RIGHTSHIP

AGE VS CLASS – WHO WINS?

JUNE 2017

The impact of the shipping boom on performance indicators

Abstract

A large number of vessels were built during the 'shipping boom' of the early 2000's. This report investigates the effect of this 'boom' with respect to the performance of the International Association of Classification Societies (IACS) Class Society, Flag States, and ship type.

Analysis was conducted on in-service vessels from 2007 to 2016 aged 30 years or less.

The results found that when subgroups were inundated with new builds, the proportion of incidents decreased and therefore the performance of this subgroup improved. This effect was present for IACS Class Societies and ship type, although no relationship was identified for Flag State. In conclusion, these findings provide insight into why some subgroups are performing better than expected and why predicting risk in shipping is more complex than a 'one size fits all' approach.

Introduction

In the early 2000's there was a period where there were too few ships, and so the decision to build a new vessel made good economic sense. With many executing this strategy at the same time, the influx of vessels resulted in what is commonly referred to as the "shipping boom". This period saw the average age of some fleet subgroups rapidly decrease. With particular subgroups being inundated with new builds, we hypothesise whether this decrease in age leads to an observed decrease in incidents given the prevailing wisdom that "newer is better".

This report investigates the aftermath of the shipping boom with respect to the performance of the International Association of Classification Societies (IACS) Class Society members, Flag State and ship type and size.

IACS Class Society

The International Association of Classification Societies (IACS) group are a collective of twelve Classification Societies, focused on making a unique contribution to maritime safety and regulation through technical support, compliance verification and research and development. More than 90% of the world's cargo-carrying tonnage is covered by IACS members. Whilst common rules apply to all IACS members, the major societies have different levels of overall performance.

From 2007 to 2016, the median age of all IACS member vessels was 13.3; and those aged from zero to 30 had a median age of 10.3. Figure 1 shows the quantity of IACS members over the last ten years, divided into six age categories: 0-4, 5-9, 10-14, 15-19, 20-24 and 25-30 years. Representing the shipping boom, this demonstrates a steady increase in the number of vessels in the 0-4 age group from 2007 to 2012. As the graph shows, as vessels get older they move into the expanding 5-9 age bracket and there is a resultant gradual decline in ships in the 0-4 age group. Thus, in the future we will continue to observe this trend, with each age category respectively increasing and decreasing in size.
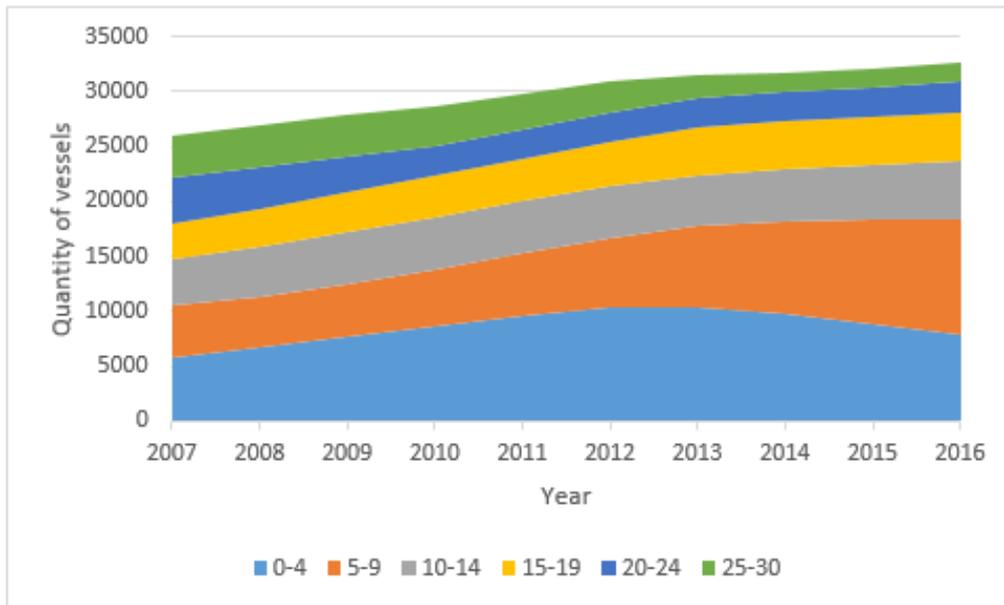
Figure 1: Overview on the quantity of vessels who are IACS members that was categorised by age groups.

