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The Search for OIL SPILL DATA

One of the most significant drivers of changes in salvage methods, contracting, and operations is the greater attention that is being paid to oil pollution prevention in our oceans. The salvage industry (amongst many additional maritime stakeholders) can proudly point at significant progress in reducing the amount of oil that is being released into the oceans.

It is reasonably well established by The International Tanker Owners Pollution Federation (ITOPF) that the accidental release of oil into oceans from shipping has gone from 115 million gallons in 1970 to 2.25 million gallons in 2015[1], and this has been the general trend over time (see Figure 1).

The salvage industry also deals with offshore oil exploration and production accidents and, except for incidents such as Deepwater Horizon, the trends are good there too (although the actual data becomes a little more difficult to obtain or manage).

However, when one asks how much oil in total has been released and continues to be released into the oceans from all sources, the picture becomes quite a bit fuzzier. This article discusses what we know and what we do not know and makes note of an effort to obtain better data that will allow us to make better policy decisions with regard to oil pollution and ocean pollution in general.

The effort to establish the sources of oil inflow into the ocean started in the early 1970s, and the first formal attempt occurred when in 1973 the National Academy of Sciences formed a panel to make an estimate of the amount of oil that flowed into the oceans, resulting in a report titled *Petroleum in the Marine Environment.*

A more quantitative version of this report was later commissioned, and was published in 1985 and was called *Oil in the Sea: Inputs, Fates, and Effects.*

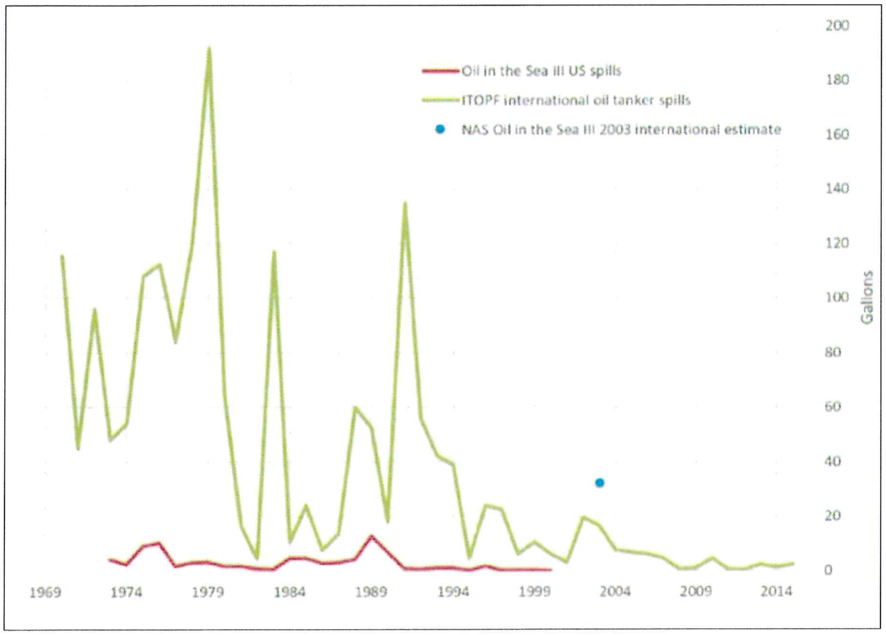
This study clearly acknowledged that the information needed to make any estimates at all was weak at best, and that the estimates needed to be regarded as estimates only.

Since that time, further research into the sources of oil into the ocean took place and in 2003 the National Academy of Sciences issued *Oil in the Sea III.* This was a very thorough paper (it would actually be better described as a book) and it provided estimates on various types of oil outflows into the seas.

When there is a lengthy paper (or book) there is an immediate urge to jump to the bottom line, and if one were jump to the bottom line on *Oil in the Sea III*, Figure 2 shows what would be the conclusion. The information in Figure 2 is interesting, but it is far from the truth. The paper itself carefully points out that there is very little data and the numbers shown are, at best, the averages of extremely wide ranging estimates by the National Academy of Sciences study committee. (see Figure 2).

