

# Liburnians and Illyrian Lembs

## Iron Age Ships of the Eastern Adriatic



Luka Boršić, Danijel Džino  
and Irena Radić Rossi



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# Abbreviations

## Primary sources

Aesch. PV	Aeschilus, <i>Prometheus Vincitus</i>
Alciphrr.	Alciphron, <i>Letters</i>
Amm. Marc.	Ammianus Marcellinus, <i>Res Gestae</i>
<i>Anth. Pal.</i>	<i>Anthologia Palatina</i>
Ap. Rhod. <i>Argon.</i>	Apollonius Rhodius, <i>Argonautica</i>
App. <i>Ill.</i>	Appian, <i>Illyrike</i>
App. <i>Mith.</i>	Appian, <i>Mithridatic wars</i>
App. <i>Pun.</i>	Appian, <i>Punica</i>
App. <i>B Civ.</i>	Appian, <i>Bella Civilia</i>
Arist. <i>De motu an.</i>	Aristotle, <i>De motu animalium</i>
Ath.	Athenaeus, <i>The Learned Banqueters</i>
Caes. <i>BCiv.</i>	Caesar, <i>Bellum Civile</i>
Cass. Dio.	Cassius Dio, <i>Historia Romana</i>
Cl. Mam.	Claudius Mamertinus, <i>Gratiarum Actio Juliano Augusto</i>
Dem. <i>C. Phorm.</i>	Demosthenes, <i>Contra Phormionem</i>
Dem. <i>Zenoth</i>	Demosthenes, <i>Contra Zenothemin</i>
Diod. Sic.	Diodorus Siculus, <i>Bibliotheca Historica</i>
Eutr.	Eutropius, <i>Breviarium ab urbe condita</i>
Festus, <i>Epitoma</i>	Sextus Pompeius Festus, <i>Epitoma operis de verborum significato Verrii Flacci</i>
Flor.	Florus, <i>Epitomae de Tito Livio</i>
Gell. NA	Aulus Gellius, <i>Noctes Atticae</i>
Hdt.	Herodotus, <i>Historiae</i>
Hor. <i>Epod.</i>	Horace, <i>Epodes</i>
Isid. <i>Etym.</i>	Isidore of Seville, <i>Etymologiae</i>
Livy	Livy, <i>Ab urbe condita</i>
Livy, <i>Per.</i>	Livy, <i>Periochae Ab urbe condita</i>
Luc.	Lucan, <i>Pharsalia</i>
Lycurg. <i>Leoc.</i>	Lycurgus, <i>Contra Leocrates</i>
Nic. Dam.	Nicolaus Damascenus
Philo Mech.	Philo Mechanicus, <i>Parasceuastica et poliorcetica</i>
Philox.	Philoxenus of Alexandria
Plin. <i>HN</i>	Pliny the Elder, <i>Historia Naturalis</i>
Plut. <i>Ant.</i>	Plutarch, <i>Antony</i> .
Plut. <i>Cat. Min.</i>	Plutarch, <i>Cato Minor</i>
Plut. <i>Pomp.</i>	Plutarch, <i>Pompey</i>
Polyb.	Polybius, <i>The Histories</i>
Prop.	Propertius, <i>Elegies</i>
Scymn.	<i>Scymni Chii periegesis</i>
Scyl.	Pseudo-Skylax's periplous
Sisenna, <i>Hist.</i>	Lucius Cornelius Sisenna, <i>Histories</i> (Fragments)
Solin.	Solinus, <i>Collectanea rerum memorabilium</i>
Steph. Byz.	<i>Stephani Byzantini Ethniconum</i>

Stob. <i>Flor.</i>	Stobaeus, <i>Florilegium</i> (Ἀνθολόγιον)
Strabo	Strabo, <i>Geography</i> .
Veg. <i>Mil.</i>	Vegetius, <i>Epitome Re Militaris</i>
Verg. <i>Aen.</i>	Vergil, <i>Aeneid</i>
Verg. <i>G.</i>	Vergil, <i>Georgics</i>
Vell. <i>Pat.</i>	Velleius Paterculus, <i>Historiae</i>

