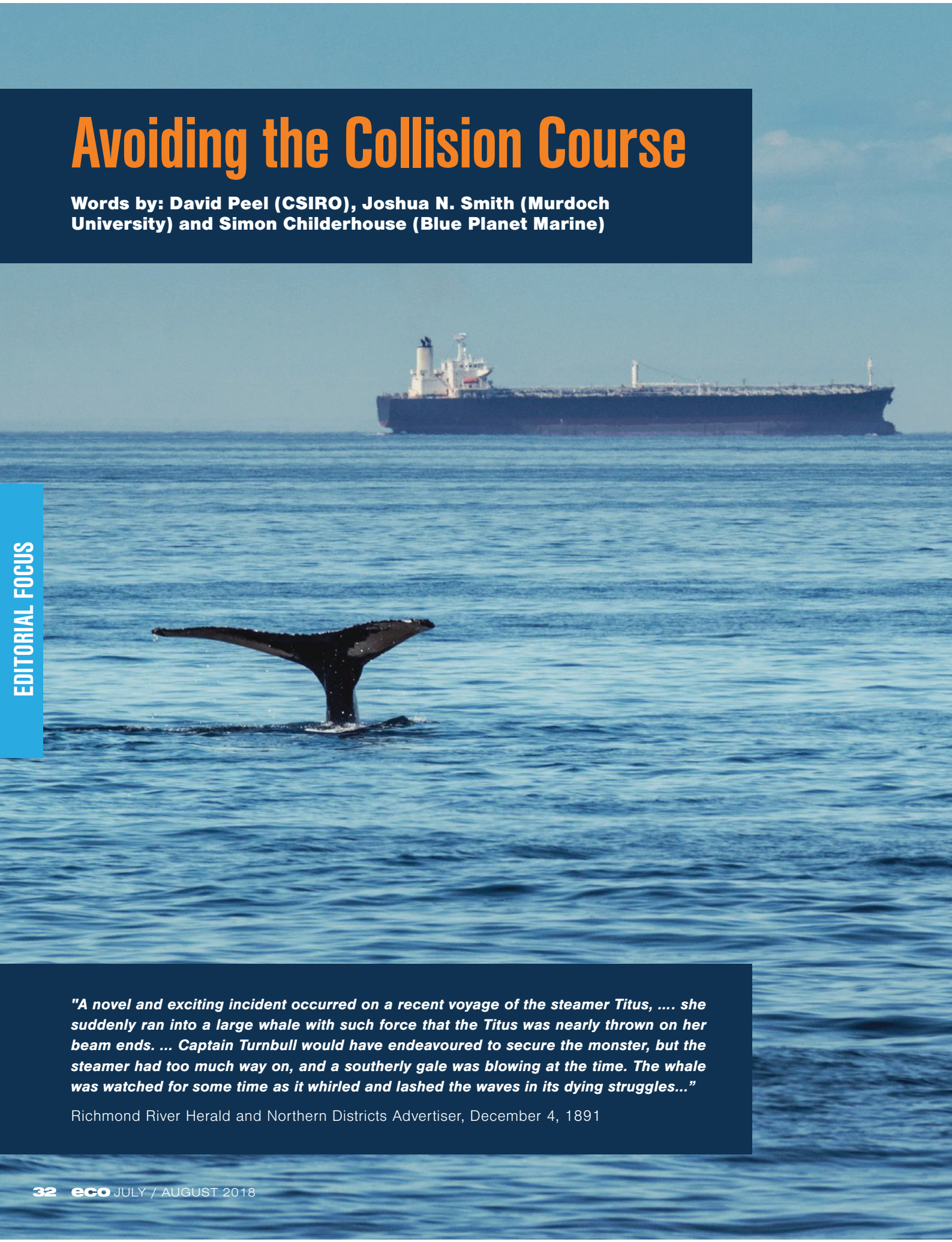
Avoiding the Collision Course

Words by: David Peel (CSIRO), Joshua N. Smith (Murdoch University) and Simon Childerhouse (Blue Planet Marine)



"A novel and exciting incident occurred on a recent voyage of the steamer Titus, ... she suddenly ran into a large whale with such force that the Titus was nearly thrown on her beam ends. ... Captain Turnbull would have endeavoured to secure the monster, but the steamer had too much way on, and a southerly gale was blowing at the time. The whale was watched for some time as it whirled and lashed the waves in its dying struggles..."

Richmond River Herald and Northern Districts Advertiser, December 4, 1891

Attitudes about collisions between whales and vessels have changed drastically since this account from a newspaper in 1891. Rather than sensational, we now view such incidents as tragic, and internationally, vessel strikes are recognized as a potential threat to whale populations.

