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1720, Brittany to Saint-Domingue, The unfinished journey of a strategic cargo

Of Nantes architecturally pre-cut building gneissic blocks.

By Dr. François Gendron[1] and Dr. Simon Q. Spooner[2]

Abstract: The partial excavation by the Anglo~Danish Maritime Archaeological Team (ADMAT) of *The Tile Wreck,* a French armed merchant ship grounded on the north coast of the Dominican Republic, reveals the transportation across the Atlantic of pre-cut architecturally shaped gneissic blocks. The geological origin of this rock is determined by petrographic analysis and X-ray diffraction. Added to this is the discovery of archival documentation, which provides valuable information on the port of origin, and final destination of the architectural building materials. In 1719, military engineer Amédée-François Frézier was assigned to Saint-Domingue colony to assess repairs to Fort Saint-Louis (Saint-Louis-du-Sud) and discovered that most of the colonial port fortifications were falling to ruin. The local stone was found unsuitable for construction use and Frézier directed the *Conseil de Marine* to arrange that pre-cut stone blocks be shipped from France. To reduce the cost of transportation, Frézier proposed the blocks be used as ballast on merchant ships sailing to the colony. Documentation shows that numerous shipments arrived between 1719 and 1723, many originating from Bordeaux, La Rochelle and Nantes. This paper states that the transport of gneiss blocks to the colony was a military directive by French high officials and provides evidence which supports the hypothesis on the wreck's origin of departure and date of sinking. The main geological research and analysis of the gneiss rock found in the remains of the wreck have identified the possible source of the material, as it corresponds to that quarried at Le Pellerin, which

1 Corresponding author, Département de Préhistoire & ADMAT-FRANCE, CNRS-UMR 7194, Muséum National d'Histoire Naturelle, 1, rue René Panhard 75013 Paris, France. fgendron@mnhn.fr. 00 33 (0)1 55 43 27 43, fax: 00 33 (0)1 43 31 22 79.
2 Anglo~Danish Maritime Archaeological Team (ADMAT), 6 Royal Mews, Hampton Court, East Mosley, Surrey. KT8 7BW England. maritime_archaeology@yahoo.co.uk & simon@admat.org.uk

is downstream from Nantes. Despite the large mineralogical variability of intrusive plutons of the southern Armorica, the metamorphism observed in the samples of gneiss and the mineral assemblage strongly supports the geological origin of these blocks and the origin of the shipwreck.

Keywords: Brittany; Cap-Français; Amédée-François Frézier; Gneiss; Nantes; Saint-Domingue; *The Tile Wreck*.

1. Introduction

On the northern coast of the Dominican Republic, near the town of Monte Cristi, the wreck of a large armed merchant ship lies beneath the sands of Jicaquinto Bay (Figure 1 and 2). As a result of looting in 1999[3], the Oficina Nacional de Patrimonio Cultural Subacuatico (ONPCS) assigned, in 2000-2013, the archaeological surveying and excavation of this wreck to the Anglo-Danish Maritime Archaeological Team (ADMAT)[4], in scientific collaboration with the Département de Préhistoire (UMR-CNRS 7194) of the Museum National d'Histoire Naturelle (MNHN) of Paris, France. The research will continue over the next few years.

1.1 Excavations and relative dating of The Tile Wreck

From the research conducted to date, it is believed that the ship sailed from France to the colony of Saint-Domingue sometime between 1720 and 1723. Encountering a storm and having to find shelter in a small anchorage, the ship was wrecked in the shallows near the shore with much of its cargo intact (Spooner, 2004). The hypothesis and relative dates are based upon the presence of faïenceware displaying the unusual design of a yellow and green solanée flower on a white background ("*polychrome à décor persan*" type) as opposed to the more traditional blue flowers and figures on white ("*bleu sur blanc d'influence rouennaise*" type). The first design was produced from 1718 to1723 (Rosen, 2009; Taburet, 1981), and is attributed to the city of Nevers (Nièvre), the main producer of French faïenceware at that time. The pottery is believed to have travelled via the Loire River to the port of Nantes (Loire-Atlantique) and from there, exported to the Atlantic colonies (Caribbean, Louisiana and Canada) to satisfy the demand of wealthy settlers for prestige goods from distant France. The dating of the faïenceware has helped narrow the time frame of the ship's sailing, but has neither lead to discovering its name nor to confirming its main reason for

3 In late 1999, the wreck was stripped of seven iron cannons by looters. Based on the three others discovered by ADMAT, it is believed the iron cannons, which are still covered with concretion, are four pounders.
4 www.admat.org.uk.

travelling to Saint-Domingue.

With little knowledge of the ship, the archaeologists named it *The Tile Wreck* because of the thousands of terracotta tiles, of the "*Carreau de bloc d'Anjou dit de Duval*" type[5], scattered in and around the vessel's remains. Under the direction of Dr. Simon Spooner, the excavations conducted by ADMAT (2000, 2006, 2007, 2008, 2009, 2010 and 2013) uncovered part of the keel, which measures 30 meters in length. The bow and stern cant frames have not yet been located; therefore, the total length of the ship cannot be confirmed. The remaining lower hull was found to be intact with a cargo of 43 stone blocks[6] neatly assembled on the ceiling planking, which was used as the cargo deck (Figures 3, 4 & 5) (Spooner, 2004). The ship's design and style of construction, along with the recovered artifacts, led to a determination of the flag (nationality), its port of origin, the time frame of the wrecking process and the final grounding.

Identifying the wreck itself has proved elusive to the researchers because of the paucity of archival information. To date, the available documentation points to *The Tile Wreck* being an armed merchant ship, possibly built as early as the 1690s. During the wrecking process, the rudder was ripped off the stern (Spooner and Nielsen, 2008) with evidence that, in order to prevent grounding, the crew endeavoured to lighten the vessel by rolling at least three iron cannons off the ship. An intense fire appears to have occurred below deck where the team came across burnt wood and ceramics as well as molten lead. The lead, possibly from sheets destined for repairing lead flashings, was heated to the point of forming droplets which pooled on the ceiling planking. The fire was likely extinguished by seawater entering a breach in the hull, with the cold water solidifying the molten lead droplets and pools. The fire is believed to have reached the deck on the starboard side as some of the rigging and deadeyes were also charred. During the wrecking process, the hull broke and numerous items of cargo and ship's construction pieces fell into the sea, some becoming buried in the light sand, such as the iron breach loading swivel cannon which was found 2 meters under the keel.

