

BEFORE THE NATIONAL GREEN TRIBUNAL

SOUTHERN ZONE, CHENNAI

Original Application No. 02 of 2024 (SZ)

In the matter of:

Tribunal on its own motion – SUO MOTU

Based on the news item published in

Newspaper The Times of India Dt. 07.03.2023 titled,

“Oil leaked in Tamil Nadu’s Nagai Spreading along

Coast, say expert’s”

And

The Member Secretary,

TNPCB, Chennai and Others

...Respondent(s)

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Through

Dr. D. Shanmuganathan

Standing Counsel of Tamil Nadu,

National Green Tribunal

Southern Zone, Chennai

Date: 17.03.2024

BEFORE THE NATIONAL GREEN TRIBUNAL**SOUTHERN ZONE, CHENNAI****Original Application No. 02 of 2024 (SZ)****In the matter of:**

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Based on the news item published in

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“Oil leaked in Tamil Nadu’s Nagai Spreading along

Coast, say expert’s”

And

1. The Member Secretary,
TNPCCB,
No. 76, Anna Salai,
Guindy, Chennai
 2. The Tamil Nadu Coastal Zone Management Authority,
Rep, by its Member Secretary,
1st Floor, Panagal Building,
Saidapet,
Chennai
 3. Cauvery Basin Refinery,
Petroleum Corporation Limited,
Rep. by its Managing Director,
Panangudi Village,
Nagapattinam
 4. National Centre for Sustainable Coastal Management (NCSCM),
Rep. by its Director,
Ministry of Environment, Forest and Climate Change,
Anna University Campus, Chennai
 5. Indian Coastal Guard Regional East,
Rep. by its Commander Coast Guard,
Chennai
 6. Commissioner of Fisheries and Fishermen Welfare,
3rd Floor, Integrated Animal Husbandry and Fisheries Building,
Nandanam,
Chennai – 600 035
- ...Respondent(s)

Report of the Tamil Nadu Fisheries and Fishermen Welfare Department on the news titled "Oil leaked in Tamil Nadu's Nagai spreading along coast, say experts"

Chennai Petroleum Corporation Limited (CPCL), Karaikal unit used to carry crude oil from CPCL, CBR crude storage tank from Nagapattinam to Karaikal Port. On March- 02, 2023 crude oil leakages occurred, in Nine-kilometer-long 20" crude oil pipe line from CPCL CBR crude storage tank at Nagore Pattinachery. The fishermen of Nagore Pattinachery informed the crude oil leakages to District Administration. After receiving information, Revenue Department, Fisheries and Fishermen Welfare Department, Police and Fire and Rescue Department visited the site and initiated action to arrest the pipe line leakages. In the mean time, fishermen of Nagore Pattinachery had announced a protest by not to go fishing from March 3, 2023 onwards.

The crude Oil leakage was temporarily repaired by M/s CPCL on 04th March 2023. After trial run was carried out, crude oil leakage occurred again on the pipe line. Subsequently the leakage was completely arrested on 04.03.2023 with external clamping and gasket sealing. The residual crude oil from the pipeline was evacuated and sent to M/s. CPCL - CBR refinery premises.

The fishermen of Nagapattinam Taluk informed that they will hold a protest on 08.03.2023 in front of the CPCL Company demanding the removal of the oil pipeline permanently and until then they will not go to the sea for fishing. In this regard, a peace committee meeting was conducted between Fishermen of Nagapattinam Taluk and CPCL officials in the presence of Fisheries and Fishermen Welfare Department and Revenue Department officials headed by Sub Collector, Nagapattinam on 06.03.2023 at 4.00PM.

During the meeting the following decisions were taken.

1. The Pipeline should not be operated further without permission of District Administration.
2. A committee has been formed with local fishermen, Fisheries, Revenue, Police, CPCL Officials, Local Panchayat to remove the pipeline.
3. The committee meeting was held on 16.03.2023 by Fisheries department for removal of the pipeline in consultation with committee members and the date to be fixed for removal of pipeline.

In continuation to the peace committee meeting, fishermen withdrew their protest in front of CPCL Office and went for fishing from 08.03.2023 onwards.

A second peace committee meeting was also conducted on 16.03.2023 by Fisheries and Fishermen Welfare Department with fishermen and CPCL officials.

The following decisions were taken during the meeting.

1. The CPCL pipeline was to be permanently removed before May 31, 2023 (before fishing ban period)
2. Before discharging the remaining crude oil in the pipeline by CPCL Company, approval to be obtained from District Administration, Fisheries and Fishermen Welfare Department, Police Department and Fishermen Panchayats.
3. The Indian Oil Company officials were to inform the date of removal of pipeline before, the next meeting proposed on 18.04.2023.

In continuation to the 2nd peace committee meeting, the said pipeline was removed by CPCL during April, 2023.

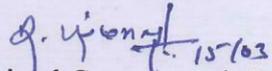
The Hon'ble NGT directed the constitution of a Joint Committee comprising representatives from the Central Pollution Control Board (CPCB), Tamil Nadu Pollution Control Board (TNPCB), District Magistrate, Nagapattinam, Indian National Centre for Ocean Information Services (INCOIS), Hyderabad and

National Centre for Sustainable Coastal Management (NCSCM), Chennai, NCSCM as a nodal agency for coordination and compliance with the report. Based on that, the committee inspected Nagore Coast on 18.04.2023 and their report is enclosed.

Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Nagapattinam had collected finfish and shellfish samples from the sites of oil spill at Nagapattinam coastal region on 12.03.2023 and submitted the sensory evaluation report on 16.03.2023. In the report it has been informed that there is no abnormal petroleum taint in the seafood samples viz, finfish, crustacean and mollusks collected from the three different fish landing centre of Nagapattinam viz, Nagore, Samanthanpettai and Mahalakshmi Nagar (TNJFU Report enclosed).

The reports of the peace committee meetings, Joint Committee Report and Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Nagapattinam Report are enclosed herewith for kind perusal.

Sd/- ShunchonngamJatakChiru
Principal Secretary/ Commissioner,
Fisheries and Fishermen Welfare


for Principal Secretary/ Commissioner,
Fisheries and Fishermen Welfare

**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI IN ORIGINAL APPLICATION NO. 205/2023**

Report of the Joint Committee on "Assessment of the M/s Chennai Petroleum Corporation Limited-Cauvery Basin Refinery (CPCL CBR) - Nagapattinam Crude Oil Pipeline Leak near Nagore Coast, Nagapattinam, Tamil Nadu".