### Modern literature

AE	<i>L'Année épigraphique</i> . Paris
BE	<i>Bulletin épigraphique</i> . Paris
BNJ	<i>Brill's New Jacoby</i> , ed. I. Worthington. Brill Online
CIL	Corpus Inscriptionem Latinorum
GodCBI	<i>Godišnjak Centra za balkanološka ispitivanja</i> . Sarajevo
HAG	<i>Hrvatski arheološki godišnjak</i> . Zagreb
HistAntiq	<i>Histria Antiqua</i> . Pula
IG	Inscriptione Graeca
IJNA	<i>The International Journal for Nautical Archaeology</i> . London
JAZU/HAZU	Jugoslavenska/Hrvatska Akademija znanosti i umjetnosti
LCL	Loeb Classical Library. Cambridge MA, Harvard University Press. Number in the brackets denotes year of publication
LSJ	<i>Liddell-Scott-Jones Lexicon of Classical Greek</i> , eds H. G. Liddell, R. Scott, H. S. Jones. Oxford, Oxford University Press
NP	<i>Brill New Pauly</i> . Leiden, Brill
P. Cair. Zen.	Cairo Zenon Papyri
P. Oxy.	<i>The Oxyrhynchus papyri. Part XVI</i> , ed. B. P. Grenfell <i>et al.</i> London, Egypt Exploration Society 1924
PJZ	<i>Praistorija jugoslavenskih zemalja</i> , ed. A. Benac. Sarajevo, Svjetlost 1987
PL	<i>Patrologia Latina</i>
RFFZd	<i>Radovi Filozofskoga fakulteta u Zadru</i> . Zadar
TTH	Translated Texts for Historians. Liverpool, Liverpool University Press. Number in the brackets denotes year of publication
VAHD/VAPD	<i>Vjesnik za arheologiju i historiju/povijest dalmatinsku</i> . Split
VAMZ	<i>Vjesnik Arheološkoga muzeja u Zagrebu</i> , series 3, Zagreb.

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## Preface

Archaeology of Adriatic Shipbuilding and Seafaring Project focused on the technological development of shipbuilding and seafaring in the eastern Adriatic from prehistory to the modern period, considering various categories of available evidence. Until recently, the maritime activities of the Bronze and Iron Age eastern Adriatic population were attested mainly through the material evidence of seafaring, seaborne trade and foreign cultural influences discovered on land sites. Relatively abundant written sources augmented by scarce iconographic evidence provided more direct information on Iron Age seafaring and the maritime enterprises of the local population. In recent times, some promising archaeological discoveries hinted at the prospect of finding new sites that could help reconstruct the development of eastern Adriatic shipbuilding and seafaring within the broader Adriatic and Mediterranean context.

The three authors of various scholarly backgrounds put together their professional experiences and skills in order to provide an overview of what was done in the past, and to complement the current interpretations by systematic examinations of written, iconographic and archaeological evidence on eastern Adriatic shipbuilding tradition. In order to trace the possible origin of the term *lemb*, often mentioned in relation to south Adriatic (Illyrian) ships, most of the Greek and Latin sources were consulted and contextualised. This demanding task was fulfilled by Luka Boršić, while Danijel Džino and Irena Radić Rossi conducted presented the state-of-the art research in analysis of on archaeological, historical and iconographical sources.

In regard to the ancient ships known as liburnians (*liburnicae* or *liburnae*), the authors are primarily concerned with their relationship to south Adriatic (or 'Illyrian') lemps, which are generally connected in earlier scholarship to the same 'Illyrian' population. Based on our present knowledge of the historical situation and the ethnical diversity of the protagonists of eastern Adriatic seafaring, such conclusions are discussed and significantly revised. The book does not aim to solve the long-lasting discussion on the origin and role of Illyrian lemps and Liburnian liburnians and their shape, but rather to clarify some fundamental notions on the geographical and historical background of the eastern Adriatic in a light of recent research, and to provide the basis for efficient future research.



