

The *Fougueux* (1805). Prototype 18th – 19th French construction system

Nuria E. Rodríguez Mariscal

Andalusian Historical Heritage Institute (IAPH), Underwater Archeology Center, Cadix, Spain

Nicolás C. Ciarlo

National Scientific and Technical Research Council (CONICET) - Institute of Archaeology, School of Philosophy & Letters, University of Buenos Aires, Argentina.

Milagros Alzaga García

Andalusian Historical Heritage Institute (IAPH), Underwater Archeology Center, Cadix, Spain

Eric Rieth

Centre National de la Recherche Scientifique/Université de Paris 1-Laboratoire de Médiévisiologie Occidentale de Paris/Musée National de la Marine de Paris, Francia

Manuel Izaguirre Lacoste

Servicio de Patrimonio Histórico-Artístico y Museo/Diputación Foral de Guipuzcoa, Spain

Abstract

The 74 guns French ship *Fougueux* belonged to the Spanish-French fleet that in 21st October of 1805 faced the British fleet in the Battle of Trafalgar. This warship lost off Sancti-Petri coast after the battle. About two centuries later, an array of iron cannons and wooden remains were studied at this site by the Underwater Archaeology Centre of Andalusia. This work shows the results of the analysis of the ship's construction system, whose particularities place it within the tradition of French naval construction between the late 18th century and early 19th century.

Keywords: *Fougueux*, Battle of Trafalgar, Naval Construction, Sheathing, Fastenings

Historical Background

The *Fougueux* was a 2nd class French ship, according to regulations armed with 74 guns. It was built in L'Orient arsenals (Bretagne) in 1784, supervised by chief engineer Charles-Jean François Segondant and following the guidelines set out in the plan-type Sané-Borda of 74 c, approved in 1782.

In fulfilment of its mission in the defence of the Atlantic and Mediterranean French coasts, the *Fougueux* enters, in 1805, to belong to the Spanish-French Combined Squadron under the command of Vice Admiral Villeneuve. The 21st October of the same year, Villeneuve will face to the English fleet commanded by Admiral Nelson in front of the coasts of Barbate, in the well-known Battle of Trafalgar. After undergoing a hard confrontation, the *Fougueux*, dismasted and ungoverned, was taken and towed as a prey of war by the English ship *Temeraire*. Finally, the *Fougueux* is abandoned to his fate in the middle of a strong storm unleashed after the contest. The latest news about the French ship indicates that it was lost breaking on the rocky slopes of Sancti-Petri in the early hours of October 22.

About two centuries later, a set of iron cannons, an anchor of large dimensions and wooden remains of what appears to be a gunship were discovered in nearby areas in which documentary sources situate the shipwreck of the *Fougueux*.

Archaeological Research

The archaeological research (2006-2008), carried out in the site by the Underwater Archaeology Centre of Andalusia, allow identifying the shipwreck as the remains of the *Fougueux*. The studies on the site were focused on the hull remains, armament, nautical equipment, personal possessions and other objects carried on board (Rodríguez *et al.* 2010).

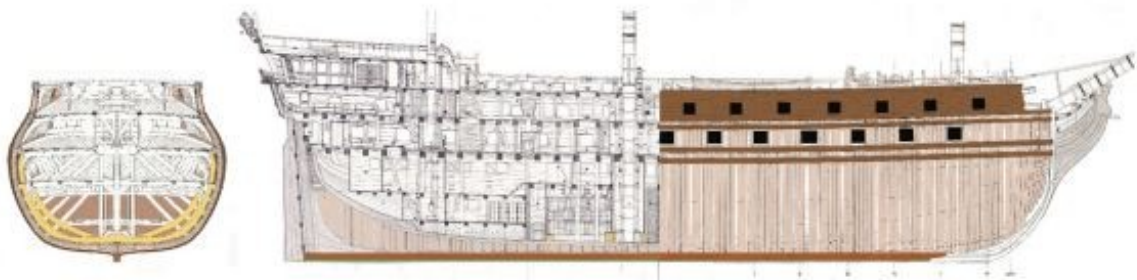
The archaeological data related with shipbuilding indicates that structural remains technical characteristics have a close correspondence with the French construction system of late 18th c. to early 19th c., which is defined by the adoption of the Sané-Borda (1782) type-plans (Rodríguez *et al.* 2013, 2014, for a detailed account of the analyses).