July - 2023

Page 1 of 17

Report of the Joint Committee on “Assessment of the M/s Chennai Petroleum Corporation Limited-Cauvery Basin Refinery (CPCL CBR) - Nagapattinum Crude Oil Pipeline Leak near Nagore Coast, Nagapattinam, Tamil Nadu”.

1. Background:

The Hon’ble National Green Tribunal -Principal Bench (NGT), New Delhi, filed a Suo Motu Case OA 205/2023 based on the news item published in The Times of India Newspaper dated March 7, 2023 titled “*Oil leaked in Tamil Nadu’s Nagai spreading along the coast, say experts*”. The news item is based on the advisory of the Indian National Centre for Ocean Information Services (INCOIS), Hyderabad, which undertook a simulation study about the incident. Proceedings were initiated in this matter by the Hon’ble NGT (Principal Bench), New Delhi, and the first hearing was held on March 28, 2023.

The Hon’ble NGT Order dated March 28, 2023 of the Hon’ble NGT (Principal Bench), New Delhi, stated that “while it is true, that as per the stand of the Indian Coast Guard (ICG) and M/s Chennai Petroleum Corporation Limited, Cauvery Basin Refinery – (CPCL-CBR), there is not much damage to the water due to the incident of the oil spill, we find it necessary to direct an investigation to ascertain whether any remedial measures are required”. In that order, NGT directed the constitution of a Joint Committee comprising representatives from the Central Pollution Control Board (CPCB), Tamil Nadu Pollution Control Board (TNPCB), District Magistrate, Nagapattinam, Indian National Centre for Ocean Information Services (INCOIS), Hyderabad and National Centre for Sustainable Coastal Management (NCSCM), Chennai. NCSCM as a nodal agency for coordination and compliance with the report.

2. Composition of the joint committee

As per the Hon’ble NGT Order dated March 28, 2023 solicited nominations from all the concerned agencies, and accordingly, the following members were nominated by the concerned organizations to serve as members of this joint committee, as stated in Table 1.

The Hon’ble NGT Principal Bench, New Delhi, in its order dated March 28, 2023 ordered the Joint Committee to undertake a site visit and interact with other stakeholders and in particular, to undertake a safety audit and examine the pipeline in question to find out whether the crack was

due to corrosion on account of non-maintenance. As per the order, it will be open to the Committee to consider the studies already undertaken and also to seek the assistance of experts/institutions.

Table 1. Details of the nominated expert members from the various institutions are provided as follows:

Sl. No.	Organization	Nominated member
1	District Magistrate- Nagapattinam. Tamil Nadu	Dr. A. Arun Thamburaj, I.A.S, District Collector, Nagapattinam
2	Indian National Centre for Ocean Information Services (INCOIS), Ministry of Earth Sciences, Government of India "Ocean Valley", Pragathi Nagar (BO), Nizampet (SO), Hyderabad	Dr. Sudheer Joseph, Scientist- G and Division Head, Applied Research and Research to Operations (ARO), INCOIS, Hyderabad
3	Central Pollution Control Board (CPCB) Ministry of Environment, Forest & Climate Change, Regional Directorate - Chennai	Er. Poornima BM, Scientist D, CPCB, Chennai, Tamil Nadu
4	Tamil Nadu Pollution Control Board (TNPCB) State Government of Tamil Nadu Chennai.	Er. V. Thamiloli, District Environmental Engineer, TNPCB, Nagapattinam,
5	National Centre for Sustainable Coastal Management (NCSCM), Ministry of Environment, Forest and Climate Change of India (MoEF& CC), Government of India, Chennai	Dr. G. Hariharan, Scientist- C, Coastal Environmental Impact Assessment (CIA) Divisions- NCSCM

3. Mandate of the joint committee

The Committee considered the following issues mentioned in the Hon'ble NGT order dated March 28, 2023 for deliberations and for submitting the report to the Hon'ble NGT.

- 1) To undertake a site visit.
- 2) To interact with Stakeholders.
- 3) To undertake a safety audit and examine the pipeline in question to find out whether the crack was due to corrosion on account of non-maintenance.

- 4) Assessment of damage to the coastal and marine environment due to the impact, if any, of the oil spill.
- 5) The required remedial measures.
- 6) Recommendations on remedial measures to be undertaken by CPCL.

4. Approach adopted by the joint committee

The Joint Committee had a meeting in the office of the District Collector and Magistrate, Nagapattinam, Tamil Nadu, on April 18, 2023, and discussed the above issues in detail. The Joint Committee conducted an intensive field investigation, such as examining the physical characteristics of the coast, the pipeline, remedial measures required or undertaken, and the observation of spill patches away from the spill location. The committee also discussed the occurrence of the incident and its first notification information at the site, as well as the spill's impact on the local community and all other stakeholders.