# 1. Introduction

### 1.1. Research problems and previous scholarship

The landscape of the eastern Adriatic coast, until very recently forced its inhabitants to live off the sea. Its rugged coastline is separated from the hinterland by the high chains of the Dinaric mountains, providing scarce resources and severely limiting the degree of connectivity with the hinterland. Thus, the sea remained the only viable source of connectivity – not only with the Italian Adriatic coast across the sea, but also with the rest of the Mediterranean. Orientation on the sea enabled the communities inhabiting the eastern Adriatic coast to participate in and benefit from the Mediterranean networks of exchange and communication.<sup>1</sup> The prosperity of eastern Adriatic communities depended on their shipbuilding and seafaring skills combined with their abilities to control the lines of maritime communications.

Taking all of this into consideration, it is not surprising that the seafaring skills of the communities from this part of the world are noted in ancient, medieval and early modern sources. This study will dissect a small segment of the rich history of eastern Adriatic navigation and shipbuilding, focusing on two types of ancient ships which appear in the written sources connected with this area: south Adriatic ('Illyrian') type of *lembos*, and Liburnian *liburnica* or *liburna*.<sup>2</sup> Both of those ship types have attracted the attention of earlier scholars who gathered existing material and written evidence, attempting to reconstruct their development, appearance and capabilities. The relative abundance of written sources suggests that both ships played significant roles in ancient times, especially *liburnica*, which became the main type of light warship in early Roman imperial fleets and ultimately evolved into a generic name for warships in the Roman Imperial period and Later Antiquity.

The published works can be divided into three general categories: Italian and Croatian archaeology/ancient history, as well as general research on shipbuilding in antiquity. The classical work remains Silvio Panciera's article published in 1956, with the Italian discussions of lemb and liburnian published later also being of note, most notably that of Stefano Medas.<sup>3</sup> Croatian authors have discussed these ships several times, starting from the pioneering work of Bartul (Bare) Poparić, which was continued by Grga Novak and Mladen Nikolanci who addressed this topic tangentially.<sup>4</sup> The topic was revisited several times between the 1970s and 1990s, particularly in the works of Zaninović, Kozličić, Jurišić and Vrsalović. However, in the 21st century it has been rarely addressed.<sup>5</sup> General research on these ship types within the broader context of ancient Mediterranean shipbuilding began at the end of the 19th century by Torr, and was continued later by Casson, Rédde, Morrison and Pitassi. Höckmann examined Illyrian lemb and *liburnica* in two articles, and Bérchez Castaño looked into the period when the *liburnicae* might have been included in the Roman Republican fleets.<sup>6</sup>

<sup>1</sup> See e.g. Kirigin *et al.* 2009; Elez 2015: 93-106.

<sup>2</sup> See the section 1.3. below on terminology.

<sup>3</sup> Panciera 1956; Medas 2004; 2016; Anastasi 2003.

<sup>4</sup> Poparić 1899: 1-39; Novak 1962: 12-13, 20 ff.; Nikolanci 1958.

<sup>5</sup> Stipčević 1973; Zaninović 1976; 1988; Jurišić 1983; Vrsalović 2011 [1978]: 142–44; Kozličić 1980/81; 1993; Džino 2003, and most recently Džino, Bošić 2020. Cf. also see the useful overview of Adriatic shipping at the times of the Greek colonisation in Radić Rossi 2010a.

<sup>6</sup> Torr 1895: 16-17, 115-16; Casson 1971: 125-27, 142, 162-63; Rédde 1986: 104-10; Morrison 1995: 72-73; 1996: 203, 248-53, 263-64, 317; Pitassi 2011: 89-90, 106-09, 138-44; 2016: 39, 47; Höckmann 1997; 2000; Bérchez Castaño 2010.