Main architectural evidences identified at the site are markedly related with the design and bevel of ship's structural elements defined in this construction system. The keel has a width of 40 cm (ca. 15 inches, being the dimension proposed by Sané) and it has a false keel of similar breadth. Double frames, 37/34 - 35/39 cm width, have a room in between of 10-12 cm and present lateral unions with iron bolts. This feature indicates that they were assembled prior to mounting, and it is shown in the models designed by Sané. In each frame, one halve is composed by a floor timber, which is joined to the keel, and followed by the second, third, etc. futtocks; the other halve is formed by a half floor timber, first, second, third, etc. futtocks. Half floor timbers -a diagnostic piece recorded in the NW area of the site- were incorporated in ships' construction during the 18th and 19th centuries to improve the strength of the hull transversal structure. On the other hand, the poor state of preservation of remains, which exhibit massive concretions, made it impossible to clearly identify the midship frames and pre-designed frames, installed subsequently. Additionally, filling pieces, inserted between the frames, were recorded longitudinally at three levels (along the frames' length). According to the documentary sources, these elements were used for reinforce the hull transversal structure. (fig. 1)

Fastenings and sheathing

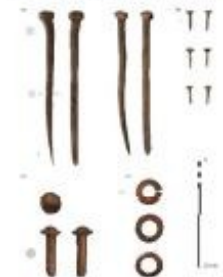
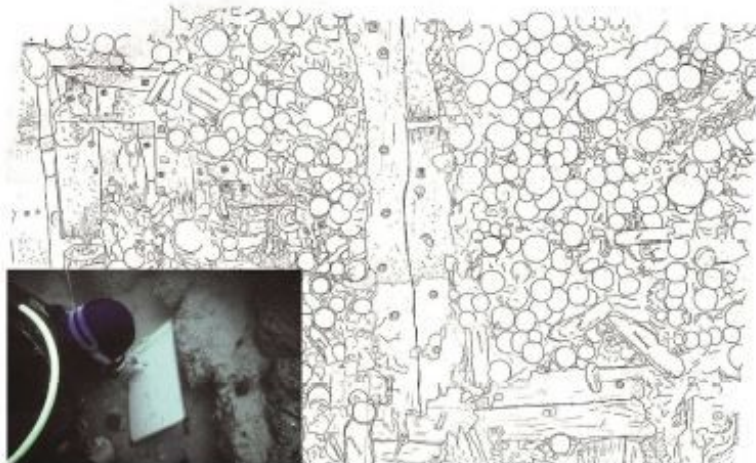
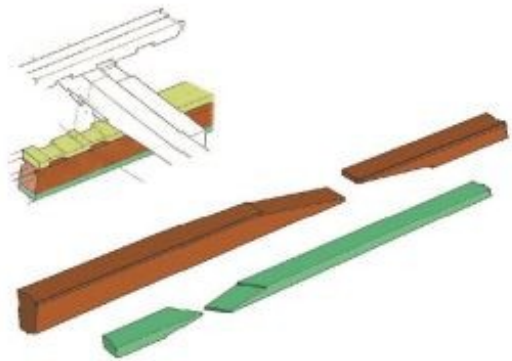
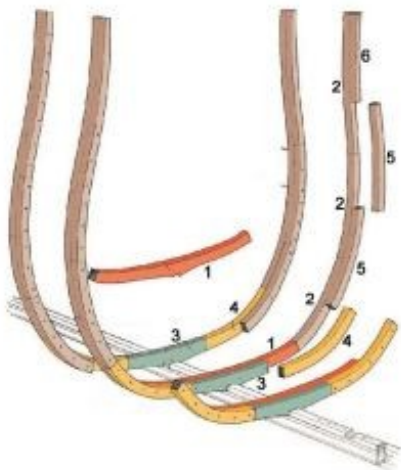
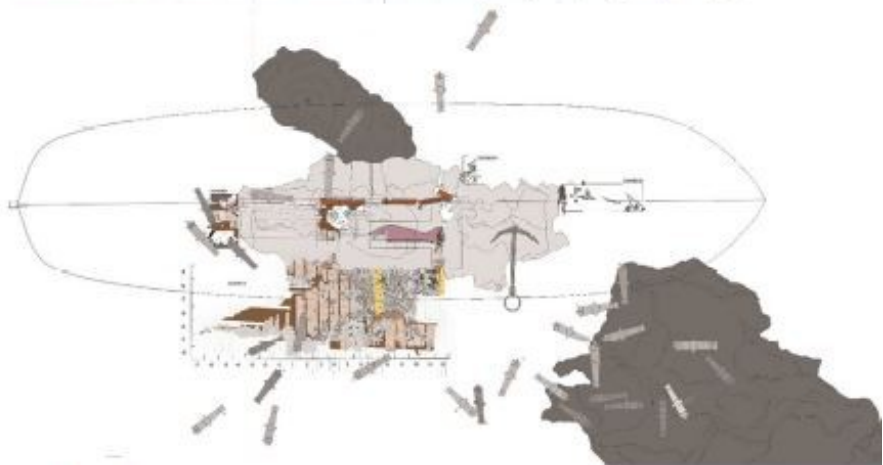
Several fastenings belonging to the lower part of the hull were located at the site. Some are still associated with the timbers, while others are scattered. The hull was copper sheathed, while lead sheets were used in the false keel for additional mechanical protection. The latter feature is consistent with historical data for French ships. Some bolts, spikes and copper sheets were recovered for analysis.