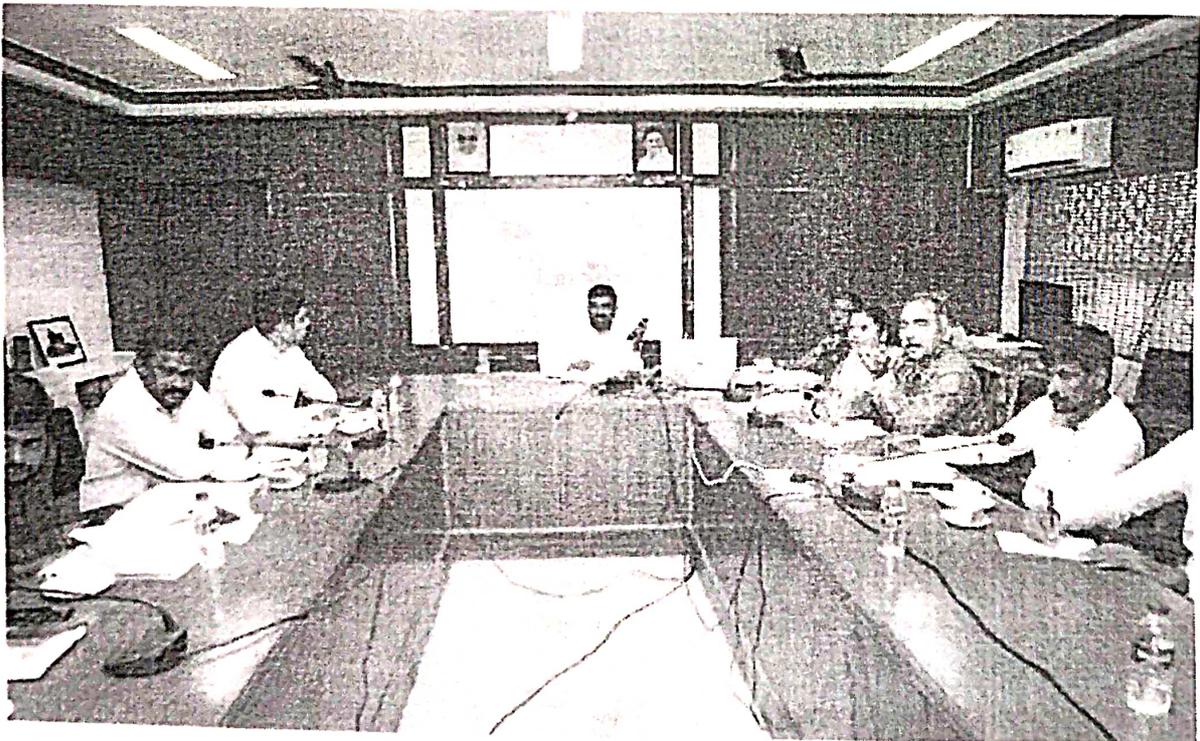


Figure: 1. Photograph taken during the Joint Committee meeting at the office of the District Collector- Nagapattinam and interaction with Stakeholders.

The Joint Committee visited the site at Pattinacherry, Nagore Coast, Nagapattinam, Tamil Nadu, and nearby coastal areas to get first-hand information on the incident happened on 2nd March 18, 2023. The Joint Committee interacted with various Stakeholders, including fishermen and CPCL officials during the site visit.



Figure: 2. Field photograph taken during the site visit by the NGT committee members and interaction with Stakeholders.

During the site inspection of the Joint Committee, concerned officials including CPCL, Tamil Nadu Police, Panchayat, and Municipal representative were also presented and gathered the requisite information. Based on the information gathered and the observations, the joint committee prepared a report, which is submitted for the kind consideration of the Honourable NGT.

5. **Interaction with residents of Pattinacherry Village**

The Joint Committee interacted with various stakeholders, such as the Councilor of Pattinacherry Village, the Fishermen Panchayat, and residents of Pattinacherry village, etc. The deliberations of the Committee on the above issues are detailed below.

- a) Village leaders informed CPCL that the leak happened around 06.50 PM on March 2, 2023. They further added that District Authorities and CPCL Officials came around 07.30 PM on March 2, 2023.
- b) The Fishermen Panchayat insisted that the district and CPCL authorities initiate the necessary action to arrest the leak. The oil leak was noticed on March 2, 2023, intermittently in small quantities. Also, they said that a clamp was provided on March 3, 2023, and Leak was arrested on March 4, 2023, early in the morning.
- c) The Fishermen Panchayat was informed that the line was initially away from the coastal area. Due to sea advancement, coastal water came close to the pipeline and the line got exposed recently due to soil erosion.
- d) It was informed that the first meeting with residents of Pattinacherry village was held on March 6, 2023, wherein the fishermen's community agreed to go for fishing. During the second meeting held on March 16, 2023, CPCL agreed to remove the crude line before May 31, 2023. CPCL initiated and removed the crude pipeline on April 18, 2023. The villagers thanked and acknowledged the district authorities and CPCL officials for their speedy response.

6. **Interaction with CPCL Officials**

Subsequently, the joint Committee interacted with CPCL Officials who informed the following to the committee members.

- a) CPCL's Cauvery Basin Refinery (CBR), located at Nagapattinam, was commissioned in 1993 for refining Narimanam crude oil from M/s ONGC. In order to increase the capacity of the refinery, this 20" Crude Oil pipeline was laid in the year 2003 to source the other

crudes by importing. The Refinery operations were stopped on April 1st, 2019 due to limitations in meeting product specifications corresponding to BS-VI.

- b) After CBR refinery operations were stopped, the crude received from M/s ONGC was collected in crude tanks located inside the refinery premises, and the same was transferred through the crude pipeline to cargo ships at Karaikkal port. The Crude oil Pipeline is used once every 45 to 50 days for transferring crude oil from CPCL tanks in the refinery to Karaikal Port. The last such consignment was completed on February 14, 2023, and the crude oil pipeline has been in idle condition since February 15, 2023.
- c) The information on the crude pipeline leak was received around 06.50 PM on March 2, 2023. Immediately, CPCL informed concerned officials such as District Authorities, the TNPCB, the Tamil Nadu Maritime Board, the Indian Coast Guard, etc.
- d) Temporary shore and a temporary sand bund wall were created near the leaky spot of the pipeline to arrest the leak and also to prevent any possibility of oil ingress into the coast. On March 3, 2023, by 15.00 Hrs., a metal clamp was fastened to the pipeline, and on March 4, 2023, by 02.30 Hrs., the leak was arrested completely. Subsequently, online sealing was also carried out at the clamped portion, for additional safety.
- e) M/s Indian Oil Corporation Limited – Southern Region Pipelines and CPCL operated the Mobile Oil Spill Recovery Unit (MOSRU) and recovered the crude oil from onshore. A temporary pit was dug and collected the contaminated crude oil spread over the seashore during external clamping and gasket sealing of the damaged portion. M/s CPCL–CBR has handed over the oil along with seawater collected from the temporary pit to M/s Oil and Natural Gas Corporation (ONGC) Group Gathering Station, Narimanam, for the recovery of oil and also for further treatment of wastewater.

7. Safety Audit and examination of the pipeline

During the committee site visit on April 18, 2023, the committee observed that the leaky portion of the pipeline was removed and kept aside. The clamp provided in the pipeline was not removed. The remaining portion of the base pipeline was found intact with very little damage to the external coating of the pipeline. CPCL officials explained that the damage to the coating material happened

during the removal and shifting of the pipeline by crane and sling. The visual inspection inside the pipeline found normal and healthy condition. The thickness measured at the leaky portion of the pipeline is at permissible levels of 6.1 mm, against the design thickness of 6.35 mm. There was no corrosion or erosion observed in the pipeline and the cause of the leak may be due to an external impact.