General agreement in the existing scholarship is that Illyrian lemb and the liburnian are the same type of fast ship, initially used for piracy. Illyrian lemb is usually regarded as a general type and liburnian as a regional type or sub-type of lemb, or the late stage of development of that ship type. Earlier Croatian authors and Höckmann stretch the origins of those ships even further, connecting them with the existing visual representations of ships from the Iron Age Adriatic and its hinterland. Such a ‘canonic’ view was uncritically accepted and rarely challenged in the scientific community, except by Medas, Džino, Radić Rossi and Tiboni. Medas points out that it is difficult to see a clear connection in the iconography of Adriatic early Iron Age ships, while Džino emphasises that the evidence connected with Illyrian *lemb* and *liburnica* comes from different periods, and is related to two different indigenous groups in eastern Adriatic.<sup>7</sup> This idea was further promoted by Radić Rossi, while Tiboni argued that the ships in earlier Adriatic iconography do not present the technical characteristics of indigenous ships but, more likely, rely on the Greek and Etruscan iconographic tradition.<sup>8</sup> It is worth noticing that the earliest English-language discussion touching on eastern Adriatic seafaring, done by Torr in 1895, did not associate lembos and liburnians, most likely because his primary goal was a catalogue of ship types rather than a thorough analysis of seafaring in specific sub-regions.<sup>9</sup>

The problem with the existing evidence is the vagueness of ancient written sources, which were usually produced by writers who were not naval experts and not acquainted with particularities of naval design. Most of these sources lack specific details which would help in recovering more information about the shipbuilding design and origins of these ships. An additional problem is the specificity and changing meanings of the terms *liburnica* and λέμβος, which often depended on the contexts known to the authors and their audience. For example, the term *liburnica* referred to a specific bireme-class of ship in the early Roman imperial fleets, but in later imperial times it becomes the general designation for any light warship. We often do not know for certain if the authors from the second century onwards used this term in a general or specific form, or whether they were referring to the original Liburnian ship or the version of the ship used in the Roman imperial fleets. Similarly, the term *lembos* was a general term, which could refer to ships used in a variety of very different civilian and military purposes. Visual representations also pose interpretative problems. The most important is certainly the question of accuracy, or in other words, how interested were the craftsmen who made these images in creating realistic depictions of these ships. Finally, the ongoing debate regarding the meaning of the ancient terms used to describe different classes of ancient ships, remains an important issue. For example, *liburnica* is usually taken to be a bireme-class warship in accordance with the testimony of ancient sources, as will be discussed later in the book. The scholarship on ancient warships interprets the term ‘bireme’ as the designation of a ship with two rows of oars, one above another, with one rower per oar. However, this matter is not necessarily solved, for different interpretations of this term are still being suggested.<sup>10</sup>

Although there is relatively abundant written evidence for both of those types of ships, we are still in the dark on crucial questions of their origins, development, shape, and capabilities,

<sup>7</sup> Medas 2004: 137-38; 2016: 162-63; Džino 2003. Lewis (2019: 84-86) also identified the lemb and liburnian as different types of ships, but without elaborating on their differences.

<sup>8</sup> Tiboni 2009; 2017; 2018.

<sup>9</sup> Torr 1895: 16-17, 115-16.

<sup>10</sup> Morrison 1996: 262; see Casson 1971: 53-62. The study of Tilley (2007), on the other hand, points out that the prefix which indicates number two in the terms *biremes*/δίκροτα lexicologically indicates the total number of rowers at the rowing bench cross-side, not the number of banks of rowers on one side of the ship.

as well as the connection between the adoption of new shipbuilding technologies and the social development of indigenous communities of the eastern Adriatic in the late Iron Age.<sup>11</sup> While some questions will remain unanswered on account of the lack of relevant sources, we will address (or rather revisit) here the most important problems related to the origins of the Illyrian lemb and Liburnian liburnian: their connection with the existing protohistoric Adriatic traditions of shipbuilding, and their shared relationship.

