BLUE WATERS

Newsletter

On Marine Environment Protection

Biannual | Jan 2016 | Vol XVII Issue 1

A Publication of the Indian Coast Guard

From the Director General's Desk

It is indeed heartening to note that there has been no major oil pollution incident in Indian waters over the past months. The Coast Guard, however, continues in its relentless pursuit of measures for the protection and preservation of the marine environment.

The Coast Guard has significantly strengthened its oil spill response capability with the commissioning of *ICGS Samudra Pavak*, the third in the series of indigenously built Pollution Control Vessels. The oil pollution response inventory onboard *Samudra Pavak* includes state-of-the-art Hi Sprint booms, River booms, Weir Skimmer, Disc and Brush skimmer, Side Sweeping arm system, Side spill spray system, Aerial Spray System, Inflatable barges, Hydraulic drum compactor, ORO system and Dispersant tank which will hold 10 tons of dispersant at all times. We may be rest assured that *ICGS Samudra Pavak* will play a key role in the fulfillment of its national mandate during any oil spill contingency.

I can proudly say that besides commissioning the pollution control vessel, the Indian Coast Guard continues to augment its inventory to which, in the recent past, it has added ocean boom, near-shore boom, oil skimmers, dispersant spray systems, etc. As Chairman NOSDCP, I sincerely hope that all stakeholders too will continue to augment their individual tier-1 capability.

I am also happy to note that nearly twenty thousand volunteers across all the coastal states participated in the International Coastal Cleanup day, coordinated by the Coast Guard on 19 Sep 2015 as a part of "*Swachh Bharat Abhiyaan*", under the aegis of the South Asia Co-operative Environment Programme.

Recognizing the importance of maintaining the NOSDCP which guides all our actions for oil pollution preparedness and response updated at all times, we have issued Amendment No.2 into the Jan 16 revised NOSDCP 2015. A notable feature of the amendment is the inclusion of the Indian Council of Agricultural Research as a resource agency under the NOSDCP. To supplement the national plan, Chairman NOSDCP Circulars have been issued from time to time. The prompt response and positive feedback on the Circulars is particularly encouraging.

Two other initiatives expected to fructify shortly also merit a mention. We have made a proposal to the INCOIS for developing a *Fishing Avoidance Zone* advisory to fishermen, which will be an integration of the existing *Online Oil Spill Advisory* and *Potential Fishing Zone* advisory and are working closely with the INCOIS for its development. Secondly, the revised edition of the Coast Guard website is slated for release on 01 February 2016 and will, notably, serve as a single point repository and tool for management of all oil pollution contingency plans. All stakeholders are requested to comply with Chairman NOSDCP Circular, which will be issued upon its launch.

I am confident that, with frequent interaction and cooperation amongst the stakeholders, we will be able to achieve much better results in our collective endeavour for sustainable development of our marine environment and attain enhanced levels of operational readiness, duly supported by legal powers to ensure total marine environmental security in Indian waters.

"Jai Hind".

(HCS Bisht)
Vice Admiral
Director General
Indian Coast Guard

01 Feb 16
New Delhi

Editorial

Publication of the Blue Waters is a continuing effort on part of the Coast Guard to keep our community apprised of developments on the national front and the international arena. It also serves to inform the stakeholders of our collective efforts to strengthen capacity and capability for marine oil spill response.

This issue of Blue Waters lends assuring perspectives on the strengths of stakeholders to the national plan. The highlights are a very lucid write-up on sub-sea well capping capabilities of the ONGC, role of the Mangrove Society of India in the protection of mangroves, the critical support provided by INCOIS through its online oil spill trajectory prediction system and valuable contribution of CMFRI.

Two other articles discuss conservation of marine living resources under the law of the sea convention and elucidate the principles of compensating economic losses in marine pollution incidents.

The events section covers the SACEP regional workshop at Colombo at which India made a proactive contribution to the review of the Regional Contingency Plan besides conduct of International Coastal Cleanup Day.

India Watch ponders on the causes of mass stranding of whales on the Thoothukudi coast. The efforts of the District Administration, in particular the District Forest Officer who tirelessly worked over three days to save over seventy of the hundred fifty odd stranded whales are truly laudable.

We thank all contributors to this edition of "Blue Waters" and solicit continued cooperation for enhancing commitment of the newsletter to marine environment protection.

Happy reading!

(AA Hebbar)
DIG
Principal Director (FE)

CONTENTS

ARTICLES

Rescue operation of Pilot Whales 3
Sub-sea Well Capping: Experiences of India and Challenges Ahead 4
Oil Spills in Mangroves 7
Oil Spill Trajectory Prediction System 10
Marine Fisheries : Experiences and Expectations 12
Conservation of Marine Living Resources under LOSC 1982 : An Indian Perspective 15
Principles on Compensating Economic Losses in Marine Pollution Incidents 16

EVENTS

SACEP Regional Training and Exercise at Colombo 18
International Coastal Cleanup Day 2015 18
Operation Olivia 2015-16 19

NEWS

IMO - International Seabed Authority : Agreement of Co-operation 20
Marine geoengineering Study 20
Gas and low-flashpoint fuels code adopted 20
Project of low-carbon maritime future launched in Singapore 21
United Nations adopts Sustainable Development Goals 22

REPORTS

INDIA WATCH

Mass Stranding of Pilot Whales in Thoothukudi 22

WORLD WATCH

M.V. Flinterstar Oil Spill 25
M.V. Global Gold Oil Spill 25
Oil Spill at Bayonne, U.S. 26
BP evacuated Valhall Field 26

INFORMATION

Annual Calender of Pollution Response Training and Exercises: 2016 27

Website : www.indiancoastguard.nic.in

ARTICLES

Rescue Operation of Pilot Whales

*Deepak Bilgi, IFS**

It was at around 9.00 PM on 11.01.2016 that the news of whales stranding on the beaches of Kallamozhi and Manapad villages in Tuticorin District was received by Forest officials.

Fig 1. Mass Stranded Whales

The Forest Guard of Tuticorin Range, Gulf of Mannar Marine National Park was alerted immediately of the incident to inspect the area and report the fact of the information received. The Forest Guard along with a few Anti-poaching Watchers (who were stationed at Tuticorin around 70 Km away) rushed to the spot immediately. Around 11.30 PM, they informed me that the stranded fish were bigger than Dolphins and smaller than whales. However, it was for sure that the species of concern would find a place under the protected species under the Wildlife Protection Act, 1972. The Forest Guard was instructed that, additional Anti-poaching Watchers may be required and the live animals stranded on the sandy beach should be pulled back to the sea. The prime intention was to keep the stranded wild animals under water, so that the body temperature of the animals could be maintained and they survive until complete rescue operation could be launched. Meanwhile, District Collector of Tuticorin was alerted so as to get the required help from the Coast Guard and the Fisheries Departments.

The staffs, who had rushed to the spot just to know the facts of stranding, had to remain at the site and keep on the rescue operations because of the reason that most of fishes were alive and were struggling to survive. Any time lost would have resulted in precious lives lost. The staffs at the site were not prepared with any equipment except the vehicle, for their mobility. The fishes were pushed back into the sea and made to remain within the water. By the mid night of 11.01.2016, they had pushed around 10 animals into the sea. The exercise continued in the morning of 12.01.2016, by which many more animals were pushed back into the sea. However, the animals which were pushed into the sea waters were not responding well; they were struggling to swim on their own, against the wave action in the deep sea waters. Realizing the fact that many whales were not responding, it was decided to further pull back the animal deep into sea waters, to a distance where there was less wave action, so that they could stabilize and start swimming back to deep waters on

Fig 2. Fishermen Helping in Rescue Operation

* *Wildlife Warden, Mannar Marine National Park, Ramanathapuram*

their own. The staffs, who had just rushed to the spot, had no equipment with them. The assistance from the fishermen had to be sought. Local fishermen spared their boats and ropes to pull the animal deep into the water. The animals were tied by their caudal fin and pulled deeper into the sea beyond the wave actions. By the end of 12.01.2016, around 36 whales were rescued and around 45 were found dead.

The area of Manapad is characterized by the presence of a small lagoon and the animals which were pushed far away from the beach but nearer to the lagoon were pushed into it, so that they could be within waters. These were later taken into deep waters during the subsequent high tide through the mouth of the lagoon.

It was actually a knee jerk reaction to the incident and we, from the forest department were poorly equipped during the emergency operation. We didn't have our own boats at the location, had no sufficient ropes, belts etc, to launch a full-fledged operation. We had to rely on the facilities available with the fishermen, especially for boats and ropes. The authorities of the Gulf of Mannar Marine National Park have their operational presence only upto Tuticorin and not down south. The current location was 70 Km away and posed difficulties in organizing the timely logistic support. The high power boats that could operate at shallow depth of sea waters, was lacking at the rescue site. Also, the strength of the rescue team was inadequate; with only 12-15 no. of watchers against the need of at least 25-30 people in the rescue team, so that they could work on rotation. Though the fishermen supported later in the rescue operation but it was not possible to retain them for the entire day. After the rescue operation, it was felt that any support from the communities could only be for a short and immediate period and will not last when the operation prolongs beyond 4-6 hrs since they start engaging themselves in their routine livelihood work. We actually had pinned hopes of greater support from the Coast Guard and their boats, but it was in vain, since we realized later that their boats could not operate in shallow waters.

Fig 3. Animal being pushed & retained in water

To summarize to the experiences of the incident and the rescue operation, it is evident that any operation of rescue in coastal and marine environments needs large number of people in rescue team. Limited numbers of rescue people soon get fatigued and their energy needs to be replenished frequently. During such operations, there needs to be a back up team for assistance, along with all support systems. Such large scale rescue operation definitely needs a well coordinated support from various line departments like, Fisheries, Fire & Rescue, Local Bodies, Revenue and Police departments.

