**5th Premiam Conference**

**Pollution Response in Emergencies: Marine Impact Assessment and Monitoring**

**Promoting best practice in an international context**

**22nd June 2020, Room E107/E108 RAI, Amsterdam**

**@Premiam_Spill**

**Abstracts:**

## Session 1: Developments & innovation in Post-spill Environmental Monitoring

### *Common challenges and opportunities for post-spill monitoring across multiple ecosystem receptors*

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Abstract:

Oil and chemical spills can have significant impacts across multiple ecosystem receptors including the benthos, marine mammals and marine birds; each of which has a key role in ecosystem functioning and health. Advancing our understanding of long-term impacts of spills across these environmental receptors and the development of relevant monitoring programmes is a key point for the achievement of clean, healthy, safe, productive, and biologically diverse waters post-spill. Identifying challenges and opportunities in post-spill monitoring across environmental receptors can have multiple benefits e.g., an advanced understanding of the impacts of human activities in the marine environment, and mitigation of those impacts. In this presentation we describe common challenges (e.g., limited knowledge of species spatial distribution) and opportunities (e.g., development of protocols facilitating data collection) for post-spill monitoring across multiple ecosystem receptors. Addressing the challenges and taking advantage of the opportunities described here will serve sustainable development in the marine environment by improving knowledge and capacities associated with the monitoring and overall management of oil and chemical spills.

***Interdisciplinary approach on the immediate effects of short-lived oil spills on marine microbial biota***

Corina Brussaard, NIOZ

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Abstract:

Marine environments are frequently exposed to oil spills as a result of transportation, oil drilling or fuel usage. Whereas large oil spills and their effects have been widely documented, more common and recurrent small spills typically escape attention. To fill this important gap in the assessment of oil-spill effects, we performed two independent supervised full sea releases of 5 cubic meter of crude oil, complemented by on-board mesocosm studies and sampling of accidentally encountered slicks. Using rapid on-board biological assays, we detect high bioavailability and toxicity of dissolved and dispersed oil within 24 h after the spills, occurring fairly deep (8 m) below the slicks. Selective decline of marine plankton is observed, equally relevant for early stages of larger spills. The study illustrates immediate effects of even a small spill.

## *Future application of marine autonomous systems – Linking response and environmental monitoring*

Rob Holland and Liam Harrington-Missin, OSRL

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Abstract:

OSRL have taken proactive steps to explore the use of marine autonomous systems (MAS) in spill response scenarios and firmly believe they will play a major role in years to come increasing efficiency, data transmission as well as driving down costs. MAS has potential in many aspects of surveillance, dispersant effectiveness monitoring and environmental assessment alongside other spill response operations. Exploring additional tools and services to add to the "response toolbox" remains at the core of OSRL's technical development activity and this presentation will present the work carried out to date by OSRL with a look to the future on MAS potential.

## *Assessing and monitoring the impacts of a hidden legacy of pollution from potentially polluting wrecks*

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Abstract:

There is a hidden legacy of World War shipwrecks at the bottom of our oceans. Numerous World War shipwrecks provide a rich maritime heritage and biodiverse habitats, acting as artificial reefs, supporting a variety of marine fauna and flora in maintaining and increasing biological productivity. However, many of these shipwrecks contain thousands of tonnes of pollutants which, if left unmanaged, threaten marine biodiversity, heritage sites, as well as the livelihoods of communities as they continue to deteriorate underwater. Urgent assessment is required to prioritise, evaluate, and manage these potentially polluting wrecks (PPW) towards safeguarding the aquatic ecosystems and the ecosystem goods and services they provide. However, estimating the likelihood of a wreck to release oil and the threat posed to marine receptors remains a challenge. Furthermore, removing oil from PPW is not always an available or achievable option for the large number of identified wrecks.

As such, a strategy is required to prioritise, evaluate and monitor the environmental risk of PPW, as well as mitigating the impacts of oil spills posed as a means of safeguarding marine ecosystems and the cultures and livelihoods of coastal communities.

The requirement to evaluate the threat of PPW has led to the development of a standardised risk assessment approach, to prioritise shipwrecks where intervention may be required, by assessing how likely a shipwreck is to release oil in the future. The risk assessment approach uses a 'likelihood of oil release assessment' scoring system where key criteria are assessed. The resultant risk score can be compared to hundreds of vessels and can consequently be quantitatively ranked with other shipwrecks.

