The Sanguinaires C shipwreck, Corsica; An early 16th century clinker-built ship of northern origin

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Abstract: Discovered in 2005, the Sanguinaires C shipwreck is located near the Sanguinaires Islands in the Gulf of Ajaccio (Corsica). After two surveys, a multiannual program (2021–2023) has been implemented. The wreck is characterized by a stone mound (dolomitic limestone) covering the architectural remains of the hull. A secondary cargo of Pisan and Ligurian ceramics dating from the first part of the 16th century has been discovered. Excavation of the architectural remains, limited to the fore and aft ends of the keel, has brought to light several main features; the most important one, in the Mediterranean context, concerns the clinker structure of the planking.

Keywords: clinker-built, Corsica, 16th century, limestone cargo

1. Introduction

Discovered in 2005 during a survey conducted by the Drassm,[1] the Sanguinaires C shipwreck lies at a depth of 19 m on the Sanguinaires Islands in the north of the Gulf of Ajaccio (Corsica) (Fig. 1). After two surveys conducted under the direction of Hervé Alfonsi (ARASM/FFESSM)[2] and three excavation campaigns, a multi-year excavation programme (2021–2023) was implemented under the direction of Hervé Alfonsi in co-direction with Marine Sadania (Drassm), and in collaboration with Éric Rieth (CNRS)[3] and Élisabeth Veyrat (ARKAEOS) (Fig. 2). The Sanguinaires C shipwreck is one of the major discoveries of the French coastline: it is clinker-built, and its cargo and equipment reveal new data on maritime trade in the early modern period (Fig. 3).

This article focuses on the presentation of the architectural remains. However, it is important to emphasise the richness and diversity of the material culture uncovered. The hull remains were covered by a cargo of dolomitic limestone, 17.40 m long, 12.40 m wide, and 2.80 m high (at its central part). This type of stone is found throughout the Mediterranean basin and was used for the manufacture of lime. The origin and destination of this limestone are the main interest regarding this cargo.

Among the on-board equipment, three wrought iron anchors with wooden stocks, which were not preserved, were observed on the site. The first is 3.54 m-long and was placed on the starboard fore extremity of the shipwreck, on the stone mound. Its diamond ring hints at a pre-16th century dating. Of two other anchors, one is 4.15-m-long. These anchors were found 10 m beyond the mound, on the same starboard fore extremity. Their position seems to indicate that they were dropped in a hurry, in case of an emergency. Numerous iron concretions were discovered in the vicinity of the shipwreck, some of which, following X-ray analysis, reveal the presence of artillery on board, which could have participated in the defence of the ship in a troubled maritime context. The exact number of artillery items is still uncertain. It could have also been used as ballast. Further investigation is needed on this subject.

The excavation of the shipwreck also revealed a collection of objects which were discovered in the space between frames, and bear witness to the daily life of the sailors. Small bone fragments, cooperage items, pewter containers, a wooden mallet, and an exceptional wooden compass cover – all provide valuable clues to life on board.

[1] Drassm: Department of underwater archaeological research, French Ministry of Culture.

[2] ARASM: Association for underwater research; FFESSM: French federation of study and underwater sports.

[3] CNRS: National Center for Scientific Research.

