Collisions of Vessels with Cetaceans:
How to Mitigate an Issue with many Unknowns

This is the text version of the Power Point presentation prepared by the IWC in collaboration with the German NGO M.E.E.R. The presentation gives a short (approx. 20 minutes) introduction to the issue of vessel-whale collisions. It highlights the current knowledge as well as knowledge gaps and research needs. It sets out different levels of mitigation, including technical, legal/operational, and educational measures. Finally, it also describes the role of the IWC and its global ship strike database.
The presentation is applicable in different contexts, e.g. to inform ship crews or representatives of other stakeholders, as well as the general public. It also can be presented at maritime schools and/or be incorporated into existing curricula.
The text given here can be read in parallel to the Power Point slides and therefore is a useful tool for interested people who want to make practical use of the presentation. The text is also integrated into the Power Point presentation itself and accordingly can be read from the screen.

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SLIDE 1
(Intro suggestion) First let me to thank … for inviting me to this talk about this issue, which, as you will see, is of growing concern worldwide.
This is a collaborative presentation developed by the International Whaling Commission (IWC) and the German based NGO M.E.E.R.

SLIDE 2
The worldwide number of collisions has significantly increased since the 1950s. During the past years, with a steep global increase of shipping traffic and increasing average travel speeds of vessels, the situation became - at least in some areas of the world – a real conservation problem, sometimes even a matter of survival for cetaceans on a population level.
Whales may be hit by the bow or the keel of a vessel, protruding parts of vessels like skegs or stabilizers, or by its propeller, leaving nasty wounds on a live animal. Sometimes whales are stuck on the bow of large ships and brought into the harbour. Such cases might only be recognized upon arrival at port.

SLIDE 3
Which vessel types are involved?
As cetaceans are animals that have to come to the surface to breathe, quite naturally every type of vessel can hit a whale or dolphin. All of the following have been reported to hit cetaceans: freighters, large ferries, high speed ferries, cruise ship, small boats, hydrofoils, navy vessels, whale watching boats and even sailors, especially those ones travelling at considerable speeds, for example during regattas & ocean races.

SLIDE 4

Which species are affected?

In principle every cetacean, be it a dolphin or a whale, can be hit. However, we know that certain species are especially vulnerable: namely those ones that are slow swimmers and/or stay for longer periods on the surface: such as right whales. As an example, 35% of North Atlantic right whale fatalities on the US East coast have been attributed to collisions and 20% of Southern right whales in South Africa die due to ship strikes.

In the Mediterranean Sea, collisions occur primarily with fin and sperm whales, while around Hawaii, numbers of collisions predominantly with humpbacks are rising - apparently as a result of their increasing abundance in that area.

In the Canary Islands sperm whales - another species spending prolonged periods of time on the surface - are threatened, with animals sometimes cut in half by large high speed ferries (*no joke*).

Small cetaceans are affected too, which is exemplified by these images involving dolphins and pilot whales in the Canary Islands.

And there is another species affected, that is us humans – as we know of several incidents where humans were injured, including some fatalities. A number of sailors have lost their boats as a consequence of running into a whale, and ferry passengers have been injured. Hence we are talking about a human safety issue here, too.

SLIDE 5

Why do collisions occur?

Cetaceans may be in a state of decreased alertness when resting. They might be distracted by hunting or feeding behaviours. Also, there will be interspecies differences or differences between age or sex classes, and even between individuals within a species. This in turn is related to experience & learning by individual animals.

Additionally, high levels of background noise or the fact that animals may suffer from hearing damage can make them less likely to detect approaching ships.

Looking at the propagation of sound in water, phenomena like refraction, bending and absorption of sound, as well as bubbles, sound shadows created in front of a vessel, the Lloyd mirror effect or near field effects may all play a role. This will lead to difficulties or even confusion about how to interpret vessel noise, i.e. knowing how far away and how fast a vessel is, which direction it comes from, etc.

And of course we thereby already imply that whales know to interpret certain types of noise as a danger, which simply might not be case either.

SLIDE 6

So there are still many unknowns. We *do* know, however, that fatality and severity of injuries to whales are related to size and speed of vessels. The great majority of accounts when whales were severely hurt or killed occurred at speeds of 14 knots or more. This graph shows that from around 10 knots the probability of a lethal outcome for a whale increases sharply. Moreover, large ships cause most lethal and serious injuries.

As an extreme example think of a fast ferry travelling at 35-40 knots where the crew detects a whale 600 m in front of the bow: The remaining reaction time will be just about 30 seconds before the ship is where that whale was seen. So what do you do? This will be referred to again in a minute… (*Slide 11*)

And we have to keep in mind that larger vessels might not be able to freely navigate due to their size, the presence of other vessels or the fact that they are navigating in shallow or otherwise restricted waters.

SLIDE 7

The question heard most often is: How many ship strikes are there?
The honest answer is: We don‘t know!
Our knowledge gaps are a result of the fact that

- Collisions may not be recognised at all (as struck whales mostly will not stay on the bow)
- Injured animals may not be identified as such
- Dead animals often will drift way and sink to the bottom,
- and regarding stranded animals, the cause of death is not always unambiguously identifiable because you need expert knowledge to tell pre-mortem from post-mortem strikes, etc.

Hence we can be quite sure that there is probably quite a large *dark number*.