5 Old French designation founded in CARAN, Marine B^3 288 (1723), f°382, *commande de carreaux de blocq d'Anjou dits de Duval avec Bertin pour Saint-Domingue*. All these tiles are standard sizes: 15 x 15 x 2 cm.

6 The excavation of *The Tile Wreck* is unfinished. Therefore, the exact number of stone pre-cut blocks carried on board as cargo is not known.

2. The stone blocks

2.1 Description

The stone blocks were found resting on the wooden "ceiling planking" a term used for the decking above the floors and futtocks, which was used as a cargo deck. These large blocks had been pre-cut and carefully arranged to fit together neatly and tightly, in some places piled two blocks high. There is no evidence of the blocks being in the fire and they did not undergo any damage at the time of the grounding, which suggests their compact storage buffered them from the impact (Spooner, 2004. Figures 4 and 5). Possibly because of their weight and placement, most of the blocks were not looted. Each of the blocks has been measured and documented and twenty have been raised in order to undergo scientific investigation and are in ADMAT's Maritime Archaeological Centre in Monte Cristi. The analysis of the blocks shows that their length (between 49 and 125 cm) and width (between 23 and 36 cm) vary significantly, but their thickness appears to be constant (between 16 and 18 cm). Each has been squared and all but one of the faces (assumed the interior face, which is not visible) have been cut but not finished. Architecturally, they correspond to window or door jamb stones (Lavenu and Mataouchek, 1999). An examination of the stone blocks shows that quartz veins, which are lines of weakness, were used to facilitate their cutting, a common practiced used by stonecutters (Figures 6 and 6a).

2.2 Petrographic studies of the rock

The weathered stone surfaces were worn and "greyed", making it difficult to provide a visual description of the natural rock characteristics, therefore requiring a deep fresh sampling[7]. Depending on the location of the stone blocks within the shipwreck, the surface colour was either stained red, a tell-tale sign of oxidized iron objects on or near the stone blocks, or contained a black discolouration, a result of decomposed organic materials. To observe fresh rock, five separate samples were taken with ONPCS authority in 2010 for study at the MNHN in Paris. The preferred methodology for studying these rocks is a description of the structure, followed by an examination of a thin petrographic section under a polarizing microscope. A mineralogical analysis was also conducted by performing X-ray diffraction at the Centre Européen de Recherches Préhistoriques

[7] OSL dating, as used by Greilich et al. (2005) on the granite stones of the castle Lindelfels (Germany) and the Nazca Lines (Peru), was not possible on the stones from *The Tile Wreck*, because they had remained buried under the mud in the seabed and were not affected by sunlight.

(CERP) in Tautavel (Pyrénées-Orientales). The X-ray analysis was made under these conditions : diffractometer *PANalytical X'Pert Pro MPD*, anticathode Cu, feeding tube: 45kV, 40 mA, continuous scan from 2 to 80° (2 Θ), no 0.017° (2 Θ) accounted for 10.3 seconds, automatic anti-divergence slits (Table A and Figures 8a - g).

Table A: Dimensions, Structure and Petrography of *The Tile wreck* granito-gneiss stone blocks								
Sample Number	**Dimensions of the Stone Blocks L x W x Ht.**	**Structure of the rock**	**Rapport white/black minerals**	■ **Minerals observed on petrografic thin section**				
				Quartz	**Feldspars**	**Plagioclases**	**Micas**	**Minerals of alteration**
TW 1	125 x 27 x 16 cm	Medium-grained, foliated, altered with subautomorphous crystals	85%/15% Leucocratic	+	Microcline and Orthoclase	Albite twin and myrmekitic structure	Biotite and Muscovite	Vermiculite
TW 2	49 x 36 x 18 cm	Medium-grained, foliated, altered with subautomorphous crystals; altered	85%/15% Leucocratic	+	Microcline twined albite and pericline. Some grains have an antiperthitic structure.	Albite with myrmekitic structure	Muscovite	Vermiculite and Kaolinite
TW 3	83 x 26 x 18 cm	Medium-grained, foliated, with subautomorphous crystals	70%/30% Leucocratic	+	Microcline and Orthoclase	Albite	Biotite and Muscovite	-
TW 4	98 x 23 x 17 cm	Medium-grained, foliated, altered with subautomorphous crystals	75%/25% Leucocratic	+	Microcline and Orthoclase	Albite	Biotite and Muscovite	Kaolinite and Calcite
TW 5	49 x 34 x 18 cm	Medium-grained, foliated, altered with subautomorphous crystals	70%/30% Leucocratic	+	Microcline and Orthoclase	Albite	Biotite and Muscovite	Kaolinite

TW: *The Tile Wreck*.

2.3 Results

Analysis shows that the five sample blocks originated from the same source, leading one to assume that this could be true for all the blocks on board *The Tile Wreck*. At hand is a granular and foliated rock (Figures 8a - d) with a mineral assemblage characterized by the presence of alkali feldspar (microcline and orthoclase, Figure 8e and f), sodic plagioclase (albite) and two micas (biotite and muscovite, Figure 9g). Rock of this composition is a granitoid gneiss or granitic gneiss caused by regional metamorphism, which generally arises from the heating and foliation of granite, in this case orthogneiss. Some peculiarities appear in the assembly of sample TW2 that are slightly different from the rest. It displayed microcline which has albite and pericline twins (Figure 9a), albite has a myrmekitic structure, one albite crystal has an antiperthitic structure (Figures 9b) and biotite has been replaced by vermiculite, a variety of chlorite. This transformation is typical of hydrothermal biotite of gneiss (Kamgang and Ekodeck, 1991). Overall, the study of these samples shows a very marked foliation of the rock: the presence of two micas, orthoclase and albite are typical in the general metamorphism of the lower half of the Mesozona (T: 500°C; P: 20-40^{-6} hPa). Finally, the analysis by X-ray diffraction reveals kaolinite, derived from feldspar alteration, is present in almost all samples. Granitic gneiss is geologically uncommon in the Caribbean and the repetition of the same petrographic structure supports the assumption that these stone blocks came from the same quarry in France. However, not all the blocks from the shipwreck have been sampled to prove this.