Historical and scientific resources can be used to enhance our knowledge on shipwrecks and their associated pollution risks. Desk based methods, such as spill trajectory and fate modelling and remote sensing techniques, can be used to explore the potential risk of exposure if an oil spill was to occur. When coupled with sensitivity data this approach can provide an understanding of risk to the surrounding aquatic environment and the people who use it. Information to support the understanding of the current condition and structural integrity of a wreck can help ascertain the potential risk arising from the remaining pollutant(s) on board. The use of data/Information collected can help to fill knowledge gaps and can be used to prioritise wrecks which are of higher concern for management intervention (i.e. monitoring, remediation (removal of oil)). Furthermore, a range of monitoring techniques can be used to ascertain whether a wreck is actively leaking, identify any evidence of previous leaks contained within the seabed sediments around the wreck and the impacts on the surrounding ecosystem.

Each PPW is unique and will require its own management plan. Depending on the perceived level of risk, management measures can range from do nothing, initiating monitoring programmes to removing the remaining oil. The approach presented here can be used as a management tool for prioritising PPW, ensuring that resources are focussed on those PPW which pose the greatest risk.

## Session 2: Emerging Issues – implications for monitoring and impacts

### *Post spill monitoring and assessment: preparedness is key*

Suzanne Ware, Cefas

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Abstract:

Pollution incidents have a number of effects on the environment and economy. On a basic level, spills have the potential to damage marine habitats and associated animals and plants. In some cases, the outcomes of such events can also impact the infrastructure and economy of a particular area with the long-term effects being felt for decades. As such, it is in the interests of 'at risk' countries to invest in the necessary pre-incident preparedness planning to ensure sufficient skills and resources are available, and ready to respond effectively, should an incident occur. Here we will explore the key stages in preparedness planning with reference to a number of UK and international case studies.

## *Trends in Fuel & Cargo types – Very Low Sulphur Fuel Oils – Implications for impacts and monitoring*

Will Griffiths, IMO

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Abstract:

Since 2020, a new limit on the sulphur content in the fuel oil used on board ships has been in force. This new limit was made compulsory following an amendment to Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL) and is known as "IMO 2020".

The limit the sulphur in the fuel oil used on board ships operating outside designated emission control areas is now 0.50% m/m (mass by mass; a significant reduction from the previous limit of 3.5%). Within specific designated emission control areas, the limits were already stricter (0.10%).

The reduction in sulphur content of fuels results in a reduction in sulphur oxide (SOx) emissions which in turn has health and environmental benefits, particularly for populations living close to ports and coasts. Sulphur oxides are harmful to human health, causing respiratory, cardiovascular and lung disease. Once released in the atmosphere, SOx can also lead to acid rain, impacting crops, forests and aquatic species and contributes to the acidification of the oceans.

Before the entry into force of the new limit, most ships were using heavy fuel oil. Derived as a residue from crude oil distillation, heavy fuel oil had a much higher sulphur content which, following combustion in the engine, ended up in ships' emissions. Now, the vast majority of ships are using very low sulphur fuel oil (VLSFO) to comply with the new limit.

This presentation will outline the differences in Ultra-low sulphur fuel oil (ULSFO; max 0.10%) and Very-low sulphur fuel oil (VLSFO; max 0.50%). Although many of the low-sulphur fuels being developed by industry share similar compositions, there remain some differences between fuels that fall within these categories which can impact he fate and behaviour of oil in the case that it is released into the marine environment.

There have thankfully been few oil spill incidents involving fuels of these types, however this presentation will outline some of the research that has been conducted as to how the different oils may behave in the marine environment and the implications for response. One of the implications of the findings of the research to date, is that due to the characteristics of some types of ULSFO and VLSFO, traditional response options such as chemical dispersant application and at sea containment and recovery may be more challenging or less effective due to heavy viscosities and propensity to form oil in water emulsions. This may mean that shoreline impact may be more likely in the event of a oil spill incident of a fuel of one of these types. The implications for environmental monitoring are discussed and the presentation concludes that due to the ongoing changes among refineries to comply with the new regulations, it would be beneficial to introduce further characterization of the Low Sulphur Fuels that are coming on to market.

***Microplastics: Monitoring and Emergency Response***

Alex McGoran, Cefas

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Abstract:

Plastic is a ubiquitous, persistent pollutant and as large items break up into micro and nanoplastics, it has far reaching effects in ecosystems. It is estimated that 8 million pieces of plastic enter the ocean every day. Plastic can entangle and choke wildlife, can transport invasive species and pathogens across oceans and can be ingested by plankton to cetaceans. In addition to leaking into the environment through traditional waste streams, preproduction plastic pellets and plastic products can be released during large spills. Large spills often have fatal effects for local wildlife and can result in plastic being dispersed more widely. Currently, background plastic concentrations are missing from many areas, resulting in difficulty measuring the impacts of spills and determining when clean-ups activities can conclude. Spills highlight the importance of ongoing monitoring of plastic pollution, both on a macro and micro scale.