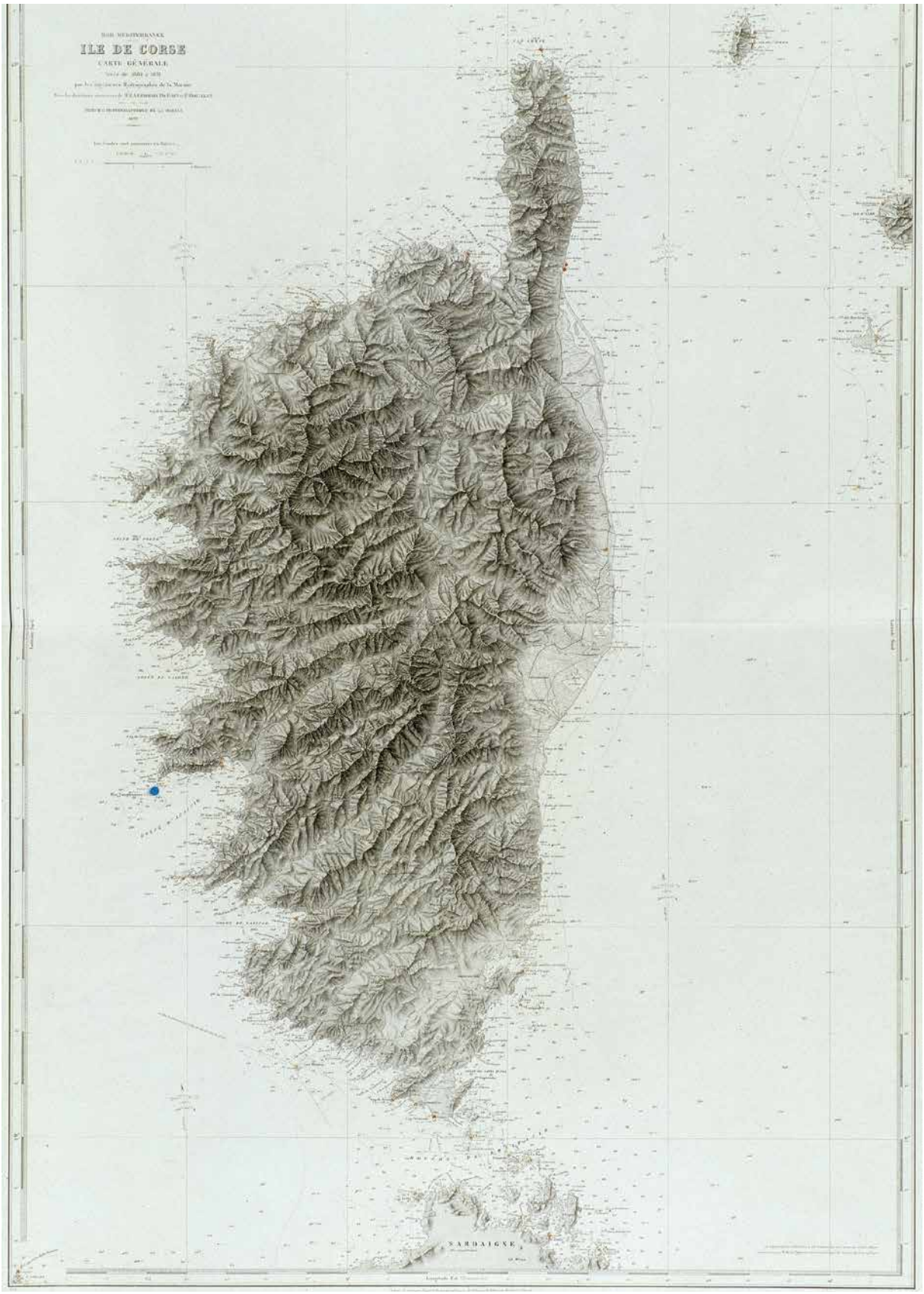

Fig. 1 Location of the wreck in Corsica (Hydrographie française, pl. 4993, © Musée national de la Marine/P. Dantec, Inv. B668)

Fig. 2 Aerial view of the Alfred Merlin, Drassm's ship, French Ministry of Culture (photo: T. Seguin, ARASM-Drassm)

