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To Remove or Not to Remove?

Dealing with pollution risks from ship wrecks

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ABSTRACT

The navigational and environmental risks posed by ship wrecks have presented a challenge to governments and the maritime industry for decades. In more recent years a consensus has developed worldwide based on assessing these risks and undertaking measures proportional to the severity of those risks. This approach has been formalised in the Nairobi International Convention on the Removal of Wrecks 2007.

With recent developments in salvage technology and equipment, the options for pollutant removal from wrecks, and the removal of entire wrecks, are becoming viable for scenarios which were previously deemed infeasible. Together with a general heightened environmental concern worldwide about impacts to the marine environment, decision-making on wreck removal and associated pollutants is under the spotlight.

Based on ITOPF's extensive experience providing advice on pollution mitigation and environmental risks posed by wrecks, this paper examines recent issues in the treatment of wrecks. The authors highlight some key concerns regarding the equitable treatment of wrecks and argue that a more rigorous, technically-based decision making process be adopted and promoted to ensure clarity and consistency for all parties.

INTRODUCTION

UNESCO estimated that there are over three million shipwrecks scattered on the ocean floor around the world (UNESCO, 2008), and a review in 2005 estimated that globally between 8,000 and 9,000 wrecks may be potentially polluting, with a staggering 2.5 – 20.4 million tonnes of oil remaining on the wrecks (Michel *et al*, 2005). While these wrecks have presented challenges to the maritime industry and government authorities for decades, even centuries, recent emphasis on enhanced navigation safety and environmental awareness amongst the maritime industry, governments and the wider public have brought the debate on wreck removal and the recovery of pollutants associated with them into the spotlight.

In parallel, recent developments in salvage technology and equipment have opened up viable operational options for wreck and pollutant removal in scenarios where such operations were previously deemed infeasible. However, challenging salvage conditions have led to significant increases in operational costs. Recent statistics published by International Salvage Union suggests that, although the number of cases where services were provided by the salvage industry remained relatively stable in the past 15 years, the gross revenue generated from wreck removal activities have increased drastically (ISU, 2015). The key factors contributing to the rising costs have been analysed in a recent report by Lloyds, and the analysis of the most expensive cases has found that the role of relevant authorities to be one of the key drivers of increasing costs (Herbert, 2013).

As noted above, the challenges posed by wrecks and associated pollutants have existed for many years and those involved with dealing with these cases (the salvage industry, pollution responders, government authorities and the wider maritime community) around the world have over time shared their ideas and lessons learned. Through this process, a consensus in approach to assessing and mitigating the risks posed by wrecks developed and was subsequently formalised within the Nairobi International Convention on the Removal of Wrecks (the Convention), which was adopted on 18th May and came into force on 14th April 2015.

The Convention clearly defines ship owners and their insurers' liability in removing a wreck that is considered hazardous and, at the same time, it provides a reference point to the definition of those factors that constitute a hazard, namely:

'any condition or threat that:

(a) poses a danger or impediment to navigation; or

(b) may reasonably be expected to result in major harmful consequences to the marine environment, or damage to the coastline or related interests of one or more States.'

In terms of addressing the measures to be taken to mitigate the risks presented by a wreck, a key principle of the Convention is that the measures taken by the affected state should be *proportionate* to the hazard.

In view of the potential hazards from wrecks and historical wrecks, many countries have recently developed comprehensive risk assessment systems to examine the wrecks in their national waters. For example, NOAA and USCG recently reviewed 20,000 shipwrecks in U.S. waters under the Remediation of Underwater Legacy Environmental Threats (RULET), project and identified that 87 wrecks may pose a substantial pollution threat. Further assessment of associated risks and salvage factors eventually identified 17 wrecks for which further pollutant removal operations were recommended (Symons et al, 2014). Similarly, the Norwegian Coastal Administration (NCA) reviewed more than 2,100 ship wrecks within its territorial waters (Bergstrøm, 2014). The wrecks were assessed according to their pollution potential, and 30 wrecks identified as high risk were monitored. Oil removal operations were organised on eight of these high risk wrecks.

The Convention is now in force in many countries (as of 24/11/2016, 33 contracting states) around the world and its underlying principles widely recognised within the wider maritime community. However, in ITOPF's extensive international experience of dealing with wrecks and the risks that they present, it is clear that there still exists some significant challenges to overcome for governments, the salvage industry and the maritime sector in applying the Convention's principles.

