

**How Boats Change: Explaining Morphological Variation in European Watercraft, based on an Investigation of Logboats from Bohemia and Moravia, Czech Republic**

Submitted by Jason Samuel Rogers, to the University of Exeter as a thesis for the degree of Doctor of Philosophy in Archaeology, September 2009.

This thesis is available for Library use on the understanding that it is copyright material and that no quotation from the thesis may be published without proper acknowledgement.

I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature.....

## ABSTRACT

This thesis examines questions regarding aspects of cultural change in prehistoric and early modern Europe, specifically the transmittal of skills, knowledge and technology. Dugout logboats from Bohemia and Moravia (Czech Republic) are used as proxy artifacts to make this transmittal visible. Boats in general and riverine watercraft specifically, are an unusual class of artifact, as they are neither completely portable nor permanently fixed in place. The movement of watercraft is restricted to a relatively narrow corridor through the landscape. The morphology and construction of logboats are reflective of skill sets and technological traditions. Pre-literate boat construction traditions and technology, spread through personal contact and experience, may thus be traced through close examination of the technical features of surviving examples. In many parts of Europe, however, dugout logboats remain an extremely uncontextualized category of artefact. Placing these vessels in their appropriate geographic, environmental, and human contexts helps us to understand their meaning and forms (and the behavior of their builders and operators). The geographic element of this investigation is especially significant, as the spread of information and skill sets in physical space is a main focus of the thesis. The Czech Lands sit astride one of Europe's main continental divides, and rivers originating on this territory flow to the North Sea, the Baltic Sea, and the Black Sea. Topographic conditions have funneled travel and transport in this region through the river valleys and across a few key passes or watershed boundaries. Water transport, far more efficient than overland haulage, was likely an important element in trans-continental trade and exchange. Analysis of the surviving logboats from this region indicates that different construction traditions prevailed in different watershed areas. These data also suggest a model explaining the mechanisms by which boats can change. Key elements of the model include an inherent conservatism of boat design; internal change, driven by social or environmental factors; and external change, adopted through the personal experience of the boat builder or operator. The model is subsequently tested against case studies of vessels from other regions of Europe, and other types of watercraft.

## CONTENTS

<b>List of Figures</b> .....	5
<b>List of Tables</b> .....	10
<b>Acknowledgements</b> .....	11
<b>Chapter One: Introduction</b> .....	12
1.1 Introduction .....	12
1.2 Boats and Watercraft.....	18
1.3 Maritime Archaeology .....	25
1.4 Research Questions .....	32
1.5 Thesis Organization.....	33
<b>Chapter Two: Previous Research and Methodology</b> .....	40
2.1 Logboat Studies: Analysis and Theories of Origin.....	41
2.2 Research from Neighboring Regions .....	63
2.3 Previous Logboat Research in Bohemia and Moravia .....	69
2.4 Thesis Methodology .....	73
2.5 Following Chapters.....	78
<b>Chapter Three: Context</b> .....	80
3.1 Physical Context: Location, Geography, and Climate .....	81
3.2 River Systems .....	86
3.3 The Human Context.....	90
3.4 Historical Use of Czech Waterways.....	115
3.5 Summary of Contextual Elements.....	122
<b>Chapter Four: Catalogue of Vessels</b> .....	124
4.1 Catalogue Overview.....	124
4.2 Bohemian Logboats .....	126

4.3 Moravian Logboats .....	183
4.4 Catalogue Summary .....	210
<b>Chapter Five: Analysis</b> .....	212
5.1 Dating and Chronology.....	212
5.2 Distribution and Geography.....	216
5.3 Deposition and Discovery .....	219
5.4 Construction Materials.....	221
5.5 Construction and Morphology .....	223
5.6 Utilization .....	234
5.7 Other Motives and Aims: Distance, Prestige, and Ideological Factors.....	244
5.8 Other Types of Watercraft and Related Evidence .....	248
5.9 Alternative Methods of Travel: Wheeled Vehicles .....	251
5.10 Towards a Model of Transmission of Boatbuilding Skills.....	254
<b>Chapter Six: Transmission and Replication: Case Studies in European Boat- Building Traditions</b> .....	260
6.1 Loire Logboats.....	262
6.2 Polish Case Studies .....	266
6.3 Alpine Case Studies.....	268
6.4 Gallo-Roman Boats .....	272
6.5 Case Studies Conclusions .....	281
<b>Chapter Seven: Conclusion</b> .....	283
7.1 Summary.....	283
7.2 Diversity and Uniformity.....	289
7.3 Inland Watercraft and the Riverine Cognitive Landscape .....	292
7.4 Spread of Knowledge and Material Culture .....	294
7.5 European Watercraft Design Traditions: La Longue Durée .....	298
7.6 Conclusions.....	301
<b>Bibliography</b> .....	305

