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Casualties and loss of life in bulk carriers from 1980 to 2010

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ABSTRACT

Bulk carriers have been linked with high risks of structural failure and foundering, and with heavy loss of human life. This study used Lloyd's casualty records to investigate the extent to which dry bulk shipping has become safer over the last 30 years, and to identify shipping factors associated with the risks of bulk carriers' foundering and crew fatalities in recent years. Although there have been reductions over time in bulk carrier casualties and crew fatalities since the early 1980s, with an interim peak during the early and mid 1990s, there have been increases since 2005, linked partly to several bulk carriers that foundered when carrying nickel ore. Of 11 shipping factors considered, the strongest independent predictors of foundering and crew fatalities in recent years were the flag state, the cargo, the location of the casualty, weather conditions and the gross tonnage. Over the study period, elevated casualty and crew fatality rates were linked strongly with newly emerging or expanding flags.

1. Introduction

Dry bulk shipping provides the most cost effective way of transporting large volumes of low value cargo. Over time vessel size has increased in order to reduce the cost of sea transport, with cargo volumes used for tailored economical shipping operations [1]. The world fleet of bulk carriers has also increased over time, especially in recent years since 2005 (Fig. 1). In 1980 dry bulk shipping accounted for 27% of the total world merchant fleet (186 million dwt), but by 2010 this had increased to 38% (532 million dwt). Tonnage demand, and hence the expansion of the dry bulk fleet, is influenced by economic growth [1]. Many other factors also affect demand, for example in 2010 dry bulk volumes increased by around 12% following a decrease in average shipment distances due to changes in shipping patterns in the Pacific region. Such demand ultimately leads to an expansion in the fleet [2]. Conversely, fleet size is also affected by the rate of scrapping of older vessels. Any slowdown in scrappage rates comparative to delivery of new tonnage has an impact on the overall size of the fleet and leads to an increase in the fleet size. The increase in the size of the dry bulk fleet in the late 2000s may continue as demolition rates decline but new tonnage continues to come on-stream [3].

Commensurate with the expansion of the dry bulk fleet has been an increase in the tonnages being carried. This growth has reflected the expansion of industrial activity in emerging regions with 60% of loaded and 56% of unloaded cargoes being accounted for by this sector. The growing share of dry bulk cargo has reflected the fast growing demand for raw materials such as iron ore and coal used in steel making [4]. As highlighted by UNCTAD, dry bulk and container trades are closely linked to economic expansion [4]. In 2011, 28% (2477 million tonnes) of global cargo tonnage loaded was accounted for by dry bulk cargo, an increase from 1957 million tonnes in 2007.

As increasing volumes of dry bulk were being carried in increasingly large vessels, bulk carriers became linked with high risks of catastrophic structural failure and heavy loss of life during the 1980s. In particular, there was extensive public interest in several major disasters such as the *MV Derbyshire* [5,6]. This was followed from the 1990s onwards by the publication of several detailed reports and analyses of bulk carrier losses [7–17]. Increased risks of bulk carrier failures were linked variously with older ships [7–12], corrosion and/or hull plate damage sustained during cargo operations [7,9,11,13,17], cargoes of iron ore [7,9–12,17], high risk trading routes, such as trades to the Far East and from Australia to northern Europe [9,12], the flag state of registration [8,9,12,15,16], and typhoons, storms or other severe weather conditions [9,11,12,17]. In many cases, the bulk carrier losses were caused by hatch cover failure or sudden catastrophic structural failure, with entire crews lost as the bulk carriers foundered suddenly or disappeared without contact. A previous

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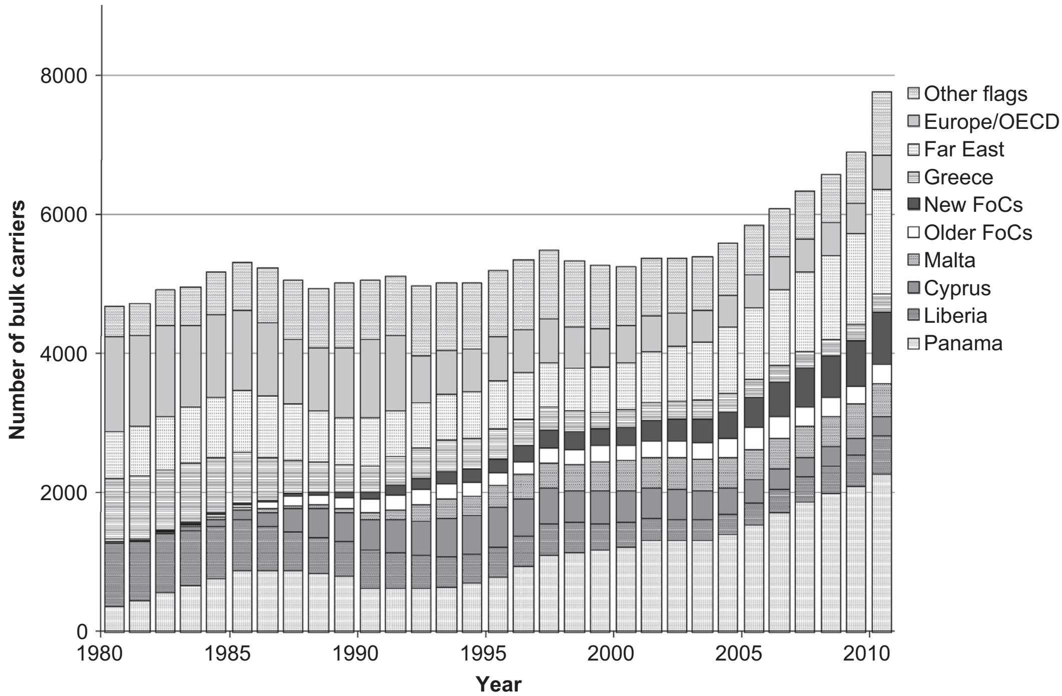