During the site visit, CPCL Officials explained that the line was laid at about 1.5 Meters depth in the land area at a distance of 40 meters from the sea. Due to the gradual shifting of the inter-tidal zone and other developments like the Construction of Breakwater at Karaikal Port, and natural calamities such as-cyclones etc., the inter-tidal zone has come into contact with the pipeline. However, the exposure of the pipeline to seawater is a recent phenomenon, and hence, corrosion and a reduction in the thickness of the pipeline did not take place.



Figure 3: Photograph of the removed portion of the pipeline with metal clamp

8. Studies undertaken by other agencies

The Hon'ble NGT Principal Bench, New Delhi, in its order dated March 28, 2023, has mentioned that it will be open to the Committee to consider the studies already undertaken and also to take assistance from any other expert/institution. Accordingly, the Committee considered the following studies in this regard.

1. Studies by INCOIS, Hyderabad
2. Joint studies by NCSCM, Chennai, and NCCR, Chennai
3. Studies by the Coast Guard, ICGS Karaikal
4. Studies by the TNPCB
5. Studies by the CPCL

8.1. Studies by INCOIS, Hyderabad

The Indian National Centre for Ocean Information Services (INCOIS), Ministry of Earth Sciences, Govt. of India, Hyderabad, released an advisory report on the Oil spill on March 6, 2023. The gist of the report is furnished below.

INCOIS has generated an oil drift pattern for the period 20.00 hrs March 2, 2023 to 23.00 hrs on March 8, 2023. As per the report, at 23.00 hrs on March 6, 2023 -10.91 KM of coastline will be affected and on the next day, it can affect 11.40 KM. Further, on March 08, 2023 at 23.00 hrs, 12.00 KM of coastline will be affected. The quantity of oil considered in this simulation study was 100 MT as the exact quantity of oil spilled was not known to INCOIS. Hence a disclaimer was provided in the report prepared by INCOIS after the simulation (Please see Annexure: 1). The forecast quality was not confirmed due to uncertainty in the spill conditions. An advisory report published by INCOIS is enclosed as Annexure: 1.

8.2. Joint study by NCSCM- Chennai and NCCR- Chennai

The Department of Environment (DoE), Government of Tamil Nadu, directed the expert committee to inspect the crude oil spill site and submit a report on the impact and assessment of the site.

A team of experts from the National Centre for Sustainable Coastal Management (NCSCM) and National Centre for Coastal Research (NCCR), the sub-collector of Nagapattinam district, the officials of the Department of Environment (DoE) and Climate Change, Tamil Nadu, and the officials of CPCL visited the crude oil spill site at Pattinacherry, Nagore Coast, Nagapattinam, Tamil Nadu, on March 6, 2023. The final report was submitted to the Department of Environment (DoE) and Climate Change, Government of Tamil Nadu, Chennai (Annexure: 2)

The summary of the report is furnished below:

- The amount of crude oil spilled: The CPCL authorities informed that about 1000 liters of crude oil spilled over the area where the pipeline was damaged. It will be used to forecast and estimate the impact of crude oil on the marine ecosystem and its fate along and across the coast.
- Treatment and removal of oil slick: The spill was completely removed from the beach and the spread was controlled by applying the oil spill dispersant.
- Physical and Biological impacts: From intertidal observation along the study area it was observed that the diversity of intertidal organisms remained good and healthy. There is no oil sludge evidence/ marking on the groins and boulders along the intertidal rocky shore. The organisms of the intertidal area consist of burrowing crabs, gastropods, bivalves, and tubicolous polychaetes, etc. The observed Total Petroleum Hydrocarbon (TPH) concentration was slightly higher than the concentrations recommended for designated best use for Class SW-1 (salt pans, shell fishing, mariculture, and ecologically sensitive zones) by the CPCB. However, the reported TPH concentrations are comparable to previous studies along the southeast coast of the Bay of Bengal.

8.3. Studies by Coast Guard, ICGS Karaikal

The requisite points from Coast Guard, ICGS Karaikal, mentioned in the NGT order dated March 28, 2023 in OA 205/2023 of the Hon'ble NGT Principal Bench, New Delhi, are furnished below.

a) On March 03, 2023, 08.30 Hrs

- ❖ Coast assessment was made until 0.8 Nautical Miles from the shoreline and reported no oil spillage along the coast until Nagapattinam.

- ❖ There was minor leakage which was spread in 50-60 Mtrs intertidal area at the scene of the incident
- b) On March 4, 2023, 11.00 Hrs
 - ❖ Both Indian Coast Guard Ships (ICGS) C-436 and ICGS C-435 reported 'No oil spill' along the coast of Nagapattinam
 - ❖ Dornier flight- Traces of oil near shore extended up to 2 KM along the coastal line
- c) On March 5, 2023,
 - ❖ ICGS C-436 reported 'No oil spill'
- d) On March 6, 2023,
 - ❖ No traces of oil seen along the coast

8.4. Report for the Water samples taken by TNPCB

CPCL and TNPCB officials, Nagapattinam inspected oil spillage on 04th and 5th March 2023. The surface water samples were collected (at the time of leakage and after arresting the leakage) at three locations along the shore at Pattinachery village in and around the leakage point and sent to Hubert Enviro Care Systems (P) Ltd, NABL accredited laboratory.

Water samples collected on March 04, 2023, very close to the leakage point of the pipeline showed a higher concentration of Total Petroleum Hydrocarbon due to oil accumulation at the spot. Whereas the Total Petroleum Hydrocarbon (TPH) concentrations are within the permissible limits at ~100 Meters away from the spot on both the north and south sampling points. The oil was removed by deploying a mobile vacuum sucker to avoid any possibility of oil ingress into the sea on March 04, 2023.

Similarly, based on the results of seawater samples collected on March 05, 2023, the TPH concentrations are well within the CPCB Permissible limits at all the sampling points. The CPCB Permissible level for Class SW-1 (for harbour waters) is 10 mg/L. A full sample analysis report is enclosed as Annexure: 3.

8.5. Studies by CPCL

The Joint Committee instructed CPCL to share the documents/reports carried out in connection with the crude pipeline leak. CPCL submitted the following reports.