## LIST OF FIGURES

### Chapter One – Introduction

Figure 1.1 Childe’s distribution map of early Neolithic cultures .....	14
Figure 1.2 Clarke’s map of Neolithic settlement in south Sweden .....	15
Figure 1.3 Reindeer antler fragment from Husum, Germany, interpreted as a Magdalenian-period skin boat frame element .....	19
Figure 1.4 Mesolithic logboat and paddle from Tybrind Vig, Denmark .....	20
Figure 1.5 Europe’s oldest logboat, from Pesse in the Netherlands .....	20
Figure 1.6 Lapstrake (clinker) hull planking – Skuldelev wreck 5 .....	21
Figure 1.7 Carvel construction - the Madrague de Giens vessel .....	22
Figure 1.8 Variation in logboat form and morphology – the Cudrefin and Beinwil am See (Switzerland) logboats .....	31

### Chapter Two – Previous Research and Methodology

Figure 2.1 Logboat construction sequence .....	42
Figure 2.2 Kentmere (UK) vessel .....	43
Figure 2.3 Utrecht (Netherlands) vessel .....	44
Figure 2.4 Logboats from Keller’s <i>Lake Dwellings of Switzerland</i> .....	45
Figure 2.5 Watercraft from Central Italy .....	48
Figure 2.6 Arnold’s typology scheme .....	49
Figure 2.7 Draught calculation graph .....	50
Figure 2.8 Fox’s logboat typology diagram .....	53
Figure 2.9 Logboat discovery locations in Switzerland .....	58
Figure 2.10 Lanting’s geographic zones .....	60
Figure 2.11 Logboat from the Starnberger See .....	65
Figure 2.12 Logboat from Wessobrunn-Blaik .....	66
Figure 2.13 Logboat from Chwalimskie Bagno .....	67
Figure 2.14 Logboat from Sierzchów .....	67
Figure 2.15 Dunajec River logboat .....	68
Figure 2.16 Morava River and oxbow lake .....	70

### Chapter Three:

Figure 3.1 Location of the Czech Republic within Europe .....	82
---	----

Figure 3.2 Topography and major features of the Czech Republic .....	83
Figure 3.3 Watershed regions of the Czech Republic .....	84
Figure 3.4 Hydrographic systems of the Czech Republic .....	90
Figure 3.5 Paleolithic sites in Moravia .....	92
Figure 3.6 Venus figurine from Dolní Věstonice .....	93
Figure 3.7 Main areas of loess deposits in Bohemia and Moravia .....	97
Figure 3.8 Moravian Painted Ware ceramic .....	98
Figure 3.9 Bronze head from the Staré Hradisko <i>oppidum</i> .....	104
Figure 3.10 Bronze pitcher decoration from Brno-Maloměřice .....	105
Figure 3.11 La Tène period settlements in Bohemia and Moravia .....	108
Figure 3.12 Slavonic Ringwall forts in Moravia .....	112
Figure 3.13 Early Slavonic settlements in Bohemia .....	114
Figure 3.14 Salt house in České Budějovice .....	117
Figure 3.15 Building a riverboat in Štěchovice, early 20 <sup>th</sup> century .....	118
Figure 3.16 Building a riverboat in Týn nad Vltavou, late 19 <sup>th</sup> century .....	118
Figure 3.17 Cargo boats on the Vltava River .....	119
Figure 3.18 Unloading cargo vessels in Prague .....	119

#### **Chapter Four:**

Figure 4.1 Map of logboat discovery locations in Bohemia .....	126
Figure 4.2 Jaroměř vessel plans .....	128
Figure 4.3 Jaroměř vessel, view from bow end .....	129
Figure 4.4 Jaroměř vessel, view from stern end .....	130
Figure 4.5 Jaroměř vessel, detail of holes at stern end .....	131
Figure 4.6 Logboat from Lewin Brzeski (Poland) .....	132
Figure 4.7 Postulated construction sequence for the Jaroměř vessel .....	133
Figure 4.8 Labětín vessel plans .....	136
Figure 4.9 Hole in upper port side of Labětín vessel .....	137
Figure 4.10 Bow of the Labětín vessel .....	137
Figure 4.11 Bow of the Labětín vessel .....	138
Figure 4.12 Kolín 1 vessel as recorded in 1921 .....	139
Figure 4.13 Kolín 1 vessel plans .....	140
Figure 4.14 Kolín 1 logboat, view from the bow .....	141
Figure 4.15 Holes along upper edge of starboard side, Kolín 1 boat .....	142