The present talk will explore plastic spills, using X-Press Pearl Sri-Lanka as a case study; microplastic monitoring in the UK; and microplastic ingestion and accumulation, using the Thames Estuary food web as an example.

***Back to the Future: Examining the History of Oil Spills to Anticipate What Lies Ahead***

Gary Shigenaka – NOAA

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Abstract:

The history of oil spills is a somewhat obscure and rarely visited subject—until, that is, a spill of magnitude or consequence occurs. During those times, spill comparisons in the media and among responders and scientists become both popular and relevant to help forecast what the potential impacts and their duration might be.

Oil spill history is something of a niche category within the history of oil itself; and especially in the early days of oil production, was considered to be a "cost of doing business". As a result, documentation of what would now be viewed as significant environmental calamities in the form of large oil releases was not often well-documented.

It was the production and transportation of increasingly larger volumes of crude oil or refined products—and the inevitable accidents that followed—that began to define what we today consider to be oil spill incidents and their cleanup. Although the term "oil spill" is somewhat subjective, there is little evidence that it even existed as a concept before the utility of petroleum was discovered and efforts to find and collect the material grew widespread. Early descriptions of large uncontrolled releases of oil into the environment appeared in the latter half of the 1800s with transportation accidents on or near rivers, and with uncontrolled well blowouts. The first accounts of large marine oil spills coincided with the transport of petroleum in tank vessels in the early 1900s.

Besides providing interesting bits of trivia for self-professed "oil spill nerds" (such as the author), is there value in unearthing and documenting episodes of oil spill history? There is a well-known quip by veteran American oil spill responder, Dr. Jacqueline Michel: "I've never been to the same oil spill twice"—meaning, each incident is unique, with its own challenges, impacts, and recovery trajectories. Nevertheless, knowledge of what has transpired previously, with similar oils, habitats, or circumstances, can help the public, scientists, and the response community define expectations of how a given incident will unfold. At the very least, looking back can help us become smarter as we look ahead.

## Session 3: The International Context

### *Common challenges faced in implementing effective environmental monitoring: an international perspective*

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Abstract:

In the first 30 years since ITOPF's foundation in 1968, industry and governments sought to strengthen their collective ability to respond effectively to spills through a combination of economic, organisational and technical measures. These efforts continue to this day, however in recent decades much greater emphasis has been placed on deepening our understanding of the environmental impacts of spills. This is demonstrated by the fact that environmental monitoring following acute pollution events, such as those from significant shipping incidents, is now mandated by law in numerous jurisdictions.

As a consequence, the number of spills following which environmental monitoring is conducted is increasing, as are the number of tools and methods to quantify impacts and inform decision-making around reinstatement. While the availability of these techniques and the expertise to utilise them is growing internationally, seamless, prompt and effective post-spill monitoring remains elusive in many cases. This is why ITOPF remains a strong advocate for initiatives like PREMIAM, which offer a much-needed framework to bridge these gaps.

In regard to accidental ship-source pollution, many of these challenges stem from the uncertainty surrounding the specific circumstances of an incident. Whereas the nature of pollution from fixed land-based or marine installations is in many cases fairly predictable, shipping incidents present a much greater degree of confounding variability. For example, the source, timing and location of the pollution incident cannot be accurately predicted; neither can the nature, persistence or trajectory of the pollutant itself. By extension, the likelihood of exposure and consequential impact of environmental receptors is similarly unclear. As a result of the interplay between these factors, the breadth of expertise among the scientific and response community needs to suitably wide and organisationally agile to overcome this uncertainty.

Drawing from ITOPF's experience of attending ship-source incidents internationally, this talk will explore some of the above challenges faced by the scientific and response community in implementing effective post-spill monitoring campaigns.

***Integration of post-incident monitoring and impact assessment into spill management systems - an international perspective***

Peter Taylor and Rob Cox – IPIECA

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Abstract:

Post-incident monitoring activities are an important component of most, if not all incident responses, and notwithstanding the fact that they are often a regulatory requirement, in the initial stages of an oil spill they are of critical importance in evaluating the spill situation, confirming the source(s) of the oil, gathering and applying pre-impact baseline data, evaluating response options and developing a response plan. As the response progresses, post-incident monitoring activities also help to evaluate the effectiveness of a response plan, determine the extent and severity of ecological and economic impacts, evaluate the recovery of affected resources, and determine appropriate restoration actions. At some point, monitoring data will be useful in presenting a scientifically valid case for terminating the initial "active" response phase and potentially moving to a longer-term monitoring and sampling programme focused on restoration and recovery, if required. The above is true for any incident management system worldwide which has, or should have, post-incident activities incorporated within them, although the way this is done will vary depending on the jurisdiction and the national response system.

