

# The tree species of Po valley Logboats

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**Abstract** – Logboats are present on many continents. Despite being made of a tree-trunk, they cannot be simplified to only one building tradition. In Italy, the main studies usually list the findings, but we lack knowledge about the timber and the vessel construction. In our study, 16 logboats, for a total of 69 samples, were analyzed to identify the tree species used in the different parts of the boats. Different tree species were identified, including oak (*Quercus* sp.), chestnut (*Castanea sativa*), and elm (*Ulmus* sp.). We found dogwood (*Cornus mas*) and willow (*Salix* sp.) in trenails, and in some cases, we detected the use of pieces of bark and phloem. Long believed to have been dug out from a single tree, our results demonstrate that these logboats also contain components made from woods different from the main hull. Thus, the traditionally accepted nomenclature seems inappropriate and likely to confuse research efforts.

## I. INTRODUCTION

During the second half of the 19<sup>th</sup> century, logboats discoveries became common in the environment of Alpine lakes and along the Po valley rivers and paleochannels [1]. At that time, some boats made from a singletree trunk had already been discovered in France, Ireland, and Denmark [2].

The logboats, however, are not a peculiarity of central Europe. Logboats are present in multiple continents, and many individual traditions existed in past times. Therefore, despite being made of a tree-trunk, they cannot be simplified to only one building tradition [3].

In Italian archaeology, after a brief and lively season of research addressing lake dwellings at the beginning of the 20th century, these artifacts were often underestimated and reputed primitive boats, applying older evolutionistic approaches to the history of navigation [4, 5, 6]. This kind of interpretation persisted for a long time, even when the findings were not from a stratigraphic lake-dwellings context [7]. In the 1960s, scholars from various European countries started to compose catalogs and lists of these findings. These studies also gave attention to stratigraphy's

presence and absence to understand the chronology of boats, and assess their context and sailing capabilities using scientific analyses and applying naval engineering knowledge [8, 9, 10].

In Italy, the main studies of the period usually list the findings only. In two cases, the authors present a geographical and chrono-typological classification, despite the absence of absolute or relative dating for most of the boats.

These studies still lack direct observations of the vessels. The wood species, at that time, were often classified based on macroscopic observations. The term “*piroghe monossili*” was applied to the Italian findings, on analogy with the one used in French studies (*pirogues monoxyles*) [11, 12].

An innovative study in this panorama was made on the radiocarbon dating of the logboat of Lova in 1999. The unexpected result of this study shifted the attention to the uncertainty of Italian logboats chronology and opened new questions on the knowledge of these boats [13].

Looking back at the few absolute dates of Italian logboats, it appears that many of them, especially the ones found in rivers and paleochannels, belong to the Middle Ages [14]. This led archaeologists to a new approach to the study of logboats in the last decades, emphasizing the scientific analyses on the findings, especially after rescue archaeology. The analyses, however, rarely involved more than few boats and aimed to answer broader research questions [15]. Recent papers summarizing studies of the past underline this Middle Ages belonging. These papers compare published reports for collecting chronological information [16, 17]. Lanting already showed similar chronological results for some north European countries in 1997. However, there is a remarkable difference between European and Italian logboats; in Ireland, Scotland, and Germany, many modern findings are known while in Italy, we have not discovered any post-medieval logboats yet [18].

This work aims to demonstrate through an

extensive sampling campaign and the application of archaeobotanical analyses on a group of logboats, how this kind of analysis, when systematically conducted, can give us valuable information on vessel construction. Based on our results, we will make comparisons to the logboat definitions in Italian archaeology and address the ongoing problem of the absence of an analytical classification.

## II. MATERIALS AND METHODS

The sampling was made through a collaboration with the Cultural Heritage Offices of Lombardia (SABAP-CO-LC and SABAP CR-LO-MN), and it was conducted on sixteen boats already placed in small local museums or awaiting restoration. Sixteen vessels were chosen from low plain rivers findings (Po, Adda, Chiese, Serio, and Oglio).