Figure 4.16 Stern cutout, Kolín 1 logboat .....	142
Figure 4.17 Kolín 2 logboat at the time of discovery in the 1920s.....	143
Figure 4.18 Kolín 2 logboat as discovered in the 1920s.....	144
Figure 4.19 Kolín 2 vessel plans .....	145
Figure 4.20 Kolín 2 logboat.....	146
Figure 4.21 Kolín 2 stern profile.....	147
Figure 4.22 The Oseček logboat, as documented by B. Novotný in 1950 ....	148
Figure 4.23 Fragment #2 of the Oseček logboat.....	149
Figure 4.24 Oseček vessel plans .....	150
Figure 4.25 Oseček vessel – square holes in stern platform.....	150
Figure 4.26 The three surviving logboats from Poděbrady .....	151
Figure 4.27 Vessel plans for Poděbrady logboats 1, 2 and 3 .....	152
Figure 4.28 Poděbrady 2 bulkhead.....	154
Figure 4.29 The Poděbrady hydroelectric station .....	155
Figure 4.30 The Přerov logboat prior to recovery.....	156
Figure 4.31 The Přerov logboat, righted in preparation for removal .....	156
Figure 4.32 Hoisting the Přerov logboat .....	157
Figure 4.33 Unloading the Přerov vessel in Český Brod .....	157
Figure 4.34 Placing the Přerov vessel at the museum yard in Český Brod..	158
Figure 4.35 The Přerov logboat’s “rudder notch” .....	158
Figure 4.36 The Přerov logboat in 2003 prior to conservation.....	159
Figure 4.37 The Přerov logboat fragments.....	160
Figure 4.38 The shed built to protect the Přerov fragments .....	160
Figure 4.39 Securing the Otradovice logboat .....	163
Figure 4.40 Removing the Otradovice logboat from the Jizera River .....	163
Figure 4.41 The Otradovice logboat on display .....	164
Figure 4.42 Otradovice vessel plans.....	165
Figure 4.43 Vertical holes in the bow of the Otradovice logboat.....	166
Figure 4.44 The Čelákovice logboat at the time of discovery in 1943 .....	170
Figure 4.45 The Čelákovice logboat on display .....	171
Figure 4.46 The amidships transverse ridge of the Čelákovice logboat .....	172
Figure 4.47 Hole cut in the Čelákovice vessel floor.....	172
Figure 4.48 Čelákovice vessel plans .....	173
Figure 4.49 The Toušeň logboat .....	175

Figure 4.50 Toušeň vessel plans.....	176
Figure 4.51 The Brandýs nad Labem 1 logboat.....	177
Figure 4.52 Brandýs nad Labem 1 vessel plans.....	178
Figure 4.53 Vessel from Horní Jiřetín, recorded by B. Novotný .....	182
Figure 4.54 Logboat discovery sites in Moravia.....	183
Figure 4.55 Mohelnice Lake, discovery location of the Mohelnice logboat .	185
Figure 5.56 Mohelnice logboat conservation shed.....	185
Figure 4.57 Mohelnice vessel plans.....	186
Figure 4.58 Mohelnice logboat transverse ridges.....	187
Figure 4.59 Wooden poles in the lakebed in the vicinity of the Mohelnice vessel discovery location .....	188
Figure 4.60 Pointed end of wooden pole from Mohelnice lakebed.....	189
Figure 4.61 The Příkazy logboat.....	192
Figure 4.62 Příkazy vessel plans .....	192
Figure 4.63 The Spytihněv logboat.....	193
Figure 4.64 Spytihněv vessel plans.....	194
Figure 4.65 Staré Město vessel stern, showing T-shaped cutout.....	196
Figure 4.66 Uherské Hradistě logboat made at the time of recovery .....	197
Figure 4.67 Uherské Hradistě vessel plans .....	198
Figure 4.68 Floor block at the bow of the Uherské Hradistě logboat.....	199
Figure 4.69 Drawing of Lideřovice vessel bow .....	201
Figure 4.70 Mikulčice 1 vessel plans.....	203
Figure 4.71 Mikulčice 2 vessel plans.....	204
Figure 4.72 Mikulčice 3 vessel plans.....	205
Figure 4.73 Peg and hole in bow of Mikulčice 3 logboat .....	206
Figure 4.74 Documented remains of the Mikulčice 4 logboat.....	208
Figure 4.75 Reconstructed vessel plans for the Mikulčice 4 logboat .....	208
Figure 4.76 Paddles excavated at the Mikulčice site .....	209