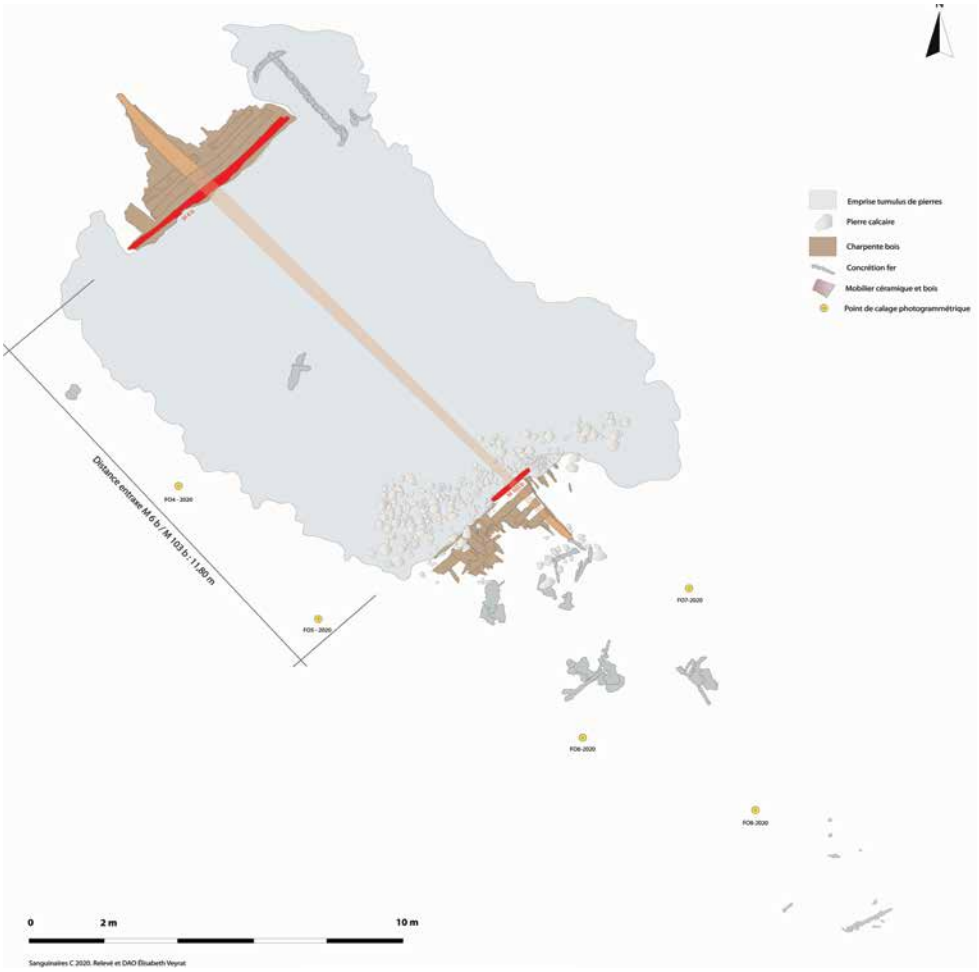

Fig. 3 Archaeological record of the wreck with the two excavation aeras; the two pieces in red correspond to the presumed 'floor timber beams' (drawing: D. Peloso, Ipso-Facto)

In the centre of the stone load and around the site numerous ceramic items were found (Fig. 4); the majority corresponds to northern Italian production, including a large collection of Pisan *graffite a stecca* (open forms: cups and bowls). These ceramic items were made of red slipped clay and are covered on the inside with a green, brown, and colourless glaze. They are characterised by deep removals of dark-coloured earth made with a gouge. The outer surface is not glazed, but in most cases the upper part shows slip and glaze flows. They demonstrate a careful, high-quality decoration with several peripheral motifs, many of which refer to a sequence attributed by Marcella Giorgio (Alberti, Giorgio 2013: 137, 306) to the period 1530–1560. The Pisa region seems to be the origin of the undecorated monochrome cups that have been identified on the site. In addition, there is a collection of Ligurian ceramic items, earthenware represented by closed containers (three *albarelli* jars and a pill box), as well as some bowls with an orange glaze and incised decoration of the type *monochrome graffite a punta*. Among the decorated ceramic items there is a *polychrome graffito* bowl and a *gotico-floreale* plate, with monochrome blue decoration of the *alla porcellana* type, characteristic of Tuscan factories, probably Montelupo and datable between the last quarter of the 15th century and the second half of the 16th century (Berti 1998: 16). The *tegame* pot and the Frejus jar, found on the site, could be more of a ship's ware. Some shards of rim and jug sides attest to the presence of closed forms on board the ship. These ceramic items, present in small quantities on the site, are evidence of a secondary cargo of food and pharmaceutical containers[4].