Worldwide, the main species affected by vessel collisions are fin whales, followed by humpback, northern right, gray, minke, sperm, southern right and blue whales. During the last two centuries of whaling almost all of these species were brought to the brink of extinction.

The recovery of these species and their local populations has varied considerably from place to place. Many populations of these whales are still dangerously small (e.g., northern right, western grey, blue whales). For these small populations, vessel collision is primarily an issue of conservation. But, it is also an animal welfare and ethical issue. This is particularly relevant for populations such as the Australian humpback whale which, while showing strong recovery from commercial whaling, is still impacted by vessel strike. Ironically, their healthy return towards pre-whaling numbers is likely to make vessel strikes more common in the future due to more whales being in the ocean.

In addition to the immense changes experienced by whale populations over the last 100 years, worldwide shipping has also seen extensive change over this same period. Shipping is the life blood of modern economies, connecting and providing the mass transportation for over 80 percent of global goods and resources. Consequently, there has been a massive increase in the overall volume of global shipping traffic. For example, the number of vessels in the worldwide merchant fleet has increased by 13 percent in the last seven years (UNCTAD 2018) and future projections show this growth will continue. There have also been considerable changes in the size, type, and speed of vessels. This is relevant to vessel strike as different vessels have different risk profiles.

This change is reflected in our collated data of vessel strikes in Australian waters which showed a steady increase in the average length of vessels colliding with whales between 1890 and 1950. Interestingly, fewer reports of large vessel collisions were made after the 1950s. This is possibly because there are fewer crew on-board the newer vessels, raising the important question of how many collisions are going unnoticed.

Revealing the True Numbers

Quantifying vessel collisions with whales is an enormous challenge. The International Whaling Commission (IWC) maintains a worldwide database of whale collisions to which nations voluntarily contribute data. But many incidents go undetected or unreported, and reporting rates can differ by location, species, and vessel type and size. For example, passenger vessels may be more prevalent in the data than cargo vessels simply because passengers are more likely to notice and report a collision. This inconsistent reporting rate can obscure the actual rate of collisions and make analysis difficult.

Despite these challenges, reported vessel strike data can provide useful insights and, at the least, give a minimum number of collisions that are occurring. In the worldwide database, the majority of records before the 1990s were from the Northern Hemisphere with little data from the Southern Hemisphere, and with only 61 reported collisions in Australia. To address this, we searched historical national and international print media archives for reports of vessel strikes globally, although with a focus on Australian waters. This search found 76 Australian records, providing new insights to historic rates of vessel collisions and more than doubling the number of known vessel strikes in Australia.

Quantifying and Mapping Risk

How can we minimize the risk and impact of collisions with whales? Several agencies and organizations around the world are actively considering the issue. This includes the IWC and the International Maritime Organization. In high risk areas, there are mitigation options available (e.g., education and targeted warnings when animals are seasonally present, speed limits, and re-routing in specific whale high-use areas).

In Australia, the National Environmental Science Programme (NESP) Marine Biodiversity Hub has funded a project to quantify the relative risk of vessel strike. This project is not only focused on collisions between larger vessels and whales, but the more general issue of collisions between all types of vessels (e.g., smaller commercial and recreational vessels) and also other marine fauna (e.g., dugong, turtles).

The aim of the NESP research project is to firstly identify and help prioritize which areas and species within Australian waters should be investigated. Secondly, it is to quantify relative risk of vessel strike and thirdly, to provide tools for the future to inform and compare mitigation options.

One of the key outputs of the NESP project is to produce national-scale maps of the relative risk of vessel strike occurring with marine life. This risk is estimated in relative rather than absolute terms primarily because, while it is possible to robustly estimate relative risk (e.g., how much higher is the risk in one area compared with another), we lack much of the information required to estimate absolute risk (e.g., exactly how many whales are being struck). This missing information includes the proportion of animals that notice and avoid the vessels, and the time animals spend near the surface.