Subsea Well Capping: Experiences of India and Challenges Ahead

*Sanjay Bhatt**

Introduction to Subsea well capping

A "capping stack" is a piece of equipment that is placed over the blowing well as a "cap." Its purpose is to stop or redirect the flow of hydrocarbons and to gain time for engineers to permanently seal the well. Subsea capping stack is a massive equipment and can weigh as much as 50 to 100 tons. The basic operational need of the stack is to attach and seal on a well during a

* *Head, Regional Crisis Management Team, ONGC, Mumbai*

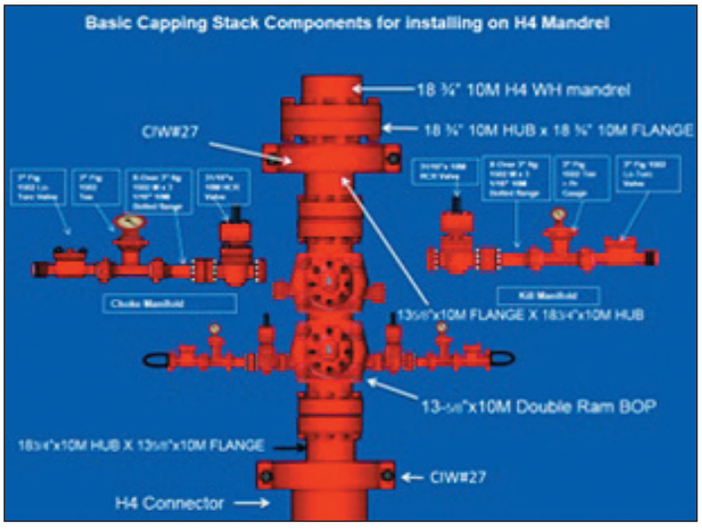

Fig 4. Basic capping Stack Components

blowout and shut the well safely. To achieve this, first a mandrel or hub profile must be exposed (either at the wellhead or on top of the BOP or on top of subsea tree). During installation of capping stack in deep water on a high flow rate blowout well, the stack is positioned over the plume and when it approaches the wellhead interface, a water post-effect occurs allowing stability and centralization of the stack in relation to the wellhead. Water post-effect, as explained above can be understood by Bernoulli's principle.

The design of capping stack is decided after thoroughly visual inspection and analysing the inputs of blowing well. In a subsea blowout, dynamically positioned support vessel equipped with work class remotely operated vehicle (ROV) plays a vital role in mitigation of blowout. Based on ROV inspection of the blowing seabed site engineers zero in on precisely what equipment is needed. Every blowout is unique and each blowout scenario has to be analysed to determine what will handle the flow best.

While preparing capping stack and finalising on deployment technique, other operations like debris removal, arrangements for containment of oil spill, etc are also taken up simultaneously. Various methods can be adopted to lower the capping stack on a blowing well like on a wire, off the side of the vessel using a heave compensated crane or from the stem of an anchor handling vessel using the A-frame or from to drill rig using a drill pipe. The capping stack is installed on the well bore and interconnected using connector and additional subsea equipment. The process of containing the well starts either by shutting or by diverting the flow depending on type, volume and pressure of the well.

All controls on the stack to operate the connector, BOPs, valves etc. are hydraulically operated by ROV stab or operated by ROV torque tool. Once all gate valves on the outlets and the BOP are shut in, the well is considered capped. It is an industry-recommended practice that two barriers exist between hydrocarbons and the environment. Once the well is capped further decision on killing and plugged abandonment of the well by various methods are followed on case to case basis.

India's experience

In India only one subsea blow out has occurred till date viz. in one of the well G-1-9 located 15 km from the Amalapuram Coast in KG Offshore Basin in Bay of Bengal, at water depth of 252m in August 2012. On 8th August 2012, an ONGC drillship reported continuous foam forming 1.5 nm south from her anchored location, nearby OSV in the field also reported gas bubbles coming from under the sea creating a big bubble plume. A helicopter survey was carried out and area of gas / water plume was reported approximate 500m in diameter. ROV survey of the field was also carried out

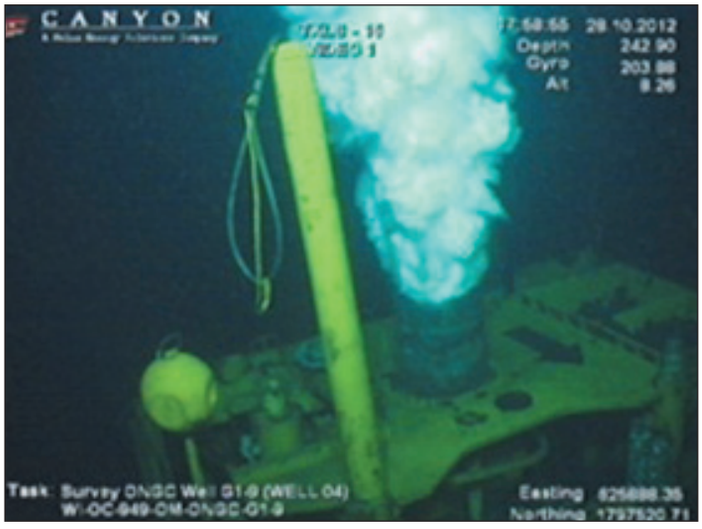

Fig 5. G-1-9 Subsea Blowout

and it was found well G-1-9 in East coast area of ONGC is Blowing Gas from well head hub of horizontal subsea X-mas tree. The probable cause of blowout was failure of retrievable bridge plugs used for temporary abandonment of the well.

To cap the blowing well, a capping stack was designed indigenously using in-house available equipment by ONGC's crisis management team. 6.8 m high and 4 m wide structure weighing 35MT was assembled at the company owned MSV Samudra Sevak having a robust 100MT crane. The capping stack was assembled using a 13 inch double Ram BOP interconnecting H4 connector at bottom and H4 mandrel on top by various change over spools and

Fig 6. Capping Stack

hub clamps. The outer frame was designed as a guide for subsea tree guide post and allowing smooth landing of H4 connector on mandrel of subsea tree. Hydraulic piston and cylinders were part of frame for soft landing.

The capping stack was shifted by crane on winches of two DP offshore supply vessels. Two work class ROV were used to position capping stack on blowing well. SIMOPS and Capping Execution was done using two ROV vessels and 5 DP vessels including capping stack carrier vessels. Lowering operation was done during favorable sea conditions.

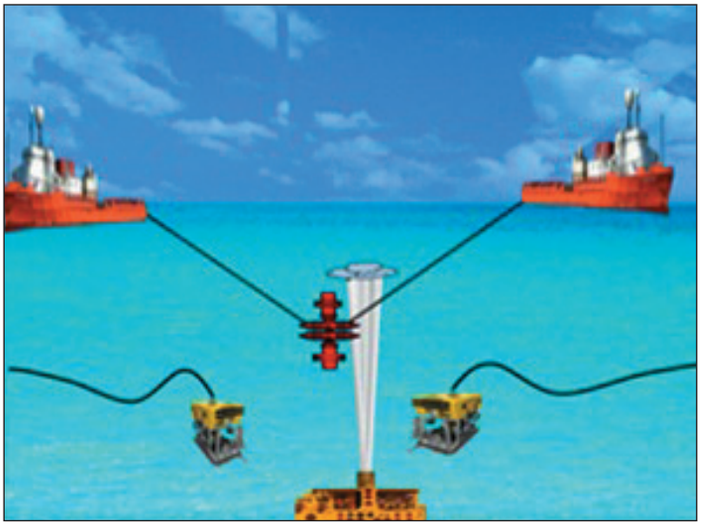

Fig 7. Max use of standard existing vessels and equipment

India's national capability

The decision making process, Capping Stack design and lowering strategy paved the way for the successful and incident-free execution of a Subsea Capping operation in the blowing gas well in the Bay of Bengal. The three and half month project employed a DP II ROV Vessel with two 150 HP work class Remotely Operated Vehicle (ROV), DP anchor handling boats and diving vessel to successfully lower a 35 Ton uniquely fabricated subsea capping stack having modified surface BOP for safely abandonment of the well in 250 m of water depth.

ONGC's Crisis Management Team and Subsea

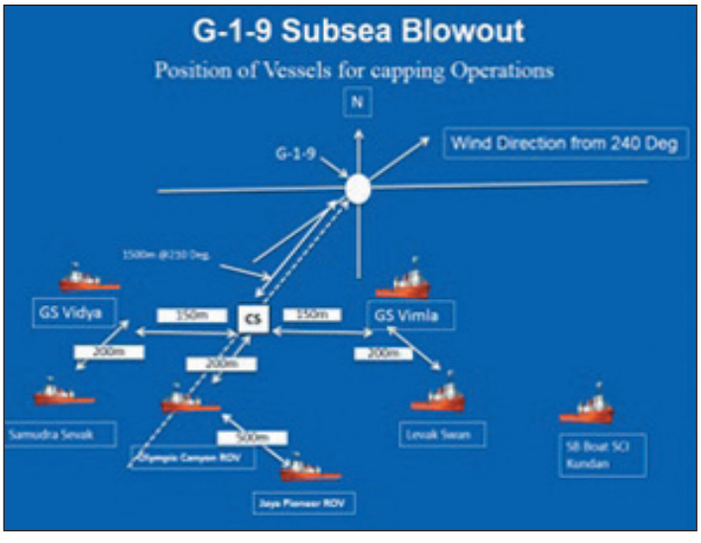

Fig 8. Position of Vessels for Capping Operations

engineers conceptualised the Sub Sea Capping operations utilizing resources available within ONGC. Parallel action was also initiated to have contingency in place. The objective was to cap the blowing well as soon as possible to avoid any potential HSE issue considering oil reservoir below gas zone and vulnerable sea conditions in Bay of Bengal.

The industry's first unparalleled subsea capping operation was successfully executed addressing numerous technical challenges in designing capping stack using surface BOP, lowering methodology & execution and finally abandonment of the subsea well, while averting any potential catastrophic HSE incident.

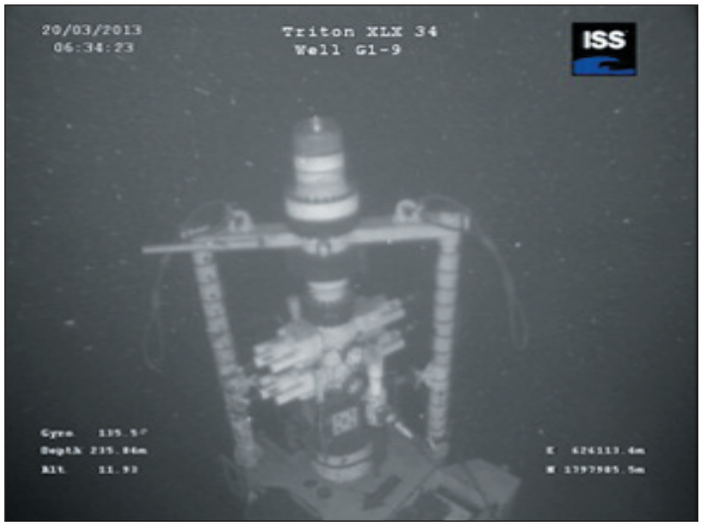

Fig 9. Triton XLX 34 Well G-1-9

The complexity of the operation was underscored with the designing, fabrication and lowering of an unprecedented subsea capping operation with the resources available within country. Practically, a ROV friendly Subsea capping stack was fabricated to perform all the functions including connectivity from surface to extend kill and choke lines for killing from surface.