## 1.2. Overview of the book

The understanding of geographical and historical context is essential when dealing with ancient shipbuilding and seafaring activities in particular Mediterranean sub-regions. For this reason, Chapter 2 provides more insight into the geographical characteristics and eco-geographical zones of the eastern Adriatic coast where these two types of ships developed. The ethnic and political makeup of this area prior to the Roman conquest must also be taken into account when attempting to understand who built the eastern Adriatic ships, and for what purpose. This, in particular, relates to the protohistoric indigenous groups in the coastal areas of the eastern Adriatic, the Greek colonisation of the central Dalmatian islands from the 4th century BC, and the question of ‘endemic’ indigenous piracy in these periods. These matters are briefly examined and presented in the Chapter 3.

The next step is the discussion on available archaeological and iconographic sources, which could be directly associated with prehistoric eastern Adriatic seafaring in Chapter 4. Putting aside substantial indirect evidence of intense maritime communication between the eastern and western coast of Adriatic, the archaeological evidence for actual ships is limited to four underwater archaeological sites in areas once populated by the communities known to ancient writers as the Histri and Liburni. These sites revealed the remains of nine boats made of stitched (sewn) planks.<sup>12</sup> One of them (Zambratija) is dated in the end of the 2nd millennium BC, i.e. to the late Bronze Age, while the other eight reflect the surviving prehistoric tradition in the early Roman imperial times. This means that the oldest shipwreck is over half a millennium older than the vessels to which the ancient authors refer when mentioning indigenous eastern Adriatic ships, while the other finds date to the period in which this area was already integrated within the Roman imperial infrastructure. Underwater finds of protohistoric and ancient ships from the north-eastern Adriatic cannot be interpreted as the remains of warships, and, in turn, should not be identified as liburnians or southern Adriatic lemb. These should rather be identified as the *serilia* – cargo ships – mentioned by ancient authors. However, these finds are very important in providing evidence for the existence of distinct shipbuilding traditions maintained in this area: locally in the northeast Adriatic, and inter-regionally on both sides of the northern Adriatic. This understanding of these local shipbuilding traditions is an important facet of the hypothesis that northern and southern Adriatic shipbuilders interacted within two different networks, producing designs of two different types of ship: the liburna and the south Adriatic or ‘Illyrian’ lemb.

The iconographic evidence is also fairly limited, and spread over time and space. It covers the period from the 7th to the 1st century BC, stretching from the Istrian peninsula in the

<sup>11</sup> Some of those questions are tackled in Dzino, Boršić 2020.

<sup>12</sup> We opted for the term ‘sewn’, although probably not the best choice in English terminology, as it has been widely accepted by scholars in various fields of humanities. See Pomey, Boetto (2019: 6) for clarifications on the argument.

north to present-day northern Albania in the south. The oldest evidence originates from the deeper hinterland of Dalmatia and the western Adriatic coast, but is often associated with the eastern Adriatic seafarers. Although scarce, the visual representations of ships in wider prehistoric Adriatic area attracted the attention of scholars in the past, provoking a range of different opinions discussed below. While some earlier scholars called upon iconographic representations of (typically Roman) warships as evidence of Iron Age lemb and liburnian prototypes, we will demonstrate that there are severe problems with identifying these representations as precursors of the warships mentioned in Greek and Roman sources. However, images of ships upon south Adriatic coinage from the 3rd and 2nd centuries BC seem to be an exception to this rule, providing probably the only significant artistic representations of the ships used by south Adriatic communities in that period: Illyrian lembos.

The limitations of archaeological and iconographic sources have been supplemented by selected quotations from the ancient Greek and Latin texts in Chapter 5. As mentioned previously, the consensus amongst most scholars is that the term *lembos* referred primarily to the south Adriatic 'Illyrian' ships, and that *liburnica* represents a sub-type of lemb developed in later periods. In order to examine different perceptions and contexts in which the Greek and Roman authors used those terms, we decided to collect and comment upon the available written sources, regardless of their specific connection with the eastern Adriatic geographical or historical context. Due to the significant amount of collected texts, they became the core of this publication. Epigraphic evidence from the Roman times is not discussed in more detail. The epigraphic mentions of lemb are very scarce, while the inscriptions mentioning *liburnicae* refer to the Roman liburnians, which were not necessarily of indigenous Liburnian origins, as shown in sections 6.1. and 6.2.