Fig. 4 Samples of ceramics from northern Italy (photo: F. Osada, ARASM-Drassm)

The excavation strategy for the architectural remains had to consider the previous excavation of the stone cargo. In this perspective, it was decided to carry out a methodical dismantling of the stone mound to try and understand the possible organisation and distribution of these stones in the hold[5]. Such a cargo raises the question of the risks of its partial displacement in case of severe weather and its consequences for the stability of the ship. Therefore, this was a major technical problem that the men responsible for loading the Sanguinaires C vessel had presumably been confronted with, and it was important to try and appreciate today. In these conditions, the strategy was based on a gradual approach to the loading and architectural remains, limiting itself to the removal of the north/forward of the hull (2018–2019) over a length of almost 3.60 m, and south/aft of the hull (2020–2021) over a length of approximately 2.20 m – two areas of the shipwreck where the height of the stones to be removed was lower than in the central part, in the area of the master frame. In total, therefore, the shipwreck was studied over a length of about 5.80 m, i.e. a little less than a third of the preserved length of the keel. This dimension, although small in relation to the extent of the preserved remains, is sufficiently representative to allow an initial sketch of the architecture of the Sanguinaires C ship.

[4] The main cargo was a load of dolomitic limestone. The secondary cargo hypothesis is based on the fact that nearly two hundred ceramic artefacts (NMI count) were unearthed, the majority of which were engobed *graffite a stecca bowls that can only be considered as merchandise to be disposed of, and not as ship's crockery.*

[5] In 2021, the collaboration of divers from the French Navy's *Groupement de plongeurs-démineurs de la Méditerranée* made it possible to dismantle the upper part of the cargo in layers, with the support of several members of the archaeological team.

2. Architectural remains (Figs 5, 6)

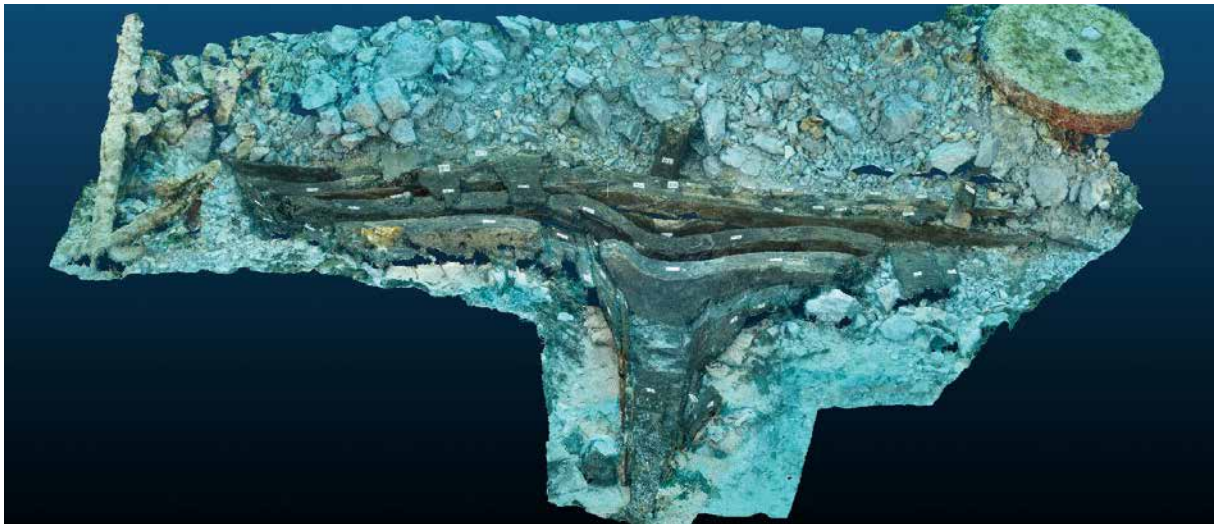

Fig. 5 The fore M 6 floor timber in the background is topped by the presumed 'floor timber beam' M 6b (authors: F. Osada, ARASM-Drassm & D. Peloso, Ipso-Facto)