This paper presents an overview of ITOPF's recent experiences of wreck (and associated pollutants) removal, the application and interpretation of the Convention and the commonly encountered challenges of reaching consensus on the approaches to be taken when dealing with wrecks. It also highlights the differences in rationale behind the decision-making as to whether or not a removal operation is necessary.

REVIEW OF RECENT INCIDENTS

In collating the common themes from recent wreck removal incidents, the authors have reviewed details and key information from incidents involving sunken wrecks that ITOPF has been involved with since 2000. In order to provide a degree of consistency between the cases chosen, only incidents that occurred within the Exclusive Economic Zone (EEZ) and territorial waters of 'developed nations' were used. For ease of reference, 'developed nation' in this report refers to countries with a long established industrialised economy which are also recognised for their comprehensive legislative and enforcement system. For the time period selected this includes incidents in North America, Europe and three countries within the wider Asia Pacific region: Japan, Singapore, New Zealand, and South Africa. Further incidents that would qualify on the above criteria have occurred since 2000 but were not attended by ITOPF and the requisite details for discussion are unknown. The location, date of the incident and removal operations are detailed in Table 1.

Table 1: Details of 30 wrecks occurring in 'developed nations' (i.e. those with comprehensive, enforced legislative systems) that have occurred since 2000. Their relative hazard and removal operations are shown.

					WRECK REMOVAL	
Vessel name	Year	Territorial Waters	Water Depth (m)	Distance from shore (km)	Hazard to Shipping	Wreck removed?
SEA FRESH 1	2000	New Zealand	20	2.0	No	No
TREASURE	2000	South Africa	50	7.8	No	No
IEVOLI SUN	2000	France	70	15.6	No	No
BALU	2001	France / Spain	4600	170.0	No	No
KATSHESHUK	2002	Canada	180	11.0	No	No
CLIPPER CHEYENNE	2002	Ireland	5	0.0	Yes	Yes
PRESTIGE	2002	Spain	2000	240.0	No	No
TRICOLOR	2002	Belgium	2	34.0	Yes	Yes
SPABUNKER CUATRO (IV)	2003	Spain	50	0.2	Yes	Yes
FU SHAN HAI	2003	Denmark	69	5.9	No	No
MARINA IRIS	2003	Japan	74	9.6	No	No
ROCKNES	2004	Norway	0	0.2	Yes	Yes
BOW MARINER	2004	U.S.A.	78	87.0	No	No
BULK/HERACLES	2004	Sweden	0	13.3	No	No
HYUNDAI NO. 105	2004	Singapore	51	4.1	Yes	Yes
ECE	2006	France	44.5	60.0	No	No
SERVER	2007	Norway	22	0.0	No	Pending
SEA DIAMOND	2007	Greece	180	0.8	No	Pending
DON PEDRO	2007	Spain	45	2.3	No	No
NEW FLAME	2007	Gibraltar (U.K.)	30	0.4	Yes	Yes
TURGUT KOCABAS	2007	Turkey	65	0.5	No	No information
SHOVELMASTER	2008	Canada	144	38.0	No	No
LANGELAND	2009	Sweden	108	2.0	No	No information
RENA	2011	New Zealand	50	2.7	No	No
COSTA CONCORDIA	2012	Italy	0	0.0	Yes	Yes
ALFA I	2012	Greece	30	2.1	Yes	No
SMART	2012	South Africa	30	2.0	Yes	Yes
BALTIC ACE	2012	Netherlands	35	50.0	Yes	Yes
BEAGLE III	2014	Japan	92	7.9	No	No
EASTERN AMBER	2015	South Korea	120	85.0	No	Pending

Wreck Removal

Of the 30 cases reviewed for this paper, nine have to date involved wreck removal operations (it should be noted that some of the cases reviewed are still subject to on-going negotiations or legal action to determine their fate). Of the nine wrecks removed, either in part or entirely, all were considered hazards to navigation and located within shallow bays (a depth of less than 50 m), close to port structures, or within shipping lanes. Five were located immediately adjacent to the shore or alongside a port, one was located approximately 2 km from shore, and one was located approximately 4 km from shore. In the remaining two cases, TRICOLOR sank to a depth of just 30 m at a location where two major international shipping lanes of the English Channel and North Sea combine. The wreck (lying on her side) rose 32 m from the seabed and was considered by the authorities dealing with the case as a significant hazard to navigation. Similarly, BALTIC ACE sunk to lie on her side at a depth of 35 m at the entrance to Rotterdam Port. With a beam of 25 m, the wreck was also considered to be a significant hazard to navigation within one of the busiest shipping lanes in the world. The underlying principle for all nine of these cases in justifying a wreck removal was that the wrecks posed a significant, and in some cases serious, hazard to navigation and satisfied this criterion under the terms of the Convention.