Chapter 6 analyses the written sources to provide detailed overviews of the usage of the terms 'lembos' and 'liburnica', the ships' possible shapes and characteristics, and the etymology of the terms, as well as to present hypotheses of their likely origins and course of development. Finally, the various analyses made within this work have allowed us to form new conclusions, which are presented in sections 6.5. and 6.6.

### 1.3. Terminology

A few words should be said regarding the terms 'lembos' and 'liburnica' used in this book. There are many different terms used by ancient authors to describe these two ships in both Latin and Greek, as presented in Chapter 5, and these terms have not been used consistently in English scholarship.

In the case of lemb, we suggest the term 'lemb', adapted to English in the same way as other Greek words with the same ending. The term lemb is meant to be an English equivalent of the Greek term λέμβος and the Latin term *lembus*. In scholarly literature it has become customary to use either the Greek or the Latin word, written in italics. This option is not very convenient for the purposes of the present study. Since this text deals with that type of ship, both in Greek and Latin sources, it would be rather unfortunate to choose either the Latin or the Greek version of the word and use it throughout the text. Moreover, since almost all other Greek and Roman ships have their name translated or transposed into English language, there is no need to keep the original name, usually written in italics, since this word appears relatively often in

ancient literature. It is not an exotic *hapax legomenon* for which there would be no need of an equivalent in modern languages. With these things in mind, we opted for the English coinage – lemb. It is composed by the same token as many other English words taken from ancient Greek: ‘angel’ from ἄγγελος, ‘abyss’ from ἄβυσσος, or even some more recent coinages like ‘dinosaur’ from δεινός + σαῦρος. We can only hope the word will continue its life in English scholarly literature as to avoid clumsy λέμβος or *lembus*, with their plural forms λέμβοι or *lembi*.

In the case of the other ship, we opted for *liburnica*, used by several important ancient authors like Caesar, Tacitus and Pliny the Elder, or the English version liburnian. The word ‘liburnian’ occasionally appears in translations and in the secondary literature, sometimes also in the form of *liburna*. This ambivalence between ‘liburnian’ and ‘liburna’ reflects that of the Latin original: both are feminine forms of the ethnic noun *Liburnus* or the ethnic adjective *liburnicus*, the latter of which being in the feminine form in relation to *navis* i.e. *navis Liburnica*.

## 2. Geographical context



Map 1. Geography of the Adriatic (D. Džino using Google Earth).

The complex eco-geographical configuration of the eastern Adriatic coast combined with the archipelago of the islands facing it, can be recognised as a plurality of different ‘maritime cultural landscapes’. This concept, first used by Westerdahl and later elaborated by other authors, emphasises the relationship between the nautical environment and the cultural and socio-economic context of its exploitation by populations which inhabit it. In other words, ‘maritime coastal landscape’ is the result of interaction between human processes and an environment consisting of sea, coast and islands over a *longue durée*.<sup>13</sup> This relationship between human processes and maritime geo-ecology heavily impacts on the needs of the local population, which transfers onto their specific requirements in shipbuilding design. Such an interaction between humans and the sea could have been an important factor in shaping the development in design of both ‘Illyrian’ lemb and liburnian, as discussed in Chapter 6. In the same way, the interaction between humans and the sea is effectively illustrated by the prolonged use of sewn plank technology in ancient northern Adriatic shipbuilding, discussed in Chapter 4.

The Adriatic Sea is the deepest gulf of the Mediterranean, which lies between the Apennine and Balkan Peninsula. It is a consistent geographical unit, which since prehistoric times connected people around its shores, and served as communication between central and northern Europe and the rest of the Mediterranean.<sup>14</sup> The sea was named after Adria, the richest emporium

<sup>13</sup> Best defined in Westerdahl 2011. See also Flatman 2012; Pungetti 2012, etc.