Continuing on from Figure 1, exploratory analysis was conducted to determine if the proportion of incidents of IACS Class Societies differs across four established and two newly-formed Class Societies. Comparative analysis was performed to determine if dual Class data should be considered. The results found that the inclusion of dual Class information did not alter the distribution of the age groups within a Class, and so for the purpose of this analysis it was not taken into consideration.

Figure 2 displays the segmentation of age and the proportion of incidents of six IACS Class societies – comprising four established, and two newer Class Societies - from 2007 to 2016. The proportion of incidents is calculated annually, formulated by the number of incidents divided by the number of in-service vessels. RightShip's database was utilised for this analysis, whereby vessels were deemed in-service when they can be risk-rated and vetted for RightShip's vetting service. At a brief glance, Figure 2 shows that all six Classes varied in the quantity of age groups for each calendar year. These graphs shows that in this timeframe, new vessels did not fall equally on all Classes.

Focusing on the newly-formed Classes, it shows that they were inundated with new vessels. For the last ten years, Class E has increased their fleet size by about 1000 vessels, simultaneously decreasing the median age of all vessels from 15 to six years old. As shown in Figure 2, the majority of the new vessels were within the age group of 0-4, with a total of 889 vessels included from 2007 to 2014. Comparing 2007 to 2016, the number of vessels under the age of ten rose from 32% to 72% of the entire fleet. The result of this Class fleet being predominantly under the age of ten may contribute to the 10% decrease in proportion of incidents from 2007 to 2016.

Even though Class F is relatively small in nature, we witness a similar trend to that of Class E. For the last ten years the quantity in each age category above ten years old has remained unchanged, which may indicate that fleet renewal has kept pace with scrapping. However between the years of 2008 and 2012, this Class was inundated with young vessels. As a result of the shipping boom, in 2016 46% of vessels registered with this Class were younger than ten years, compared with 21%

in 2007. Having a younger fleet may have contributed to the casualties in Class F decreasing from 2.7% in 2007, to 0.9% in 2016.

The established Classes do not differ greatly from the newly formed Classes. In Class A, aside from vessels under the age of ten, the quantity of vessels in each age category remained unchanged. From 2007 to 2016, the number of vessels less than ten years increased from 1129 to 2398. In this same period, the probability of this Class having a casualty deceased from 0.039 to 0.020. This similar trend can also be seen with Class B, whose percentage of casualties decreased from 3.8 to 1.2 percent over the ten years of data. With respect to Class B, the number of vessels younger than four years rose from 26% in 2007 to 32% in 2011.

