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Review

Fishing grounds' influence on trawler winch design

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ABSTRACT

Although Spain cannot boast of noteworthy fishing grounds of its own, the tradition of fishing is deeply rooted there. This country has developed a huge, deep-sea fleet that can easily adapt to operating in a range of international fishing zones. Across these zones, the fishing winch stands out as an essential piece of equipment. If it works well, a vessel's fishing capacity is assured.

The aim of this study is to determine which fishing winch is the most suitable for operating in the numerous fishing grounds frequented by the trawlers from the Spanish fishing fleet. For each fishing zone, therefore, a relationship will be established between fishing winch design parameters and the depth in which the fishing gear works.

This activity is directed towards a specific fishing ground and species, which in turn determine the type of boat and fishing system used. Different equipment is needed because depths vary. Hence, the type of system changes. However, it would be interesting to see how this variation affects fishing winch design for far distant fishing conditions in terms of drum capacity, traction and rendering and recovery speeds.

Contents

1. Introduction

With the Spanish population's high demand for fish products, it became clear that not enough fish would come from the country's own fishing grounds. As a result, in the mid- twentieth century, a strong fishing fleet was created to cover grounds in other corners of

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the world. This was the case until the 1980s, with the III Law of the Sea Conference under the auspices of the United Nations (Naciones Unidas, 1982). Coastal countries decided to extend their territorial waters up to 200 mile. The *200 Mile Convention* had several ramifications: fishing grounds were lost; a number of fisheries disappeared; large-scale vessels were scheduled to be scrapped and many mixed joint enterprises were established. Moreover, an itinerant fleet was created; it could go to an open fishing ground when it could not stay where it was (Gil-Olcina and Gómez-Mendoza, 2001). Thanks to all of these factors, Spain had a vast far-distant fishing fleet that could adapt to the varied working conditions of different fishing grounds.

Even with all these difficulties, fishing has been a crucial sector in Spain until recently. To provide an idea of the position of trawling within the whole sector, 43% of the fleet – expressed in gross tonnage – is dedicated to trawling. This figure goes up percentage-wise if one only considers fishing vessels heading towards deep sea and middle water in sea fishing grounds over 24 m in length (MAGRAMA, 2013).

Active groups are involved in trawling; they are searching for fish. With this method, almost any kind of sea-dwelling organism of commercial interest can be caught. Thus it is the most versatile mode of fishing with the greatest range of adaptation and application.

The origins of trawling have been lost to time. However, technological advances mean that it is possible to fish in deeper waters farther and farther away (Trout, 1967; Solovyov and Cherniavsky, 2013). At the same time, catches are becoming scarcer. These two factors mean that improvements have to be made to fishing systems (Santos and Nuñez, 1994).

With variations in depth, trawling methods have to adapt to how the fishing gear is operated and the type of manoeuvres used. Benthic or demersal trawling may take place close to or along the bottom of the seabed, respectively. Alternatively midwater fishing entails pelagic trawling. Trawling from the stern-side with a ramp is the most common type of manoeuvre. The nets are cast by means of a ramp positioned on the transom and later spread out over the deck. The deck has to be quite long so that the large nets can be handled while leaving space for the trawling winch at one end of the stern. As a result, the bridge has to be positioned in forward deck (Fyson, 1985; Santos and Nuñez, 1994) (Fig. 1).

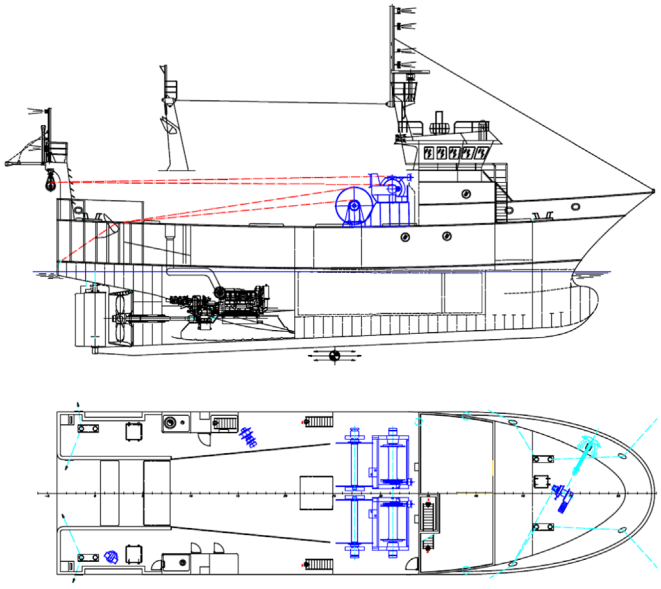

Fig. 1. Coastal Trawler. Longitudinal cross-section of the winch and bridge. *Source*: author's own.

