

This pdf of your paper in *Sveti Pavao Shipwreck* belongs to the publishers Oxbow Books and it is their copyright.

As author you are licenced to make up to 50 offprints from it, but beyond that you may not publish it on the World Wide Web until three years from publication (June 2017), unless the site is a limited access intranet (password protected). If you have queries about this please contact the editorial department at Oxbow Books ([editorial@oxbowbooks.com](mailto:editorial@oxbowbooks.com)).

*An offprint from*  
**SVETI PAVAO SHIPWRECK**  
A 16th Century Venetian Merchantman  
from Mljet, Croatia

WITH ITALIAN AND CROATIAN ABSTRACTS

*by*  
*Carlo Beltrame, Sauro Gelichi and Igor Miholjek*

*with contributions by*  
*Cristiano Alfonso, Jurica Bezak, Elisa Costa,*  
*Martina Ćurković, Margherita Ferri, Anita Jelić, Antonija Jozić,*  
*Garo Kürkman, Igor Mihajlović, Robert Mosković, Mladen Mustaćek,*  
*Domagoj Perkić, Tajana Trbojević Vukičević and Vesna Zmaić Kralj*

Paperback Edition: ISBN 978-1-78297-706-3

Digital Edition: ISBN 978-1-78297-707-0



© Oxbow Books 2014  
Oxford & Philadelphia

[WWW.OXBOWBOOKS.COM](http://WWW.OXBOWBOOKS.COM)

Published in the United Kingdom in 2014 by  
OXBOW BOOKS  
10 Hythe Bridge Street, Oxford OX1 2EW

and in the United States by  
OXBOW BOOKS  
908 Darby Road, Havertown, PA 19083

© Oxbow Books and the individual authors 2014

Paperback Edition: ISBN 978-1-78297-706-3  
Digital Edition: ISBN 978-1-78297-707-0

A CIP record for this book is available from the British Library

All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic or mechanical including photocopying, recording or by any information storage and retrieval system, without permission from the publisher in writing.

Printed in the United Kingdom by Berforts Information Press Ltd, Eynsham, Oxfordshire

For a complete list of Oxbow titles, please contact:

UNITED KINGDOM

Oxbow Books  
Telephone (01865) 241249, Fax (01865) 794449  
Email: [oxbow@oxbowbooks.com](mailto:oxbow@oxbowbooks.com)  
[www.oxbowbooks.com](http://www.oxbowbooks.com)

UNITED STATES OF AMERICA

Oxbow Books  
Telephone (800) 791-9354, Fax (610) 853-9146  
Email: [queries@casemateacademic.com](mailto:queries@casemateacademic.com)  
[www.casemateacademic.com/oxbow](http://www.casemateacademic.com/oxbow)

Oxbow Books is part of the Casemate Group

*Front cover:* Galleon on the Contarini monument in the Saint Anthony's church in Padua (middle of the XVI century AD). Chart "Golfo di Venezia, olim Adriaticum" (1688) by Vincenzo Coronelli; courtesy of the Yale University Map Department, Sterling Memorial Library

Croatian Conservation Institute  
Department for Underwater Archaeology  
Zagreb



HRVATSKI  
RESTAURATORSKI  
ZAVOD

Dipartimento di Studi Umanistici  
Università Ca' Foscari Venezia  
Venice



Università  
Ca' Foscari  
Venezia

financed by Regione del Veneto  
through L.R. n. 15/1994



REGIONE DEL VENETO

# Contents

<i>List of contributors</i>	v
<i>Preface</i> (Mario Braun and Paolo Eleuteri)	vi
<i>Foreword</i> (C. Beltrame, S. Gelichi and I. Miholjek)	vii
<b>Chapter 1. Introduction</b>	1
<i>C. Beltrame and I. Miholjek</i>	
<b>Chapter 2. Methodological and technical aspects</b>	7
2.1 Discovery, research methods and techniques	7
<i>I. Miholjek and D. Perkić</i>	
2.2. The photogrammetric documentation of the hull	17
<i>C. Alfonso</i>	
2.3. The photographic documentation	20
<i>R. Mosković</i>	
2.4. 3-D reconstruction of the hull	22
<i>E. Costa</i>	
<b>Chapter 3. The historical and archaeological maritime context</b>	25
3.1. The Adriatic Sea, pottery and shipwrecks in late and post-Medieval period: an archaeological perspective	25
<i>S. Gelichi</i>	
3.2. Archaeological traces of Venetian navigation in the Mediterranean and Atlantic from the 16th and the 18th centuries	36
<i>C. Beltrame</i>	
<b>Chapter 4. The shipwreck of Mljet</b>	45
4.1. The ship, its equipment and the crew's personal possessions	45
<i>C. Beltrame</i>	
4.2. The ordnance	53
<i>I. Mihajlović</i>	
4.3. A transport of Iznik pottery	64
<i>V. Zmaić Kralj</i>	
4.4. Other pottery finds	105
<i>S. Gelichi</i>	
4.5. Glass finds	110
<i>M. Ferri</i>	
4.6. Metal finds	114
<i>J. Bezak</i>	
4.7. The Ottoman <i>Akches</i>	137
<i>G. Kürkman</i>	