On a technical and scientific level, it is valid to provide best possible estimates, but only within a certain level of accuracy does an estimate become useful. If one were to study the pie chart, and consider it to be reasonably true, one would immediately judge that ships (purple) and shipping spills (green) are pretty bad players. It indicates that the shipping community, by itself, causes more than three times the pollution than all the oil that runs off the shores (dark red). That certainly would be a significant cause for concern. However, closer investigation of the data in this 2003 report would indicate that this is a poor comparison, since the methodologies that were used to make estimates for accidental oil spills, normal ship operations and

Figure 1. Marine Transportaion Accidental Oil Spills



runoff from land sources are completely incompatible. In 2003 there was a reasonably good (but partial) record for big oil spills[2], but the normal ship operation pollution estimate was a blind assumption that simply assumed, without any data, that a certain percentage of ship operators pump oil over the side[3]. With regard to run off from land sources, there simply was no concise data, even though it made use of some existing US river water quality data.[4]

With proper caution the 2003 data could simply be assumed to be the state of the art and could be used very cautiously as a starting point for further investigation.

However, *Oil in the Sea III* had a very unusual impact. From the moment it was published, it became the bible of oil outflow and continues to be quoted in academic and non-academic literature. There has been substantial work in all categories of oil flows into the ocean since, but *Oil in the Sea III* is the only readily available consolidated set of data.

This has introduced inaccuracies to the public debate. For example the September 2014 issue of the US Navy Institute Proceedings had a one page article named "The Biggest Oil-Spill Culprit? Mother Nature".

This 2014 article quoted the 2003 summary data, and, from that, concluded that natural seepage (blue, 47%, in the Figure 2 pie chart) is the biggest oil pollution culprit[5]. The main point of the article may still be true, but since it republished the 2003 data, it very much misstated the latest data on transportation accidental spills and transportation normal operational data.

Based on the newest available data, it is almost certain that transportation accidental spill volumes are much smaller (maybe an order of magnitude smaller) and while we are still struggling with obtaining the best available normal operational data[6], there is little doubt that huge improvements have been made in that category too.

If the other categories remained steady (and are accurate), it can still be reasonably concluded that natural oil seepage is the worst culprit and today would be an even larger culprit in relative terms. Possibly, marine transportation is no longer a significant factor in ocean oil pollution. This is a dangerous statement since the effect on nature from natural oil spills is very different from accidental spills and non-point source pollution caused by shipping, but it still is valuable data in formulating public debate. Maybe the days of calling shipping the bad polluters of the ocean should be over and we, with continued vigilance by the marine industry on oil pollution, can declare a certain level of success and move on to the next big thing. Today, that may be carbon emissions or greater vigilance with regard to sewage treatment. Meanwhile, possibly, the oil pollution debate needs to

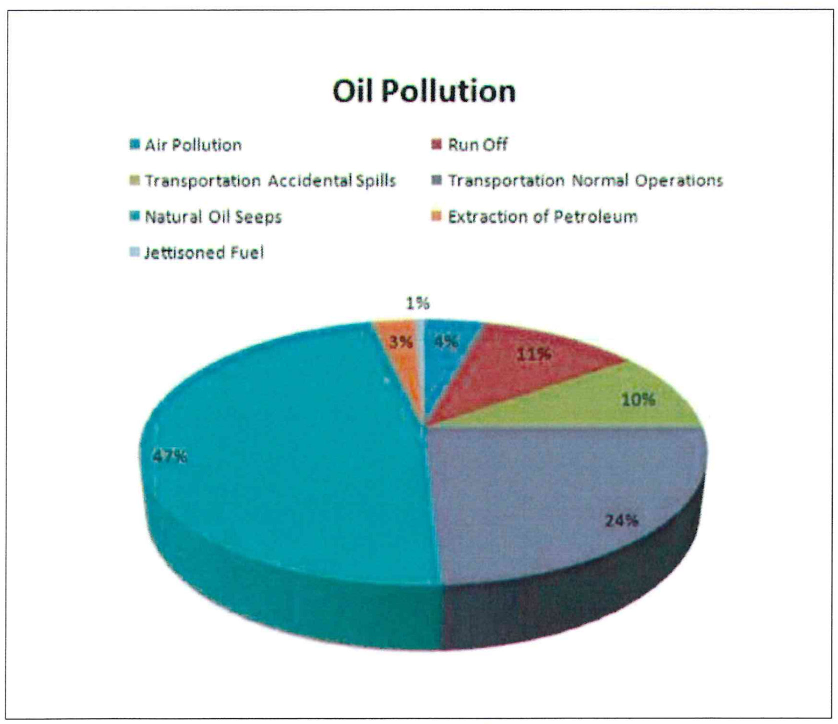


Figure 2. Oil in the Sea III Oil pollution summary (2003)

shift to land or to oil exploration (which as an industry successfully follows marine transportation processes, but has been less successful at preventing large spills).