ONGC is having dedicated crisis management team for handling any well control and blowout control operation. Capping operation in blowing oil/gas well is not new to Indian industry. In onland and offshore surface operation dozens of capping operation on blowing wells have been performed successfully by the ONGC crisis management team. This team provides services to private operators as well.

Challenges Ahead

In Indian E&P sector, production from subsea well has started recently and very few subsea producing wells are in operation. Resources like DP II ROV Vessel with work class Remotely Operated Vehicle (ROV) are not readily available, although vessel can be hired from south Asian countries. However, mobilisation time of the ROV, have so ever short, could be an ever of concern.

Since each blowout is unique in type and nature, a particular equipment used for capping a well may not be suitable for the next blowout. The capping stack and its lowering methodology has to be designed after thoroughly analysing the incident. As the subsea drilling industry in India continues to evolve, ONGC's Crisis Management Team is geared and keeps it resources ready to handle any offshore oil and gas industry's emergency situation.

Oil Spills in Mangroves

*Arvind G. Untawale & Narayan B Bhosle **

What is a Mangrove?

Mangroves are trees and shrubs that inhabit coastal intertidal zone of tropical and sub-tropical environments. These plants survive the variable flooding and salinity stress conditions imposed by the coastal environment. Mangroves are widely spread along the Indian coastline. Largest mangrove formation is located in the Gangetic Sunderbans of West Bengal along the east coast of India. Andaman and Nicobar group of Islands and deltaic areas of Mahanadi, Godavari, Krishna, Pichavaram and Muthupet on the east coast also account for large formation of mangroves. In contrast, coastal areas of Gujarat, Maharashtra, Goa, Karnataka, and Kerala along the west coast of India have limited formation of mangroves.

Why are mangroves important?

Located along the coastline, mangroves play a very important role in soil formation, shoreline protection, and

** Mangrove Society of India, Mapusa, Goa*

Fig 10. On December 12, three days after a cargo vessel collided with a tanker, oil reaches mangrove environment and coats mangrove trees in the Sundarbans region of Bangladesh causing extensive damage to the trees (From National Geographic, 2014)

stabilization. Mangroves absorb and reduce the impacts of the strong winds, tides, and floods thereby protecting uplands from more severe damage. Mangrove environment is highly productive and provides both habitat and food for a diverse biological community that inhabits both the forest interior and the adjacent coastal waters. Some animals depend on the mangrove environment during their entire lives while others utilize mangroves only during specific life stages, usually reproductive and juvenile stages. Tropical mangrove forests are carbon-rich, and play important role in carbon sequestration. The total global mangrove above-ground biomass is about 2,83 billion tones. It is estimated that these mangrove forests bury 31–34 million tons of carbon per year. Mangroves are also an attractive tourist destination mostly because of the birds and crocodiles that inhabit these forests. As mangroves inhabit coastal areas, they are subjected to several pollutants including oil spills. Oil is transported from one place to other using sea routes. During transport oil tankers may involve in accidents releasing oil in the environment. Spilled oil can damage mangrove ecosystems.

Oil Toxicity and Effects on Mangroves

Oil is a complex mixture of many kinds of chemicals. Oils released into the environment are subjected to weathering processes that immediately alter its original physical and chemical characteristics. Lighter oils are more acutely toxic to mangroves than are heavier oils. Increased weathering generally lowers oil toxicity.

Mangroves are highly susceptible to oil exposure. Oiling may kill them within a few weeks to several months. Oil-impacted mangroves may show yellowed and curled leaves, defoliation, and failed biological processes. Other responses include branching of pneumatophores, interference in salt exchange, germination failure, decreased canopy cover, increased rate of mutation, and sensitivity to other stresses. Mangrove-associated invertebrates and plants recover more quickly from oiling than do the mangroves themselves. Under severe oiling conditions, mangrove impacts may continue for years to decades, resulting in permanent habitat loss.

Mangrove Community Impacts

In extreme cases a massive die-off of plants and animals attached to the mangrove roots will follow the initial release of oil spill. Five years after the spill, epibiotic bivalves will reduce in oiled areas compared to unoiled reference areas. After 29 years, oysters and snails in the oiled site will decline. Residual oil remaining on mangrove sediments will increase the ambient soil temperatures affecting germination and growth of plants. Decomposition of the mangrove root mass following large-scale mortality will cause significant erosion. Even if oiling does not result in tree death, the surviving trees can become weakened and vulnerable to drought, flooding, and storms.

Oil Spill Response and Cleanup Options for Oiled Mangroves

The objective of spill response is to minimize the damage caused by the released oil to mangroves. Mechanical recovery of spilled oil using booms and skimmers is the initial clean up technique. Dispersant application or *in situ* burning of oil on water may significantly reduce the risk of oil reaching mangroves. If mangrove shorelines are oiled, extreme caution must

be exercised in selecting cleanup activities. In some cases it is appropriate to do nothing. Response techniques including passive collection, flushing, and use of barriers, chemical cleaners, and addition of nutrients can be used to remove oil from mangrove environments.

Indian Scenario

Over 50 oil spills have been reported in Indian waters. Fortunately, these oil spills have not impacted Indian mangroves to any great extent. However, on December 9, 2014 an oil tanker *Southern Star VII* collided with a cargo vessel and released about 350,000 litres of furnace oil in the Sunderbans, Bangladesh which is a UNESCO World Heritage site located about 100 kilometers from Kolkata Port. By December 17, the oil had spread over a 350 km^2 area affecting protected mangroves. The spill caused extensive damage to mangroves and other biological communities. This event caused great concern in India. The oil spill, however, did not reach Indian part of the Sunderbans.

Fig 11. Cleanup oiled mangroves off Sikka and Sarmat

Mangrove Society of India

The mangroves South of India (MSI) is a registered NGO. Its members and network are spread throughout the Indian coastal belt. The society acts as a watchdog for mangrove wellbeing. It arranges various programs and publishes literature to create awareness about mangroves and their importance in protecting and maintaining our environment. In the event of oil spills MSI can help in assessing the damage to the oiled mangroves and suggest some remedial measures to restore mangroves.

P.S. The MSI has been incorporated as a resource agency for oil spill preparedness and response in the revised NOSDCP 2015.

The Sunderbans National Park, West Bengal

*Dy Comdt Sumit Rawat **

Spread over 2,585 sq.km, the Sunderbans National Park in West Bengal, is the world's biggest estuarine mangrove forest delta and declared a UNESCO World Heritage site in 1987. The park is home to a wide variety of plant life in addition to an amazing variety of wildlife. Endangered species like Olive Ridley turtles, Gangetic Dolphins, the fishing cat, River Terrapin, etc. find a home here. The park is known as the main habitat of the endangered Royal Bengal tiger too which number more than 200. The Tiger Reserve is undoubtedly the most popular draw in Sunderbans National Park. The tigers have adapted themselves to the unique eco-system of the region and are excellent swimmers who eat fish. Jungle cats, wild boars, rhesus monkeys, fishing cats, chitals, dolphins, snakes, king cobras and estuarine crocodiles are some of the inhabitants of the park. Crocodiles are bred at Crocodile Sanctuary at Bhagabatpur. The Sajnekhali Bird Sanctuary, home to birds such as spotted-billed pelicans, white ibis, eagles, ospreys, falcons, Caspian terns and open-billed herons, to name a few. A Mangrove Interpretation Centre helps to create awareness about the need for conservation of forests and marine life.

Fig 12. Royal Bengal Tiger being released in the Sunderbans

** Commanding Officer, ICGS C-149*

Further Reading

1. Dhargalkar, V.K., R. D'Souza, D. P. Kavlekar, A. G. Untawale. 2014. Mangroves of Goa. Published by Department of Forest, Govt. of Goa

2. NOAA. 2014. Oil spills in Mangroves: Planning and response consideration. Available at: http://www.noaa.gov/features/climate/sealevelchanges.html

Oil Spill Trajectory Prediction System

*S.J. Prasad, T.M. Balakrishnan Nair, P.A. Francis & S.S.C Shenoi **

Introduction

At the heart of the oil spill trajectory prediction system is the GNOME trajectory model. Details of the oil spilled, location, date and time of the spill, quantity and type of oil spilled are provided as inputs to the model. The forcing parameters which cause movement/drift of the pollutant parcel are, predicted wind forcing & current forcing. These forcings obtained from the Ocean State Forecast Laboratory of INCOIS are used to drive the GNOME model. To get the overall movement the *u* (east-west) and *v* (north-south) velocity components from currents, wind and other movers are added together at each time-step, *i*, using a forward Euler scheme. The generated trajectory is layered on a Web map, so that the nearby zones that are likely to be affected are known. Various case studies were executed for oil spill incidents that occurred after 2010 and the predictions were compared with the observation of oil slicks obtained from radar datasets.