SLIDE 8

There are three categories of mitigation measures: TECHNOLOGICAL, OPERATIONAL and EDUCATIONAL. Here is an overview:
TECHNOLOGICAL: *Sonar* will only be applicable within a very short range, and of course it introduces an additional source of noise into the marine environment. Actually, historically whalers used to use Sonar (Asdic) to bring whales to the surface, so such a measure could also cause more hits. The same applies to *Acoustic Warning Devices* (AWDs), where again nobody knows what type of warning sound would be an alerting signal for cetaceans, and even if that was the case, there easily might be effects like habituation.
Other systems have been developed include *night vision, infrared or thermal imaging* technologies but again efficacy will largely depend on the general conditions.

SLIDE 9

As for measures that can be summarized as *alerting tools*, a famous example is the passive acoustic monitoring system off Boston (USA), involving a number of hydrophones where acoustical whale detections are broadcasted in real time to mariners in the area. No need to tell that this system involves large amounts of money which not always will be available elsewhere, e.g. in developing countries.
Another system is *REPCET* developed in the Mediterranean Sea where ship crews can inform each other about whale sightings via an online interface.
Recently the first mobile APP was developed which has a similar mode of operation.
Placing on-board observers is another option, especially as studies have revealed that observers are an effective means to detect whales in the path of a ship.
It has to be noted that the value of alerting tools may be limited given the unpredictable nature of whale movements, the dependence of observation on favourable (light, weather and sea state) conditions and the fact that they will strongly rely on crews and captains reacting in the right way. Hence, all these systems need proper testing before being considered as „true“ and effective mitigation tools.
As a conclusion: there is currently *no technology* known to effectively avoid collisions.

SLIDE 10

Looking now at possible OPERATIONAL mitigation measures: examples include the relocation of shipping lanes, such as the realignment of the Traffic Separation Schemes (TSS) servicing Boston, the ones implemented off San Francisco or in Southern Spain off Almeria, where the TSS was moved offshore away from an existing marine mammal protected area. These re-routing measures were implemented through the International Maritime Organisation (IMO).

Here, we need to consider a multi-species approach, as moving shipping routes offshore may lift the pressure from a more coastal species, but at the same time may create problems for others with a more pelagic distribution. Hence there is always a necessity that such measures are based on sufficient scientific data. And the process of implementation through large international organisations such as the IMO can sometimes be quite lengthy.

SLIDE 11

Other operational measures include Areas To Be Avoided (ATBAs) off Nova Scotia in Canada, as well as voluntary & mandatory speed reductions introduced in the Strait of Gibraltar or in the Glacier National Park in Alaska. Off the east coast of the US, there are seasonal speed restrictions in place for North Atlantic right whales in accordance to their occurrence when migrating north or south. Here, all ships 65 ft or longer have to slow down to 10 knots in certain areas and during certain seasons.

Generally, mandatory reporting should be implemented wherever possible, ideally through strong legislation.

Common sense tells us that there should always be a possibility to initiate avoidance manoeuvres, but we know of countless cases of near misses even under good conditions, where the whale was seen well in advance and still there was no obvious option to avoid it.

As a skipper or captain, when you detect or are alerted to a whale, you will have to decide

a) where to go so as to steer away from the animal
b) about reducing speed which has consequences for manoeuvrability and sometimes passenger safety, or
c) opt for doing nothing, relying on the whale to avoid the vessel.

These are no trivial questions and decisions, especially when there are only seconds to react.

SLIDE 12

The third level of mitigation is EDUCATION.

Training for vessel personnel & crew is paramount, but knowledge about the issue must also be increased amongst managers and policy makers. Introduction of the issue into the curricula at navigational schools is equally important, and speed reductions can be noted on nautical maps.

Other tools to make people aware, including the general public, are websites, brochures and a leaflet produced by Belgium as a member state of the IWC in collaboration with the International Fund for Animal Welfare (IFAW).

SLIDE 13

Let's now have a look at the role of the International Whaling Commission. IWC has been central in placing the issue high on the international agenda. As early as the 1990s, a dedicated *Ship Strike Working Group* was set up and in 2012 two *ship strike data coordinators* were appointed. Under the leadership of Belgium the IWC has set up regular

documentations monitoring the global situation, as well as international expert workshops. The relevant reports can be found on the organisation‘s website.
IWC is reaching out to the shipping industry to develop guidance documents, and in 2014 recently IWC had a very fruitful collaboration with WWF and the Volvo Ocean Race (VOR), a global regatta.

SLIDE 14
This is one of the take-home-messages: *Reporting is essential.*
That‘s why the IWC has set up its global database on ship strikes, which went online in 2009, and which was modified, modernized and re-launched in 2015.
The database currently holds more than 1,200 incidents, both historical and recent, with numbers of reports increasing steadily. Please visit the IWC Website if you are searching for more information.
Most importantly: If you have witnessed a strike, if you found a dead animal with suspicious lesions, or if you were unlucky enough to have had a collision, go to the website and enter all the information you have. The database will guide you through the various questions in an interview style with an intuitive and interactive interface.

SLIDE 15
To summarize, here is what IWC recommends:

- Wherever possible, separate vessels from whales: A precondition will be the availability of sufficient data about abundance of cetaceans
- The *only* mitigation measure known to date to be effective in reducing numbers of ship strikes is *Speed reduction*
- On-board observers are important - but note the limitations that have been mentioned
- and to report collisions to the IWC data base

So if one would boil down this presentation into just two words, or, to phrase it differently:
If a whale would have a say, she would probably put it like this: (next slide)

SLIDE 16
”Slow down!”

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