All the logboats, founded in natural deposits, still lack of stratigraphical dating or a radiocarbon analyses. The sampling campaign was done following UNI11118 instructions [19]. After a first autoptic examination, it became clear that most of the boats presented treenail insertions fixed in small holes on the bottom or sides of the main hull. The position of the nails and eventual tiles were recorded, and each separate piece of wood was sampled. Two boats do not have any kind of insert, while another two are too damaged by cubical brown rot and old restoration works to identify any inserts. In two of the logboats preserved in water, the nails were too soft for sampling without damaging them. At the end of the operation, a total of 69 samples was selected: 19 samples from hulls and hull fragment and 50 samples from tile and wood nails.

A stereomicroscope and an optical microscope with transmitted light (Olympus CX41, 3 Lenses 40×, 100×, 400× magnification) were used for the wood species identifications through microscopic analyses of the three (transversal, radial, and tangential) sections of wood [19]. The identifications were made with reference to the anatomical descriptions available in the literature [20, 21, 22]. In a few cases, we used a scanning electron microscope (SEM Hitachi S-2300) on the most damaged treenails samples of Pizz2\_628.

## III. RESULTS

The majority of the hull's samples (14) are *Quercus sp.*, despite the highly degenerate archaeological wood, many sections seem to fit the *Quercus* sect. *Quercus* characters [23]. The last two samples, from the hulls considered made

of Oak, are actually from *Castanea sativa* (Chestnuts) and *Ulmus sp.* (Elm) [20].

For ten logboats, it was possible to analyze treenails, and in four of them, we found different wood species from the main hull. (*Cornus mas* and *Salix sp.*) [24]. In two logboats, "wood nails" were made of broadleaved barks (Fig.1) [25]. In four of them, oak wood was used both for the hull and the treenails.

TABLE 1. ANALYSES RESULTS

Id.	Location	River	Number of Treenails samples	of Treenails samples
Piz1_434	Gerola, Pizzighettone (CR)	Adda	1 <i>Quercus sp.</i>	5 <i>Phloem</i>
Piz2_628	Gera, Pizzighettone (CR)	Adda	1 <i>Quercus sp.</i>	2 <i>Cornus Mas</i> 2 <i>Quercus sp.</i>
Piz3_555	Formigara (CR)	Adda	1 <i>Castanea Sativa</i>	7 <i>Phloem</i>
Pav1_750	San Cipriano Po (PV)	Po	1 <i>Quercus sp.</i>	//
Cav1_650	Montodine (CR)	Serio	1 <i>Quercus sp.</i>	//
Cav2_870	Montodine (CR)	Serio	1 <i>Quercus sp.</i>	8 <i>Quercus sp.</i>
Man1_440	Casalmoro (MN)	Chiese	2 <i>Quercus sp.</i>	3 treenails, 6 tiles <i>Quercus sp.</i>
Abb1_320	Isella (LO)	Adda	1 <i>Quercus sp.</i>	1 <i>Cornus Mas</i> 2 N.D. 2 <i>Quercus sp.</i>
Mil1_750	Pieve di Grumone (CR)	Oglio	1 <i>Quercus sp.</i>	1 <i>Salix sp.</i>
Sir1_585	//	Oglio	3 <i>Quercus sp.</i>	6 <i>Quercus sp.</i>
Sir2_640	Quinzano (BS)	Oglio	1 <i>Quercus sp.</i>	2 <i>Quercus sp.</i>
Sir3_877	Ostiano (CR)	Oglio	1 <i>Quercus sp.</i>	3 <i>Cornus Mas</i>
Can1_763	Canneto sull'Oglio (MN)	Oglio	1 <i>Quercus sp.</i>	//
Can2_315	Canneto sull'Oglio (MN)	Oglio	1 <i>Ulmus sp.</i>	//
Mil2_730	Pieve di Grumone (CR)	Oglio	1 <i>Quercus sp.</i>	Nd
Mil3_420	Corte dei Cortesi (CR)	Oglio	1 <i>Quercus sp.</i>	Nd