Metallurgical examination by means of light microscopy (LM), scanning electron microscopy (SEM), X-ray energy dispersive spectroscopy (EDS), optical emission spectrometry (OES), and atomic absorption spectrometry (AAS) were performed. Analyses indicate that the raw material used for manufacturing the mentioned elements was unalloyed copper. The grain shapes and sizes, annealing twins and elongated inclusions indicated that fastenings were handmade, mainly by a hot forging process. This evidence suggests that traditional techniques to produce copper fastenings continue long after the improvements made in England by William Forbes with his patent (1783) of grooved rollers. Additionally, metallurgical characteristics of spikes show a high degree of similarity in terms of alloys used and manufacturing methods to those registered in the pieces recovered from the French warship *Bucentaure* (1805) (Ciarlo *et al.* 2014).



- Hull (outer) planking
- Ceiling (inner) planking
- Frames
- Riders
- Keel
- False keel
- Copper sheathing
- Filling pieces

FOUGUEUX (1782-1805)
PICO DE CAMPOSÓDIO



References

Ciarlo N. C., De Rosa H., Lucchetta M.C., Marino P., Rodríguez N., Martí J., Maxia G.

2014 Estudio comparado de dos navíos franceses de la Batalla de Trafalgar: los elementos de fijación estructurales del *Fougueux* (1785-1805) y *Bucentaure* (1804-1805), in D. Juanes & C. Roldán (coord), *Actas del X Congreso Ibérico de Arqueometría*, Subdirección de Conservación, Restauración e Investigación IVC+R de CulturArts Generalitat, Castellón, Spain. p. 217-229.

Boudriot J.

1975-2001. *Le vaisseau de 74 canons: traité pratique d'art naval*, 4 vols, Collection Archéologie Navale Française, Paris.

Rodríguez N. E., Rieth E., Izaguirre M.

2010 Investigaciones en el pecio de Camposoto: hacia la identificación del navío francés *Fougueux*, *Boletín IAPH* 75, p. 94-107.

Rodríguez N. E., Alzaga M., Izaguirre M., Rieth E., Márquez L., Acerra M.

2013 El *Fougueux*, análisis del sistema constructivo de un navío de línea de la armada imperial de Napoleón Bonaparte, in X. Nieto, A. Ramírez & P. Recio (coord), *I Congreso de Arqueología Náutica y Subacuática Española*, Ministerio de Educación, Cultura y Deporte, Cartagena, Spain, p. 575-592.

Rodríguez N. E., Alzaga M., Martí J., Rieth E., Izaguirre M.

2014 El *Fougueux*, Trafalgar (1805). Un navío construido y artillado para la batalla, in R. Castillo, A. Ramírez & L.A. Torres (eds), *Proceedings of the 5th International Congress on Underwater Archaeology, IKUWA V*, Ministerio de Educación, Cultura y Deporte, Cartagena, Spain, p. 1036-1038.