Of the 30 cases reviewed, 16 wrecks were not removed. These include four wrecks which were located less than 3 km offshore. However, given the locations of these wrecks and the depth of the water in which they sank, they were not considered to pose a significant hazard to navigation nor did the physical structure of the wrecks or their contents pose a hazard to the environment, and hence have, to date, been left in place.

Pollutant Removal

Removal of pollutants within the wrecks was carried out in 20 of the 30 cases reviewed. Table 2 provides key information on the type and quantity of pollutants remaining on the wreck and whether or not the pollutant was observed to be leaking. It is also noted whether the wreck was designated an environmental hazard and whether a pollutant removal operation was undertaken. For a number of these cases it remains unclear whether all of the known pollutants (bunker fuels and/or cargo) on board the wrecks were removed in full or in part although it is known that the DON PEDRO wreck was thoroughly cleaned to provide a recreational dive site. The authors are also aware that in five cases, oil is known to have been released from the wreck over an extended period after hydrocarbon removal operations had been undertaken.

Of the 20 wrecks where pollutant removal operations were carried out, 15 were located relatively close (≤ 8km) to shore or a port. The remaining five wrecks included two chemical tankers that contained a significant amount of hazardous product remaining onboard after sinking. The first, the chemical tanker IEVOLI SUN sank in the English Channel 16 km from shore with substantial quantities of several chemicals remaining within her cargo tanks (reportedly 3,998 MT Styrene, 1,027 MT Methyl Ethyl Ketone and 996 MT Isopropyl Alcohol) in addition to her bunker fuels (180 MT Intermediate Fuel Oil (IFO 180) and 53 MT Marine Gas Oil (MGO)) (CEDRE, 2007). The second, the chemical tanker ECE, sank to a depth of 44 m in the English Channel with over 10,000 MT of phosphoric acid and around 70 MT IFO 180 bunker fuel oil onboard (CEDRE, 2006).

Four of the wrecks subject to pollutant removal were located offshore i.e. TRICOLOR 34 km, BALTIC ACE 50 km, PRESTIGE 240 km and EASTERN AMBER 85 km. In these cases, the rational for justifying the pollutant removal operations was the substantial quantities of oil remaining onboard the wrecks. The TRICOLOR wreck contained 2,000 MT fuel oil onboard, the BALTIC ACE wreck had 540 MT HFO onboard and the oil tanker PRESTIGE had an estimated minimum of 13,000 MT HFO remaining onboard after she had sunk. It is worth noting that after the oil removal operation, PRESTIGE was estimated to have approximately 700 MT HFO left in the aft section of the wreck (IOPC Funds, 2012).

Of the cases reviewed for this paper, pollutant removal was not undertaken in several instances. The chemical tanker BALU sank to a depth of 4,600 m some 170 km offshore, with an estimated 8,000 MT sulphuric acid onboard, along with an undetermined quantity of bunker fuel. Given the depth of the wreck and due to sulphuric acid being denser than seawater, it was considered that any release of the cargo would be rapidly diluted in the surrounding seawater by subsea currents. On this basis, the risk to the environment was assessed as low and therefore a cargo removal operation was not deemed necessary. Three wrecks, KATSHESHUK, MARINA IRIS and SHOVELMASTER, contained only limited amounts (<70 MT) of MGO or MDO onboard. MGO and MDO are, in most formulations, considered to be non-persistent oils (as defined by International Oil Pollution Funds FUND 92 Convention). These oil types would be expected to rapidly dissipate through the natural processes of dispersion (within the water column) and evaporation (for any oil reaching the sea surface). On this basis, the pollutants were not considered a sufficiently high risk to the environment to warrant the resources required to recover the pollutants from the wrecks. For two wrecks, HERAKLES and BULK, almost all of their bunker fuels were lost as a result of the collision damage, prior to sinking. The very limited quantities of oil assessed to be remaining on these wrecks were considered as unrecoverable.