4.8. Two Saxony talers <i>V. Zmaić Kralj</i>	144
4.9. Animal bones <i>T. Trbojević Vukičević</i>	147
4.10. Considerations of dating and the historical context of the Mljet shipwreck <i>C. Beltrame</i>	150
<b>Chapter 5. Conclusions</b> <i>C. Beltrame, S. Gelichi, I. Miholjek and V. Zmaić Kralj</i>	152
<b>Appendix. The conservation and restoration of the finds</b> <i>M. Mustaćek, M. Ćurković, A. Jozić and A. Jelić</i>	154
Bibliography	167
Index	175

## 4.5. Glass finds

### *Margherita Ferri*

#### **Abstract**

*Tra i rinvenimenti si conta un discreto quantitativo di frammenti in vetro. Essi possono essere attribuiti a tre sole tipologie di recipienti molto simili l'una all'altra e tutte realizzate congiungendo due paraisons all'altezza del collo. Oltre ad un solo esemplare di grande bottiglia con rigonfiamento sul collo e corpo schiacciato, sono state rinvenute almeno 14 bottiglie di dimensioni minori prive del rigonfiamento sul collo e almeno tre recipienti con versatoio e corpo decorato con spirali ottenute a stampo. I recipienti sono molto uniformi per il colore, il tipo di vetro, la forma del corpo su base ovale e per la tecnica di produzione a due paraisons. Si tratta di prodotti ottomani che facevano parte del carico, probabilmente differenziati in base al contenuto. Poco si conosce sull'industria ottomana del vetro della fine del XVI secolo, ma la testimonianza del carico di Mljet conferma l'esistenza di una produzione in rapida espansione almeno inizialmente finalizzata alla produzione di recipienti funzionali a contenere prodotti locali destinati all'esportazione.*

*Brodolom je sadržavao veću količinu staklenih predmeta. Pronađene staklene posude mogu biti podijeljene u tri homogene skupine: boce koje su sužene na stranama i s izbočinom u donjem dijelu vrata; barem 14 boca suženih na obje strane i bez izbočine na vratu; 3 vrča na kojem je vidljiva narebrena spiralna dekoracija. Svim staklenim posudama nedostaje veći dio tijela. S obzirom na broj nalaza i visoku standardizaciju njihovih oblika i dekoracija, očito je da su stakleni nalazi s brodoloma bili dio brodskog tereta. Također je moguće da su staklene posude kupljene i prevožene i radi svojeg sadržaja. Varijante koje možemo razlikovati prema veličini, dekoraciji i postojanju grlića možda odgovaraju različitim vrstama tekućina koje su se prevozile. Iako nema jednoznačnih arheoloških indikatora koji bi točno definirali različite proizvode kraj je 16. i početak 17. stoljeća vrlo važan period za otomansku industriju stakla, osobito za proizvodnju odgovarajućih spremnika za proizvode lokalne proizvodnje.*

The shipwreck contained a substantial amount of glassware. However, no single specimen could be completely restored due to the thinness of the glass of the body. The containers recovered can be easily divided into three very homogeneous groups.<sup>1</sup>

The first group consists of only one item. It is a fragment of a bottle (Fig. 4.70: 171/2009), with the body in almost colourless transparent glass, but with a green shade near the rim, where the glass is thicker. The rim is thickened and rounded, and the neck almost cylindrical with a bulge in it. It is assumed that the item was manufactured from two *paraisons*, but this cannot be proved, as it was broken at the shoulder. The diameter of the rim is 4 cm. This item

is a “standard vessel type” as defined by Hayes (1992: 410): a flask with a truncated body, flattened on the sides and with a bulge in the lower part of the neck.

The second group consists of at least 14 bottles, of an intense green colour (Fig. 4.71: 42/2008; 196/2010; 127/2009; 111/2009; 210/2010; Fig. 4.72). They have the rim more or less markedly rolled inwards (diam. at rim 5–6 cm), the neck constricted in the middle (without a bulge). They were manufactured by joining two *paraisons*, with an irregular seam combined with thickening of the wall at the shoulder, the result of adding a second gather of glass to the free-blown neck. The plain body is flattened at the sides, the base is not acutely kicked, and the bottom