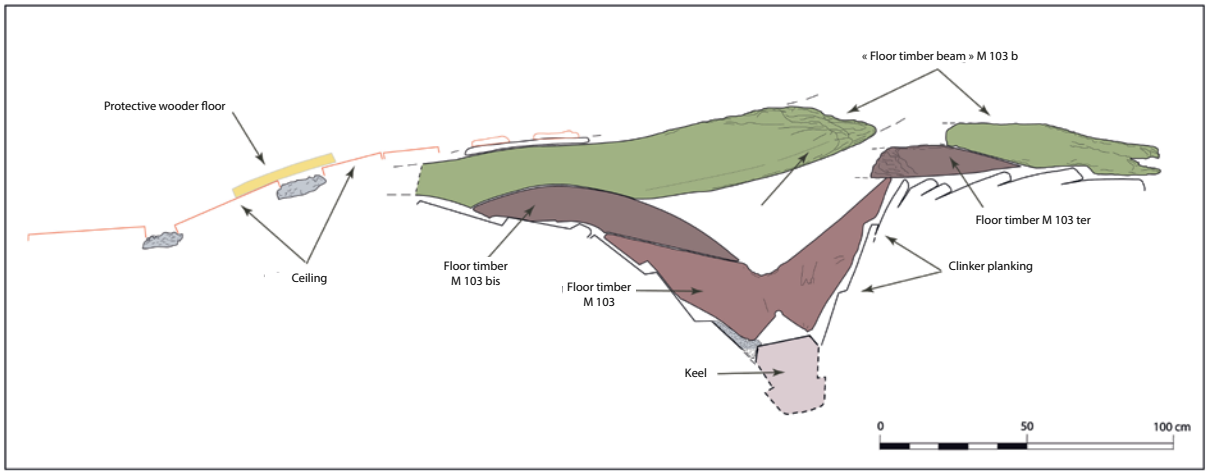

Fig. 6 Cross section at the level of the aft floor-timber M 103 with the presumed 'floor timber beam' (broken) M 106b (drawing: E. Veyrat, ARKAEOS)

2.1. Longitudinal axis

The oak keel is preserved over a length of 17.80 m. The fore extremity of the keel is preserved up to the base of the stem, however the aft extremity is destroyed. The regular reduction in the width of the last low strakes of the planking towards the aft end indicates that the stem probably originally extended to a length of maximum 1 m. A section of the aft part of the keel incorporating one of the garboards was taken to define its precise dimensions and morphology. Its section is trapezoidal: the width increases from nearly 19 cm at the aft end to 29 cm at 1.90 m from the aft end for an average height of 25.5 cm at the aft end. At the fore end, the keel dimensions appear to be much larger: the width varies from 30 to 52 cm at M 3 and M 4 frames and the average height is 42 cm.[6] The keel has a 3-cm-deep rabbet whose profile evolves. The rabbet has a right angle in relation to a vertical garboard at the fore end and opens at the aft end in relation to a slightly sloping garboard.

An oak keelson, of which only the aft end was found at the level of floor timber M 104, was set on the upper face of the floor timbers. This extremity of the keelson is 18 cm wide and 24 cm high and is located at the front of floor timber beam M 103b.

[6] No evidence of a counter-keel and a false keel was identified. Further observations of this fore part of the keel will have to be made to understand these differences in dimensions.

2.2. Clinker planking

The clinker planking of the Sanguinaires C shipwreck is one of its three main characteristics. The oak planks are between 21 and 33.5 cm wide. The average thickness of the planks is 3.4 cm, except for the garboard, which is thicker, at about 3.8 cm. The clinker strakes are joined together without any particular arrangement,[7] with an average overlap of 7 to 12 cm. The assembly was carried out by means of iron rivets driven in from the outer face of the planks. The tip of the rivets was pressed onto a quadrangular iron rove with an average size of 2.8 cm on each side. Rivets and roves are only preserved as iron concretions. Their average interval is around 17.5 cm, with occasional more irregular intervals. A particularly important feature of the roves in relation to the ship's construction process was noted. During the dismantling of several fore and aft floor timbers for a detailed study on the surface, it was found that some of the roves were overlapped by these frames. This overlap is a clear indication that these floor timbers were placed after the lower part of the planking had been raised and assembled following the classic chronology of the longitudinal shell-first construction method. In the current state of progress of the excavation, however, it was not possible to observe whether this same arrangement of overlapping roves was evident at the level of the first futtocks. The sealing between the planking at the level of their overlapping and joining surfaces was carried out according to the luting method, as the planking rises, with a material based on braided cords of horsehair and/or sheep's wool. Each strake is made up of several planks joined together by means of a vertical flat scarf. A final characteristic of this planking is that the planks were fastened to the frames by means of 3 to 3.5 cm long treenails, some of which were wedged. Only the two garboards seem to have been fastened to the keel and the frames by treenails and iron carvel nails.