Fig. 1. The number of bulk carriers in the world fleet according to the flag state of registration, 1980–2010.
Source: Lloyd's Register of shipping [18].

study of casualties from the 1960s to 1996 found that the most important factors that affected bulk carriers' foundering were the cargo, the trading route, the age of the bulk carrier and the flag state [12].

Subsequently, there have been improvements in the design of bulk carriers, aimed at the watertight/weather tight integrity of the hull, flooding detection and protection, and the survival prospects of crews involved in the casualties [16]. These include measures covering hatch covers and securing arrangements, water ingress detection and pumping arrangements, and stipulations regarding provision of immersion suits and life rafts. Although there has been evidence of reductions in bulk carrier losses and crew fatalities [15], it is unclear as to the extent to which bulk carrier safety has improved over time.

The overall aim of this study was to investigate and assess the extent to which dry bulk shipping has become safer over the last 30 years, and how it compares with other cargo sectors. The main objectives were, firstly, to investigate long term trends in bulk carrier casualty rates and associated crew fatality rates over the 31 year period from 1980 to 2010. Secondly, to establish how the casualty and crew fatality rates in bulk carriers compare with those for other cargo carrying ships, including tankers, container ships and general cargo ships. Thirdly, to compare casualty and crew fatalities across flag states that register bulk carriers. Fourthly, to determine factors that have affected, the risks of bulk carriers foundering and the risks of crew fatalities following a bulk carrier casualty, during the 14 year period from 1997 to 2010.

2. Material and methods

2.1. Shipping casualties and crew fatalities

The study used Lloyd's casualty records to identify bulk carrier casualties and crew fatalities following the casualties. The Lloyd's casualties included in this study were bulk carriers that were reported as either actual total losses (ATLs) or constructive total losses (CTLs) as a consequence of collisions, foundering, grounding, etc, during the 31 year period from January 1st 1980 to December 31st 2010.

The study excluded 32 bulk carriers that were lost as 'war casualties' with a total of 30 fatalities. The study also excluded 2916 bulk carriers that were minor casualties during this period, which resulted in a total of 133 fatalities. As Lloyd's casualty records do not distinguish fatalities among crew from passengers and other non-crew, all fatalities were assumed to refer to crew.[1] A total of 501 bulk carrier casualties satisfied the inclusion criteria and were included in the study. These 501 casualties resulted in a total of 1824 lives lost.

The study investigated and compared shipping casualty and crew fatality rates in bulk carriers with those in other cargo carrying ships — container ships, tankers, liquefied gas carriers, roll on roll off (RoRo) cargo, refrigerated cargo and general cargo ships — using the same data source, Lloyd's casualty records.[2] The study also compared casualties and crew fatalities across flag states that register bulk carriers. Because of small numbers of bulk carriers in some flags, in some analyses it was necessary to combine some flags. Details of this categorisation is included in the Appendix. It was based, firstly, on the four major flags of convenience (FoCs) [3]; Panama, Liberia, Cyprus and Malta, other

[1] Although a small percentage of the fatalities would include non-crew such as passengers, supernumerary wives and pilots, etc, the vast majority of these fatalities in bulk carriers would refer to crew.

[2] These ship types were included for comparison as the main cargo-carrying ships world-wide and since they are — with the notable exception of general cargo ships — often of a broadly comparable size to many bulk carriers (although they are smaller on average). Using the Lloyd's ship type classification [18], the bulk carriers included in this study include ore carriers, bulk oil carriers, ore bulk oil carriers, bulk carriers and self discharging bulk carriers, but exclude other (typically smaller) specialised dry cargo ships such as aggregates carriers, cement carriers and limestone carriers.

[3] FoCs are based upon the list of FoCs provided by the International Transport Federation [19].