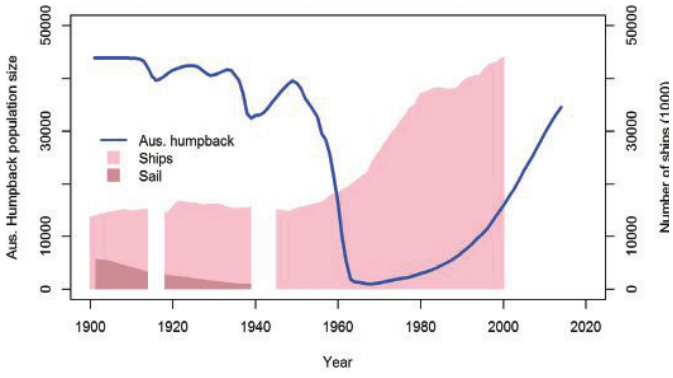
The use of relative risk and the associated data layers and maps can still provide powerful insights into the issue. For example, it is possible to compare:

The effect on relative risk due to management changes. For example, Smith et al. (2018) looks at the effect of changes to shipping routes in the Southern Great Barrier Reef on the risk of vessel strike with humpback whales;

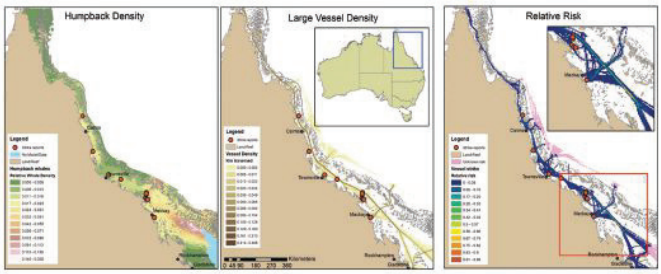
Relative risk between sub-groups of the whale population. For example, Peel et al. (2015) found that based on the different areas the animals use, the relative risk to humpback mother-calf groups in the Great Barrier Reef from large vessels (≥80 meters length) was around 3 percent more than the risk for adult-only groups, and, for smaller vessels (<80 meters length), it was 64 percent more for mother-calf groups compared to adults; and

The difference in relative risk between locations and over time. For example, Peel et al. (2018b) examined a range of species around Australia and identified areas of higher relative risk compared to the whole coastline.

These relative risk maps and findings will not tell you if action is required, but they will tell you which locations and species should be looked at more closely. If action is needed, mapping risk can then also be a powerful tool to help compare management options and help target mitigation to provide the most benefit.



An example of the changes seen in Australian humpback whale numbers (from Jackson et al. 2015) and worldwide commercial ship numbers (based on Lloyd's Register of Ships from Endresen, Sørgård et al. 2007). Source: Peel et al (2018a).



An example of the information used to get a final relative risk map for humpback whales and large vessels (>80m in length) in the Great Barrier Reef Area, Australia.

The two key pieces of information we need to produce these risk maps are the density of both vessel traffic and whales. The vessel traffic density can be calculated from vessel's Automated Information System (AIS) data. Although originally designed for safety, AIS data provides an exceptional tool to understand and quantify shipping impacts. Calculating animal density is more difficult, especially covering the large areas of concern. Often the data available is patchy and collected using disparate methods, so it is difficult to combine the different sources into a single, integrated map. The obvious solution of course is to collect more data. However, the areas we are talking about are vast (e.g., Australia wide) and for rarer whale species, the task is akin to finding needles in a haystack.

"Why don't the whales just get out of the way?"

A common question we get asked is why don't the whales just get out of the way of vessels? The limited studies of whale behavior near vessels have reported a mixed response; some found strong avoidance of vessels whereas other showed no avoidance response, even to very close approaches. There are also differences between how individual whales react. For example, mother-calf groups may show different avoidance than single adults, feeding whales may show less avoidance than travelling whales, or there may be other external influences that effect the ability of whales to detect and/or avoid vessels. Ultimately, given the 137 reports of whales in Australia alone that have been hit by vessels, it is obvious some whales do not get out of the way.

Interestingly, looking at the witness statements from these events, there are a number of references to animals being motionless and "asleep" before being hit and then moving after being struck. Otherwise, many of the accounts simply describe the unlucky circumstance of the paths of the vessel and the whale crossing, and the whale being struck.

What does the Future Hold?

With current predictions for steady increases in global shipping, the future may seem foreboding for whales. At one end of the spectrum, there are species that are showing little or no signs of recovering from past commercial whaling which, in conjunction with other pressures, may be pushing them even closer to extinction (i.e., North Atlantic right whales). At the other extreme, species that have shown a healthy recovery since whaling ceased could become a victim of their own success, given that as whale numbers increase, so does the likelihood vessels and whales will meet. Therefore, the sight of injured or dying whales could become much more common place for these recovering species in future.

In a worldwide context, do we rise to the challenge of reducing vessel strikes, or do we just accept the negative conservation, animal welfare and ethical issues? We believe that understanding and quantifying the risks is an important tool to develop pragmatic solutions to help shipping and whales to coexist and share the ocean.