In ITOPF’s experience, whilst pollutant removal can be planned for, it is not always necessary to complete the operation. This is illustrated by the case of the chemical tanker

BOW MARINER. The vessel sank as a result of a cargo tank explosion following tank cleaning operations, and came to lie at a depth of 80 m approximately 80 km off the coast of Virginia, USA. While most of the ethanol cargo was lost during the explosion and the sinking, the wreck was estimated to contain 720 MT HFO and 166 MT MDO (CEDRE, 2004). Given the considerable amount of HFO onboard, a bunker fuel removal operation was planned and an experienced salvage team was contracted to carry out the work. A detailed hot-tapping bunker removal plan using a remotely operated offloading system and a Remotely Operated Vehicle (ROV) was prepared, and permission to proceed was given by the US Coast Guard (USCG), along with State and Federal government authorities (Martin, 2004). However, after mobilisation of the salvage team, further ROV investigations inside the cargo tanks discovered that the segregating bulkheads had been destroyed and that no readily accessible oil remained within the fuel tanks (NOAA, 2013). Other tanks with smaller quantities of oil were considered to pose a low level of environmental risk and therefore no further intervention was deemed necessary by authorities. This decision was made on the basis that the remaining pollution risk posed by the wreck was not considered great enough to warrant such a complex, high risk and costly pollutant removal operation.

		POLLUTION				
Vessel name	Potential Pollutant	Pollutant Description	Estimated Amount in Wreck (m^3)	Pollutant Leaking?	Designated Environmental Hazard	Pollutant removed?
SEA FRESH 1	Bunker	MDO	60	No	Yes	Yes
TREASURE	Bunker	HFO	161	No	No	No - wreck sealed
IEVOLI SUN	Bunker / HNS	IFO / Styrene, Methyl Ethyl Ketone, Isopropyl Alcohol	160 / 6,000	No	Yes	Yes
BALU	HNS	Sulphuric Acid	4,348	No	No	No
KATSHESHUK	Bunker	MDO	430	Yes	No	No
CLIPPER CHEYENNE	Bunker	IFO / MDO	235	No	No	No - wreck sealed
PRESTIGE	Bunker / Cargo	HFO / HFO	14,343	Yes	No	Yes
TRICOLOR	Bunker	MFO / MDO	1,460	Unreported	No	Yes
SPABUNKER CUATRO (IV)	Cargo	IFO 180 / GO / MDO	725	Unreported	No	Yes
FU SHAN HAI	Bunker	IFO 380 / MDO	1,423	Unreported	No	Yes
MARINA IRIS	Bunker	MGO	50	Unreported	No	-
ROCKNES	Bunker	IFO 380 / MDO	344	Unreported	No	Yes
BOW MARINER	Bunker / HNS	MFO, MDO / Ethanol	0	No	No	No
BULK / HERACLES	Bunker	IFO 180 / MDO	6	Unreported	No	No
HYUNDAI NO. 105	Bunker	HFO	600	Unreported	No	Yes
ECE	Bunker / HNS	IFO 180, MDO / Phosphoric Acid	61	Yes	Yes	Yes
SERVER	Bunker	IFO 180	215	No	No	Yes
SEA DIAMOND	Bunker	HFO / MDO	274	Unreported	No	Yes
DON PEDRO	Bunker	IFO 180	100	No	No	Yes
NEW FLAME	Bunker	IFO 380 / MDO	600	No	No	Yes
TURGUT KOCABAS	Bunker	HFO	Unknown	Unreported	No	Yes
SHOVELMAS-TER	Bunker	MGO	69	Unreported	No	No
LANGELAND	Bunker	MGO / Lube	0	Unreported	No	Unknown
RENA	Bunker	HFO / MDO	1,500	Unreported	Yes	Yes
COSTA CONCORDIA	Bunker	HFO / MDO	2,930	Unreported	Yes	Yes
ALFA I	Bunker / Cargo	IFO 380 / IFO 180, MGO	1,954	Unreported	No	Yes
SMART	Bunker	HFO / MDO	1,898	No	No	Yes
BALTIC ACE	Bunker	HFO	540	Unreported	No	Yes
BEAGLE III	Bunker	HFO	360	Yes	No	Yes
EASTERN AMBER	Bunker	IFO 180	80	Yes	No	Pending

Table 2: Details of potential pollutants onboard 30 wrecked vessels and the salvage process.