3. Geological discussion linked with archival datum about transportation of construction stones from France during 18th century.

The authors' hypothesis that this ship sailed from the French port of Nantes and was grounded during a storm sometime between 1720 and 1723 in Jicaquinto Bay is based on the archaeological site investigations, research on the diagnostic artifacts found in the wreck (the French faïence designs,) and numerous archival documents (for example, the order for transportation of the blocks). These documents are housed in the Centre d'Accueil et de Recherche des Archives Nationales (CARAN) in Paris and in the Centre des Archives d'Outre-Mer (CAOM) in Aix-en-

Provence[8] (Bouches-du-Rhône). Their study reveals two main historical and geological factors: 1) a colonial building program between 1719 and 1723 that necessitated the delivery of large volumes of construction stone from France; 2) a range of possible sources within France from which the granitic gneiss may have originated.

3.1 Situation of Saint-Domingue's fortifications in 1719.

In 1719, France's *Conseil de Marine*[9] appointed military engineer Amédée-François Frézier[10] (1682-1773) as *Directeur des fortifications de Saint-Domingue* (Figure 10) (Blanchard, 1979, 1981; Verrand, 2004). He was sent to evaluate the condition of the colony's fortifications including Fort Saint-Louis, the only example of Vauban architecture in Saint-Domingue[11]. The *Compagnie Commerciale de Saint-Domingue*[12] stationed at the fort had failed to maintain it, as reflected in Frézier's report of 1720: "Dykes made to withstand the assaults of the sea... and the sides of the covered walkway to the east and west are completely ruined. There remain some guard posts, some hats and bare support posts, broken and rotted so that the sea eats the land without hindrance…"[13] Fort Saint-Louis was not the only stronghold in this state; according to Frézier, all the colony's port

[8] These documents are conserved in the series: Colonies C^9A, C^9B and Marine B^1, B^3.

[9] The *Conseil de Marine* was created after the death of King Louis XIV (1715) to manage the business until King Louis XV reached his majority. Chaired by the Regent Philippe d'Orléans (1674-1723), the *Conseil* operated from 1715 to 1722.

10 Amédée-François Frézier studied theology, mathematics and botany in Paris. He acquired during his adventurous life a vast culture, enriched by experiences, which allowed him to collaborate on the famous *Encyclopedia* of Diderot and d'Alembert and to help l'Abbé Prévost draft his collection of the *Voyages*. After his studies, the young Frézier left for Italy to study architecture and the fine arts. In 1712, named engineering officer in the service of the King, he participated in an exploratory expedition to the South Seas. He also performed work as a botanist, physicist, mineralogist and even economist and ethnologist, drawing maps and plans, but also the people, vegetables and animals for his *Relation* published in 1716.

[11] Located on a small island at the centre of the Bay of Saint-Louis-du-Sud, south of Saint-Domingue (N18° 15' 05.62"; W73° 33' 06.07"), this fort was constructed between 1700 and 1706 and comprised a garrison of 75 men. Plans of Fort Saint-Louis were drawn in 1699 by the military engineer Bernard Renau d'Eliçagaray (1652-1719) (Lavedan et al., 1982). A detail of historical importance, the famous military architect of Louis XIV, Sébastien Le Prestre de Vauban (1633-1707) complements and enhances the d'Eliçagaray plans. Plans of Fort Saint-Louis are conserved at the CAOM, FR ANOM 15DFC869A, (1707) *Profil du dernier projet de la fortification de l'île Saint-Louis de M. Vauban*.

12 Trading company founded in 1698 by Louis XIV. The mission of this Company was to set ports for trading in the southern part of Saint-Domingue. Its aim was to develop the transatlantic slave trade with the *Compagnie de Guinée* (founded in 1685) to increase sugar production in the colony. The large fortified French presence in the south of the colony was to prevent the return of English forces from Jamaica and to control the Spanish who colonised the eastern half of Hispaniola Island. In 1698, the Company installed its warehouses in Jacmel and Saint-Louis-du-Sud (Buisseret, 1983).

13 CARAN, Colonies, sous-séries $C^{9B}6$ (1720), *Correspondance à l'arrivée, Saint-Domingue et Iles sous le Vent, rapport Frézier*: 1, §1.

fortifications were in dire need of repair. The previous year, April 1719, Frézier had inspected the fortifications and batteries of Le Cap-Français (today Cap-Haitian), noting that the soldiers were housed in old wooden barracks prone to attack as much by the rains as by wood lice[14]. To replace the existing structures, Frézier recommended "...a body of barracks made of masonry with tiled floors and capable of containing 150 men, three captains, six subalterns and an engineer"[15]. He submitted the plan to the marquis Léon de Sorel (1655-1743), the newly-arrived governor of the colony, who was amazed at the deteriorating conditions. With little understanding of the finances involved, the new Governor immediately approved Frézier's plans[16]. However, the cost of replacing these barracks and other buildings (powder storehouse, the King's storehouse, etc.) at Le Cap-Français was beyond the finances of the colony. Additionally, the proposal required the formal approval of the *Conseil de Marine* in France, not just the Governor's. Jean-Jacques Mithon de Senneville (1669-1737)[17], the colony's superintendent of finance, wrote to the *Conseil*: "*Sieur* Frézier is highly regarded in engineering, but connects all his ideas to the building trade in France, [and] he has forgotten that the scarcity of funds is the King's affair. Prior to his arrival in Le Cap, he proposed... more than forty thousand *écus* for erecting a two-storey barracks with two wings and four pavilions for the accommodation of officers and soldiers (including his own staff)... All these works are truly necessary... However, these buildings do not appear to me in proportion to the area, especially the barracks. It seems to me that before all else, one must work with the funds on hand (...). The Marquis de Sorel has again insisted on the barracks... I acquiesced to his wish; I have received only that the project will be decreased"[18].