- a) Crude pipeline inspection report for the past one year
- b) Thickness measurement of the crude pipeline inspection report
- c) Central Mechanical Engineering Research Institute (CMERI) metallurgical analysis report of a 20" crude pipeline failure of CBR.
- d) Indian Oil Corporation Ltd- Research and Development (IOC-R&D) report on Bioremediation of sand
- e) The Energy and Resources Institute (TERI), New Delhi on Environment Impact Assessment study
- f) Indian Institutes of Technology (IIT), Chennai, for oil spillage drift pattern study & oil spill quantity study

The committee studied the reports and the important observations are furnished below.

a) Crude line inspection report for the past one year (internal audit)

CPCL shared the walk-through audit report for the crude pipeline. This inspection was carried out during the course of crude oil pumping through the pipeline. As per the CPCL crude pipeline inspection report, there were no abnormalities found in the pipeline (Annexure: 4).

b) Thickness measurement of crude pipelines carried out in 2022

CPCL carried out ultrasonic thickness gauging of the subject crude pipeline in June 2022 at various locations on both above-ground and underground portions of the pipeline. The external condition of the above-ground portion of the pipeline was found to be good. The thickness of the pipeline is well within the limits and satisfactory (Annexure: 5).

c) CSIR-Central Mechanical Engineering Research Institute, Durgapur (CMERI) metallurgical analysis report of 20" crude pipeline failure of CBR

CPCL entrusted the Central Mechanical Research Engineering Institute, Durgapur, which is the apex R&D institute for mechanical engineering under the aegis of the Council of Scientific and

Industrial Research (CSIR) to carry out the metallurgical analysis of crude pipeline to identify the root cause of the failure. The CMERI metallurgical analysis report has concluded that the pipeline failed primarily due to external object impact force. The CMERI conclusion is furnished below. The CMERI Report is enclosed as Annexure: 6.

- 1) The crack was initiated only on the outside diameter (OD) pipe wall surface of the pipeline
- 2) The plastic collapse on the pipeline was due to the impact of external or foreign objects
- 3) The plastic deformation-induced deformation texture bands within the metal matrix microstructure are evidenced by electron microscopy and optical microscopy.
- 4) The crack morphology on the failed pipeline was predominantly dominated by a brittle fracture due to sudden impact, while a mixed (brittle and ductile) mode of crack propagation was also evidenced.

d) IOC R&D report on Bioremediation of sand

IOC R&D team visited on March 06, 2023, to study the requirements of bioremediation. IOC R&D experts observed the following:

- 1) On the shore near the leak site as well as in the adjacent area, no traces of oil or tarball were observed. It is noteworthy that when crude oil comes in contact with sand, it forms tar balls due to the mixing of oil and sand with sea waves.
- 2) A few black spots were noticed on shore, which was probably due to material like coal dust which was not sticky like crude oil.
- 3) A representative composite sample of sand from the beach was collected from different depths and analyzed for Total Petroleum Hydrocarbon (TPH) content using the USEPA 9071B method. The TPH content of the composite sample was below the detection limit (less than 1 ppm).

IOC R&D Report is enclosed as Annexure: 7.

- e) **The Energy and Resources Institute (TERI), New Delhi, on Environment Impact Assessment study**

The Energy and Resources Institute (TERI) has carried out an Environment Impact Assessment study on seawater and sediment quality, Aquatic Biodiversity effect on the aquatic population.

The TERI report concluded based on the overall marine water and sediment quality analysis of the study area that there is no evidence of environmental damage attributed to the oil leak, and their findings are detailed below.

- 1) The overall water quality analysis, sediment and biodiversity analysis of the study area from the crude oil leak point, revealed that there is no evidence of visible environmental damage.
- 2) The sampling and site investigation findings showed that there is no visible contamination in and around the sampling site.

A detailed report is attached as Annexure:8

f) IIT Chennai for Oil spillage drift pattern study and Oil spill quantity study

IIT studied the oil spill pattern based on the satellite imagery from the PlanetScope image with 3-meter resolution on the day of the incidents and subsequently.

As per the findings of satellite imagery

❖ On March 3, 2023 at 9:39 AM

Oil spots were noticed at the leakage point, and subsequent drifting on the southern side with insignificant oil spill patches has been noticed.

❖ On March 4 and 5

Satellite images are not clear due to cloud coverage in that area.

❖ On March 6 and 7 at 09.30 Hrs

No oil spill was noticed on March 6 and 7 satellite images.

IIT has also generated oil spill trajectory patterns on a forecast basis using the GNOME model for the spill reported due to pipeline leakage at Nagore Beach to identify the quantum of leakage. The validation has been carried out using satellite image analysis.

IIT also studied oil spillage with Numerical modelling with 10MT with 1000 splots, 20 MT with 2000 splots , 40MT with 4000 splots , 60MT with 6000 splots, 80 MT with 8000 splots and 100MT with 10000 splots. IIT compared the spill pattern with an actual satellite image and concluded that roughly 10 MT would have leaked. CPCL clarified that they have deployed a mobile vacuum sucker and removed 3.4 MT (4000 Litres) and used oil dispersant to disperse 4.25 MT (5000 Litres). Hence, net spillage after vaporization is around 1.04 MT (1227 liters).

IIT Oil spillage drift pattern study (Annexure: 9) and Oil spill quantity study reports are enclosed (Annexure:10).

9. Summary and Findings of the Joint Committee

- a) The oil leak was observed on March 2, 2023, around 18.50 Hrs and a temporary clamp was provided on March 3, 2023, and the leak was arrested on March 4, 2023 early in the morning. On March 06, 2023, the site was again inspected by the TNPCB officials, Nagapattinam, and it was observed that no crude oil leakage was observed and the visual observation of the shoreline was clean. No fish deaths were reported due to the incident. The samples (at the time of leakage and after arresting the leakage) at three locations along the shore at Pattinachery village in and around the leakage point were collected and sent to NABL accredited private laboratory.
- b) Water samples collected on March 04, 2023, very close to the leakage point of the pipeline showed a higher concentration of TPH due to oil accumulation at the spot. The oil was removed by deploying a mobile vacuum sucker to avoid any possibility of oil ingress into the sea on March 04, 2023. Similarly, on March 05, 2023, the TPH concentrations were well within the CPCB Permissible limits in all the sampling points. The CPCB Permissible level for Class SW-1 (for harbour waters) is 10 mg/L.
- c) On March 16, 2023, the District Administration, Nagapattinam, convened a peace committee meeting with the Pattinachery Fishing Village People, Department of Fisheries, TNPCB Officials, and revenue officials and concluded to remove the pipeline laid in the sea.