## **Chapter Five:**

Figure 5.1 Logboat discovery locations in the Czech Republic.....	217
Figure 5.2 Logboat cross-sectional diagrams, showing internal features and partitioning.....	233



Figure 5.3 Grindstones found at the Staré Hradisko <i>oppidum</i> in Moravia were imported from as far as Austria’s Burgenland and western Bohemia.....	239
Figure 5.4 J.M. de Navarro’s map of the amber routes from the Baltic to the Mediterranean .....	242
Figure 5.5 Ceramic boat model from the Otava River, top view .....	249
Figure 5.6 Ceramic boat model from Otava River, side view .....	249
Figure 5.7 Ceramic boat model from the Otava River, showing cross-sectional profile.....	250
Figure 5.8 ‘Cult Wagon’ model from Strettweg, Austria.....	253
Figure 5.9 Key overland transport zones of Bohemia and Moravia .....	256
Figure 5.10 Interrelationship of the three key concepts for the model of boat design change.....	259

## **Chapter Six:**

Figure 6.1 Map of Loire region logboat discovery sites.....	263
Figure 6.2 Radiocarbon dating of the Loire logboats .....	263
Figure 6.3 The Ancenis 1985 logboat .....	264
Figure 6.4 Logboats from the Seine watershed .....	265
Figure 6.5 Auvernier 1973 logboat.....	268
Figure 6.6 Auvernier 1975 logboat.....	269
Figure 6.7 Bevaix 1917 logboat.....	269
Figure 6.8 Early 20 <sup>th</sup> century plank vessel from Lake Zurich .....	270
Figure 6.9 Planked flat-bottomed Neuchâtel boats.....	271
Figure 6.10 The Laibach vessel .....	274
Figure 6.11 Bevaix 1970 vessel.....	275
Figure 6.12 Zwammerdam 3 vessel .....	276
Figure 6.13 Plan of the Blackfriars 1 vessel .....	277
Figure 6.14 Plan of the Barland’s Farm boat .....	279
Figure 6.15 The County Hall ship .....	280
Figure 6.16 The 8 <sup>th</sup> and 13 century boats from Krefeld-Gellup .....	281

## LIST OF TABLES

### Chapter Four:

Table 4.1 Surviving Bohemian and Moravian logboats .....	125
--	-----

### Chapter Five:

Table 5.1 Absolute dating of Czech logboats .....	216
---	-----

Table 5.2 Presence of internal partition features of Czech logboats.....	230
--	-----

### Chapter Six:

Table 6.1 Comparison of Polish vessel morphology by watershed region .	267
--	-----

## ACKNOWLEDGEMENTS

This body of work, for all its likely flaws and unfinished strands, would have been impossible with the assistance, cooperation, enthusiasm, and support of many people. My thanks and deepest gratitude to:

My wife, Evguenia Anichtchenko

My parents, Karen and Fred Rogers

My advisor, Professor Robert Van de Noort, University of Exeter

Professor Christer Westerdahl, Norwegian University of Science and Technology

Dr. Alan Outram, University of Exeter

Professor Anthony Harding, University of Exeter

Věra Šlancarová, Masaryk University, Brno

Martin Hložek, Metodické Centrum Konzervace, Brno

Miroslava Cejpová, Radko Sedláček, VČM Pardubice

Alena Selucká, Technické muzeum, Brno

Aranka Daňková, Polabské muzeum, Poděbrady

Simona Chlupová, Zdeněk Mazač, Lenka Mazačková, Regionální muzeum, Kolín

Jaroslav Špaček, Městské muzeum, Čelákovice

Blanka Kreibichová, Vladimír Brych, Národní muzeum, Prague

Milan Rosenkranc, Oblastní muzeum, Děčín

Olga Mertlíková, Městské muzeum Jaroměř

Ivan Krutina, Oblastní muzeum Praha - východ, Brandýs nad Labem

Jaroslav Peška, Archeologické Centrum Olomouc

Radovan Frait, Vlastivědné muzeum, Olomouc

Waldemar Ossowski, Polish Maritime Museum, Gdańsk

Jiří Zahradníček, Prague

Pavel and Taťana Kočař, Litoměřice