<sup>14</sup> E.g. Braudel 1972: 125-27.



in the early Iron Ages, and since the very beginnings of Greek seafaring the Adriatic was perceived by the ancients as a gulf.<sup>15</sup> It measures 870 km in length, from the Lagoon of Marano in the northwest to Butrint in modern Albania to the southeast. The maximum width of the Adriatic is 216.7 km, with the average distance between the eastern and western coast being 159.3 km. Up to the line between Pula–Ancona, sea depth never exceeds 50 m, whilst the deepest part, which is in the Southern Adriatic Depression, measures 1233 m.<sup>16</sup> The Adriatic has clear morphological differences along its longitudinal and transversal axis, and is thus divided into three sub-basins. The northern sub-basin spans to the line formed by Giulianova (Italy) and Zadar (Croatia), and is characterised by a shallow depth (about 30 m) and a strong river runoff. The middle Adriatic is a transition zone between the northern and the southern sub-basins, and its conditions are often similar to that of an open sea. This middle zone spans to the Palagruža sill, the line connecting Vieste (Italy) and Split (Croatia). The southern sub-basin extends to the Otranto sill, which divides Adriatic from the Ionian Sea.<sup>17</sup>

The western coast of the Adriatic Sea, in modern-day Italy, is a shallow and sandy area with only a few significant features such as two larger peninsulas: Monte Gargano and Monte Conero near Ancona and the Po valley and delta. The northern arc of the Adriatic, stretching all the way from Venice to Piran (Slovenia), had been used since the early times for communication between the sea and the central European hinterlands through the large mountain passes of the south-eastern Alps. The eastern Adriatic coast is shared at the present by modern countries of Slovenia, Croatia, Bosnia and Herzegovina, Montenegro and Albania. It possesses limited resources thanks to its karstic landscape separated from the hinterland by a high mountain chains of Dinaric Alps. Specific geography shaped its economy through history, directing the coastal population towards the exploitation of marine and agricultural resources of the Adriatic coast and islands, and increased connectivity enabled by maritime links.

A large number of islands, islets, and sea rocks characterise the eastern Adriatic coast north of modern Cavtat – there are 79 islands, 525 islets and 642 sea rocks in total.<sup>18</sup> The western Istrian coast with its settlements, although having an important place in history, never played an important role in seafaring. Further south is the Kvarner gulf, with its small archipelago dominated by the large islands of Cres, Lošinj, Krk and Rab. The present-day area of northern Dalmatia, between Zadar and Šibenik has a large number of islands, the most prominent being Pag, Ugljan, Pašman, Dugi Otok and Kornat. These islands follow the coast parallel with the Dinaric Alps, and gave the origin to the term *Dalmatian coastal type*, which is widely used in oceanographic and geomorphologic terminology.<sup>19</sup> The Ravni Kotari plains in the immediate hinterland of modern Zadar is one of only few regions in the eastern Adriatic to have an abundance of arable land, and is linked to the deep Adriatic hinterland through a system of navigable river valleys, such as those of the Zrmanja or Krka rivers. Due to advantages posed by arable land, the area was densely inhabited in prehistory, antiquity and the medieval periods.<sup>20</sup> The configuration of the coast and presence of numerous islands certainly impacted

<sup>15</sup> Braccesi 2010: 62.

<sup>16</sup> Riđanović 2004: 188–89.

<sup>17</sup> Artegiani *et al.* 1996.

<sup>18</sup> Duplančić Leder *et al.* 2004.

<sup>19</sup> Magaš 2013: 178.

<sup>20</sup> Zaro, Čelhar 2018.

on the seafaring skills of local communities, and it is not surprising that it is in this part of the Adriatic Sea that we can trace the development of small and swift ships.