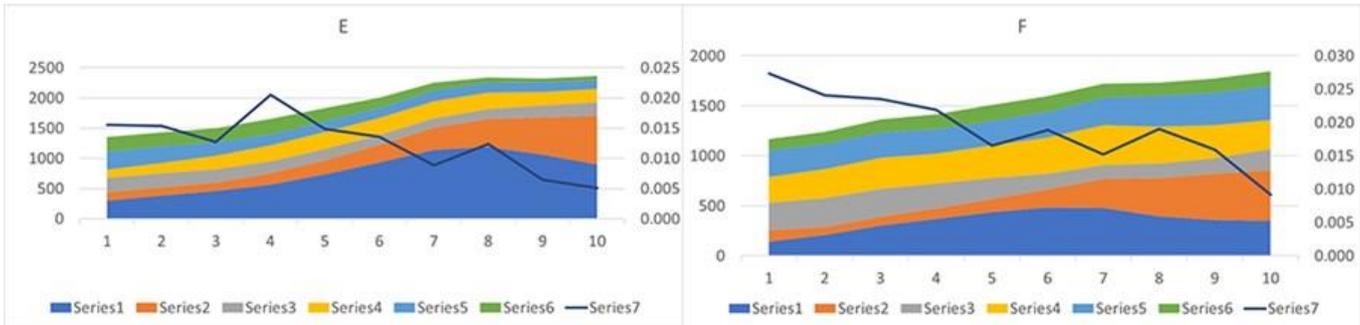## Established Class
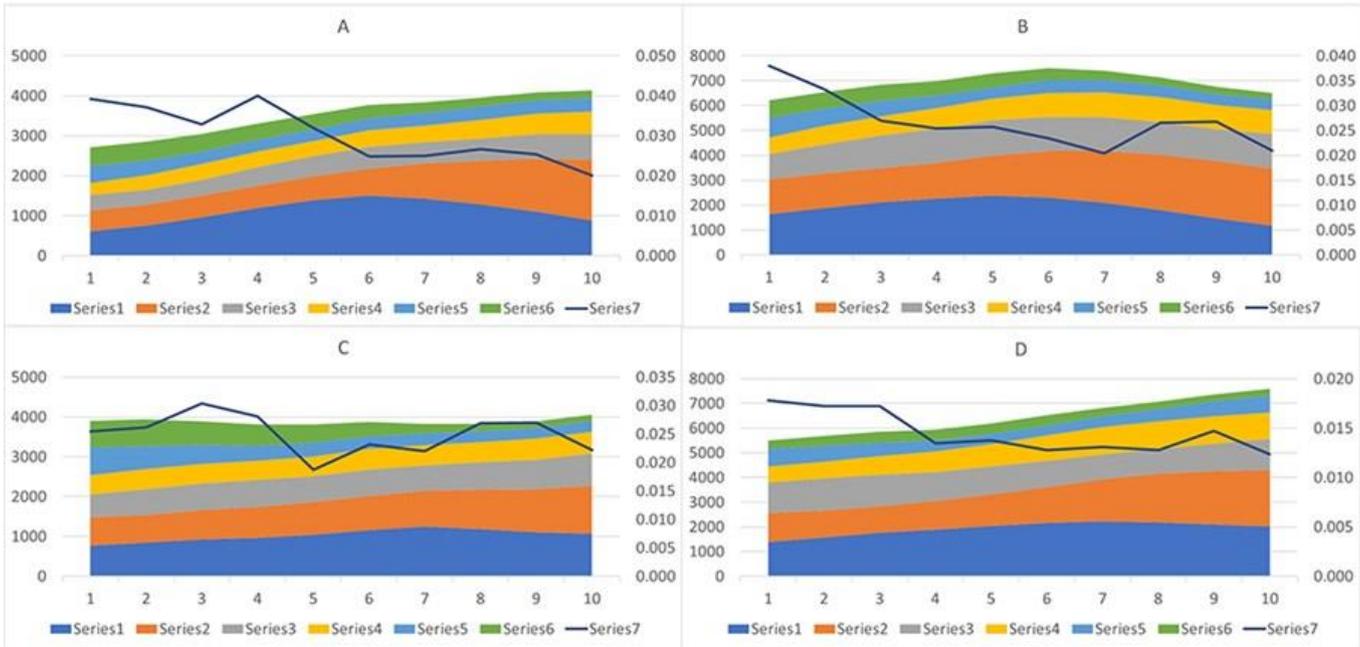
Newly Formed Class

Figure 2: The quantity of in-service vessels that were categorised by age and the proportion of incidents occurred for six Class societies. Prop_Incid = Proportion of Incidents

With regards to Class C, the age distribution and percentage of casualties has remained relatively unchanged in the ten year period. From 2007 to 2011, the number of vessels four years old and

younger increased from 764 to 1048. In the same time period, Class C's proportion of incidents decreased from 0.025 to 0.019.

After analysing each individual graph, the results demonstrate a clear difference in the performance of the established and newly-formed Class societies. However taking into consideration geographic and geopolitical forces, it is not surprising that the newer classes received more vessels from the shipping boom.