3.2 The Frézier project to transport stones from France

Upon his arrival, Frézier notes the poor quality of Saint-Domingue rocks and instructs the *Conseil de Marine* to dispatch to Fort Saint-Louis "... stone from France for corbels for the sentry boxes,

14 CARAN, Marine B^1 42 (1719), f°50-52; CARAN, Colonies C^{9A} 16 (1719), *Lettre de Sorel au Cap-Français, 1 août 1719*.
15 CARAN, Colonies C^{9A} 16 (1719), *Lettre de Frézier au Cap-Français, 1 août 1719*.
16 CARAN, Marine B^1 42 (1719), f°51, juillet 1719.
17 *Conseiller du Roi, intendant de justice, police, finances et Marine des îles-de-sous-le-vent de l'Amérique* (Adviser of the King, superintendent of justice, police, finance and Navy of the American Islands-Under-the-Wind).
18 CARAN, Colonies C^{9A} 16 (1719), *Lettre de Mithon à Léogâne, 24 septembre 1719*.

battlements and for main entry door jambs"[19]. Frézier goes on to propose an idea for the free transportation of stone: "The *Conseil* could send [the stones] gradually by merchant ships, requiring they take a certain amount of ballast... Every year approximately 140 vessels arrive to this coast from 100 to 300 register tons[20], accounting for... 150 cubic feet [5.14 m^3] ... to the weight of 12 register tons [12,000 kilograms], one has after one year 22,500 cubic feet [771.23 m^3] which would be considerable and would not disturb trade."[21]

Documentation shows that in January 1720, the barracks of Le Cap-Français were already under construction. However in February La Vigne, the contractor, refused to repair the Governor's residence at Fort Saint-Louis because "... there is no good quarry stone in the country. We need 902 cubic feet [30.91 m^3] following the proportions taken by the *Sieur* Frézier[22]... We urge the *Conseil* to try to prepare the ports of La Rochelle, Nantes and Bordeaux and order the transport by merchant ships, it will cost very little for the freight, and these stones will serve as ballast and decrease by almost nothing the cargo of the vessels"[23]. With the planned construction of coastal batteries and sea defences, barracks, powder storehouse and docks multiplying throughout the colony, Frézier continues to send his submissions for French stones[24]. One order received by M. de Ricoüart, a King's officer at the port of Nantes, includes the following: "I am aware of sites where one can easily find these types of stone; I have learned where one easily extracts the best stones of this species is Ploüarzel, around Brest. Attached is my recollection of what they cost at this said port [Nantes]"[25]. For the transport to Saint-Domingue, de Ricoüart referred to Frézier's plan: "It would be easy to pick up in Brest these stones in scows that come to this river [Loire] (...). The scows

19 CARAN, Colonies C^{9A} 16 (1719), *Lettre de Frézier au fort Saint-Louis, 11 juin 1719.*
20 A register ton weighed, according to the old French measurement system, 2,000 pounds or one ton or 1,000 kg. Every ship would have transported seven to eight tons of rock. According to the average dimensions of those of *The Tile Wreck*, this is between 50 and 100 rubble stones. The French Old Régime cubic foot amounts to 34.277 liters or 0.034277 m^3 in today's standardised measurements.
21 CARAN, Colonies C^{9A} 16 (1719), *Lettre de Frézier au fort Saint-Louis, 11 juin 1719.*
22 CARAN, Colonies C^{9A} 17 (1720), *Mémoire du Sieur Frézier sur la grosseur et quantité de pierres qu'il faut faire venir de France pour le fort Saint-Louis.*
23 CARAN, Colonies, sous-série C^{9B} 6 (1720), *Rapport de Sorel et Mithon à Léogâne, 10 février 1720.*
24 CARAN, Colonies C^{9A} 21 (1723), *Lettre de l'intendant de Montholon au Petit Goâve, 01 mai 1723 instead of wooden logs which he intended to use for lack of stone to secure the wall of the battery as suggested at the forefront of Léogâne on a reef, he now maintains that he must use stone from France, not one that the Conseil has sent from Rochefort which would not last long, but the safest and most solid such as that from the coast of Brittany*).
25 CARAN, Marine B^3 264 (1720), f°453. 24 octobre 1720.

unload...in the port of Le Pellerin [downstream from Nantes], these stones… would... [be] loaded on ships preparing for Saint-Domingue, in each of which could be consigned seven to eight register tons of stone in place of ballast taken at Le Pellerin, and this load would be cheap because...the merchants of this town promised last October to carry them free of charge to Saint-Domingue.”[26]. The lack of good building material in Saint-Domingue led to the necessity of transatlantic shipping of stone from France, in the early 18th century and in the periods after. The supply of suitable rock (ie. that resists erosion in a wet tropical climate for at least a decade) from Saint-Domingue is extremely limited.

3.3 Geological range of possible sources of stone

Archival documents reveal that the stone blocks of granitic gneiss on *The Tile Wreck* may have come from Bordeaux, Rochefort, Nantes or Ploüarzel. The ports of Bordeaux (Gironde) and Rochefort (Charente-Maritime) can be eliminated as only sedimentary rock outcrops occur in these regions. In Ploüarzel (Finistère), several quarries operated in the 18th century and the area produced two types of granite: the two micas granite "*Perzpaul type*" and the tourmaline leucogranites “*Ploüarzel type*” (Chauris, 1967; 1994: 45). The two micas granite, a coarse type of Perzpaul, occurs on the island of Segal. This is a clear rock which has minor tourmaline and sometimes a magmatic layering can be seen, but usually has no oriented texture. In the tourmaline leucogranites "*Ploüarzel type*", muscovite is much more frequent. The assembly of granites in Ploüarzel does not match the granitic gneiss from *The Tile Wreck*. None of the archaeological rock samples analysed contained the yellow coloured tourmaline, which confirms that this is not a leucogranite, thus eliminating Segal Island as well.

Nantes (Loire-Atlantique) is the ultimate purveyor of local stone from France cited in the archival documents and it coincides with the hypothesis for the port of origin of *The Tile Wreck*. The Nantes area consists of a metamorphic series of different mineralogical assemblage and varying degrees of south Armorican Hercynian domain (Cogné, 1974). Metamorphic and structural evolution is complex and involves two steps: between 430 and 380 M.Y. there have been several episodes of

26 CARAN, Marine B^3 264 (1720), f°454. 24 octobre 1720.

eclogitization ending with the intrusion of anatectic granites; and, during Carboniferous (340-300 My) transcurrent shear zones with coeval and intrusion of leucogranites occur (Jegouzo et al., 1986). Downstream from Nantes, on the southern bank of La Loire, quarries excavate the metamorphic formations, orthogneisses and leyptinites[27]. By a process of elimination, where augen gneiss structure occurs, the possibilities are as follows:

- two micas gneiss of Rezé;
- leptynitic gneiss of Le Pellerin;
- granitized gneiss of Port Launay;
- two micas granite from Vigneux-Orvault.