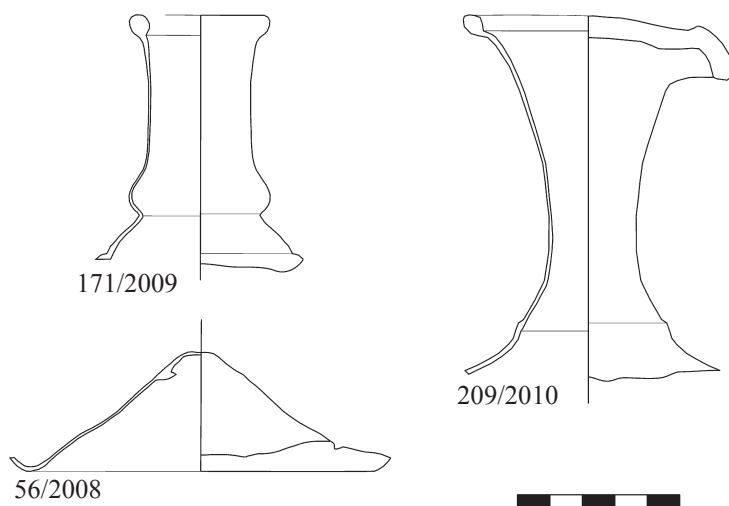


Fig. 4.70. 171/2009: bottle, first group; 209/2010 and 56/2008: jugs, third group (drawing: M. Ferri)

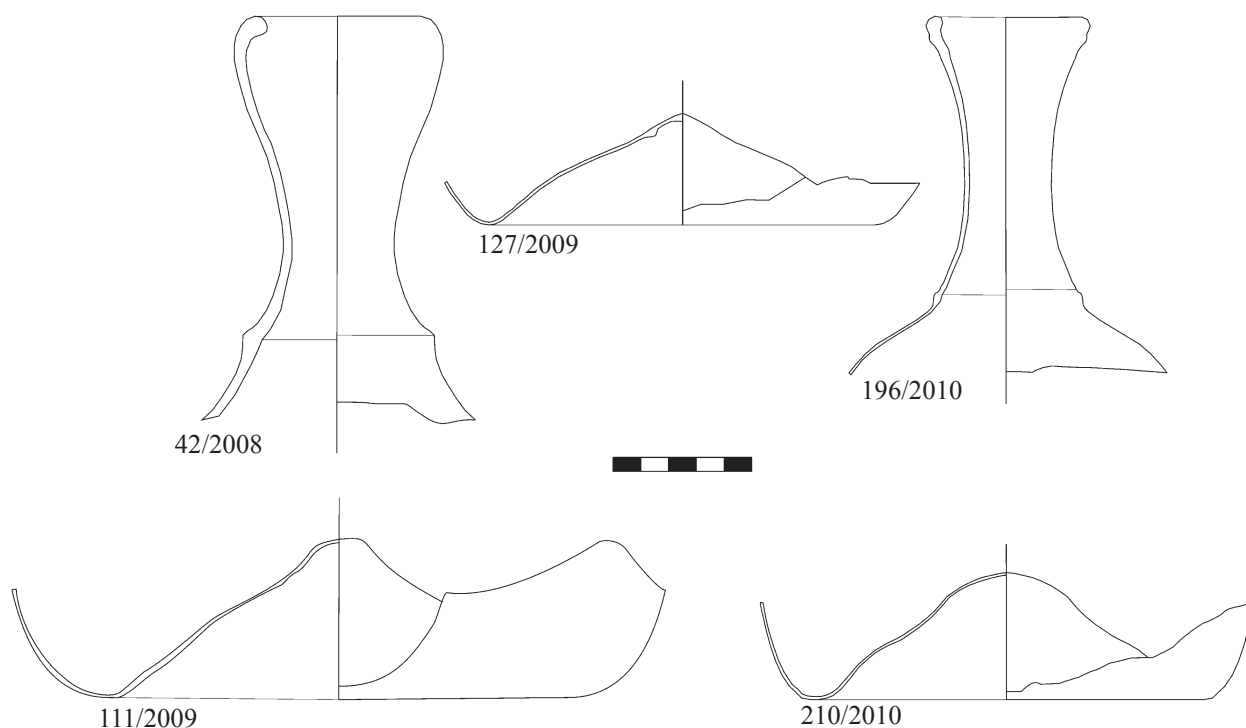


Fig. 4.71. Bottles, second group, drawings (drawing: M. Ferri)

has a pontil scar (diam. at base 13–17 cm). Hayes defines these bottles as a rare variant of a standard vessel type (Hayes, 1992: 410).

The third group has closed forms in an intense green colour, and may in fact be considered a variant of the second group. It comprises at least three jugs or pitchers (Fig. 4.70: 209/2010; 56/2008). The lip is rolled inwards, with a heart-shaped opening and a spout that turns slightly down. The neck is constricted in the middle, without a bulge, and the vessel has an irregular seam at the shoulder to connect the mould-blown body to the free-blown neck.