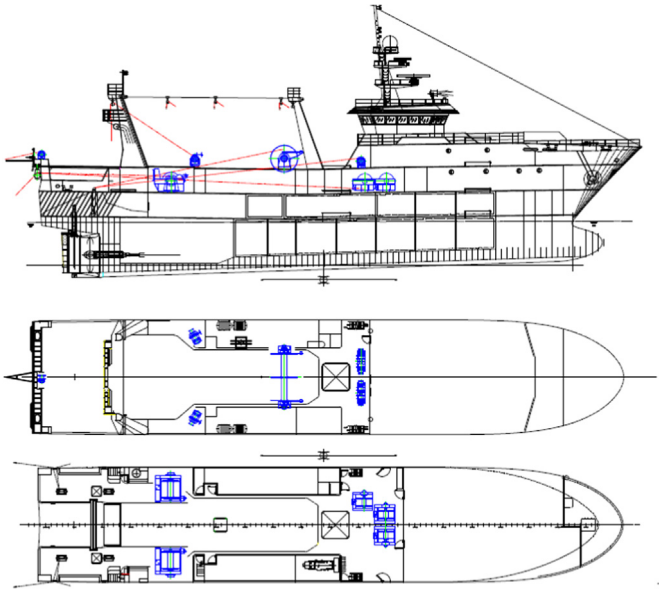

Fig. 2. Twin deck Deep sea Trawler arranged with trawl winches: trawl winches, bridle winches, auxiliary winches and net drum. *Source*: author's own.

With the method used by ramped stern trawlers, the vessels must be mid- to large-sized and use huge nets. It is precisely the bigger dimensions of the vessels and their gear that make it necessary to employ a technologically complex fishing winch whose characteristics make it possible to carry out the manoeuvres (Carral, 2005).

More suitable than their single counterparts, twin decks are common when length exceeds 25–30 m. Blah (Santos and Nuñez, 1994 p. 135) explains why the twin configuration works better. The fish can be taken below deck, where it can be processed more efficiently and comfortably. Moreover, the hold, pens and factory have a greater capacity, with more space for more sophisticated equipment (Fig. 2).

Winches are used for manoeuvring the fishing gear. These winches are made up of the components that handle sweep lines, warps and cargo runners for the codend and drum ends. The way in which this equipment is positioned on the deck may vary (Fig. 3). Two independent winches may be used, one on each side, or a net drum on the bridge deck. In the latter case, only one, centrally located winch is employed. It has pulling drums on each side to leave space in the middle for the net drum (Carral and Carral, 1999). The sweep lines and warp can be stowed in the same or separate drums (Santos and Nuñez, 1994 p. 138). The winch for hoisting the codend is usually kept to one side in the deck.

Guidelines for the fishing vessel to operate safely are a concern for both the state of the fishing flag and the ship owner. In terms of the state, there are two frameworks: its own regulations (ISO, DIN, and so on) and those imposed on a global scale (through the IMO or ILO, for instance). Ship owners are obliged to respect the regulations set by the classification societies they have chosen for their vessels. To understand the implementation guidelines for designing trawl winches, it is necessary to look at the full range of regulations.

The International Standards Organisation (ISO) relies on the collaboration of experts from more than 156 countries. Among these are most of the European states. This entity has its own implementation guidelines for trawl – winches through the ISO – TC 8 Technical Committee for Ships and Marine Technology. ISO 6115:1988 – Shipbuilding – Trawl winches (ISO, 1988) serves as a benchmark for designing and testing trawl winches. However, its contents also deal with other fishing gear components. Table 1