Flag States

After conducting in-depth analysis at a Class Society level, it is logical to consider if the same trend occurred at a Flag State level. Analysing thirty major Flag States, it was found that they were not inundated with new builds. As there are more Flag States than Class Societies the spread of the new builds was more even, and as such no material effect was identified at this level.

Ship type

Analysis on ship type groups was conducted to determine whether the shipping boom impacted on these subgroups. To perform this analysis, vessels were categorised into one of three ship types: Bulker, Tanker and Other. Gas carrier and container vessels were omitted from this analysis as the sample size was too small.

Figure 3 displays the quantity of vessels in each ship type group for the last ten years, divided into six age categories. As shown in Figure 3, the Bulker group was the only ship type where the pace of delivery more than offset the pace of scrapping. From 2007 to 2014, the Bulker ship type increased the quantity of vessels in the 0-4 age bracket from 1249 to 4794 vessels. This inundation of young vessels may have caused the proportion of Bulker incidents to decrease by two percent.
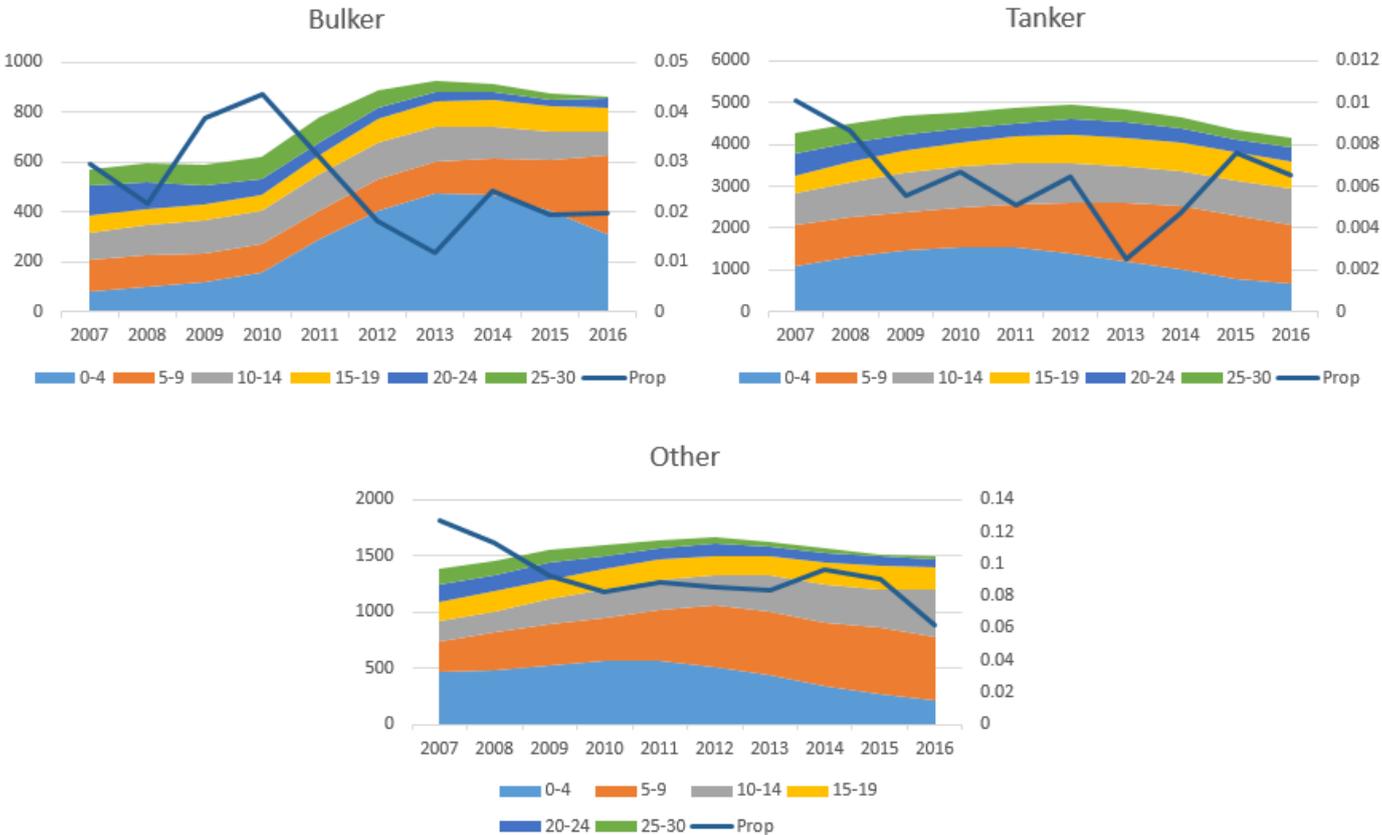
Figure 3: Overview of the ship type groups that has been categorised by age groups. Prop_Incid = Proportion of Incidents.