It is cautioned that if environmental monitoring is not considered and integrated within the incident management system, there is a likelihood that it will not achieve its necessary objectives. Implementation of a monitoring programme will need logistics and resources, which may also be under demand from other aspects of the response operations. Embedding the monitoring function in the system ensures it is given proper consideration.

In *"integration of post-incident monitoring and impact assessment into spill management systems - an international perspective"* we evaluate the potential to internationalise the Premiam post-incident guidelines – which are excellent for a UK audience - for an international audience over a range of Incident Management Systems from a Single Command system (usually for a small incident) through Coordinated Command to Unified Command (the system commonly used for large incidents in the United States for example). In each case there are subtle differences in how the post-incident monitoring system will be "plugged in" to the default Incident Management System and as a consequence how we might adapt the UK guidelines for an international audience. This includes alignment with the International Maritime Organization Publication "Implementation of an Incident Management System (IMS)" document I581E.

Embedding the monitoring function in a coordinated or unified command structure also mitigates the risk and inefficiencies of duplicative or even adversarial monitoring programmes being established at the same incident – one by the polluter and one by the regulators or authorities. Having published and credible guidance, as represented by Premiam, can provide a basis for both 'sides' to agree a coordinated programme

We raise the question as to whether Premiam can be expanded beyond temperate habitats to serve a wider international audience. Finally, we provide an example of Oil Spill Monitoring Good Practice from the IPIECA-IOGP Technical Support Document on this topic which could be used to provide additional granularity as the Premiam Guidelines are adapted for international use.

## *The UK as Part of International Post Spill Emergency Response – The Role of Defra International Programmes*

Suzanne Ware, Cefas

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Abstract:

In recent years, the UK has been requested to offer technical expertise, as part of the international offer of assistance, to support emergency response for a number of significant pollution events. A number of current Defra led international programmes, supported by the Blue Planet Fund, enable more proactive and rapid support through formal inclusion as part of the programme remit. This presentation will provide an overview of how this works in practice.

## *The Wakashio an example of the potential of Tier 3 Scientific Support and Monitoring*

Matthew Sommerville – Spectrum Spill Services

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Abstract:

Anyone involved in incident response will be familiar with Tiered Response and its use in contingency plans, exercises and incidents. However, plans and exercises often focussed on the physical response resources and less so to mobilising support for the longer-term activities and those bodies who will carry them out.

While past public and media expectations were satisfied by reports on lengths of booms, tonnes recovered the more discerning now demand verifiable facts from scientists and independent sources they inform them about the impacts and longer-term effects and how these are to be monitored.

The Wakashio oil spill provides a potential example of the value of more planning related to these less visible
capabilities and to Scientific Support and Monitoring.

On 25th July 2020 the Bulk Carrier Wakashio found herself, as other ships have as a result of a human error, hard aground in an environmentally sensitive site on the south coast of the island of Mauritius. On the 6th of August, the world had its first Low Sulphur Fuel Oil spill in what had been at one time the home of the Dodo.

Mauritius had a national oil spill contingency plan, resources and access to external regional support but 2020 was not like other years with a global pandemic, lock downs and huge restrictions on the ability to move people and equipment. Therefore, it was a significant step for the government to ask for Tier 3 assistance from the UN and other nations and for those offering support to take on the challenge of moving to Mauritius.

Beyond the physical containment and oil recovery, in which the civil society player a key role, the government of Mauritius was via its own departments, bodies and agencies able to mobilise to monitor, measure and report on aspects of the environmental impacts. These bodies however were nor resources to meet the demands of an incident, to coordinate activities and to communicate rapidly technical and scientific information to the press and public.

This was not a new issue and following the Sea Empress oil spills in 1996 lessons learned in the UK had led to the development of **Premiam** (**P**ollution **R**esponse in **E**mergencies: **M**arine **I**mpact **A**ssessment and **M**onitoring).

It was fortunate then within the many offers of support to Mauritius the government of the UK included CEFAS scientists familiar with Premiam and able to help coordinate and support the work already in progress, help eliminate duplicated efforts and support communications between diverse groups and out to civil society. As outside scientists they were perceived as independent of the Mauritius government or specific departments interests and able to broker compromises rapidly while as scientists were able to interpret and present the information being gather by others. These issues may have been resolved in time, but the external support allowed a faster transition, fresh minds not work down by the first weeks of intense activity to facilitate the coordinated, planned and collaborative monitoring and reporting needed.

In the Wakashio that required capability came forward in good time and was welcomed by the national bodies but had such external Tier 3 scientific support and monitor should have been better represented and included in the contingency plans and could have deployment sooner.

They have learned the lesson what about you plans what's included?