2.3. Frames

The oak frames are the second significant feature of the architecture of the Sanguinaires C shipwreck. The first aspect to be noted is the large sample of the frames, crotches, and floor timbers. Their typical sided is between 22 and 29 cm. This sampling of the frames is combined with an irregular room and space that ranges from 8.5 to 16 cm in the fore part and from 15.4 to 23 cm in the aft part. The crotches and floor timbers are extended by futtocks joined by a flat scarf. This was achieved by overlapping the end of the floor timber with its extension futtock. According to the traditional clinker architecture, the lower face of the frames has a series of notches of 4 to 5 cm deep on average intended for embedding the top of the lower strake at the level of its overlap by the upper strake. The second important aspect to be mentioned concerns the irregular morphology of the frames and the preservation of the bark on several crotches and floor timbers in relation to their minimal shaping. One of the questions is whether this is a technical choice intended to favour the sampling of the frames to the detriment of the quality of their shaping or, on the contrary, whether it is a constraint imposed by shipyard's supply problems.[8] The third particularly revealing aspect of the frames concerns the relationship, or rather the lack of connection, between the base of the crotches and floor timbers and the keel. On the one hand, several frames do not rest on the keel, from which they are separated by few centimetres, and, on the other hand, they were not fastened to the keel by iron bolt or treenail. In other words, these frames appear to be 'floating' in relation to the longitudinal axis of the hull and only fastened to the planking by treenails. Obviously, these features were only identified at the level of the fore and aft end frames of the shipwreck. The question is whether this arrangement is found in the central part of the hull. One fact is certain: this lack of connection between the frames and the keel implies that they were installed after the planking was fitted to the bottom of the hull, at least in accordance with the shell-first construction method. One final aspect should be noted. Two forward floor timbers, M 5 and M 6a, have engraved marks on their north/front moulded face in the form of one horizontal and two vertical lines for the M 6a frame and one horizontal and four vertical lines for the M 5 frame. The nature of these engravings is unknown at present, maybe carpenter or merchant marks. Further excavation will perhaps allow us to propose a hypothesis of interpretation.

2.4. Floor timber beam

The third feature particularly revealing of the shipwreck's architecture relates to the M 6 fore frame and M 103 aft frame. A massive quadrangular transverse wooden piece9 rests on the upper ends of the two floor timbers and extends on the port and starboard sides, forming extensions. The lower sided face of this timber resting on the planking has a series of notches for fitting the clinker planks. The two transverse timbers are arranged roughly symmetrically in relation to the fore and aft ends of the keel and are separated by a gap of about 12 m which, probably may correspond to the length of the hold. These two transverse timbers seem to be very comparable to the *biti* of the Nordic clinker architec-

[7] There were no sloping edges or grooves for the sealing material.

[8] The frequency of the presence of bark on the crotches and floor timbers, as well as on other structural parts, seems to rule out the possibility of repairs.

[9] The piece M 103b combined with floor timber M 103 is broken. Its quadrangular section measures on average 25 cm wide by 22 cm high. An interesting detail is that its moulded (south) face is regularly shaped, whereas its north face, facing the cargo, is in a rough state with its bark is still on.

ture which can be interpreted as a kind of 'floor timber beam' acting mechanically as transverse reinforcements of the bottom of the hull.[10] This reference to the *biti* system and more broadly to the Nordic clinker architecture constitutes a major argument for the historical interpretation of the construction of the Sanguinaires C ship.

