovljene razlike sardinijskoga geološkog opsidijana) (prema K. P. FREUND, Z. BATIST, 2014, Sl. 3).

Frequencies of obsidian finds in the 6<sup>th</sup> millennium BCE on the Sardinia – Corsica – Northern Italy – Southern France route (SA, SB and SC are the chemically established varieties of the Sardinian geological obsidian) (according to K. P. FREUND, Z. BATIST, 2014, Fig. 3).

99 K. P. FREUND, Z. BATIST, 2014, 376-377.

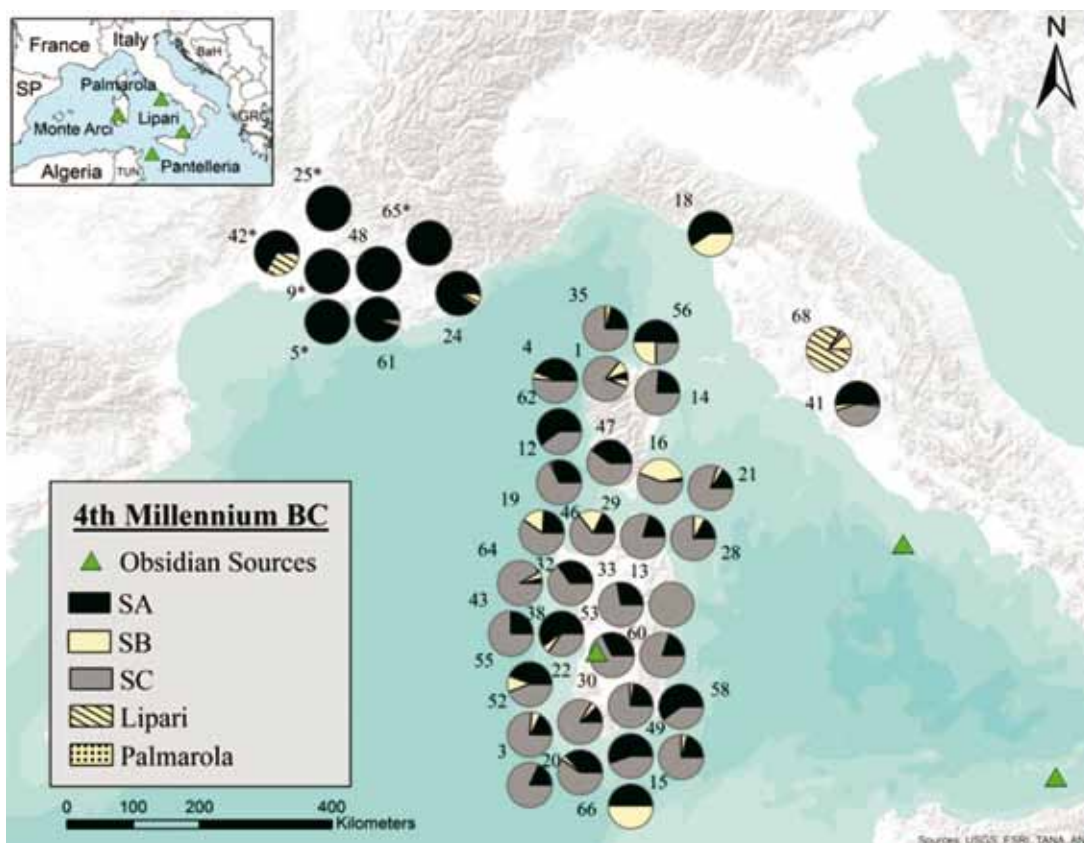
99 K. P. FREUND, Z. BATIST, 2014, 376-377.



Sl. 12. / FIG. 12.

Frekvencije pojave opsidijana tijekom 5. tis. pr. Kr. (prema K. P. FREUND, Z. BATIST, 2014, Sl. 4).

Frequencies of obsidian finds in the 5<sup>th</sup> millennium BCE (according to K. P. FREUND, Z. BATIST, 2014, Fig. 4).



Sl. 13. / FIG. 13.

Frekvencije pojave opsidijana tijekom 4. tis. pr. Kr. (prema K. P. FREUND, Z. BATIST, 2014, Sl. 5).

Frequencies of obsidian finds in the 4<sup>th</sup> millennium BCE (according to K. P. FREUND, Z. BATIST, 2014, Fig. 5).