High Resolution Trajectory Prediction for the West Coast

ESSO-INCOIS has set up a High resolution Operational Ocean Forecast and reanalysis System (HOOFS) of resolution 1/48º for the west coast of India. Ocean currents from HOOFS are used for forcing GNOME. The m.v. Rak Carrier sank on 04 Aug 2011 due to water ingress. Oil spill was reported from 05 Aug 2011 till 16 Aug 2011. GNOME was forced with ocean currents of 1/8º and 1/48º. The predicted oil spill trajectories were compared with the oil spill signature obtained from ENVISAT- ASAR data on 09 Aug 2011. The predicted trajectory obtained while forcing with 1/48º ocean currents was found to be more accurate

* *Indian National Centre for Ocean Information Services, ESSO-MoES, Hyderabad.*

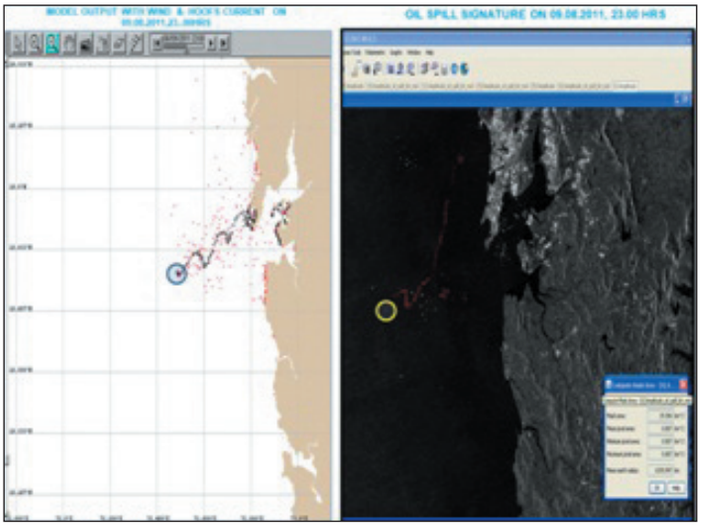

Fig 13. Trajectory with High resolution currents (Left) Oil slick from ENVISAT - ASAR data (Right)

i.e has followed the path of the observed oil slick, than the trajectory obtained while forcing with 1/8º currents. Figure 13 shows the trajectory with high resolution currents and the oil spill signature from ENVISAT data. Figure 14 shows the comparison between the predicted and observed trajectory.

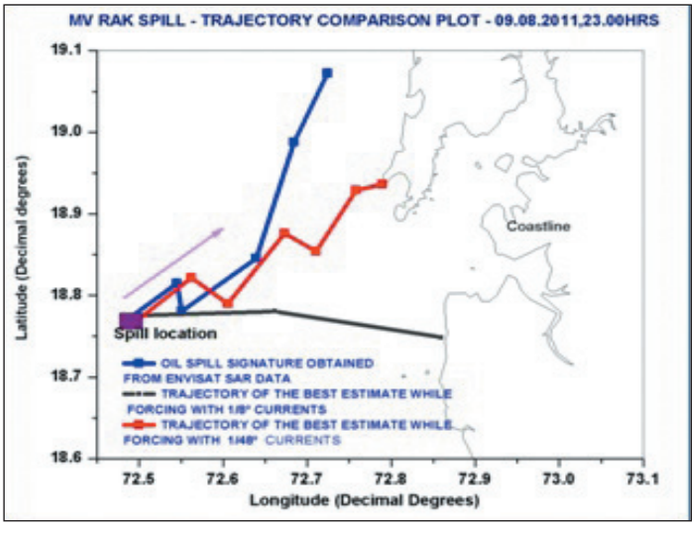

Fig 14. Comparison between the predicted and observed trajectory of MV Rak spill, Aug 2011

Advisory issued to Indian Coast Guard during Exercise "Pradhushan-2015"

A level -II pollution response exercise was conducted at Mumbai from 15 Oct 2015 to 16 Oct 2015. Table top exercise and deployment of pollution response equipment was also conducted, assuming a hypothetical

oil spill incident from an oil tanker which was anchored at 19.25º N, 72.3830º E on 15 Oct 2015, 0600 hrs. Oil spill trajectory prediction was requested by Coast Guard for deploying the pollution response equipment against the oil drift. The predicted oil spill trajectory was disseminated from INCOIS to Coast Guard Region (West) on 14 Oct 2015. The deployment of the pollution response equipments were carried out accordingly. Figure 15 shows the predicted oil spill trajectory during the exercise - Pradhusan 2015.

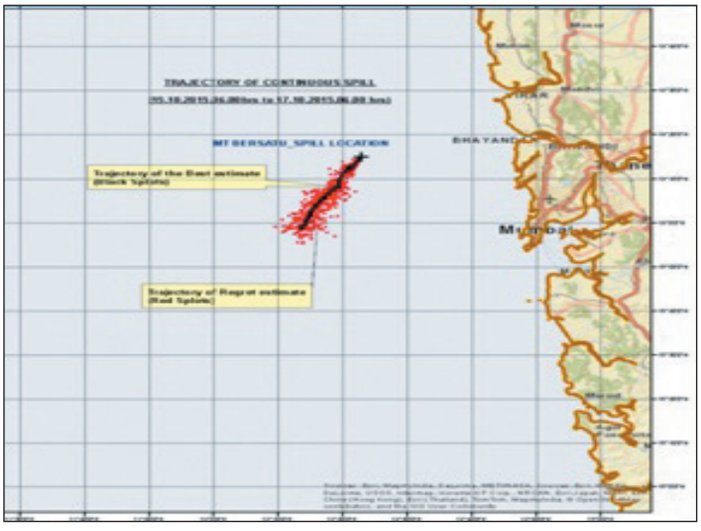

Fig 15. Trajectory issued during EXERCISE "PRADHUSHAN-2015"

Online version of the Oil Spill Trajectory Prediction System

Setting up a local model, soon after an oil spill will be typically difficult. In order to trigger the trajectory model during emergency situations, the diagnostic mode of GNOME is operationalised. This Online Oil Spill Advisory (OOSA) system will be triggered automatically when the user submits the details of the spill through a web interface. OOSA enables the user to obtain the trajectory without interacting with INCOIS officials. This set up is capable of predicting the trajectory for both continuous and instantaneous spills. The trajectory of the pollutants such as gasoline, kerosene/jet fuels, diesel, fuel oil No. 4, medium crude, and fuel oil No. 6 can be predicted by OOSA. The generated trajectory will be layered

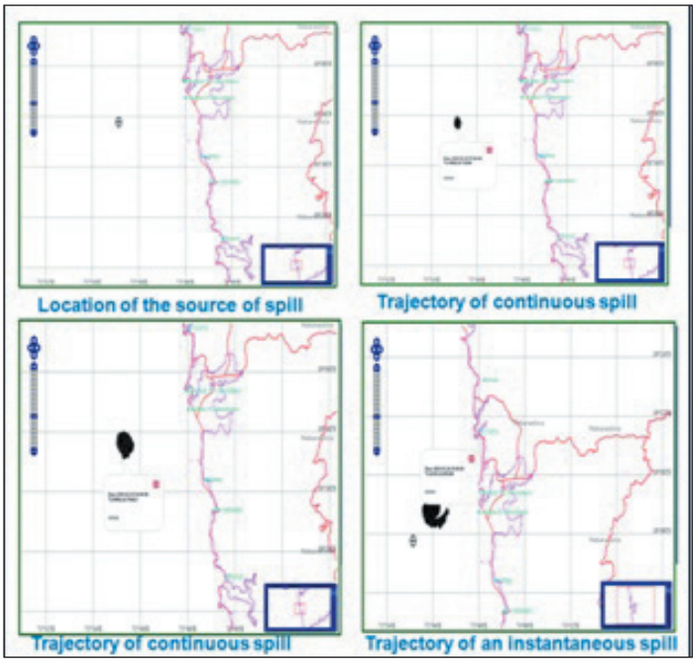

Fig 16. Snapshots of the Online Oil Spill Advisory executions

automatically on a Web GIS map, so that the nearby zones that are likely to get affected are known. A country-wide table top exercise is being carried out with this online oil spill advisory (OOSA) tool from May 2015 vide Chairman NOSDCP Circular No. 03/2015 dated 01 May 15. This tool can be used for oil spill response, mock drills and contingency planning. OOSA is available at http://115.113.76.60/OilSpill/Login.jsp. Figure 16 shows the snapshots of OOSA executions.

Future advancements in our Prediction System

Trajectory predictions from a drifting source, trajectory prediction along the line source are successfully executed experimentally and will be made available online within a couple of months. The Coast Guard proposal for integration of the PFZ (Potential Fishing Zone) and OOSA to generate a FAZ (Fishing Avoidance Zone) in the oil spill advisory is being progressed. Validations are proposed with the help of Surface Velocity Profile (SVP) drifters from M/s. Pacific Gyre, USA. The drifters will be deployed during the forthcoming National Pollution Response Exercise

(NATPOLREX) conducted by Indian Coast Guard. The track obtained from SVP drifters will be compared with the trajectory obtained from the model executions. Figure 17 shows an SVP -Drifter. Advancements made in our system will be updated in the NOSDCP meetings periodically.

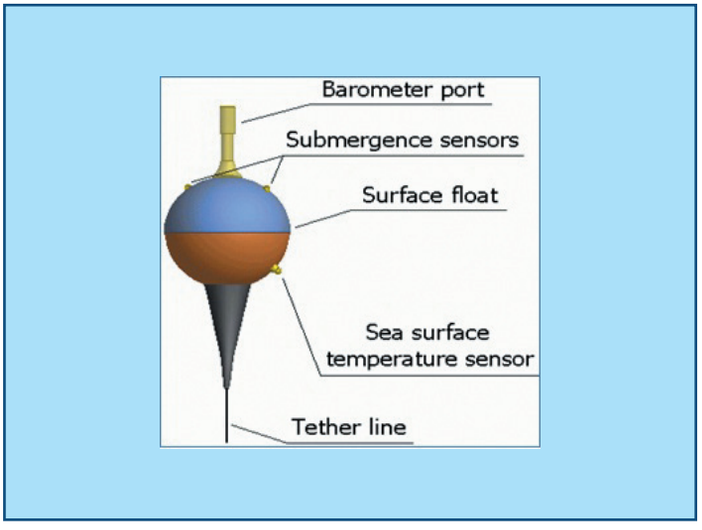

Fig 17. SVP drifter

Marine Fishers : Experiences and Expectations

*Dr. Gopalakrishnan A. & Grinson George**

India is the second largest producer of fish in the world, contributing to 5.68% of global fish production. India accounts for 2.5% of the global fish market and the fisheries sector is a source of livelihood for over 1.44 crore people. During the 11th five year plan, the fisheries sector contributed 1.1% to the GDP. Contribution to agricultural GDP in the year 2014-15 was 5.3%.Total production during 2013-14 is at 9.58 Million Metric Tonnes (MMT), (Marine- 3.44 MMT and Inland- 6.14 MMT). Overall growth in fish production in 2013-14 was 5.9% (Marine- 3.7% and Inland- 7.3%). Fisheries is one of the major forex earners with revenue reaching Rs.18,856 crore in 2012-13, accounting for about 18% of agricultural exports. During 2013-14 the volume of fish and fish products exported was 9.8 lakh tones, worth Rs.30213.26 crores. The sector began playing a vital role in the Indian economy through its consistent contributions to the GDP, besides becoming a vital source of livelihood for about four million people including 1.6 million active fishermen. Indian marine fisheries research sector is catering to the needs of a variety of stakeholders. These stakeholders include fishermen; mariculture farmers; seafood exporters, wholesalers, retailers and vendors in domestic marketing; self-help groups; developmental department for fisheries in 9 maritime states and 4 UT's; Department of Animal Husbandry Dairying and Fisheries; financial institutions; researchers and academicians; policy planners; conservationists and all associated fraternities contributing to the better cause of marine fisheries in the country. The Central Marine Fisheries Research Institute (CMFRI) established in 1947 has been foraying into the research and development activities in marine fisheries sector supporting all these stakeholders in different capacities directly or indirectly. This article is looking into our past experiences, futuristic plans and research support provided to these stakeholders.