Further analysis was performed to determine which size of Bulkers were affected. To conduct this analysis, Bulker vessels were divided based on their DWT (dead weight tonne): small (0 – 60,000 DWT), medium (60,000-90,000 DWT) and large (90,000 DWT and above).

Figure 4 displays the quantity of vessels in each DWT Bulker ship type group. This shows that all three groups were inundated with new builds, with particular emphasis on the medium and large groups. In regards to the large DWT group, from 2007 to 2014 it increased from 290 to 1638 vessels in the 0-4 year old age group. As before, the inundation of new builds in the large group may have caused the proportion of incidents to decrease from 15% in 2011 to 8% in 2014.
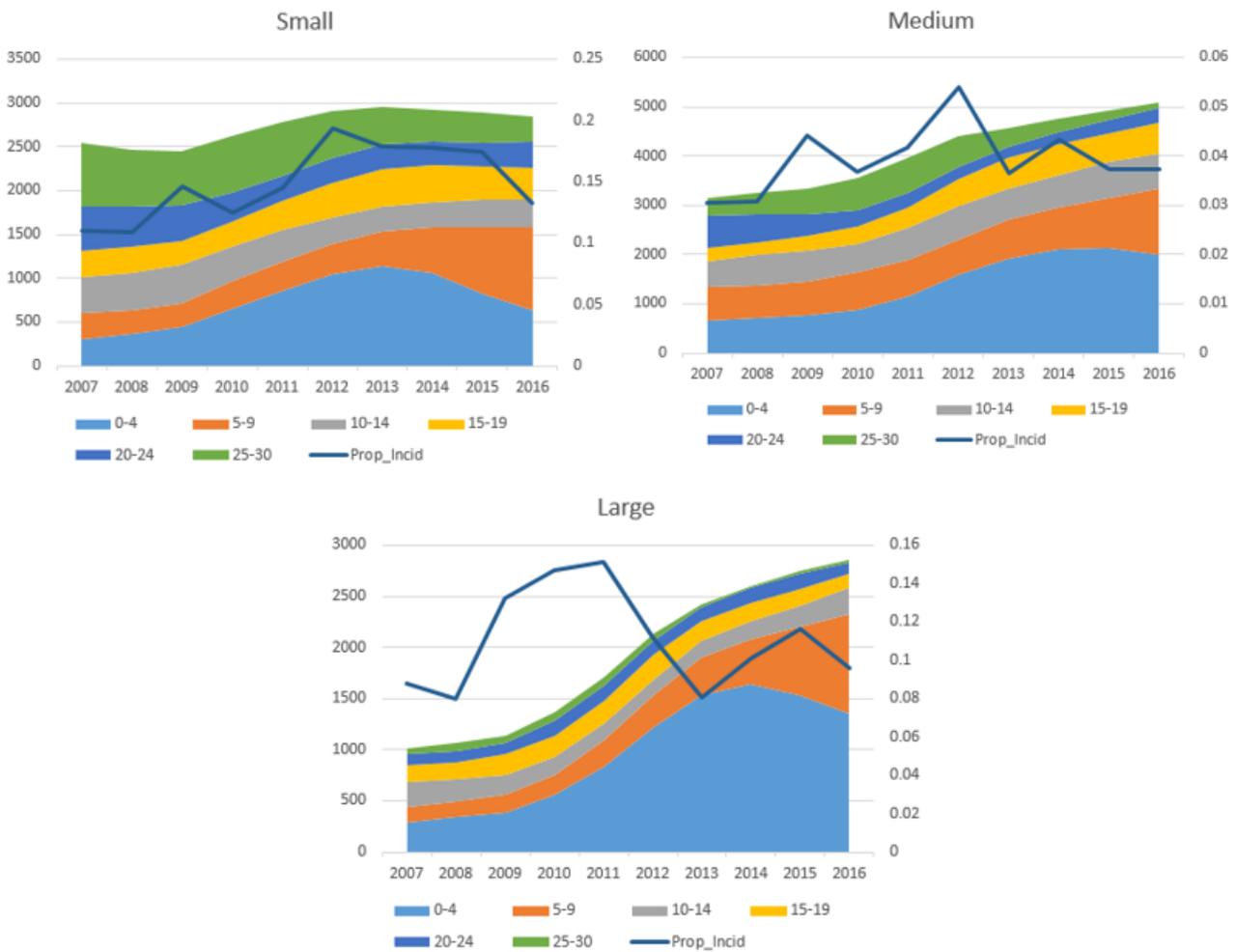