CHALLENGES TO THE CONSENSUS APPROACH

The review of 30 recent cases above illustrates that the decision making on whether or not to remove a wreck and/or its associated pollutants is commonly based on the assessment of two key hazards; namely, the hazard posed to navigation and the hazard that the wreck and its pollutants pose to the local environmental and/or socio-economic sensitivities. Included within an assessment of these hazards would be a consideration of several factors including; distance of the wreck from shore, the depth of the wreck, the type and quantity of pollutant onboard and the accessibility of the pollutant for recovery.

Table 3: Criteria and key considerations for determining the fate of wrecked vessels and their onboard pollutants adopted by multiple agencies

FACTORS	CRITERIA	KEY CONSIDERATIONS
Location of the wreck	Proximity to important areas	Distance from shipping routes / port / tourist or residential areas / offshore installation, etc.
	Traffic density	Does the wreck affect shipping in this area
	Depth of the wreck	Is any part of the wreck above water surface at lowest astronomical tide or affect normal shipping?
Condition of the wreck	Construction	Likelihood of structural breakup and catastrophic release
	Integrity	Has the sinking or the events leading up to the sinking resulted in substantial damage to the integrity?
Pollutants onboard	Type of substance	Oil / HNS / others
	Quantity of the pollutant	Does the quantity of pollutant/s onboard pose a risk to the environment?
	Properties of the substance & behaviour upon release	Persistent / non-persistent oil; physicochemical properties, toxicity of the remaining HNS;
	Storage condition	Is a weakness in structural integrity likely to lead to a catastrophic pollutant release?
Ecological & Socio-economic sensitivities	Concentration of substance in water column above harmful threshold	Is the wreck location close to vulnerable resources e.g. important fish spawning sites / fishing grounds / marine protected areas / tourism centres?
	Trajectory of pollutant /potential to form large slick at surface	Will a pollutant release threaten important habitats for surface-dwelling marine life e.g. mammals/seabirds, or commercial activities e.g. shipping / fishing?
	Whether substance will come ashore and threaten shoreline resources	Have potentially 'at risk' areas been identified as important habitat for protected species / area slow to recover / bird or turtle nesting sites (in breeding season), or areas with important economic resources e.g. industrial water intake, aquaculture facilities, tourism centres?

Operational considerations	The feasibility, technical challenges and practical considerations for undertaking a wreck removal/reduction or pollutant recovery operation to be determined by salvage experts.

The criteria identified in Table 3 above are common to those criteria addressed in the Convention and the risk assessment approaches adopted by NOAA (NOAA, 2013) and European maritime countries (ICRAM & CEDRE, 2007).

Whilst the existence and widespread application of the technical criteria to assess the risks associated with wrecks and their pollutants should mean there is clear determination and agreement on their treatment, ITOPF's experience indicates that there are still significant challenges that exist to the consensus approach. The common theme with these challenges is the priority given to local factors over the underlying principles of the Convention and the international consensus approach, and a departure from strictly technical criteria. In the next section of the paper, the authors explore some of the recent challenges encountered.

Local Politics

Any incident response has the potential to be subject to political forces that can affect its outcome. For example, the refusal of safe harbour to the stricken oil tanker PRESTIGE by three European nations in 2002 arguably led to one of the largest oil spills in history. Whilst it is important that the interests and concerns of those potentially or directly affected by an incident should be addressed alongside purely technical considerations in the decision making process, a recent high profile incident demonstrated local politics leading operational practice potentially setting a difficult precedent.

In January 2012, the passenger liner COSTA CONCORDIA grounded on the island of Giglio in Italy and over the next two and a half years, the world followed the events on site as a large array of personnel and equipment were deployed to recover the bunker fuels and then stabilise, parbuckle, refloat and remove the wreck. This incident raised the profile of wrecks and their salvage with the wider general public and illustrated the potential, given sufficient financial resources, of undertaking hugely complex wreck removal operations.

The large majority of initial proposals for the removal of the wreck favoured cutting up the vessel in situ and removing the parts to a remote site for final disposal. The Italian Civil Protection Authority made it clear at a meeting of Giglio residents in February 2012 that the vessel would be refloated and removed whole. The islanders had argued passionately that the vessel should not be cut up in situ based on perceived concerns for the environment and potential reaction of those following the incident worldwide. It is widely recognised that, from a technical perspective, a salvage operation involving the cutting up of the vessel would have been the less complex, less costly and more speedily undertaken option. The authors are unaware of any report presenting a direct comparison of potential environmental impacts between the different options to the wreck removal.