Over a period of time, the marine fisheries sector of the country changed tremendously. The fishing fleet became larger and more energy-intensive, and the catch and trade of marine fishes increased substantially. However, conflicts in sharing the limited resources intensified within and with other sectors and this, in turn, had high economic, social and environmental costs. In 'business-as-usual' scenario, fish catches in the tropics are expected to decline, and since most of the seafood comes from wild capture, such a situation will be detrimental to our food security. We have to change this situation by reducing our dependence on wild capture and instead, promote mariculture.

Mariculture, the farming and husbandry of marine plants and animals in the marine environment, is the fastest growing subsector of aquaculture. Over a period of time, the proportion of production from coastal and marine aquaculture should be aimed at 40% and in terms of value, at 70%. Any planned sectoral development needs appropriate policies, legislations

* *Central Marine Fisheries Research Institute (CMFRI)*

and acts. As the existing policies are inadequate to meet the anticipated challenges in the sector, it is important to develop effective new policies. In the case of mariculture, as it is an emerging sector, there is need for developing leasing policies and other regulations.

However, the current operating environment in marine fisheries is focused on short-term profits and livelihood instead of long-term sustainability and profitability. This 'business' environment is harmful to the oceans, fishermen, traders, consumers, and the coastal communities. Fishermen need predictable and stable access to fisheries and a flexible management regime that allows them to improve their financial security while safeguarding the invaluable marine ecosystems. India being very rich in marine biodiversity, there are opportunities for providing monetary benefits to the coastal communities through benefit sharing from biodiversity conservation. The profit should motivate the community to conserve biodiversity. A consortium of biodiversity conservationists, biotechnologists and communities will change the operating environment of the sector from solely fishery dependent activities to "earning from biodiversity conservation".

Fig 18. Open Sea cage fish farming

On the down side, increasing marginalization or even complete disappearance of traditional fishing communities and small-scale fishermen is likely. The changes in species composition, distribution and abundance of fish stocks due to climate change impacts are likely to alter the fishing types, costs and benefits. As these changes will be beneficial to larger boats with greater mobility, small-scale fishermen may find fishing unviable. With the anticipated addition of Marine Protected Areas, marine sanctuaries and no-fishing zones, a large number of fishing communities are likely to be displaced. As a result, we are likely to see an outflow of skilled human labour (fishing communities) seeking a non-risky and sustainable livelihood option and inflow of un-skilled migrant labourers from non-coastal States into marine fisheries. Increased mechanization and correspondingly increased dependence on fossil fuels will occur. Thus the operating environment in the capture fisheries sector would see an increasing cost of fishing coupled with scarcity of skilled manpower. Consequently, the government agencies will have to either increase financial flow or attract funds in to the sector to meet the requirements (labour, capital and infrastructure) of the transformed industrialized marine fishing sector.

Along with all the changes in the capture fisheries sector, a progressive shift towards fish farming is also anticipated to change the operating environment. Development of an entirely new set of technological interventions and infrastructure such as state-of-the-art hatcheries, feed mills and ancillary facilities will be seen with changes in the entrepreneurship, trade and societal responses. All the changes envisaged in the operating environment will result in a broader scale of operation with change in the composition of stakeholders. The anticipated open trade of fish and fish products will add another dimension to the sector which warrants an increase in India's competitiveness and bargaining power in international trade.

Until the time seed production techniques are standardized, Capture-based Aquaculture (CBA) or the practice of collecting seed material from the wild is an option to address seed scarcity for mariculture. Large-

scale collection and conditioning of wild collected seed and establishment of seed banks are urgently required. This will facilitate the farmers and entrepreneurs to get the required seed. On a global level, marine ornamental fish trade has emerged as a multi-million dollar enterprise. Establishment of small-scale ornamental fish hatcheries can lead to income generation for rural communities.

An overhaul of the domestic fish marketing system is envisaged for better returns to the fishermen and continued economic viability of the sector. A Sophisticated Market intelligence and Information System using a combination of real time data and ICT needs to be established. A domestic fish marketing grid will help the fishers to receive the maximum share of consumer's rupee. The advanced market intelligence system ensured by the fish marketing grid will pave the way for profitable vertical and horizontal market integration.

The fisher's households do not get a sustained income throughout the year due to various factors such as closed seasons, natural calamities such as cyclones and other related factors, which affect their livelihood seriously. Hence, a supporting income through any alternate livelihood options (ALO's) is very much essential. Mariculture or sea cage farming including sea weed farming, repairing of crafts and gears are a few areas of ALO's which have proved successful. The ALO's will be successful only when it is linked with sustained market potential. Biodiversity conservation and the benefits arising out of that such as mariculture of non-conventional species (sponges, holothurians, gastropods etc.) could be developed as an alternate livelihood option for affected coastal communities. Bio prospecting from the marine ecosystems on a public-private partnership with active involvement of local communities is also another viable option. Developing successful rehabilitation models for launching any capital intensive labour displacement (alternate livelihood) is also essential.

Research institutions, governments and non-governmental organizations looking for achieving the vision of *Seafood for all and forever* should consider a suite of appropriate approaches that will rebuild fisheries and ecosystems that can create incentives for stakeholders and lead to environmentally and economically sustainable fisheries and mariculture. To support and meet the goals, a strategic plan for each approach listed in 'Way Forward' is needed. The framework for the strategy of preparation and implementation of plans should be characterized by participation of a large number of national research and development organizations, consultations with regional and global organizations, and stakeholders such as fishermen associations, traders, processors, environmentalists, conservationists etc.

Collaboration with survey agencies for information and infrastructure support, fishing industry for skilled human resource for exploration and harnessing of offshore resources is important. For integration of remote sensing in fisheries and spatial management, collaboration with the space research agencies, oceanographic laboratories and numerical modelling groups are needed. To operationalize the domestic fish marketing grid collaboration with regional fisheries research, education and developmental organizations are necessary. Policy formulation and implementation support from government agencies are essential to meet the goals.

Resource management can succeed only with the involvement and participation of all the stakeholders in the sector as well those from relevant non-fishery sectors. This involves developing vital links with all stakeholders.The contribution of fisheries to nutritional security, economic growth and livelihoods is often ignored. The priority is in convincing governments that the sector has an important role to play in the national development process by contributing to growth process in a substantive manner; and include fisheries and aquaculture in national development agenda.

Conservation of Marine Living Resources under LOSC 1982 : An Indian Perspective

*Comdt Rajesh Mittal **

The Law of the Sea Convention 1982 provides, inter-alia, the basic legal framework for conservation of marine living resources. This entire framework principally is governed by two approaches; the zonal management approach and species specific approach. In addition the concepts of allowable catch and maximum sustainable yield are reflected in order to achieve sustainable exploitation of these resources. However, on a closer scrutiny of convention text, it emerges that the convention provides generic guidelines (e.g. Art. 117, 118) and leaves enough latitude for the State Parties to the convention both of interpretation as well as implementation of provisions which actually is one of the reasons for non-implementation of domestic and international legislations resulting in dwindling living resources.

Fig 19. Pink Coral Conservation

One may talk about sustainable development and include the issues pertaining to marine living resources in the same ambit; however, these issues are inherently much more complex than management of land-based resources as limitations of maritime zones created by LOSC 82 may be entirely different than the ecologically prevalent boundaries. More so, the highly migratory species including anadromous and catadromous species pose a significant challenge for operation of legal provisions given somewhat loosely identified obligations, guidelines and mechanisms available for the State parties (e.g. Art. 63, 64, 65, 66, 67) making it difficult to identify breach of treaty obligations. In addition, disputes related to conservation of marine living resources are exempted from the compulsory settlement procedures enshrined in Part XV of the convention.

Given some of the above identified difficulties, the overall sentiment of treating marine living resources as *bounties of the oceans* and even the conflicting ideologies of *Res Communis* versus *Res Nullious*, much progress has been made by humankind in form of already existing numerous and efficiently operating treaties and agreements which are principally governed by regional approaches to management of living resources. As the global population increases, the need for protein also increases. A bigger question thus arises as to *who owns this planet and resources on it?* The best connotation would be that we have inherited the planet from our predecessors and hold it as custodian for the future generations. By degrading the planet and its resources we are creating a net negative intergeneration equity.

In context of India, the issues pertaining to conservation of marine living resources attain a distinct and complex proportion because of two main factors; huge population and the enormity of marine spaces under considerations. Until 1950s, the coastal waters of India were predominantly fished by traditional fisherfolk, principally by using sailing and rowing boats. By 1963 the fisheries became a business sector and saw use of mechanized fishing trawlers which saw clash between subsistence fishing and fishing for business.

* *Officer-in-Charge, Coast Guard Training Centre, Kochi*

Several coastal states enacted fishing regulations act demarcating the areas for protection of traditional fisher folk. However, the central question remained as to how to achieve sustainability yet achieving growth? Most modern writers support the view that only growth can provide sufficient revenues for the provision of education and good health for the masses.

Fig 20. Marine Living resources

Indian policy on conservation of marine living resources thus manifested into regional bilateral and multilateral treaties like Indian Ocean Tuna Commission, Asia-Pacific Fishery Commission, Bay of Bengal Programme - Inter Governmental Organisation, Environmental Organizations - Bay of Bengal Large Marine Ecosystem, Coastal Oceans Research and Development in the Indian Ocean (CORDIO) etc. The role of National Fisheries Development Board was redefined in addition to enhancement of central and state government's roles. Domestic legislation was also repackaged to achieve monitoring and implementation of laws at sea in form of various acts including The Wild Life (Protection) Act, The Merchant Shipping Act, The Coastal Aquaculture Authority Act, The Environment (Protection) Act, The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, The Coast Guard Act, The Marine Products Export Development Authority (MPEDA) Act etc.