- d) Based on the TERI, DoE-Tamil Nadu (NCSCM & NCCR) and TNPCB reports confirmed that, there is NO visible environmental damage in and around the spillage area. Also, the reports concluded that the TPH concentrations along the spillage site are within the permissible level.
- e) The quantity of oil leaks was less and has not had an environmental impact. The leak was not due to internal or external corrosion but was due to an external impact.
- f) The portion of the pipeline adjacent to the clamped area was found intact and healthy and the visual inspection of the pipeline found that there was NO internal or external corrosion.
- g) CMERI failure analysis has concluded that the pipeline failed primarily due to external object impact force and the crack was initiated only from the OD pipe wall surface of the pipeline.

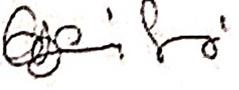
10. Recommendations on remedial measures to be undertaken by CPCL

During the Site visit, it was found that the ~850 meters pipeline from the seashore was completely dismantled and removed. It was instructed by the committee that Scraps found on this seashore should be removed at the earliest. And also, it was ascertained by the joint committee that the stakeholders of Pattinacherry and Nagore Village are satisfied with the action taken by the District Administration and also M/s Chennai Petroleum Corporation Limited-Cauvery Basin Refinery – CPCL-CBR).

As such, no remedial measures are suggested for the subject crude line

- a) While laying the new crude line for the proposed gross root Refinery, the line needs to be laid at an adequate depth as per good engineering practices.
- b) The Data Acquisition system (SCADA) and SOP has to be developed for monitoring the pipeline integrity. CPCL should ensure Supervisory Control and Data Acquisition system (SCADA) system for monitoring the pipeline integrity and leak.
- c) Implementing a sound management system to develop and maintain the integrity of pipelines. The proposed crude lines shall have wall thickness higher than the actual requirement as per engineering requirements considering the above factors.

Signature of the Joint Committee Members

Members of the joint committee	Signature
District Collector & Magistrate, Nagapattinam, Tamil Nadu.	 District Magistrate/ District Collector,
Dr. Sudheer Joseph, Scientist- G and Division Head, Applied Research and Research to Operations (ARO), INCOIS, Hyderabad.	
Er. Poornima BM, Scientist D, Central Pollution Control Board (CPCB), Regional Directorate – Chennai, Tamil Nadu	 Scientist D, CPCB
Er. V. Thamiloli, District Environmental Engineer, Tamil Nadu Pollution Control Board (TNPCB), Nagapattinam.	 Er. V. Thamiloli, District Environmental Engineer,
Dr. G. Hariharan, Scientist- C, Coastal Environmental Impact Assessment (CIA) Divisions, National Centre for Sustainable Coastal Management, Chennai.	 Scientist- C- NCSCM

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வே.03/2023/அ3
நாள்:06.03.2023

சார் ஆட்சியர் அலுவலகம்
நாகப்பட்டினம்

அமைதி பேச்சுவார்த்தை கூட்ட நடவடிக்கைகள்

நாகப்பட்டினம் மாவட்டம் மற்றும் வட்டம், நாகூர் நகரம், பட்டினச்சேரி கிராம கடற்பகுதியில் அமைந்துள்ள சி.பி.சி.எல். நிறுவனத்திற்கு சொந்தமான எண்ணெய் குழாயில் கடந்த 02.03.2023 அன்று மாலை கசிவு ஏற்பட்டது. இதனை 03.03.2023 அன்று சி.பி.சி.எல். நிறுவனத்தினரால் கசிவு தற்காலிகமாக சரிசெய்யப்பட்டு சோதனை ஓட்டம் செயல்படுத்தப்பட்டதில், தோல்வியுற்றது. அதனை தொடர்ந்து 05.03.2023 அன்று மாலை சி.பி.சி.எல். நிறுவனத்தினரால் முழுவதுமாக எண்ணெய் கசிவு சரிசெய்யப்பட்டது. இச்சம்பவத்தினால் சி.பி.சி.எல். எவ்எண் குழாயினை அப்பகுதியிலிருந்து நிரந்தரமாக அகற்ற கோரி பட்டினச்சேரி மற்றும் நாகப்பட்டினம் வட்ட மீனவ கிராம பஞ்சாயத்தார்கள் மற்றும் பொதுமக்கள் சார்பில் வருகிற 08.03.2023 அன்று சி.பி.சி.எல் நிறுவனத்தை முற்றுகை போராட்டம் நடத்த போவதாகவும், எண்ணெய் குழாய்களை அகற்றும்வரை நாகப்பட்டினம் வட்ட கிராம மீனவர்கள் மீன்பிடிக்க கடலுக்கு செல்வதில்லை எனவும் தீர்மானிக்கப்பட்டுள்ளதாக வரப்பெற்ற புகார் தொடர்பாக மேற்படி பிரச்சினைக்கு சமூக தீர்வு காணும் பொருட்டு இன்று (06.03.2023) மாலை 04.00 மணியளவில் நாகப்பட்டினம் சார் ஆட்சியர் அலுவலகத்தில் உட்கோட்ட நிர்வாக நடுவர் மற்றும் சார் ஆட்சியர் தலைமையில் சமாதான பேச்சு வார்த்தை கூட்டம் நடைபெற்றது. இக்கூட்டத்தில் கீழ்க்கண்ட துறை அலுவலர்கள் மற்றும் பட்டினச்சேரி கிராம பொதுமக்கள் சார்பில் கீழ்க்கண்ட பிரதிநிதிகள் கலந்து கொண்டனர்.

வ.எண்	கூட்டத்தில் கலந்து கொண்டவர்கள் (திருவாளர்கள்)	கலந்து கொண்ட அலுவலர்கள்
1.	என்.கௌதமன், தமிழ்நாடு மீன் வளர்ச்சி கழகத்தலைவர் மற்றும் மாவட்ட செயலாளர், நாகப்பட்டினம் (தெற்கு)	இணை இயக்குநர், மீன்வளம் மற்றும் மீனவர் நலத்துறை, நாகப்பட்டினம்.
2.	மீனவர் பஞ்சாயத்தார்கள் பட்டினச்சேரி, நாகூர்	உதவி இயக்குநர், மீன்வளம் மற்றும் மீனவர் நலத்துறை, நாகப்பட்டினம்.
3.	மீனவர் பஞ்சாயத்தார்கள் அக்கரைப்பேட்டை.	காவல் துணை கண்காணிப்பாளர், நாகப்பட்டினம்.
4.	மீனவர் பஞ்சாயத்தார்கள் கீச்சங்குப்பம்.	இயக்குநர், தொழில்நுட்பத்துறை, சி.பி.சி.எல். நிறுவனம், சென்னை

5.	மீனவர் ஆரியநாட்டுத்தெரு, நாகப்பட்டினம். பஞ்சாயத்தார்கள்,	பொது மேலாளர், சி.பி.சி.எல். நிறுவனம். பணங்குடி நாகூர்.
6.	மீனவர் சாமந்தான்பேட்டை, பஞ்சாயத்தார்கள்,	சிறப்பு காவல் உதவி ஆய்வாளர், (குனிப்பிரிவு) நாகூர்.
7.	மீனவர் பஞ்சாயத்தார்கள் கல்லூர்.	சரக வருவாய் ஆய்வாளர், நாகப்பட்டினம்.
8.	மீனவர் பஞ்சாயத்தார்கள், மேல பட்டினச்சேரி, நாகூர்.	கிராம நிர்வாக அலுவலர், நாகூர்.