In the petrography and structural comparison between our samples and rocks of these different locales, the leptynitic gneisses of Le Pellerin have the greatest similarity. These gneisses are leucocratic, massive, banded or layered outcrops and in many folds. Their bedding is marked by thin layers of biotite and muscovite, alternating with beds of thicker, clear, millimeter-grained quartz, oligoclase [Ab 90-70%-An 10-30%], and microcline (with myrmekite). Viewed on edge, the rock appears very finely banded (Ters et al., 1970). A very solid type can be observed in Bethlehem (Saint-Jean-de-Boiseau) at La Mothe, Roche-Ballue and Port Launay. These leyptinites were quarried at Bois-Tillac[28] (1 km west of Le Pellerin), at des Moutons in Saint-Jean-de-Boiseau and at des Maraîchers (Figure 12). At Bois-Tillac, gneiss is associated with masses of anatexis and granitoid gneiss composed of oligoclase, microcline and biotite. A final element further supports the hypothesis that Nantes was the port of origin for *The Tile Wreck*'s departure: the town of Le Pellerin claims that the merchant ships departing from Nantes within the specified time period, were ballasted by order from military authorities.

4. Conclusion

The petrographic study of the pre-cut gneissic blocks, which were cargo used as ballast on *The Tile Wreck*, confirms our hypothesis that this armed merchant ship departed from Nantes and explains

27 Leyptinites are metamorphic rocks of the gneissic fine-grained type, composed of quartz, alkali feldspar, and garnet but with small quantities of amphibolite and mica. Clear in colour, leyptinites have a square fault line and a slightly marked foliation flow.

28 N 47° 12’ 12.35″ - W 01° 45’ 54.98″.

their presence on the ship. These stone blocks are window or doorjambs or possibly blocks for military buildings, fortifications and defensive seawalls, probably destined for use at Le Cap-Français. They are carved in orthogneiss similar to the leptynitic gneiss quarried at Le Pellerin, downstream from Nantes. It is the absence of good building stone in Saint-Domingue that provides the reason for military engineer Amédée-François Frézier to order them from France.

Assigned to the colony in 1719, Frézier discovers that the fortifications are sub-standard compared to those in France. He made use of the new governor's recent arrival to support a project to build stone barracks with an official residence for his use. Frézier's astute proposal that the pre-cut stone blocks be used as ballast assured the project's approval by the *Conseil de Marine* via "free transportation" of the required material. Between late 1719 and early 1720, orthogneiss Le Pellerin stone blocks, *Carreaux de bloc d'Anjou* and Nivernais's faïenceware are loaded onto one of these vessels departing from Nantes for Saint-Domingue. However, within reach of its destination, a storm arises and the ship is grounded in Jicaquinto Bay off Monte Cristi in late 1720 or early 1721. This results in part of the cargo of French faïenceware, terracotta tiles, and armaments being strewn within and around the flooded hull remains. Only the pre-cut stone blocks appear to have stayed in place, due to their compact storage.

During the period of his directorship (1719-1728), Frézier exhausted the colony's budget with his military architectural projects. The barracks of Le Cap-Français, alone, cost 500,000 Pounds[29]. By August 1721 they were nearing completion, tiled and ready for occupation, therefore not requiring further stone after this date[30].

ADMAT continues the scientific investigation on *The Tile Wreck* recording its construction to compare with documented ship plans, reviewing the artifacts and scatter pattern to determine the wrecking process, researching archival information to further narrow the date of sinking. It is hoped that the continued research on the transportation of pre-cut stone will assist in the identification of this historic French shipwreck.

29 CARAN, Colonies C^{9B} 6 (1720), *Lettre de MM. Sorel et Mithon, 12 mai 1720.*
30 CARAN, Colonies C^{9B} 7 (1721), *Lettre de Frézier au Conseil, 23 août 1721.*

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Figures of the article:
1720, Brittany to Saint-Domingue, the unfinished journey of a strategic cargo of Nantes architecturally leptynolitic orthogneissic blocks
By : François Gendron, Simon Q. Spooner and Damien Deldicque.

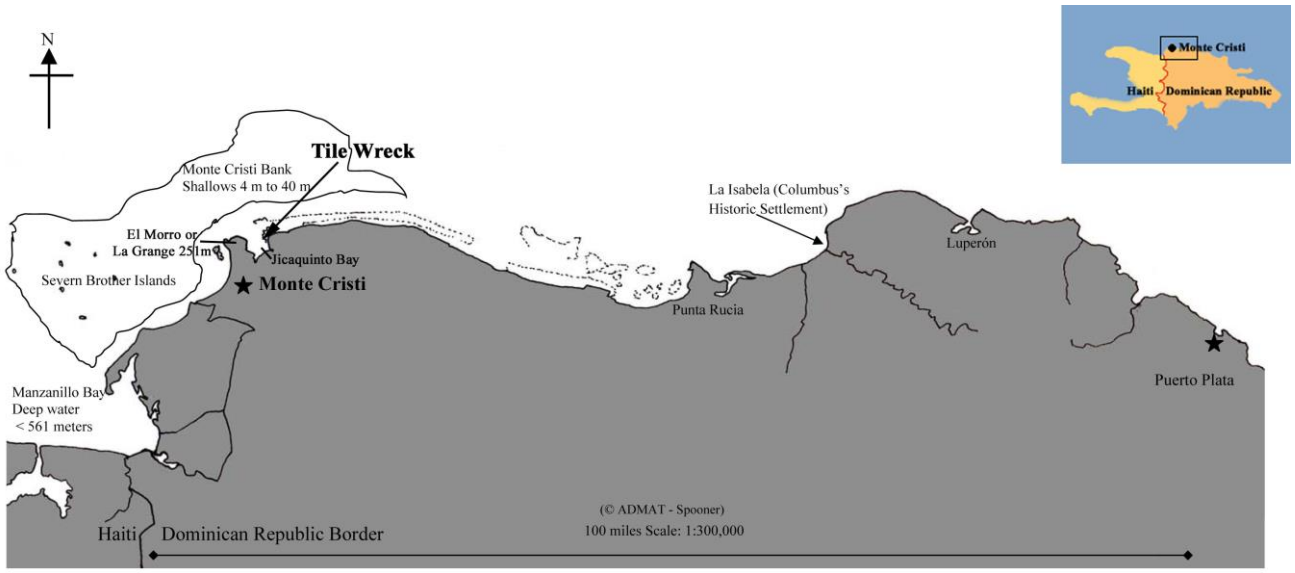

Figure 1: Northern Coast of Hispaniola Island, localization of *The Tile Wreck*; (©Spooner-ADMAT).