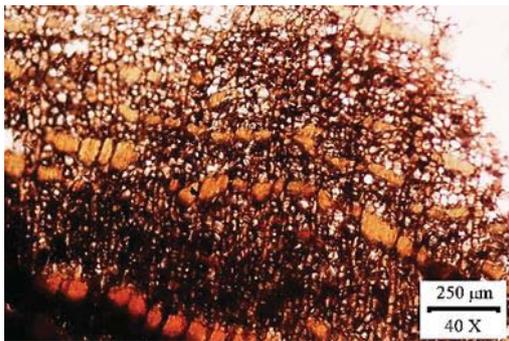


Fig. 1 Transversal section of broadleaved bark in Pizz\_434 treenail.

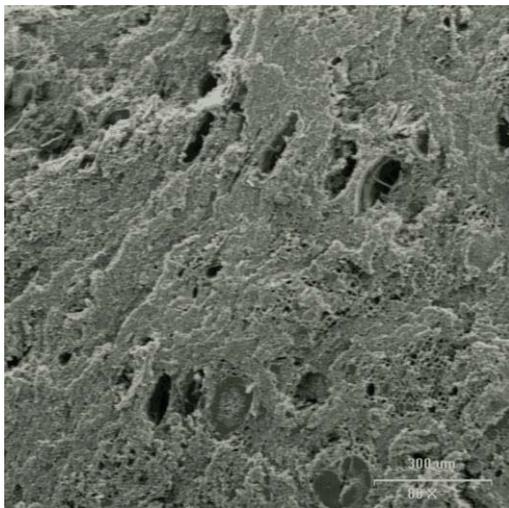


Fig. 2 Treenail sampling from Pizz\_628. Cross-section with anomalous occlusion in vessels of the ring-porous.

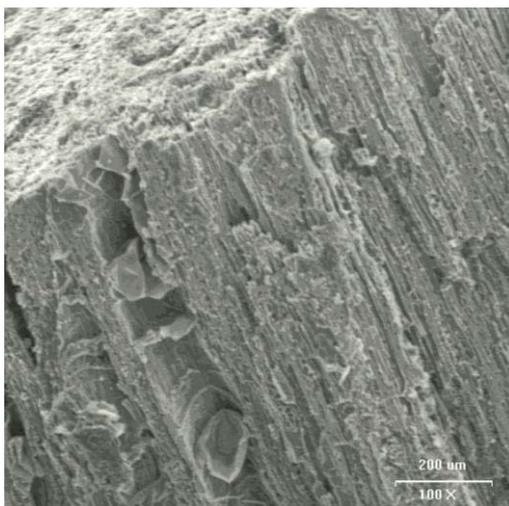


Fig. 3 Treenail sampling from Pizz\_628, Tangential section with tyloses in an empty vessel.

#### IV. DISCUSSION

The wood species detected during the analysis

include mainly hygrophilous forest trees [26]. *Cornus mas* was well known and used in roman time carpentry and boatbuilding. We can find it used in our logboats in two ways, as ordinary treenails, and for the specific fix of a tile in the hull, taking advantage of his mechanical hardness already described in antiquity [27]. The use of *phloem* for treenails in through-holes and blind holes indicate a necessity to fill the cavity. Despite the material's low hardness, the *phloem* would have also been a way to recover a boatbuilding process waste. The material would also offer good workability [22]. Another material available in the tree-trunk leftovers would have been Oak *duramen* [28]. The use of wood materials with such different properties for treenails on the bottom of the hull may indicate a function compatible with the only corking of holes: The holes were probably thickness gauges, as proposed in McGrail studies of logboats [29]. The scanning electron microscope was particularly useful in analyzing high friable samples.