Discussion of accidental oil spills automatically results in discussions about dispersant usage and it was a subject of discussion in *Oil in the Sea III*. Whether to use disperants is a complex issue that can be analyzed on a micro level or a macro level. The macro level analysis is easy. Reduce oil spills and, in the simplest terms, the need for dispersants becomes unnecessary, since it can be argued that nature will take care of any spills that, in volume, are much smaller than natural seepage. Even in very large oil spills, like the Deepwater Horizon spill[7], one could argue: Why bother with dispersants? Let the oil come to surface and deal with the mess even knowing that it will take a while. With that approach we do not have to try to figure out whether dispersants help or hurt. That is a macro discussion, but it does not invalidate the micro discussion: Could dispersants be beneficial in case of an oil spill? That is a complex question and has been the subject of a significant amount of research after the Deepwater Horizon spill.

Technical communication (rather than stale technical regurgitation) is a wonderful thing. After reading the 2014 US Navy Institute article (which I did not read until 2015), I asked an office intern to find the data source for the article and we discovered the issues described above.

I also discovered that I knew some of the people who worked on the 2003 *Oil in the Sea III* project and received further background information from them. This led me to contact the National Science Foundation and they told me that they too were uncomfortable with the status of this data and have brought it up in their review and update agenda. On April 15, the National Academy reviewed the subjects (oil pollution and dispersants) to decide what their next step will be.

This could result in a long and complex study and would result in an *Oil in the Sea IV*. Hopefully this will be a validation of our hard efforts in the last decade and longer. Until that time there will be no reliable quantitative data on ocean pollution, even in order of magnitude estimates, and, with regard to quantifying oil pollution in the oceans, we are groping in the dark.

FOOTNOTES

1 These are spills over 7 metric tons.

2 At the time *Oil in the Sea III* could not refer to international oil spill data because in 1999 international oil spills were not closely monitored. However, North American oil spills had been closely monitored for years and showed a very significant downward trend (with a big Exxon Valdez spike in 1989).

3 *Oil in the Sea III* does not provide any data, but, rather, provides an estimate based on an assumed percentage of vessels that did not comply with MARPOL regulations and then assumed a certain level of illegal discharge and multiplied it by the number of vessel in the world trade. This study arrived at a total discharge volume of 270,000 metric tons, with a range from 90,000 to 810,000 metric tons (an almost order of magnitude range estimate). The biggest proportion of this pollution is assumed to be caused by illegal discharge of fuel sludge.

4 This calculation starts with measured hydrocarbon loads in major US rivers by the EPA and then extends this estimate to the world. Remarkably this method provides a range of 6,800 to 5,000,000 tons per year and the paper provides a best estimate of 141,000 metric tons per year.

5 Estimating oil seep volumes inherently is a difficult thing to do. The *Oil in the Sea III* best estimate is 600,000 metric tons per year with an estimate range from 200,000 to 2,000,000 metric tons per year. That, again, is an order of magnitude estimate range.

6 See the MAX 1 study: http://www.martinottaway.com/technical-documents/MAX1-Studies

7 Deepwater Horizon occurred in 2010 and the volume spilled is reported at 668,000 metric tons. We cannot assume that there is a spill like this every year. Using the National Academy of Science method, taking this one oil spill and assuming it is the only North American exploration spill in a decade so, we divide it by 10, which results in 67,000 metric tons per year in North America. Using the NAS multiplier to convert to worldwide extraction spills (110,000/4,937) this would convert to 1,500,000 metric tons per year spilled due to extraction of petroleum. This is a very unlikely amount, since it indicates that there are more than two Deepwater Horizon spills each year in the world.