Figure 2: Jicaquinto Bay off Monte Cristi; (© Gendron-MNHN).

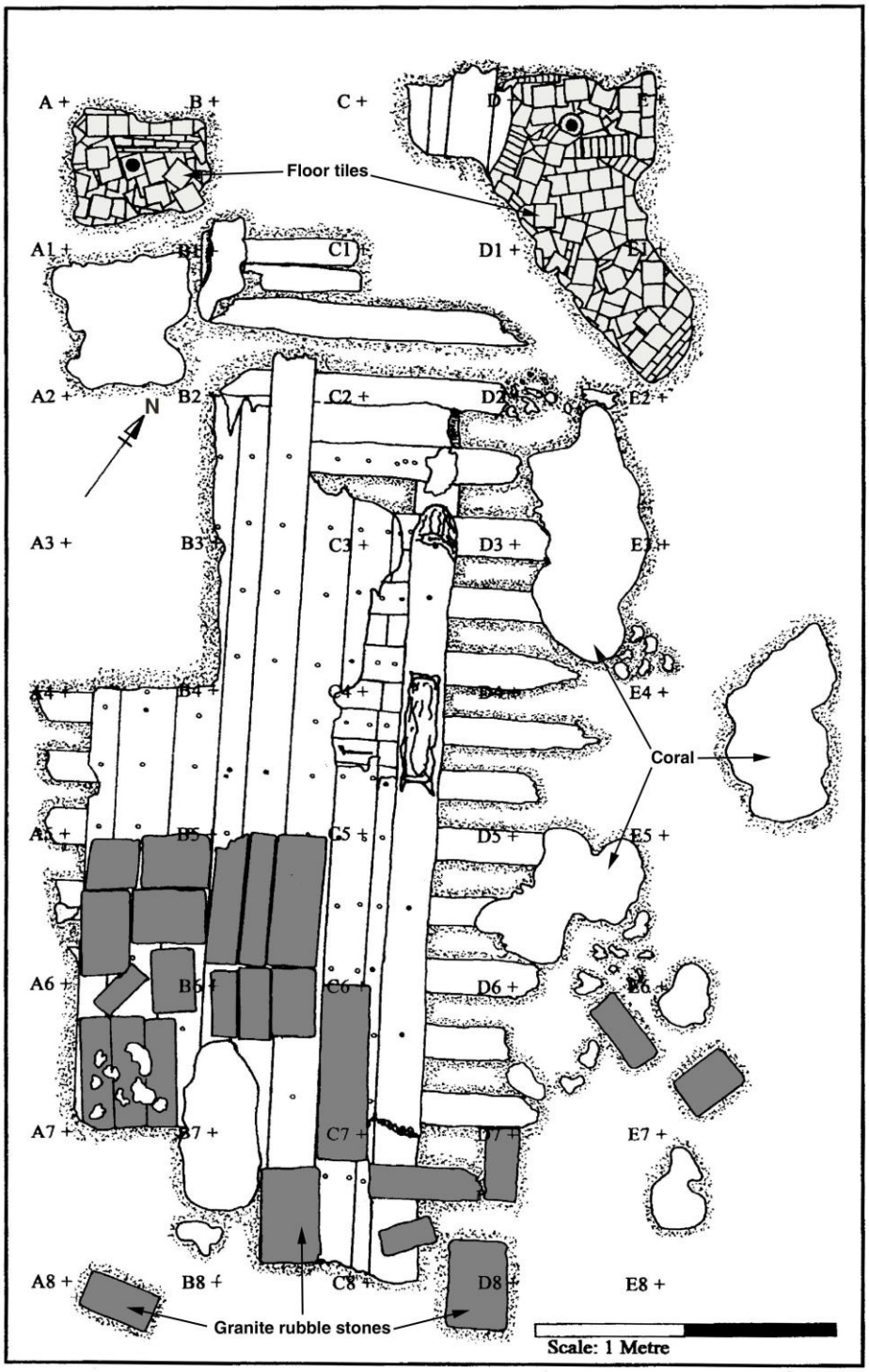

Figure 3: *The Tile Wreck* interim site plan showing some of the orthogneissic blocks and floor tiles concentrations. Drawn to scale; (© Spooner-ADMAT).

Figure 4: Cargo of orthogneissic blocks on *The Tile Wreck* with a one meter archaeological grid; (© Spooner-ADMAT).