The decision made by all parties involved with the case to remove the wreck would clearly be in accordance with international guidelines, however, the decision on the approach taken in this specific example is less clear cut. The final cost for the wreck removal was in excess of US$ 1 billion and, whilst it is arguable exactly how much quicker and more cost-effective an alternative approach may have been in achieving the same results, it is highly probable that the differences would be significant. This is just one of a number of examples of a wreck incident where local political and social concerns and priorities have dictated the approach taken to a wreck or pollutant removal operation. In ITOPF’s experience, this factor presents the greatest challenge worldwide to the technically-based, consensus approach to dealing with wrecks.

Continual Pollutant Releases

One of the most common scenarios that ITOPF encounters which challenges a purely technical approach to dealing with a wreck is that which involves a release of small quantities of pollutants over an extended time period; a ‘continual release’. In these cases, typically the wrecks:

- lie in deep water; are subject to strong tidal currents;
- may have suffered severe structural damage or the location of the bunker tanks is relatively inaccessible within the wreck preventing easy access to the pollutants;
- contain pollutants that may have spread into multiple pockets within the wreck structure, or;
- contain a relatively small total quantity of pollutants.

As a result, whilst a technical assessment of the requirements to remove the wreck or its associated pollutants at a given time point would indicate that there is no justification for wreck or pollutant removal operations, a wreck releasing pollutants over an extended period, particularly when these are visible on the sea surface, is likely to cause concern amongst coastal communities and authorities and lead to strong demands for action.

Amongst the cases reviewed by the authors for this paper, PRESTIGE and SEA DIAMOND are examples of wrecks which released pollutants over an extended period.

The single-hulled tanker PRESTIGE broke in two and sunk in November 2002, approximately 260 km west of Vigo, Spain. The vessel was carrying a cargo of 77,000 MT of heavy fuel oil of which an estimated 63,000 MT was estimated to have been spilled as the vessel broke up. The wreck settled on the seabed at a depth of 3,650 m and continued to leak oil at a slowly declining rate for the next two years. The Spanish government estimated that the wreck contained 13,800 MT of crude oil cargo and, as a result, ordered a cargo recovery operation. Over the course of five months in 2004, ROV-based operations succeeded in removing 13,100 MT of cargo at a cost in excess of €100 million but it was estimated that at least 700 MT of cargo oil remained unrecovered (O'Brien, 2010). Reports suggest the wreck has continued to intermittently release small quantities of cargo since the oil recovery operations but the origin of this oil, whether from untapped tanks or from small deposits trapped within the ship's infrastructure, remains unconfirmed.

In April 2007, the cruise ship SEA DIAMOND ran aground and sank off the Greek island of Santorini in 130 m of water. Early ROV surveys observed oil leaking from broken windows high up on the vessel, many decks above the fuel tanks. More than half of the total fuel reserves (approximately 300 MT) were released from the wreck within the first few weeks and these were collected as part of the initial response operation. However, the vessel continued to release small quantities of oil for many months and, in light of this situation, a sophisticated anchor system was put in place and an enclosure of boom was installed above the wreck. In 2009, a ROV-based bunker removal operation was undertaken which succeeded in recovering over 150 MT of oil from several natural collection points in the wreck (O'Brien, 2010). As of the end of 2016, small quantities of oil continues to be released and the boom enclosure with its daily maintenance regime remains in place.

Important differences exist between these two cases. The PRESTIGE wreck contained a large quantity of oil and lies in deep water, far from sensitive environmental or economic resources. The SEA DIAMOND wreck lies in relatively shallow water, close to shore but is not considered to have large 'pockets' of oil onboard. Although the natural beauty of Santorini is a major tourist attraction, the coastal environment is robust and has not been appreciably impacted by the continued oil release and scientific studies to date have not identified any adverse environmental effects. Despite these differences, in both cases there was strong local and national public opinion which demanded action by the authorities in removing the perceived risk posed by the continual release of oil despite the wrecks posing no hazard to navigation and, arguably, insufficient risk to the environment to justify pollutant removal operations.