Global instruments like LOSC 82 may not be able to provide for all the answers. According to Tanaka (2012), the existing rules of international law concerning conservation of marine living resources comprise many limitations, yet represent a paradigm shift from the lasses-faire system of freedom of fishing to conservation of marine living resources.

It may thus be concluded that conservation of marine living resources is an important aspect of national policy which is inherently intertwined with social, economical, political and international aspects and needs focused and participatory approach by the stakeholders.

Principles on Compensating Economic Losses in Marine Pollution Incidents

*Comdt P Rajesh**

Introduction

Incidents of pollution may result in damage to third parties who are not generally associated with the transactions involving the substances that pollute the environment. Third parties often become the victims of pollution incidents where they suffer damage which involves economic losses. Compensating the damage suffered by the victims is a widely debated subject. Many principles have also evolved over a period of time, for determining the compensable damage suffered by the victims.

In the marine pollution incidents, the victims are generally the fishermen, aquaculture industries etc. Even the coastal states also become the victims who may have to take actions necessary for restoring the environment to the original state it was before the pollution incidents. Legally, the marine pollution incidents form part of Maritime Torts. Tort is a civil wrong in which

* *Commanding Officer, ICGS Aadesh*

the victim can take legal remedies and seek monetary compensations. The compensations are awarded based on the causation of the damage, proximity of the pollution incident in relation to the damage suffered by the victim and the remoteness of the cause with respect to the cause of damage. In other words damage suffered by direct impact or by proximity of the pollution incidents are likely to be compensated than the damage occurred due to an indirect or remote impact of the pollution incident. This principle is followed primarily to avoid opening of floodgates of remote claims.

Fig 21. Fish killed in the polluted waters following Hurricane Rita in Gulf of Mexico 2005

Categorisation of Economic Losses

The claims for compensation generally arise out of Consequential Economic Loss (CEL) or Pure Economical Loss (PEL). CEL occurs due to the direct impact of the pollution, whereas PEL are due to the indirect impact of the pollution. Fishermen loosing livelihood due to oiling of fishing net as a result of oil spill can be categorised as CEL. But hotel industry losing business due to low turnover of tourist as a result of polluted beach is a PEL.

Compensating Economic Losses

Under law of torts in common law system, a defendant may be liable for compensating the foreseeable damage suffered by the plaintiff due to negligence. Courts have generally favoured the losses out of physical damage to the property, i.e. CEL but PEL are considered remote for compensation. This practice is quite wide in UK and USA.

In civil law States, approach has been different. PEL concept has been recognised and such practices are seen in Nordic States. If the plaintiff's proprietary interests have been affected, then claim may be admitted by the courts. And example is the French system. However, difficulty in proving a PEL is an issue and the plaintiff may result in securing less compensation.

The International Oil Pollution Compensatory (IOPC) Fund recognises PEL within certain limitations. Loss of profit as a result due to the impairment of environment is also recognised as pollution damage as per the convention, but limited to the cost of reasonable measures of reinstatement of environment actually undertaken or to be taken. Cost for preventive measures or further damage or loss caused by preventive measures are also considered as pollution damage.

Bibliography

Anderson, C. D. (2009). *Shipping and the Environment.* London: Informa.

Gauci, G. (1997). *Pollution at Sea, Civil Liability and Compensation for Damage.* West Sussex: John Wiley & sons Ltd.

IOPC. (2008). *International oil Pollution Compensation Fund Manual* London: IOPC Fund 1992.

IOPC. (2011). *Liability and Compensation for Pollution Damage Texts of The 1992 Civil Liability Convention, the 1992 Fund Convention.* London: IOPC.

Lefebvre, P. K. (n.d.). Fishermen and Oil Pollution Damage: Regimes of Compensation. *In J-L Chaumel[ed] Labour developments in Fishing Industries*, Pg 73.

EVENTS

SACEP Regional Training and Exercise at Colombo

The Oil Spill Preparedness and Response under 'Enhancing Regional Cooperation Mechanisms on Marine Pollution Preparedness and Response in the SACEP Region' was held from 02-06 November at Colombo, Sri Lanka.

Fig 22. Indian delegation with SACEP team

Five South Asian countries namely Bangladesh, India, Maldives, Pakistan and Sri Lanka are part of the South Asian Seas Programme. With a view to protect the marine environment in the region, South Asia Co-operative Environment Programme (SACEP) and the International Maritime Organisation (IMO) undertook a jointly funded project to assist the region in developing a South Asian Regional Oil Spill Contingency Plan in 1989. The purpose of the Contingency Plan is to establish a mechanism for mutual assistance, under which the national Authorities of Bangladesh, India, Maldives, Pakistan and Sri Lanka co-operate towards an integrated response to the marine pollution incidents either affecting or likely to affect the territorial sea, coasts and related interests of one or more of these countries, or to incidents beyond the available response capacity of each of these countries alone. SACEP held national workshops in each of the five member countries, in collaboration with IMO and with the financial assistance of NORAD. The regional training and exercise at Colombo constituted the next phase of the project.

The national presentations covered overview of the contingency planning elements, risk assessment, response strategy, response options, mobilization, coordination, management and demobilization of overseas resources, claims and compensation, and case studies including the Prestige and Hebei Spirit.

In the course of discussions it was brought out that India is already engaged in bilateral and multi-lateral cooperation with countries in the region, including for oil spill response and, therefore, the regional plan was merely a formalization of ongoing initiatives.

The representative of the IMO will update the plan as discussed during the exercise and workshop. Member States will individually review the updated plan and render information as obliged by the Regional Contingency Plan or simply provide a web-link to their National Plan as is the case with India. The SACEP secretariat will apprise the SACEP governing Council of the updated regional plan.

Fig 23. Group photograph with the Minister for Megapolis and Urban Development, Sri Lanka during SACEP regional training and exercise at Colombo

International Coastal Cleanup Day- 2015

International Coastal Cleanup-2015 (ICC-2015) day was organised across all coastal states by the Coast Guard on 19 September 2015. The International Coastal Cleanup day is conducted in various parts of the world in September every year under the aegis of

United Nations Environment Programme (UNEP) and South Asia Co-operative Environment Programme (SACEP) in the South Asian Region. The Coast Guard has been involved in this activity since 2006.

Nationwide, about twenty thousand volunteers participated in the ICC-2015 campaign conducted by the Coast Guard. Various Govt. and civil agencies including NCC cadets, NSS, school and college students formed the largest proportion of volunteers. Mumbai, Chennai and New Mangalore witnessed the highest participation of volunteers.

The nationwide campaign resulted in the collection of having seventy tons of marine litter.

Fig 24. Panorama of ICC 2015 across India

National Cadet Corps cadets, National Service Scheme, school and college students formed the major proportion of the volunteers. Apart from the armed forces, ICC-2015 received good support from the civil authorities, central and state government organisations, municipal corporations, NGOs, ports, oil agencies and other private enterprises. Chief Guests for ICC-2015 included a Hon'ble Chief Minister, Mayor, Deputy Commissioner Customs, Deputy Chairman Port Trust, Additional Collector and Sub-Divisional Officers in

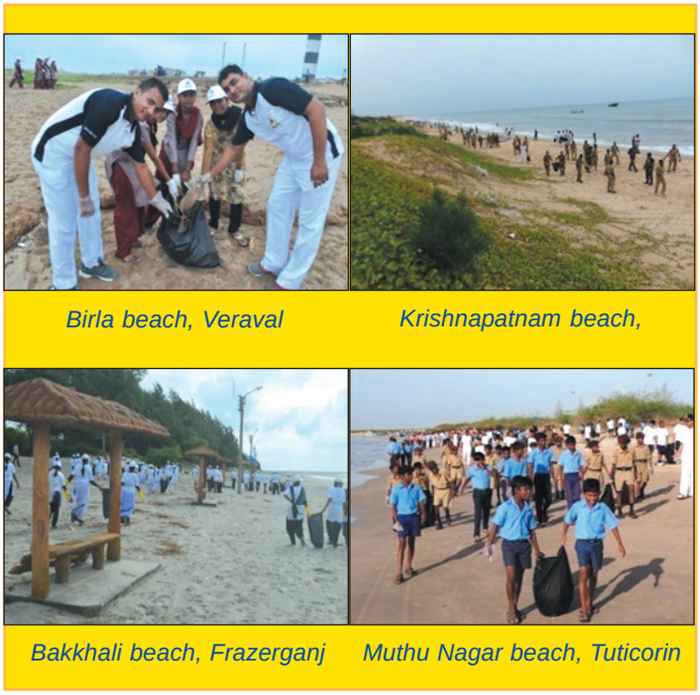

Fig 25. Panorama of ICC 2015 across India

smaller locations.

Overall, the participation was in proportion to the local population. Adequate support was received from all quarters for conduct of international coastal cleanup day. The event was well covered by the local print and electronic media.

Operation Olivia 2015-16

The Coast Guard has been protecting and safeguarding the Olive Ridley turtles during their nesting season by strict enforcement of the provisions of the Wildlife Protection Act and the Orissa Marine Fisheries Regulation Act in the Gahirmata Marine Wildlife Sanctuary since 1997.

'Operation Olivia 2015-16' was launched by Coast Guard District Headquarters No. 7 at Paradip on 24 Nov 15 for coordinated operations with the Orissa State Forest Department.

Enforcement operations by the Coast Guard has resulted in apprehension of 296 boats since inception of the programme.

NEWS

IMO - International Seabed Authority: Agreement of Cooperation

The International Seabed Authority (ISA) Assembly meeting in Kingston, Jamaica (21-22 July) approved the proposed IMO/ISA Agreement of Cooperation, which details how the two organizations could cooperate across a number of areas, particularly offshore exploration and exploration activities and the impact of these activities on the safety of navigation and the marine environment. The agreement will be endorsed by the IMO Assembly later in 2016.

Marine geoengineering study

An international experts' working group has recently been established to explore the possible environmental impacts of marine geoengineering activities, such as those which involve the deliberate introduction of certain elements into the sea in order to stimulate CO_2 uptake.

Working Group 41 of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), will work with relevant organizations with a view to producing a study aimed at providing a better understanding of the potential ecological and social impacts of different approaches to marine geoengineering.