Modern central Dalmatia contains sizeable islands like Brač, Hvar and Vis, and the only significant quantity of arable land is found in the plains between modern Trogir and Split, where the important ancient settlements of Tragurion (Trogir), Salona (Solin) and Spalatum (Split) developed. The coast further south consists of a very narrow stretch of land, limited by the high rising chain of the Biokovo mountain. The mouth of river Neretva, around the ancient city of Naronā (the village Vid near Metković) was a swampy area with large quantities of arable land providing excellent communication routes upstream with the hinterland. The mouth of the Neretva is enclosed by the large Pelješac peninsula, which is further connected with the nearby islands of Korčula, Lastovo and Mljet, as well as the Elaphiti islands further south towards modern Dubrovnik. The coast of modern Montenegro is plain, with the exception of Boka Kotorska, a large gulf with some important coastal settlements from prehistoric and ancient times. The Adriatic part of the modern Albanian coast stretches from the mouth of Buna near the Lake of Shkodër in the north, to the Bay of Vlorë in the south. It is ecologically diverse, containing alluvial deposits and marshes which provided beneficial conditions for the development of larger ancient urban structures such as Scodra, Dyrrachium or Apollonia.<sup>21</sup>

Navigation in the Adriatic, especially in the pre-modern period, is seriously affected by its changing weather patterns, particularly its various types of winds. The sailing season in antiquity was limited to the period between March and October, although some long-distance trans-Adriatic sailing could have taken place during the winter months. Thus, it is not surprising that the dangers of sailing in the Adriatic became a *topos* in ancient literature.<sup>22</sup> Serious waves are caused by *bura* (*bora*, north-easterly wind), *jugo* (*sirocco*, south-easterly wind), *maestral* (*maestrale*, north-westerly wind) and *lebić* (*garbino*, west/south-westerly wind). *Bura* is the strongest wind in all the Adriatic regions. It creates the short and sharp waves raising 'smoke' from finely dispersed particles of seawater which does not allow seafarers to breath and highly reduces the visibility. *Jugo* blows with constant strength, along the coast, and raises long waves. At present, they do not threaten ships, which have enough time to escape in a safe anchorage. The same happens with the *maestral*, which blows from the exactly opposite direction. It blows strongly but briefly, and it usually does not raise the type of waves which endanger navigation. The waves raised by the not so common *lebić* are strong, but not so high. They come at a right angle to many eastern Adriatic ports, penetrating inside port breakwaters with the potential to seriously endanger docked ships and shipping inside port. These winds are also an important factor in local shipbuilding traditions, necessitating the development of fast and sturdy ships which are able to cope with the potential dangers created by changing weather patterns, such as sailing with the side wind for example, which was crucial for trans-Adriatic navigation.<sup>23</sup>

The variety of Mediterranean landscapes, economic resources and seafaring conditions, all of which depended on natural, economic and political factors, resulted in the development of

<sup>21</sup> See, for example, Ferriès, Skenderaj 2015.

<sup>22</sup> E.g. Poulain, Racich 2013 (the winds); Brusić 1970; Arnaud 2006; Kozličić, Bratanić 2006; Kirigin *et al.* 2009: 143-50, Kozličić 2012, etc. (ancient navigation in the Adriatic), and Milićević Bradač 2009 (ancient literary *topoi* about sailing in the Adriatic).

<sup>23</sup> Kirigin *et al.* 2009: 143.

various types of ships suitable for specific purposes. As we saw from this very brief overview, the Adriatic Sea unifies the various different micro and macro eco-geographical zones around its shores by providing its inhabitants with the potential for increased connectivity through navigation. However, these different eco-geographical zones around the Adriatic significantly affect local navigation habits and ship design requirements, creating different 'maritime cultural landscapes'. This is particularly visible in the differences between the eco-geography of the southern and northern Adriatic. There is no doubt that these different 'maritime cultural landscapes' played an important role in the development of different local shipbuilding traditions, as well as strategies of selective acceptance of Mediterranean shipbuilding innovations, as we will discuss later.