Peto i četvrto tisućljeće pokazuju značajnu unutarotočku razmjenu između zajednica na Sardiniji i Korzici, dok susjedna i bliža italska obala u većoj mjeri koristi distribuciju opsidijana s Palmarole i Eolskih otoka.<sup>100</sup> Južna Francuska predstavlja sasvim suprotnu sliku indicirajući zaključak da je trgovina u to vrijeme bila vrlo vjerojatno na direktnoj razmjeni na liniji Sardinija/Korzika – južna Francuska, što s krajnjeg SZ rta Sardinije i današnjeg Hyèrea u Francuskoj iznosi gotovo okruglih 300 km otvorenog mora. Dakle, kada govorimo o neolitičkoj navigaciji u Jadranu: a) nemamo dokaza o brodovima s jarbolom ili sličnom konstrukcijom koja bi nosila jedro; b) nemamo čak ni vjerodostojnih prikaza brodova kao indirektnih dokaza jer primjer iz Grapčeve špi-lje, kako smo vidjeli, nije vjerodostojan. Međutim, imamo vrlo intenzivnu trgovinu prilično dugačkim dionicama koje karakterizira očigledna učestalost i gospodarska važnost putovanja te dovoljno vremena da se otkrije i razvije koncept plovidbe na jedra. Složili bismo se s ranijom Tykotovom pretpostavkom, potkrijepljenom recentnom analizom Freunda i Batista, da upravo tim očitim nedostacima sardinijskog opsidijana na toskanskoj i ligurskoj obali, a temeljem njegove pojave u južnoj Francuskoj, smijemo pretpostavljati kvalitetnu i ozbiljnu brodogradnju neolitičkih moreplovaca. Konačno, u arheologiji se mnogo puta pokazalo da nedostatak dokaza ne mora uvijek biti dokaz nepostojanja. Ta tema svakako zaslužuje jednu detaljniju obradu, a to je već pretpostavljao i argumentirano dokazivao Zdenko Brusić<sup>101</sup> čijoj uspomeni posvećujemo ovaj rad žaleći što rasprave o pitanju plovidbe Jadranom u prapovijesti, svojedobno vođene s njim, više nećemo moći nastaviti. U konačnici, veslanjem ili jedrenjem, italska i hrvatska obala bile su povezane, a Jadran je bio medij koji ih je povezivao. One su samo jedan od polazišta i ciljeva unutar mreže mediteranskih itinerera kojima se plovi, trguje i od kojih se živi.

The fifth and fourth millennia indicate a significant interinsular exchange between the communities on Sardinia and Corsica. At the same time, the neighboring – and closer – Italic coast largely depended on the distribution of the obsidian from Palmarola and the Aeolian Islands.<sup>100</sup> Southern France is an opposite example; it indicates that the trade in those days probably took place in the form of exchange on the Sardinia/Corsica – Southern France route. Measured from the southwesternmost tip of Sardinia to the present-day Hyère in France, the distance is almost 300km across the open sea. As a conclusion, when we talk about the Neolithic seafaring in the Adriatic: a) there is no evidence of ships with a mast or some similar structure that would support a sail; b) there are even no credible depictions of ships as indirect evidence because the example from Grapčeva Cave – as we have seen – is not reliable. However, an intensive trade along rather lengthy routes did take place. It was characterized by obvious frequency, economic importance of the voyages undertaken and a long enough period of time for discovering and developing the concept of sailing. We can agree with the above quoted assumption of Tykot, supported by the recent analysis of Freund and Batist, that the striking lack of Sardinian obsidian on the Tuscanian and Ligurian coasts and its presence in Southern France indicate a high-quality structure of the Neolithic seafarers' ships. Finally, time and again, archaeology has proved that lack of evidence does not necessarily mean that something has never existed. The subject definitely deserves a detailed study. Our late colleague Zdenko Brusić supported such a thesis and provided well-argued evidence to it.<sup>101</sup> Missing the discussions on the prehistoric seafaring in the Adriatic with him, we dedicate this work to his memory. Be it rowing or sailing, the Italic and Croatian coasts were connected, with the Adriatic Sea as the medium connecting them. They are but one starting point and one destination in the network of the Mediterranean itineraries used as arteries through which the life current of navigation and trade is flowing.