Marine geoengineering is defined as "a deliberate intervention in the marine environment to manipulate natural processes, including to counteract anthropogenic climate change and/ or its impacts, and that has the potential to result in deleterious effects, especially where those effects may be widespread, long-lasting or severe". An example of such activity is "ocean fertilization", which involves the introduction of iron, nitrogen or phosphorus compounds into the ocean with the aim of stimulating CO_2 uptake by the oceans.

An amendment to the London Protocol adopted in 2013 prohibits the dumping of material for marine geoengineering, except for those activities listed in an annex. Currently, the annex only contains ocean fertilization activity. This may be considered for a permit, if it is assessed as constituting legitimate scientific research taking into account a specific placement assessment framework. The assessment framework provides criteria for an initial assessment of a proposal and detailed steps for completion of an environmental assessment, including risk management and monitoring. Importantly, it does not contain a threshold below which experiments would be exempt from its assessment provisions. Every experiment, regardless of size or scale, should be assessed in accordance with the entire assessment framework. The anticipated report from the GESAMP Working group could assist London Protocol Parties to identify other marine geoengineering techniques that could be considered for a permit.

At its recent annual meeting, GESAMP noted that many proposed marine geoengineering techniques or activities are often little more than concepts, but most of them involve potentially large-scale interventions in the ocean with the potential for significant impacts on the marine environment. In addition, many of these activities would likely take place on the high seas, beyond national jurisdictions, and therefore may raise international concerns. While a number of reviews of geoengineering to date have considered a small number of such techniques, mainly for their efficacy, none has reviewed the wider range of marine geoengineering techniques for their marine environmental impacts.

Gas and low-flashpoint fuels code adopted

The MSC adopted a new mandatory code for ships fuelled by gases or other low-flashpoint fuels (the IGF Code), along with amendments to make the code

mandatory under the International Convention for the Safety of Life at Sea (SOLAS).

The use of gas as fuel, particularly liquefied natural gas (LNG), has increased in recent years due to its having lower sulphur and particulate emissions than fuel oil or marine diesel oil. But gas and other low-flashpoint fuels pose their own set of safety challenges, which need to be properly managed. The IGF Code aims to minimize the risk to the ship, its crew and the environment, having regard to the nature of the fuels involved.

The amendments to SOLAS chapter II-1 (Construction- structure, subdivision and stability, machinery and electrical installations), include amendments to Part F Alternative design and arrangements, to provide a methodology for alternative design and arrangements for machinery, electrical installations and low- flashpoint fuel storage and distribution systems; and a new Part G Ships using low-flashpoint fuels, to add new regulations to require ships constructed after the expected date of entry into force of 1 January 2017 to comply with the requirements of the IGF Code, together with related amendments to chapter II-2 and Appendix (Certificates).

The IGF Code contains mandatory provisions for the arrangement, installation, control and monitoring of machinery, equipment and systems using low-flashpoint fuels, focusing initially on LNG.

The code addresses all areas that need special consideration for the usage of low-flashpoint fuels, taking a goal-based approach, with goals and functional requirements specified for each section forming the basis for the design, construction and operation of ships using this type of fuel.

The MSC also adopted related amendments to the International Convention on Standards of Training, Certification, Watchkeeping for Seafarers (STCW), STCW Code, to include new mandatory minimum requirements for the training and qualifications of masters, officers ratings and other personnel on ships subject to the IGF Code. The amendments also have an entry into force date of 1 January 2017, in line with the SOLAS amendments related to the IGF Code.

Project of low-carbon maritime future launched in Singapore

The Global Maritime Energy Efficiency Partnership Project (GloMEEP), which aims to support increased uptake and implementation of energy-efficiency measures for shipping, was formally launched on 28 September 2015 in Singapore, at the IMO-Singapore Future Ready Shipping conference.

The project, formally designated “Transforming the Global Maritime Transport industry towards a Low Carbon Future through Improved Energy Efficiency”, will focus in particular on building capacity to implement technical and operational measures in developing countries, where shipping is increasingly concentrated.

The aim is promote a low-carbon maritime sector, in order to minimize the adverse impacts of shipping emissions on climate change, ocean acidification and local air quality.

A particularly interesting aspect of the project is its expected role in catalyzing an innovative public-private sector partnership within the project framework, though a new Global Industry Alliance (GIA) for maritime energy efficiency. Participation is anticipated from leading private sector companies, including classification societies, ship builders, ship owners, ship operators, marine equipment suppliers, port operators, and marine consultancy and management system providers.

India is amongst the ten IMO Member States that have signed up to the GloMEEP project as lead pilot countries. The lead pilot countries will be supported in taking a fast-track approach to pursuing relevant legal, policy and institutional reforms, driving national and regional government action and industry innovation to

support the effective implementation of IMO's energy efficiency requirements.

IMO, the Global Environment Facility (GEF) and the United Nations Development Programme (UNDP) have allocated US$ 2.0 million to the project. Other funds will be mobilized in the form of in-kind and financial donations, to a projected total of some US$ 13.8 million.

United Nations adopts Sustainable Development Goals

The United Nations Sustainable Development Summit adopted the 17 Sustainable Development Goals and 169 targets on 25 September 2015, to follow on from and build on the millennium development goals (MDGs), which were agreed by governments in 2001.

The SDGs are intended to be integrated and indivisible and to balance the three dimensions of sustainable development: the economic, social and environmental. The SDGs form part of the 2030 Agenda for Sustainable Development, a plan of action for people, planet and prosperity which seeks to strengthen universal peace in large freedom.

Goals 7, 9 and 14 of the SDGs have particular resonance for IMO:

Goal 7 is to ensure access to affordable reliable sustainable and modern energy for all. Goal 9 is to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation and Goal 14 is to conserve and sustainably use the oceans, seas and marine resources for sustainable development.

IMO has developed the concept of a sustainable maritime transportation system (SMTS), which identifies the various 'imperatives' that must be met to implement an SMTS, and the activities that will need to be undertaken to achieve them.

REPORTS

INDIA WATCH

Mass Stranding of Pilot Whales in Thoothukudi

*DIG Anish A Hebbar, TM **

The Incident

About 100-150 short-finned pilot whales were stranded from 11-13 January 2016, along a 15-kilometer stretch, on the beaches of Alanthalai and Manappadu, south of Thoothukudi in Tamil Nadu, and at least 60 died. Each whale measured about four metres in length, and weighed about 1,000 to 1,500 kilograms. Fishermen had never sighted whales within 40 kilometers of the shore. However, 147 pilot whales were spotted at the same place on 14 January 1973,

Fig 26. Coast Guard Official inspecting dead whale

with many of them perishing. At that time too, no one knew why. The first recorded beaching of short-finned pilot whales was in 1852 near Kolkata.

Community and Government Response

Over 30 whales were spotted on the Kallamozhi shores at night, on 11 January 2016 and the fishermen succeeded in getting 21 whales back into the sea. However, more whales were found along the Manapad

** Principal Director (Environment), Coast Guard Headquarters, New Delhi*

beach in the morning on 12 January 2016. The fishermen tied a few whales to their fiber boats and pulled them back into the sea. But the whales kept getting washed back to the beach.

On receipt of first information, the local police, the fisheries department, revenue department and forest department of Tuticorin district visited the beach on 12 January 2015 to try and ascertain the cause. A team comprising three officers assisted in the rescue efforts of the Wildlife department and district administration in taking the whales to deep sea. The District Forest Officer was personally involved in the rescue operation. The Coast Guard offered its assistance to the district administration and Wildlife department. Around 50 whales were rescued on 12 January 2016. Fishing boats were deployed for taking the whales into deeper waters.

Marine biology experts are carrying out a detailed study into the large-scale beaching. The Veterinary department of the Government of Tamil Nadu has taken tissue samples of the whales for laboratory analysis.

Government officials deployed earth-moving machines for pushing the whales to one end of the beach, for burial. Local fishermen requested the officials to bury the whales further away from their village.

Sadly, hordes of tragedy tourists were taking photographs with the whales in the background.

Fig 27. Whale buried by earth-moving machines

Navigation by Whales

Toothed whales use echo-location, like bats. They throw sound waves through the water — and when the waves hit a prey, vessel or barrier, the whales' brains process the echo to determine the location, size, shape and texture of the object.

Baleen whales migrate over huge distances without deviating off-course for more than a single degree. Researchers have concluded no established models of directional orientation — magnetic or solar — can explain their extreme navigational precision.

The short-finned pilot whales stranded at Tuticorin are inhabitants of deep, warm waters in the Indian, Pacific and Atlantic Oceans, and yet known for frequent stranding. Their pods of up to 50 mammals form ranks that can stretch over a kilometre. This may explain how dozens of animals beach themselves across several kilometres, but it is not clear why they approach shallow waters in the first place.

Plausible Cause of Stranding

Marine scientists opine that it is an unusual mortality incident. Common reasons for whale beaching include pollution, changes in weather and parasites affecting internal navigation mechanism. Also, when one of the mammals becomes sick and stranded, it lets out distress calls which could cause the entire pod to respond. When they beach, the whales often die due to dehydration.

Mass beaching has baffled humans for centuries. Aristotle asserted in 300 BC that, "*it happens when the fancy takes them and without any apparent reason*." Centuries later, Romans thought stranding was punishment for offending Neptune, the god of the seas.

Whales live in large social groups and an entire pod can follow a disoriented leader into shallow waters and beach themselves. One fisherman blamed the hot water released into the sea from the Koodangulam nuclear plant in neighbouring Tirunelveli district. Another fisherman, from Manappadu, attributed it to changes

Fig 28. Scientist taking sample for study

in water current. The Assistant Director Fisheries suspected that the whales had come by mistake. The Head of Marine Ecology and Conservation Department of a college in Thoothukudi suggested that the whales may have become disoriented due to sonar interference or may have been hit by a large vessel. Temperature fluctuation on account of heavy rains is yet another suspect. That there might have been changes in the currents in the deep ocean which the whales might have followed is another reason going around. However, intoxication, or any poison was ruled out as a cause of death because other fish would have also died due to the same reason.

Toothed, rather than Baleen whales, are more susceptible to stranding. Following prey-rich currents might draw whales towards land, or they might end up panicking at the presence of a mega predator such as a killer whale. Gently-sloping shorelines can deceive whales dependent on echolocation for navigation. There's also climate change or unnatural weather phenomena.