2.5. Ceiling

The frames were covered almost exclusively with oak ceiling planks which were attached to the frames by treenails and iron carvel nails. The irregular width of the ceiling (from 11 to 38 cm in the aft ceiling for example) and the typical thickness of the planks (between 3.5 and 4 cm) appear to be arranged at more or less regular intervals, forming as many openings as possible, and as many traps for archaeological material for the interest of archaeologists. This ceiling was covered by a protective wooden floor on which rests the load of stones with aggressive edges for the wood. These planks, made of Mediterranean conifers, have an average thickness of 2.8 cm and an irregular width of between 8 and 35 cm. They are fixed to the ceiling planks with iron nails. There is one main difference between the protective floor at the fore extremity and the one at the aft extremity: the fore one does not rest directly on the ceiling planks, but on wooden crosspieces placed on the ceiling planks, whereas the planks of the aft protective floor are in direct contact with the ceiling planks. A particularly important aspect is the almost systematic use of Mediterranean conifers for the protective floor. Unlike the oak ceiling planks, which can be interpreted as the original planking, the protective floor would appear to have been made later during the life of the ship in a Mediterranean port, and corresponds either to a repair of the bottom of the hull or to an arrangement designed more specifically to protect the ceiling planks from the stone cargo.

3. Conclusions

All the data collected from the excavated areas of the shipwreck converge to characterise the architecture of the Sanguinaires C as that of a clinker-built merchant ship. This architecture, in relation to the chronological context of the ship's construction, which is probably close to the beginning of the 16th century, or even the end of the 15th century, is characterised by a particularly strong transverse framework based on thick frames with a reduced room and space. In the context of the Mediterranean shipyards characterised by a multi-secular frame-first carvel architectural tradition (since the end of the 5th–beginning of the 6th century in the eastern Mediterranean), the clinker shell-first architecture of the Sanguinaires C shipwreck appears, in the current state of research, to be an archaeological *unicum*, along with the Barcenoleta 1 shipwreck, Barcelona, Spain (Pujol i Hamelink *et al.* 2017: 283–289), which dates from the 1430s. This shipwreck, of which only part of one side is preserved, is linked to the north Iberian tradition of the clin.[11] Written sources attest to the presence of Basque ships in the Mediterranean in the late 13th/early 14th century. The most famous evidence is that of the *Nuova Universale* chronicle which mentions the presence of Basque ships (*cocche*) in the Mediterranean in 1304: "[...] *di Bajona in Guascogna con loro navi, le quali si chiamavano cocche Baonesi ... e d'all hora inanzi i Genovesi e Vinitianti e Catalani usarono di navicare con le cocche* [...]". The Mediterranean written sources, on the other hand, do not seem to mention ships coming from northern Europe to the Mediterranean in the first half of the 16th century, the period corresponding to that of the sinking of the Sanguinaires C ship. However, several characteristics of the shipwreck in the form of authentic *architectural fingerprints* of historical dimension, such as the almost exclusive use of oak for the construction of the hull, including the keel, and above all the two floor timber beams reminiscent of the *biti*, tend to associate the architecture of the Sanguinaires C shipwreck with a Nordic rather than a north-Iberian origin.[12] The decisive argument should be provided, as dendrometric references allow, by analysis of the wood samples from the shipwreck which are currently underway.13 In the meantime, the closest comparison to the Sanguinaires C shipwreck appears to be that of Riddarholm (Sweden) dated to 1520/1527 (+/- 5 years) (Linberg 1985).

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[10] Thanks to Morten Ravn and Mikkel Haugstrup Thomsen of the Viking Ship Museum in Roskilde and Emmy Kauppinen of the Medieval Museum, Stockholm for their comments, documentation and bibliographical contributions.

[11] Analyses (particularly of pollen from the moss used to seal the clinker planks) have revealed a north Iberian origin (Cantabrian-Basque coast) of these sealing materials.

[12] For example, the use of beech for the keel is considered as one of the architectural fingerprints of the north Iberian shipbuilding tradition.

[13] Analysis by Frédéric Guibal (IMBE-CNRS) and Alba Ferreira Dominguez (Ipso Facto).

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