The body has spirally twisted ribbing. The bottom is smaller than the second group of bottles (diam. at base 8–11 cm), and the base is kicked. In the Saraçhane (Hayes, 1992) and Marmaray Sirkeci excavations (Ozgumus, 2010; Canav Ozgumus, 2012) jugs/pitchers with spouts are not mentioned, but the quality and colour of the glass, as well as the fabrication technique with two *paraisons* is similar to the second group. These smaller vessels were perhaps used for serving drinks. The glassware described above, considering the larger size, could instead have had a primary use as transport containers and for storage in the cellar.



Fig. 4.72. Bottles, second group, pictures (photo: R. Mosковиć, HRZ archive)

The traditional dating attributed to this type of bottle, produced from two *paraisons*, is fully compatible with the dating of the ship that was carrying them, on the basis of the date engraved on the bell found on board and the analysis of other materials recovered (such as the coins).

As already mentioned, the distinctive manufacturing technique and the characteristic colour of the glass lead to the firm conclusion that the bottles in the ship are Ottoman, and it is likely that they were produced in Constantinople. Their presence in a merchant ship presumably *en route* for the northern Adriatic is unique, but it may not have been unusual, if we look at their contents.

Literature on the history of glass agrees that the glassmaking industry in the Islamic world continued its decline in the 16th century, and extant material indicates that European imports were the stimulus for glass produced locally under the Ottomans (Rogers, 1983; Diba Soudavar, 1983: 187; Jenkins, 1986: 47; Carboni, 2001: 374–375; Carboni and Whitehouse, 2001: 278). For information about glass production before the 18th century we are forced to rely on contemporary accounts and illustrated manuscripts. From documents of the time and from excavations we know that imports, particularly Venetian products, sometimes adapted to the stylistic requirements of foreign markets (Carboni, 2007: 269), were popular.

However, glass was also produced in Ottoman Empire at this time, and there seems to have been an improvement in the quality of local glass, judging by Palace accounts of 1573–1575, and from an order of the Sultan Ahmed Mosque of 1609–1617 (Rogers, 1983: 245). Detailed building records imply that window panes and glass vessels were being manufactured in Constantinople in the middle of the 16th century; in 1582 the *Surname-i-Humayun* provides pictorial evidence of local glassblowers (Rogers, 1983: 250–251; Jenkins, 1986: 49; Carboni 2001: 280). In the next century, Ewliya Celebi mentioned the presence in the city of four glass factories (Jenkins, 1986: 51). For earlier periods, it is necessary to go back to about the 10th century, when a written source describes the installation of a furnace near the coppersmiths' quarter and the church of Saint Mary Chalkoprataia (Henderson and Mundell Mango, 1995: 346).

However, there are no unequivocal archaeological indicators that exactly define the different products of the 16th century. Production wastes have not been found in Saraçhane, although the increase of the presence of green glass in deposits of the late 16th to the first half of the 17th century suggests the development of local production, of which only few signs are left (Hayes, 1992). From the Marmaray excavation only few objects with thermal cracks



and production waste were recovered, which indicate local production in the Ottoman period (Ozgumus, 2010: 130, fig. 13; Canav Ozgumus, 2012: 330).

Nevertheless, it seems certain that a glass industry producing suitable containers for locally manufactured products existed. We know from European travellers who wrote accounts of glass factories in Shiraz, Persia, that in the middle of the 17th century there were at least three glass factories that manufactured bottles for different purposes: containers for rose water, for pickled fruits, and for wine in long-necked bottles protected by wicker covering (Jenkins, 1986: 52). For the area of Persia, it is thought that expatriate Italian craftsmen brought about this revival (Carboni, 2001: 374–375), but it is remarkable that there was a well recognised production with a specific target.

The end of the 16th and the beginning of the 17th centuries is a very important period for the Ottoman glass industry: production increased, glass manufacturing improved, and by 1640, there is detailed evidence for the sale and consumption of imported and locally produced glass on the open market in Istanbul (Rogers, 1983: 260–266).

Given the number of items recovered and the highly formal and decorative standardisation, glassware recovered from the Sv. Pavao shipwreck is clearly part of the cargo, and the glassware is to be considered as containers for other items, or as objects in themselves. They may have been commercialised for their artistic value, but this possibility frankly appears unlikely. It is probable that glassware was purchased and transported aboard the ship for its contents. The cargo of the Sv. Pavao shipwreck indeed allows us to assert that, about 1570–1580, the production of glass bottles in Turkey included variants, differentiated by size, decoration and the possible presence of a spout, perhaps corresponding to the different products they contained.<sup>1</sup>

#### *Note*

- 1 I would like to thank Nergis Günsenin, Seniz Atik and the Rakow Library of the Corning Museum of Glass (NY) for their help.