In the case of the treenails, despite the strong decay of wood was possible to detect an anatomical characterization compatible with *Quercus* sp. and the presence of anomalous material filling few vessels of the ring-porous (Fig.2 and 3). According to the logboat's provenience from Adda riverbanks [30], we may hypothesize the material being a type of biodegradation from rhizomes intervened during the formation of alluvial deposit after the abandon of the boat [31].

Our results demonstrate the presence of more than a wood species in a single logboats. This detail is not surprising in the European context where composed and extended logboats are well known. In these boats, the presence of more than a piece of wood is immediately detectable and can raise awareness of the need for analyses of any boat components. In Italy, however, where none of these composed boats have been found, analyses are often conducted only on the hull [32].

This group of Italian logboats suggests that, right now, we can, at least, separate four kinds of logboats in Northern Italy based on the material chosen for boatbuilding. There are (1) hulls made in a single wood without inserts, (2) logboats with wood nails or tiles of the same *duramen* of the hull, (3) logboats where bark is used in treenails instead of wood, and (4) logboats where treenails are made of wood species different from the hull. Finally, if we compare coeval logboats in Europe, the presence of a hull made in chestnuts in Italy

can be noted. The use of chestnuts seems a peculiarity of a few Italian logboats [14, 33, 4]. We cannot exclude that, in the future, analyses on other findings will show the use of other wood species.

We suggest the need to critically review the terms “*piroghe monossili*”, used in Italian archaeology when referring to logboats.

The words “*monossile/monossilo*” and “*monoxylon*” imply, in the present Italian, a slightly different meaning from its etymological meaning and from other ancient languages terminology. The word *μονόξυλος*, from ancient Greek, indicates mainly a boat made of a tree trunk or one (*μovo-*) woodblock (*ξύλον*) [34].

But the same meanings are not always included in the modern reception of the word *ξύλον* by antiquarians and archaeologists that often translate it as made of a wood species only [35, 36].

The Greek terms were Latinized by some Roman authors, but in Roman times, there were many alternative words to identify logboats, including *linter* (also used for other boats) and later words like *trabariae* and *caudicae*, (from *trabs* “beam” and *caudex* “tree-trunk”) (*Isid. Orig. XIX, 1, 27*) [37, 38].

Considering all these other terms, and how they were used in Latin, we do not have reasons to believe that they indicate expressively the use of only one wood species, although many of them generally indicate a boat built starting from a single trunk.

The interpretative problem becomes more complex if we consider that in the Po valley, we have mostly preRoman and medieval findings, with huge variability of shape and measures. Therefore, we do not have any valuable reason to think that the word, arbitrarily chosen in the past to define our findings, can be property explicative of their technology.

Therefore, we cannot assume the use of the term “*monossili*” as a neutral and scientific one, usable in classification, or we will risk of ignoring some of these vessels’ peculiarities [39].

Also, the word “*piroga*” came from a very different context and can cause some interpretative problems. Pirogue seems to have originally referred to a small boat, of Caribbean origins, but the word spread quickly in the modern age and is now also used to refer to plank-boats of a very different building tradition [37].

## V. CONCLUSION

The present study, similar to previous works on absolute dating, shows how our knowledge of

Italian logboats is incomplete and how wood analyses can contribute. More importantly, the result of this study highlights the inadequacy of traditional terminology. Even so, if we decide to continue to use the traditional definition of monoxylon boats in Italian language, due its diffusion or the lack of other terminology, we must at least be aware of its history, the absence of a philological correspondence or a fixed meaning, and find new descriptive terms when we attempt to reach a classification.

The presence of treenails inserts and materiality of the wood choices bring our findings nearer to other coeval North European logboats instead of the simplified image of these boats describe in classical authors. A central problem remains to isolate specific features in the Po valley’s group of archaeological findings to arrive at a classification, despite the huge degree of wood decay of the archaeological findings.

This will be the first step to creating more objective terms of comparison within the group variety and, outside, with other better-known building traditions, and, finally, to improve our knowledge of these vessels, their shapes, construction, and uses.

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