Figure 4: Overview of the quantity of vessels within the Bulker ship type group that has been split via DWT groups. Prop_Incid = Proportion of Incidents.

Figure 5 displays the statistically significant polynomials for each ship type using data from 2009 to 2013. The purple area represents two standard deviations from the prediction for each ship reflecting the fluctuating level of uncertainty with age. These graphs show that different ship types have different trends. In regards to the Bulker ship type, it appears to have an increasing relationship with age which remains steady between ten and 20 years, increasing again thereafter. The proportion of Tankers experiencing an incident increases sharply in the first ten years and then

lessens, whilst the Other ship type sees a greater likelihood of incident occurrence until around 20 years. These results suggest that the relationship between age and incident is not linear, but varies depending on the ship type.
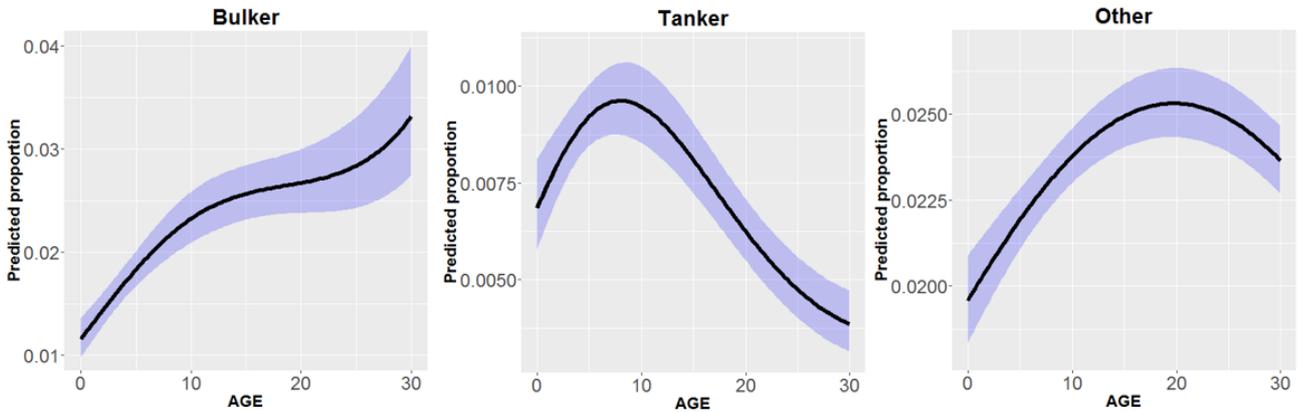

Figure 5: The line of best fit of age and the proportion of incidents.