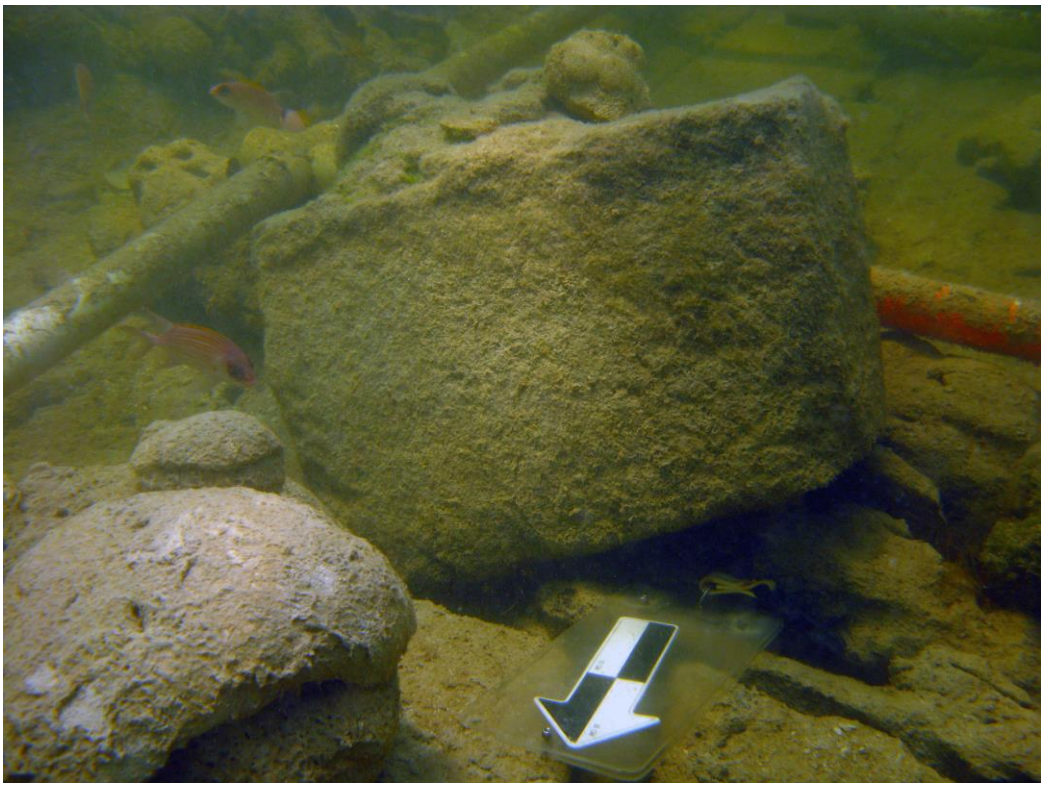

Figure 5: One of the gneissic block on *The Tile Wreck*; (© Gendron-MNHN).

Figure 6: Gneissic blocks of *The Tile Wreck*, the lower block shows a cutting according to the elongation of a vein of quartz; (© Gendron-MNHN).

Figure 7: Gneissic blocks of *The Tile Wreck*, showing surface tool marks, oxidations and coral growths; (© Gendron-MNHN).

Figure 8a: Sample TW1, rock is medium grained and foliated; (© Gendron-MNHN).

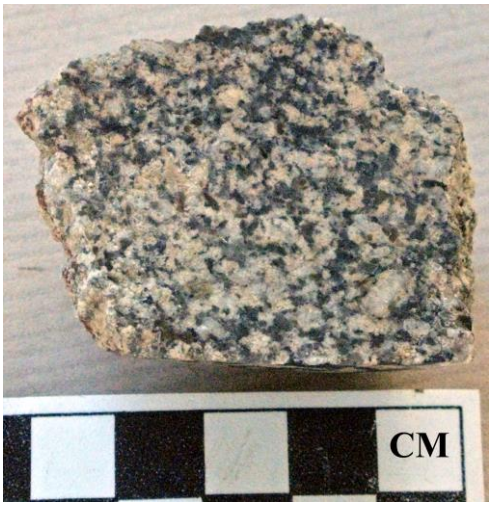

Figure 8b: Sample TW3, rock is medium grained and foliated; (© Gendron-MNHN).

Figure 8c: Sample TW4, rock is fine grained and foliated; (© Gendron-MNHN).

Figure 8d: Sample TW5, rock is fine grained and foliated. A halo of oxidation about 2 cm width is showing on the edge; (© Gendron-MNHN).

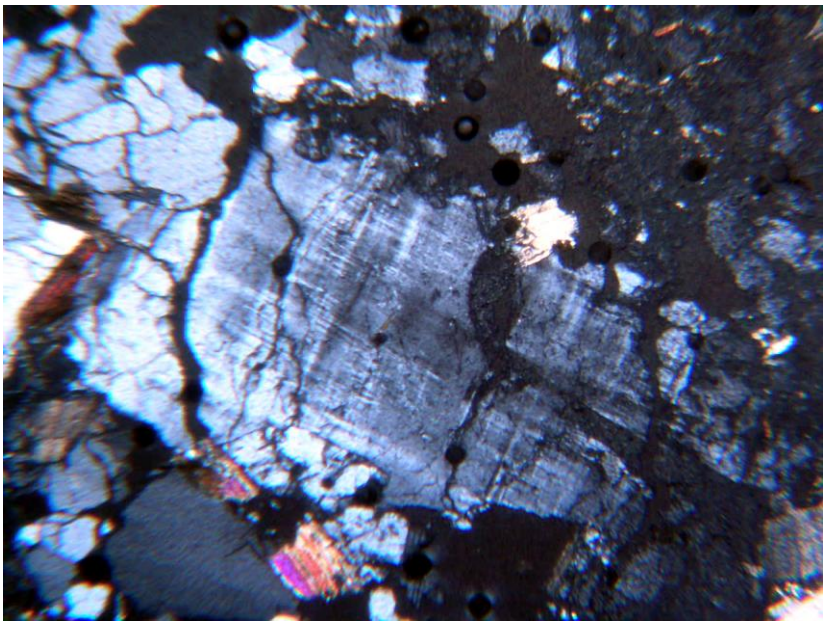

Figure 9a: Sample TW2, microcline with albite and pericline twins in polarized light, X40; (© Gendron-MNHN)**.**

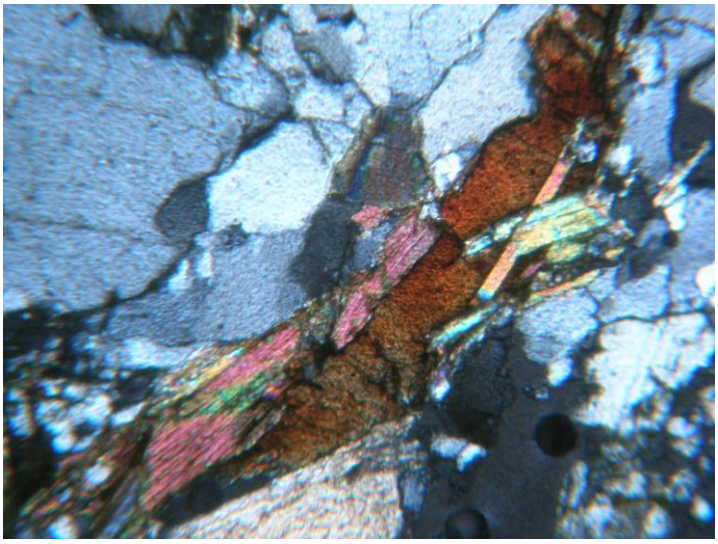

Figure 9b: Sample TW5, (at right) biotite crystal (brown) and (at left) muscovite (pink) between quartz and feldspars in polarized light X40; (© Gendron-MNHN)**.**