The immense pressure of manmade sonar waves can cause internal bleeding in the ear and brain tissues, killing or disorienting whales. Some scientists argue that whales may interpret sonar as an approaching predator, triggering panic and subsequent beaching. Incidentally, the last mass whale stranding in Tuticorin occurred not long after the 1971 war that might have necessitated intense and prolonged scanning of these waters. The sonar aspect was probably not covered in the studies that followed the 1973 stranding of 147 whales.

Repeated beaching in one area may suggest a flat slope or currents unique to the shoreline. One study suggested that a gently sloping beach would not supply a coherent reflection to sonar. Another concluded that a gently sloping beach posed major problems for echo-navigation. The Manappadu beach is even flatter — from zero to 5-17 m over 3 kilometers. But Indian scientists are of the view that further studies would be required to conclude whether beach slope resulted in the mass stranding.

Fig 29. 40 ft Blue whale being rescued off Dapoli. Inset: Dead Bryde's whale, Juhu beach

Whales are indeed being spotted at regular intervals near the coast either dead or alive which is a matter of concern. On 03 February 2016, forest officials rescued a 40 foot long Blue whale off Dapoli, 200 km South of Mumbai. A 25 foot dead Bryde's whale, weighing around 4 tonnes washed ashore at Juhu Beach, Mumbai on 28 January 2016.

References

Nadar, Ganesh A. (2016, January 12). Why did 100 whales get beached in Tuticorin?. Rediff.com (www.rediff.com)

Yazhiniyan. (2016, January 13). Thoothukudi's Beaches Awash with 100 Whales. The Indian Express (www.newindianexpress.com)

(2016, January 14). 10 more whales die at Tiruchendur beach. News Today (newstodaynet.com)

(2016, January 14). Express Explained: Why beaching of whales still baffles science. The Indian Express (indianexpress.com)

WORLD WATCH

M.V. Flinterstar Oil Spill

The 9,000 ton, 130 meter Netherlands flagged cargo vessel 'Flinterstar' collided with Marshall Islands flagged gas tanker 7 nm northwest of Zeebrugge, Belgium on 06 October 15, had around 427 tons of heavy fuel oil and 125 tons diesel at the time of the incident. resulting in leakage of oil into the North Sea, the Flinterstar which was loaded with steel plates bound for Spain. Although the gas tanker suffered serious damages, then no water ingress or gas leak.

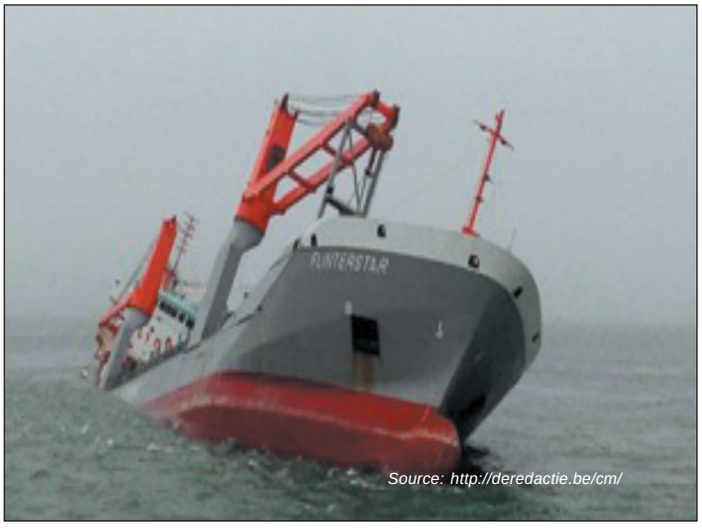

Fig 30. The M.V. Flinterster

After the collision Flinterstar was partially sunk and reportedly resting on bottom. The Flinterstar continuously leaked oil which caused a visible mile l ong trail of oil in the sea. Though, the oil was not heading for the coast, still the fire and civilian protection service checked beaches for oil. The spill was tackled by Belgian authorities and HFO and remaining heavy fuel oil was removed from the Flinterstar. The amount of fuel and oil, which leaked into the North Sea could not be determined. Dutch salvage and towage companies removing of heavy fuel oil and diesel oil from the vessel commenced on 10 October 15. The oil was pumped to the specialised offshore supply ship Vos Sympathy, with the salvage rescue vessel Offshore Beaver performing the cleanup of any leaked oil.

Vessels operated by Multraship and Smit ship worked to remove fuel oil from the Flinterstar's tanks before safe removal of the vessel was considered. Belgian authorities had taken charge to remove the wreck in accordance with to Belgian law, which provide that owners of the two vessels will contribute the maximum amounts to the costs of the wreck removal. *Strong winds and adverse sea state made* the oil removal too dangerous for the divers and salvage teams to continue their work. The divers then drilled holes in the vessel's intact fuel tanks as Flinterstar was pinned on the sandbank, and increased wave height endangered divers and any floating salvage vessel near the wreck.

M.V. Global Gold Oil Spill

Panamanian-flagged, 33,562 dwt, bulk carrier m.v. Global Gold sustained hull damage of about

Fig 31. Containment of spill in progress

4'/ 8" gash in the above the waterline and leaked diesel oil on alliding with pier in the Port of Astoria, Oregon on 02 October 2015.

After investigations by the Incident Management Division from Coast Guard Sector Columbia River, the

vessel's engineer and Coast Guard crews determined that a maximum 4164 ltrs had spilled after securing the hole. The Clean Rivers Cooperative was mobilized by the vessel agents and deployed boom around the vessel and pier. The vessel's crew also applied oil-absorbent pads to a small area of land affected by the spill at the end of the pier. The US Coast Guard coordinated with agencies; the shipping agent and Clean Rivers Cooperative for clean up the spill while securing the source. The spill was contained within the boom surrounding the vessel and pier. Protective booming was maintained for cleanup was completed. The quick response and notification prevented the spill from becoming a much more serious situation to marine environment.

The cause of the damage is not known. No damage to marine species was reported.

Oil Spill at Bayonne, U.S.

On 04 August 2015 a tug boat collided with a fuel terminal pier at the International Matex Tank terminal (IMTT), Bayonne, New Jersey. The collision resulted in 3780 liters of oil leakage into the sea.

Fig 32. Laying containment boom

The U.S. Coast Guard launched Pollution Response Team New York Sector to investigate and monitor oil recovery operations. The U.S. Coast Guard pollution responders as well as IMTT crew members deployed more than 2,500 feet of containment boom for securing the source of the oil. A Coast Guard Dolphin helicopter was also launched for responding the oil spills.

BP evacuated Valhall field in North Sea

On 31 December 15, stormy weather with waves at 10-15 m high, caused 109.7 m long and 45 m wide Eide Barge 33, owned by Eide Marine Services to break its anchor and head toward the rigs owned operated by BP in the Valhall field in Southern Norwegian North Sea. The imminent danger of collision resulted in an emergency evacuation around 150 workers through airlift, as precautionary measure ordered by BP.

Valhall, discovered in 1975 is a giant oil field began its production from 1982 in the southern Norwegian North Sea, which currently has eight operation offshore platforms. The oil field is operated by BP and co-owned by Hess, producing at a rate of about 50,000 barrels per day and has a depth of around 2,400 m.

BP restored its oil production from the rig, after 24 hours on confirmation that danger is over.

Fig 33. Valhall oil field, North Sea

Indian Coast Guard
Annual Calendar of Pollution Response Training and Exercise: 2016

Date	Venue	Event	Coordinator
20-21 Jan	Tuticorin	Mock Drill	ICGS Tuticorin
09 Feb	Goa	Level I Exercise	Coast Guard Dist. Headquarters-11, Goa
10-11 Feb	Chennai	Level I Exercise	Coast Guard Dist. Headquarters-5, Chennai
22-26 Feb	Chennai	Level II Course	AMET University/Pollution Response Team (East)
15 Mar	Murud Janjira	Mock Drill	ICGS Murud Janjira
15-18 Mar	Vadinar	Level I Course	ICGS Vadinar
17 Mar	Vadinar	Mock Drill	ICGS Vadinar
28 Mar– 01Apr	Chennai	Level I Course	Pollution Response Team (East)
07 Apr	Ratnagiri	Level I Exercise	ICGS Ratnagiri
11-15 Apr	Port Blair	Level I Course	Pollution Response Team (A&N)
25-29 Apr	Mumbai	Level I Course	Pollution Response Team (West)
27-28 Apr	Vizag	Level II Exercise	Coast Guard Dist. Headquarters-6, Vizag
04-05 May	Haldia	Seminar & Training	Coast Guard Dist. Headquarters-8, Haldia
06 May	Beypore	Mock Drill	ICGS Beypore
09-13 May	Chennai	Level I Course	Pollution Response Team (East)
18-19 May	Karaikal	Mock Drill	ICGS Karaikal/ Puducherry
11-15 Jul	Chennai	Level I Course	Pollution Response Team (East)
20-21 Jul	Kakinada	Level I Exercise	ICGS Kakinada
22-26 Aug	Port Blair	Level I Course	Pollution Response Team (A&N)
29 Aug–02 Sep	Chennai	Level II Course	AMET university/ Pollution Response Team (East)
07-08 Sep	Krishnapatnam	Mock Drill	ICGS Krishnapatnam
15-16 Sep	Kochi	Level II Exercise	Coast Guard Dist. Headquarters-4, Kochi
03-07 Oct	Mumbai	Level I Course	Pollution Response Team (West)
04-07 Oct	Vadinar	Level I Course	ICGS Vadinar
06 Oct	Vadinar	Mock Drill	ICGS Vadinar
18 Oct	New Mangalore	Level I Exercise	Coast Guard Dist. Headquarters-3, New Mangalore
Oct/Nov	Port Blair	PR Demonstration	Pollution Response Team (A&N)
16-17 Nov	Paradip	Seminar & Training	Coast Guard Dist. Headquarters-7, Paradip
17 Nov	Kavaratti	Level I Exercise	Coast Guard Dist. Headquarters-12, Kavaratti
08 Dec	Vizhinjam	Mock Drill	ICGS Vizhinjam
19-23 Dec	Chennai	Level I Course	Pollution Response Team (East)

Editorial Office : **Directorate of Fisheries & Environment**
Coast Guard Headquarters, National Stadium Complex, New Delhi 110 001, India
Tel : (+91)(11) 23388668 Fax: (+91)(11) 23074131
E-Mail: dte-fe@indiancoastguard.nic.in
Website : www.indiancoastguard.nic.in