Conclusion

These results demonstrate that as the number of younger vessels in a subgroup increases the proportion of incidents decrease, therefore improving the performance of the subgroup.

This trend was present in IACS Class Societies and ship type groups, intimating that younger vessels typically experience fewer incidents than older vessels.

Figure 6 validates these findings by outlining the mean proportion of vessels having an incident at a specific integer age. It shows that younger vessels are less likely to have an incident, and as vessels age beyond 22 years old the probability of these vessels having an incident steadily increases. There is a confounding factor however, in that the highest regularised vessels – tankers – are pruned by self-regulation of maximum age, not by actual regulation of effective design life. Thus, a greater percentage of young vessels in a subgroup could generally improve the performance of a particular subgroup.
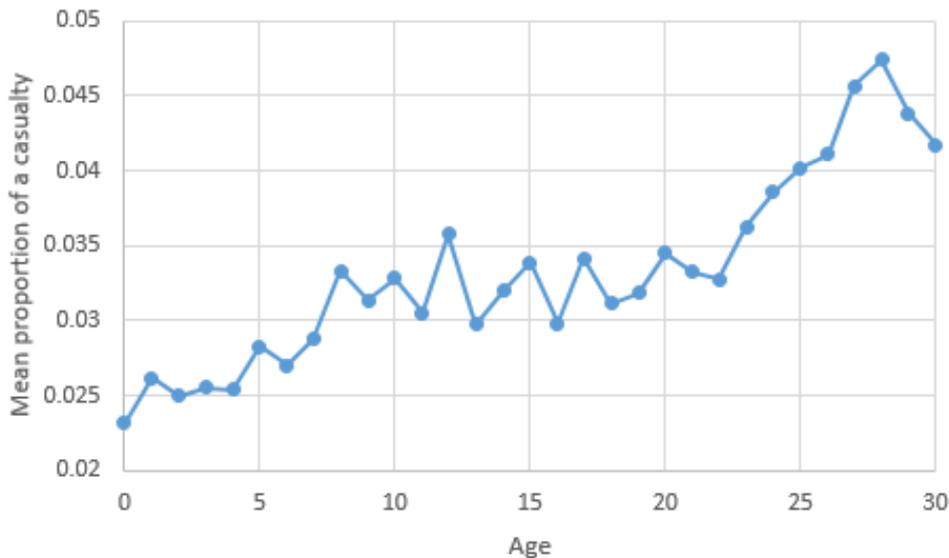

Figure 6: The mean proportion of having an incident from 2007 to 2016.

To account for different regulations amongst vessels, further analysis was conducted to determine whether the trend of age and the proportion of having an incident differs across ship types (Bulker, Tanker and Other). Within each ship type a polynomial of best fit that was statistically significant was fitted to the data.

This report has shown that when subgroups were inundated with new builds it tends to improve their overall performance. Further analysis is required to determine whether age constancy is present within the dataset. For example, are all ten-year-old vessels equal today compared to ten years ago? It also would be interesting to witness how the proportion of incident trends continue, and what type of incidents occur, as the vessels from the shipping boom era get older. Previous RightShip research has shown that two vessels with a different history can, at the same age, present a very different risk profile.

This report demonstrates that age is a complex variable as it has been found to confound with other variables. It shows that age is a more important variable than previously assumed, and therefore future work on RightShip Qi's predictive model will take this into account. As the bulk fleet in particular has become younger, faster it is of increasing importance to understand the interaction and dynamic of age and manage the associated risk, as this fleet in turn will age at a rapid pace.

With the insight of the effect of age on performance, further analysis will be conducted to determine if any benefit would occur if the Class Societies were split into age categories to cater for shipping boom occurrences.

This report is evidence that a complex algorithm entailing an iterative and recursive process is required to drive RightShip Qi. This analysis isolates the effect of age, ignoring other leading indicators about ship performance. As such it should not be interpreted as simply "all younger vessels are low risk" as this analysis does not take into account contributing factors such as yard, DOC, PSC and the benefits of a well-run and maintained vessel with a high performing crew.