100 K. P. FREUND, Z. BATIST, 2014, 371.

101 Z. BRUSIĆ, 2008, 68-69.

100 K. P. FREUND, Z. BATIST, 2014, 371.

101 Z. BRUSIĆ, 2008, 68-69.



## ZAHVALE

Autori zahvaljuju uredništvu na pozivu na sudjelovanje u zborniku radova posvećenom neprežaljnom kolegi Zdenku Brusiću. Također, izraze zahvalnosti upućuju kolegi Zvonimiru Šataliću iz Zavoda za poznavanje i kontrolu sirovina i prehrambenih proizvoda, Prehrambeno-biotehnološkog fakulteta u Zagrebu na pomoći pri izračunavanju nutritivnih vrijednosti hrane, te prof. Kostas Kotsakis u Aristotelovog sveučilišta u Solunu na korisnim savjetima i zanimljivom raspravom o ranoj plovidbi Mediteranom. Zahvaljujemo i g. Tončiju Gugiću, načelniku općine Vela Luka, na detaljima veslačkog poduhvata Vela Luka – Vieste 2000. godine te kolegi Dinku Radiću, ravnatelju Centra za kulturu Vela Luka. Na koncu, posebne i iskrene zahvale idu anonimnim recenzentima koji su vrijednim i argumentiranim komentarima kvalitetu rada podigli na jedan novi nivo.

Rad je dovršen u okviru financijske podrške projekta Hrvatske zaklade za znanost br. UIP-2014-09-7131 *Houses, Roads and traders of Early European Civilization*

## CREDITS

The authors would like to express their gratitude to the editorial board for inviting them to contribute to the collection of works dedicated to our sorely missed colleague Zdenko Brusić. We would also like to thank our colleague Zvonimir Šatalić from the Department of Food Quality Control of the Zagreb Faculty of Food Technology and Biotechnology for his assistance in calculation of the nutritional values of foodstuffs, as well as to Prof. Kostas Kotsakis from the Aristotle University of Thessaloniki for his useful advice and an interesting discussion on the early seafaring in the Mediterranean. We are also grateful to Mr. Tonči Gugić, Mayor of Vela Luka, for the details of the Vela Luka – Vieste 2000 rowing expedition, and to our colleague Dinko Radić, Director of Vela Luka Cultural Center. And finally, special credit is due to the anonymous consulting editors whose valuable and well-argued comments have substantially contributed to the quality of this work.

The paper is finished with the support of Croatian science foundation (project no. UIP-2014-09-7131 *Houses, Roads and traders of Early European Civilization*).

Translation: Duško Čavić

## LITERATURA / REFERENCES

- BAR-YOSEF MAYER, D. E. *et al.*, 2015. – Daniella E. Bar-Yosef Mayer, Yaacov Kahanov, Joel Roskin, Hezi Gildor, Neolithic Voyages to Cyprus: Wind Patterns, Routes, and Mechanisms, *The Journal of Island and Coastal Archaeology*, 10:3, 412-435.
- BROODBANK, C., 2006. – Cyprian Broodbank, The Origins and Early Development of Mediterranean Maritime Activity, *Journal of Mediterranean Archaeology*, 19:2, 199-230.
- BASS, B., 1998. – Byron Bass, Early Neolithic Offshore Accounts: Remote Islands, Maritime Exploitations, and the Trans-Adriatic Cultural Network, *Journal of Mediterranean Archaeology*, 11:2, 165-190.
- BILIĆ, T., 2004. – Tomislav Bilić, Navigacija prema zvijezdama u prethistoriji i antici (I dio), *Naše more*, 51 (5-6), Dubrovnik, 239-248.
- BRUSIĆ, Z., 2008. – Zdenko Brusić, *Pokrovnik. Naselje iz neolitika*, Šibenik.
- CARTER, R., 2006. – Robert Carter, Boat remains and maritime trade in the Persian Gulf during the sixth and fifth millennia BC, *Antiquity*, 80:307, Durham, 52-63.
- COLEMAN, J. E., 1985. – John E. Coleman, "Frying Pans" of the Early Bronze Age Aegean, *American Journal of Archaeology*, 89:2, 191-219.
- ČEČUK, B., RADIĆ, D., 2005. – Božidar Čečuk, Dinko Radić, *Vela Spila. Višeslojno pretpovijesno nalazište*, Vela Luka.
- FARR, H., 2006. – Helen Farr, Seafaring as Social Action, *Journal of Maritime Archaeology*, 1, 85-99.
- FERENTINOS, G. *et al.*, 2012. – George Ferentinos, Maria Gkioni, Maria Geraga, George Papatheodorou, Early seafaring activity in the southern Ionian Islands, Mediterranean Sea, *Journal of Archaeological Science*, 39, 2167-2176.
- FREUND, K. P., BATIST, Z., 2014. – Kyle P. Freund, Zack Batist, Sardinian Obsidian Circulation and Early Maritime Navigation in the Neolithic as Shown Through Social Network Analysis, *Journal of Island and Coastal Archaeology*, 9:3, 364-380.
- FORENBAHER, S., MIRACLE, P., 2005. – Stašo Forenbaher, Preston T. Miracle, The Spread of Farming in the Eastern Adriatic, *Antiquity*, 79:305, 514-528.
- GIMBUTAS, M., 1982. – Maria Gimbutas, *The goddesses and gods of Old Europe, 6500-3500 B.C.: myths and cult images*, Oakland.
- GLUŠČEVIĆ, S., 1994. – Smiljan Gluščević, Brodolomi na Jadranu u antici i srednjem vijeku, *Adrias*, 4/5, Split, 13-31.