மேற்படி கூட்டத்தில் பட்டினச்சேரி கிராம பொதுமக்கள் சார்பில் கீழ்க்கண்ட கோரிக்கைகள் மாவட்ட நிர்வாகத்திடம் முன் வைக்கப்பட்டது.

நாகப்பட்டினம் வட்டம் நாகூர், பட்டினச்சேரி கடல் பகுதியில் உள்ள சி.பி.சி.எல் நிறுவனத்திற்கு சொந்தமான எண்ணை குழாய்யில் கசிவு ஏற்பட்டு கடல் பகுதியில் சுமார் 20 மீட்டர் அளவுக்கு எண்ணை பரவி கடல் நீர் கருப்பு நிறமாக மாறி உள்ளதாகவும், இதனால் அப்பகுதியில் எண்ணை தூர்நாற்றம் வீசி வருகிறது என்றும் தெரிவித்திருந்தனர்.

மேலும் சி.பி.சி.எல் நிறுவனம் குழாயில் ஏற்பட்ட கசிவை சரி செய்யவிடாமலும் எண்ணை குழாயினை நிரந்தரமாக அப்பகுதியிலிருந்து அகற்ற கோரி பட்டினச்சேரி பகுதி பொதுமக்கள் பந்தல் அமைத்து எதிர்ப்பு தெரிவித்து வந்த நிலையில் நாகப்பட்டினம் சார் ஆட்சியர் தலைமையில் நடைபெற்ற அமைதி பேச்சுவார்த்தையின் மூலம் தீர்வு ஏற்பட்டு எண்ணை கசிவு குழாய் சீர்செய்யும் பணி நடைபெற்று சரிசெய்யப்பட்டுவிட்டது.

கூட்டத்தில் பின்வருமாறு முடிவுகள் தீர்மானிக்கப்பட்டது:

1. மாவட்ட நிர்வாகத்தின் அனுமதி இல்லாமல் பைப் லைன் ஆபரேஷன் செயல்படுத்தபட மாட்டாது.
2. பைப் லைன்கள் அகற்றுவது தொடர்பாக உள்நூர் அளவில் குழு ஒன்று அமைக்கப்படவுள்ளது. இக்குழுவில், CPCL நிர்வாகிகள், நாகப்பட்டினம் வட்ட மீனவ பஞ்சாயத்தார்கள், உள்ளாட்சி பிரதிநிதிகள், வருவாய்த்துறை, காவல்துறை, மீன் வளத்துறை ஆகியவர்களை உள்ளடக்கியதாக கொண்டு இக்குழு செயல்படும்.
3. மேற்படி குழுவானது பைப் லைன்களை அகற்றுவது தொடர்பாக எதிர்வரும் 16.03.2023 அன்று காலை 11.00 மணியளவில் மீன்வளத்துறையால் ஏற்பாடு செய்யப்படும் கூட்டத்தில் ஆலோசனை செய்து பைப் லைனை அகற்றுவதற்கான தேதி முடிவெடுக்கப்படும். இம்முடிவானது எழுத்துப்பூர்வமானதாக இருக்கும்.

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மேற்கண்ட உத்திரவாதத்தை ஏற்றுக் கொண்டு பட்டினச்சேரி கிராம பொதுமக்கள் மற்றும் நாகப்பட்டினம் வட்ட மீனவ பஞ்சாயத்தார்கள், சார்பில் எதிர்வரும் (08.03.2023) புதன்கிழமை, அன்று சி.பி.சி.எல் நிறுவனத்தை முற்றுகை செய்யப்போவதாக அறிவிக்கப்பட்ட போராட்டத்தினை கைவிடுவதாகவும், இன்று முதல் மீன்பிடித்தொழிலுக்கு விதிக்கப்பட்டிருந்த தடையினை நீக்கி கொள்வதாகவும் இன்றைய கூட்டத்தில் கலந்து கொண்ட நாகப்பட்டினம் வட்ட மீனவ பஞ்சாயத்தார்கள் சார்பில் கலந்து கொண்ட மீனவ பிரதிநிதிகள் தெரிவித்தனர். இதனை ஏற்கும் விதமாக கீழ்க்கண்டவாறு கையொப்பமிட்டுள்ளனர்.

R. S. S. S. S.

S. S. S. S. S.

M. S. S. S. S.

S. S. S. S. S.

P. S. S. S. S.

S. S. S. S. S.

S. S. S. S. S.

R. S. S. S. S.

S. S. S. S. S.

**மீன்வளம் மற்றும் மீனவர் நலத்துறை இணை இயக்குநர் அலுவலகம்
(மண்டலம்) நாகப்பட்டினம்**

ந.க.எண்.1086/இ/2023

நாள்.16.03.2023.

நாகப்பட்டினச்சேரி மீனவ கிராமத்தில் உள்ள கடற்கரை பகுதியில் CPCL நிறுவனம் மூலம் அமைக்கப்பட்ட குழாயை முழுமையாக அகற்றுவது தொடர்பாக மீன்வளம் மற்றும் மீனவர் நலத்துறை இணை இயக்குநர் முன்னிலையில் மீனவர்களுக்கிடையே அமைதி ஆலோசனை கூட்டம் 16.03.2023 அன்று காலை 11.00 மணியளவில் நடத்தப்பட்ட அமைதி ஆலோசனை கூட்ட நடவடிக்கைகள்:

கூட்டத்தில் கலந்து கொண்ட அலுவலர்கள் விவரம்:

1. மீன்வளம் மற்றும் மீனவர் நலத்துறை இணை இயக்குநர் (மண்டலம்) நாகப்பட்டினம்,
2. சார் ஆட்சியர் (கூ/பொ) நாகப்பட்டினம் / வருவாய் கோட்ட அலுவலர் வேதாரண்யம்
3. நேர்முக உதவியாளர் சார் ஆட்சியர் அலுவலகம் நாகப்பட்டினம்.
4. வட்டாட்சியர் நாகப்பட்டினம்.
5. காவல் ஆய்வாளர் நாகூர்.
6. சார் ஆய்வாளர் "Q" branch நாகப்பட்டினம்
7. தொழில்நுட்ப இயக்குநர் CPCL. மற்றும் அதிகாரிகள்.
8. மாவட்ட மாசுக்கட்டுப்பாட்டு வாரிய அலுவலர்.