Conflicts with National Law

The Convention, and similar principles for dealing with wrecks, have been incorporated into national law in an increasing number of countries and form the basis for legal judgements on the risks posed by a particular wreck and the justifiable measures that should be undertaken to mitigate those risks. However, this is not universal and therefore conflicts between national law and the principles of the Convention do occur.

In January 2007, the bulk carrier SERVER grounded off Fedje Island, Norway and split into two sections; the fore section was salvaged whilst the aft section sank and came to rest in 20 m of water within the boundaries of a bird sanctuary. The vessel had been carrying approximately 590 MT IFO180 and an estimated 70 MT diesel when she ran aground. As a result of the grounding and subsequent splitting of the vessel into two sections, an estimated 375 MT oil was released. It was estimated that 109 m^3 of IFO180 remained within the wreck after sinking. Oil removal operations were undertaken although little oil was found or recovered.

In assessing the fate of the wreck and the risks that it posed, the wreck was not considered a hazard to navigation. However, the Norwegian authorities considered that the fabric of the wreck itself and the materials within the wreck including; the hull coating (heavy metals), batteries and electrical systems, fire extinguishers, refrigerants, brominated fire retardants, micro-plastics and hydrocarbons were a significant environmental risk. As a result, an initial Wreck Removal order was imposed on the ship owner by the authorities and supported by the District and Appeal Courts. The legal situation was further complicated by a second wreck removal order citing that the wreck was unsightly, and legal proceedings are on-going.

This is the first case that ITOPF is aware of that, in simple terms, the 'components onboard' (rather than bunker fuel or cargo) have been cited as a sufficient hazard so as to justify the removal of an entire wreck. Environmental monitoring fieldwork at the site has, to date, detected no discernible impact on marine life in the vicinity of the wreck.

The potential costs, salvage challenges and risks to both the environmental and salvage personnel of a future wreck removal will be considerable. Whilst the identified environmental risks posed by the SERVER wreck would not justify its removal under the terms of the Convention, this is not the case under Norwegian law where, for this case, there is no requirement for the mitigating actions to be proportionate to the identified risks. The fate of the SERVER is still to be determined but this case illustrates the challenges that can be presented by national law to those tasked with assessing the requirements for a wreck removal.

CONCLUSIONS

Authorities in coastal states are facing increasing pressure to manage potential risks posed by wrecks and associated pollutants, either as hazards to navigation or for relevant environmental concerns. Given the inherent risks (both to the salvors and the environment) and cost implications of wreck salvage and pollutant recovery operations, it is vital that there is a clear consensus amongst all concerned parties on risk assessment and decision-making i.e. to leave a wreck in-situ, remove its pollutants or undertake a complete or partial wreck removal. A consensus, such as that underlying the Convention, promotes a co-operative approach and increases the likelihood of a successful outcome of any operations undertaken.

The importance of an established co-operative approach is heightened by increasing global interconnectivity and user generated media. Images and opinions produced by non-specialists can form the basis of public opinion more swiftly and easily than official information sources, which in turn, creates misinformed political pressure. This development has also blurred the lines of what would be traditionally considered a 'local' or 'international' matter, with social media enabling the public to highlight their concerns to a worldwide audience. This in turn can focus considerable political and media attention on to a relatively small-scale wreck incident and with this, pressure on those decision-making authorities.

Without consistent, universal application of technical arguments to manage wrecks, the precedent is set for politically motivated discussion. The danger with this approach is that each case will then undergo further subjective scrutiny leading to unnecessary risks for salvors, added expenditure for those paying for the operations together with increased vulnerability for coastal communities and the marine environment in countries with a high degree of legislative flexibility.

This paper has identified some key factors taken into consideration by coastal states around the world when making the decision to remove or not remove a wreck and/or its pollutants. A risk assessment on a wreck, and the pollutants within it, is typically carried out with regard to its significance as a navigational hazard and the potential hazard it poses to the environment. Together with the technical challenges and feasibility of a wreck and/or pollutant removal operation, a factor which was not addressed by the authors here, these three aspects form the technical foundation of the decision-making process. The case studies discussed in this paper have illustrated how these considerations are commonly challenged leading to uncertainty and a lack of clarity in the decision-making process.

Within the pressurised environment that is typically observed following a shipping incident and the creation of a new wreck, the authors consider it vital for all coastal states to have clear, technically-based, risk assessment procedures in place to help the authorities in charge to make this important ‘remove or not remove’ decision.

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