- IHDE, C., 1995. – Christian Ihde, Die Elefantendarstellungen der Hvar-Lisičići-Kultur und das Problem ihrer Herleitung, *Arheološki vestnik*, 46, Ljubljana, 53-88.
- JACOBSEN, T. W., 1981. – Thomas W. Jacobsen, Franchthi Cave and the Beginning of the Settled Life in Greece, *Hesperia*, 50:4, Athens, 303-319.
- KIRIGIN, B. *et al.*, 2009. – Branko Kirigin, Alan Johnston, Marko Vučetić, Zvonimir Lušić, Palagruža – The Island of Diomedes – and Notes on Ancient Greek Navigation in the Adriatic, u/in: *A Connecting Sea: Maritime Interaction in Adriatic Prehistory* (ur./ed.: S. Forenbaher), BAR International Series 2037, Oxford, 137-155.
- KLEISIARIS, N., BAKAS, S., SKARMINTZOS, S., 2014. – Nikolaos Kleisaris, Spyridon Bakas, Stefanos Skarmintzos, The Developmental Steps of Experimental Archaeology in Greece Through Key Historical Replicative Experiments and Reconstructions, u/in: *Experiments Past. Histories of Experimental Archaeology* (ur./eds.: J. Reeves Flores, R. Paardekooper), Leiden.
- KNAPP, A. B., 2010. – A. Bernard Knapp, Cyprus's Earliest Prehistory: Seafarers, Foragers and Settlers, *Journal of World Prehistory*, 23:2, 79-120.
- KOROŠEČ, J., 1957. – Josip Korošec, Zanimive upodobitve na keramičnih fragmentih iz „Grapčeve spilje“ na Hvaru, *Arheološki vestnik*, 8, Ljubljana, 3-8.
- KOTSAKIS, K., 2008. – Kostas Kotsakis, A Sea of Agency: Crete in the Context of the Earliest Neolithic in Greece, u/in: *Escaping the Labyrinth: The Cretan Neolithic in Context* (ur./eds.: V. Isaakidou, P. Tomkins), Oxford, 52-75.
- MARANGO, C., 2001. – Christina Marangou, Neolithic Craft: Evidence about Boat Types and Uses, u/in: *Archaeometry Issues in Greek Prehistory and Antiquity* (ur./eds.: Y. Bassiakos, E. Aloupi, Y. Facorellis), Athens, 737-751.
- MILLOT, C., TAUPIER-LETAGE, I., 2005. – Claude Millot, Isabelle Taupier-Letage, Circulation in the Mediterranean Sea, *Handbook of Environmental Chemistry*, 5, Heidelberg – Berlin, 29-66.
- MORTON, J., 2001. – Jamie Morton, *The Role of the Physical Environment in Ancient Greek Seafaring*, Leiden.
- MOUNDREA-AGRAFIOTI, A., 2003. – Antiklia Moundrea-Agrafioti, Mesolithic fish hooks from the Cyclope Cave, Youra, *British School at Athens Studies*, 10, Athens, 131-141.
- PETRIĆ, N., 2002. – Nikša Petrić, Zanimljivi crteži na pretpovijesnoj keramici hvarske kulture: prikazi kometa iz približno 3000 g. pr. Kr., *Vjesnik Arheološkog muzeja u Zagrebu*, 3. ser., 35, Zagreb, 11-18.
- POWEL, J., 2003. – Judith Powell, Fishing in the Mesolithic and Neolithic—the Cave of Cyclops, Youra, *British School at Athens Studies*, 9, Athens, 75-84.
- RADIĆ, D., 2002a. – Dinko Radić, Špilja Žukovica pored Račišća i Pelješki kanal tijekom mlađeg kamenog doba, *Godišnjak grada Korčule*, 7, Korčula, 19-28.