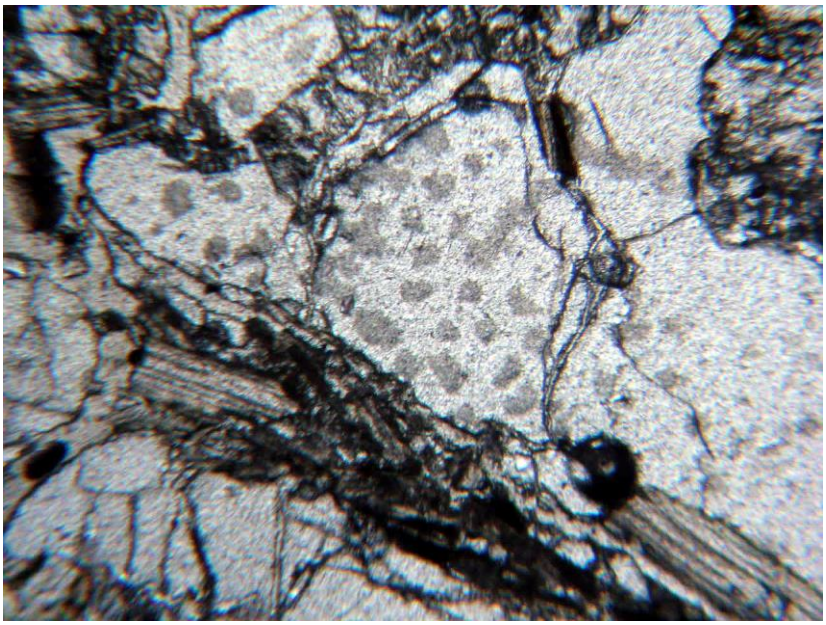

Figure 9c: Sample TW2, feldspar with antiperthitic structure in plain, X40; (© Gendron-MNHN)**.**

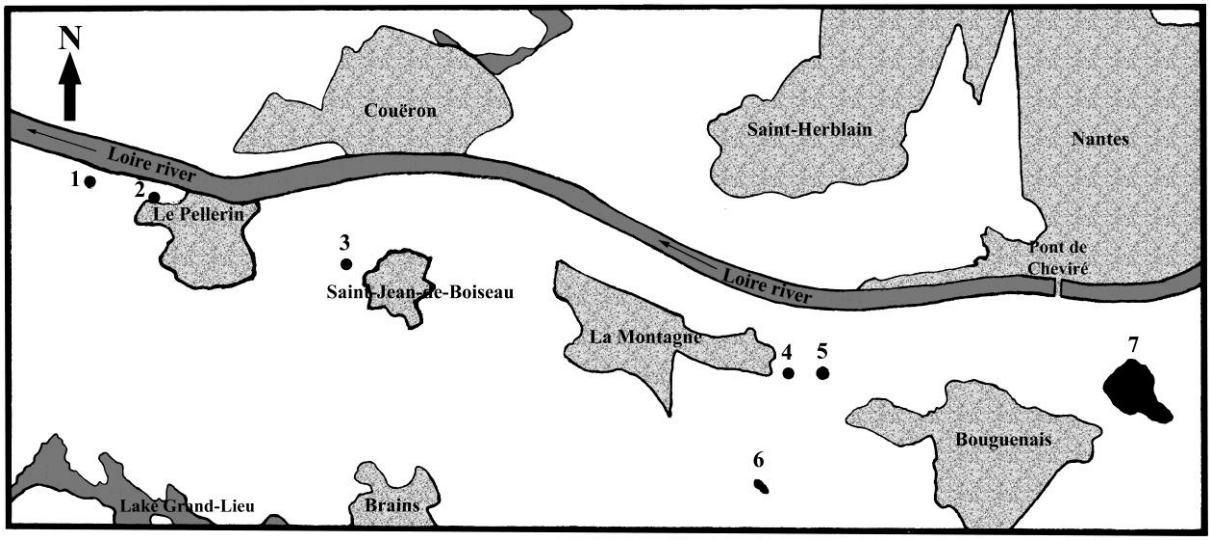

Figure 10: Quarries of granito-gneiss and leptynites on the South bank of La Loire River between Le Pellerin and Bouguenais (Loire-Atlantique): 1 abandoned quarry; 2 quarry of Bois-Tillac; 3 Bethléem; 4 quarry La Mothe; 5 quarry of La Roche-Ballue; 6 quarry in exploitation; 7 quarry of Bouguenais; (© Gendron-MNHN).

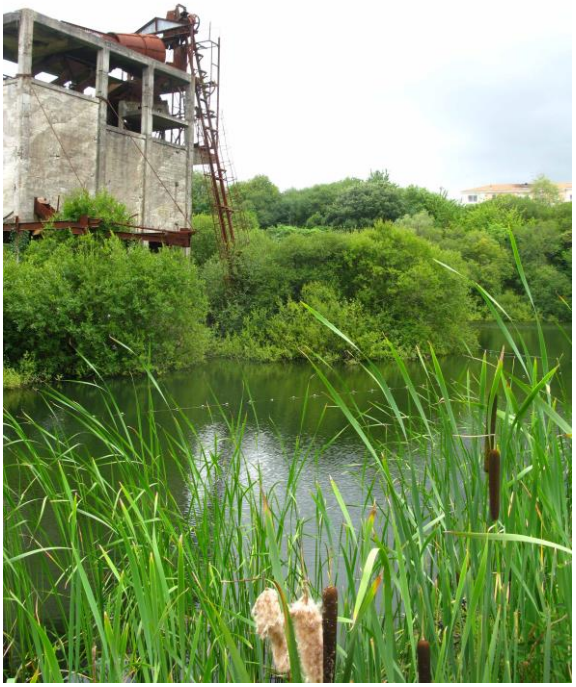

Figure 11: South bank of La Loire River, the closed and flooded orthogneissic Des Coteaux Quarry, Le Pellerin, (Loire-Atlantique); (© Gendron-MNHN).

Figure 12: Polished gneissic sample of the rock exploited in the Bois-Tillac Quarry, Le Pellerin (Loire-Atlantique); (© Gendron-MNHN).

Figure 13: ADMAT's Rafael Rodriguez (Rami) excavating the *Tile Wreck* cargo of floor tiles; (© Spooner-ADMAT).