- RADIĆ, D., 2002b. – Dinko Radić, O jednom zoomorfnom prikazu na keramici hvarske kulture, *Vjesnik Arheološkog muzeja u Zagrebu*, 3. ser., 35, Zagreb, 19-33.
- RADIĆ, D., LUGOVIĆ, B., 2004. – Dinko Radić, Boško Lugović, Petrografska i geokemijska korelacija artefakata iz mezolitičkih naslaga Vele Spile i magmatskih stijena srednjodalmatinskoga otočja, *Opuscula Archaeologica*, 28, Zagreb, 7-18.
- RADIĆ, D., 2009. – Dinko Radić, The Beginnings of Trans-Adriatic Navigation: A View from, Vela Spila Cave (Korčula Island), u/in: *A Connecting Sea: Maritime Interaction in Adriatic Prehistory* (ur./ed.: S. Forenbaher), BAR International Series 2037, Oxford, 13-24.
- ROBINSON, A. R. *et al.*, 2001. – Allan R. Robinson, Wayne G. Leslie, Alexander Teocharis, Alex Lascratos, *Mediterranean Sea Circulation*, [http://robinson.seas.harvard.edu/PAPERS/encyrc.pdf, June 2015], 1-19.
- SIMMONS, A., 2012. – Alan Simmons, Mediterranean Island Voyages, *Science*, 338, 895-897.
- STRASSER, F. T. *et al.* 2010. – Thomas F. Strasser, Eleni Panagopoulou, Curtis N. Runnels, Priscilla M. Murray, Nicholas Thompson, Panayiotis Karkanas, Floyd W. McCoy, Karl W. Wegmann, Stone Age Seafaring in the Mediterranean: Evidence from the Plakias Region for Lower Palaeolithic and Mesolithic Habitation of Crete, *Hesperia*, 79:2, Athens, 145-190.
- STRASSER, F. T. *et al.* 2011. – Thomas F. Strasser, Curtis Runnels, Karl Wegmann, Eleni Panagapoulou, Floyd McCoy, Chad Digregorio, Panagiotis Karkanas, Nick Thompson, Dating Palaeolithic sites in southwestern Crete, Greece, *Journal of Quaternary Science*, 26:5, 553-560.
- TEŽAK-GREGL, T., 1998. – Tihomila Težak-Gregl, Neolitik i eneolitik, u/in: S. Dimitrijević, T. Težak-Gregl, N. Majnarić-Pandžić: *Prapovijest* (ur./ed.: M. Mirić), Zagreb, 56-157.
- TICHÝ, R., 1999. – Radomír Tichý, *Monoxylon II. Plavba po 8000 letech*, Hronov.
- TOMAS, H., 2016. – Helena Tomas, *Prapovijesni Kikladi. Kulture ranoga brončanog doba na kikladskome otočju u Grčkoj*, Zagreb.
- TYKOT, R. H., 1996. – Robert H. Tykot, Obsidian procurement and distribution in the central and western Mediterranean, *Journal of Mediterranean Archaeology*, 9:1, 39-82.
- WEDDE, M., 1999. – Michael Wedde, War at Sea: the Mycenaean and Early Iron Age Oared Galley, *Aegeum*, 19, vol. 2 [POLEMOS. Le contexte guerrier en Égée à l'âge du Bronze], Liege, 465-478.

## INTERNETSKI IZVORI / INTERNET SOURCES

- <http://www.sailingissues.com/meltemi.html> (lipanj / June, 2015)
- <http://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/water/art-20044256> (lipanj / June, 2015)
- <http://www.caloriecount.com/calories-figs-dried-uncooked-i9094> (lipanj / June, 2015)