கூட்டத்தில் கலந்துகொண்ட மீனவபிரதிநிதிகளின் விவரம்:

1. நாகூர் மேலப்பட்டினச்சேரி மீனவபஞ்சாயத்து/விசைப்படகுஉரிமையாளர்கள்
2. நாகூர்கீழப்பட்டினச்சேரி மீனவபஞ்சாயத்து/விசைப்படகுஉரிமையாளர்கள்
3. சாமந்தான்பேட்டைமீனவபஞ்சாயத்து/விசைப்படகுஉரிமையாளர்கள்
4. நம்பியார் நகர் மீனவபஞ்சாயத்து/விசைப்படகுஉரிமையாளர்கள்
5. அக்கரைப்பேட்டைமீனவபஞ்சாயத்து/விசைப்படகுஉரிமையாளர்கள்
6. கீச்சாங்குப்பம் மீனவபஞ்சாயத்து/விசைப்படகுஉரிமையாளர்கள்
7. கல்லார் மீனவபஞ்சாயத்து/விசைப்படகுஉரிமையாளர்கள்.

கூட்டத்தின் நோக்கம்

- நாகூர் பட்டினச்சேரியில் கடற்கரையில் CPCL நிறுவனம் மூலம் சுமார் 20 ஆண்டுகளுக்கு முன்னர் அமைக்கப்பட்ட கச்சா எண்ணெய் குழாயானது 02.03.2023 அன்று இரவு நாகூர் பட்டினச்சேரியில் கடற்கரையில் இக்குழாயில் உடைப்பு ஏற்பட்டு கசிந்தது.இந்நிலையில் இப்பிரச்சனையினை சுமுகமாக தீர்வு காணும் பொருட்டு 06.03.2023 அன்று மாலை 4.00 மணியளவில் நாகப்பட்டினம் சார் ஆட்சியர்

M. OmniEdmond Anumj'moj Bellow

R. Thud'le ...

S.M. RAJU

A. I. I. I.

S. D. E. I. I. I.

V. R. I. I. I.

T. vijay

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B. I. I.

M. I. I.

J. I. I.

K. I. I.

P. An.

P. G. I. I.

C. M. I. I.

P. muruga

K. I. I.

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TAMIL NADU Dr. J. JAYALALITHAA FISHERIES UNIVERSITY

From

To

Dr. N. Felix, Ph.D.
Registrar,
Tamil Nadu Dr. J. Jayalalithaa Fisheries
University,
Vettar River View Campus
Nagapattinam – 611 002.

The Joint Director,
Fisheries and Fishermen Welfare Department,
District Collectorate Campus,
Nagapattinam.

Lr.No.1360/TNJFU/D3/2023

Dated:16.03.2023

Sir,

Sub: TNJFU – Report on "Sensory evaluation and also test report on Poly aromatic hydrocarbons of finfish and shellfish collected from the sites of oil spill in Nagapattinam coastal region" - reg.

I am directed to send herewith the report on the "Sensory evaluation and also test report on Poly aromatic hydrocarbons of finfish and shellfish collected from the sites of oil spill in Nagapattinam coastal region" for kind information and action.

Encl: as above

REGISTRAR

16/03/23

16.03.2023

CC: PA to VC, TNJFU, Nagapattinam
Stock file / Spare



TAMIL NADU Dr. J. JAYALALITHAA FISHERIES UNIVERSITY

TNJFU Referral Laboratory for Fish Quality Monitoring and Certification

Department of Fish Quality Assurance and Management

Fisheries College and Research Institute, Thoothukudi - 628 008

Mobile : +91 94870 57915

E-Mail : dfgamferi@gmail.com

TEST REPORT

Test Report No.:TR-61/03-2023

Date:15.03.2023

Name and Address of Customer Sampled by TNJFU	Service Order No.	: Q61/2023
	Sample Description	Mackerel, Barracuda, Shrimp, Silver biddy, Carangid, Sardine curry
	Sample ID	: 13.03.2023/61(61.1-61.7)
	Condition of the Sample Received	: Sample in iced condition in insulated box
	Parameters to be tested	Sensory test and Poly aromatic hydrocarbon analysis
Date of Receipt:13.03.2023	Sample Quantity	:200g each
Date/s of Analysis:13.03.2023 to 14.03.2023		

Sensory analysis:

No abnormal odour detected in all samples

S. No.	Sample Name	Parameter	Method	Phenanthrene Concentration(ppb)	Fluranthene Concentration(ppb)
1	Mackerel	Poly aromatic hydrocarbon (Triphenylene Perylene Benzo-a-anthracene Benzo-e-pyrene Fluranthene Pyrene Benzo-a-pyrene Phenanthrene Anthracene)	GC-MS	75	52
2	Threadfin bream			58	46
3	Silver biddy			76	42
4	Barracuda			57	46
5	Carangid			92	69
6	Shrimp			106	40
7	Sardine curry			115	60

Note:

Detection of Phenanthrene and Fluranthene in all the samples reflects the possible contamination due to recent oil spill in Nagapattinam region. All other PAH's analysed including Benzopyrene, a carcinogen is however not detected in all samples.

Analyzed by

[Signature]
15.03.23

Approved by

[Signature]
15/3/23

TNJFU- Dr. MGR Fisheries College and Research Institute, Thalainayeru

Report on "Sensory evaluation of finfish and shellfish collected from the sites of oil spill in Nagapattinam coastal region"

The samples were collected from the three different locations of Nagapattinam such as Nagore, Kamanthapettai and Mahalakshmi Nagar landing centre. The sample collection and sensory evaluation was done based on the methodology of Objective Sensory Evaluation of Seafood for Presence of Petroleum Taint of the U.S. Food and Drug Administration (USFDA) and National Oceanic and Atmospheric Administration (NOAA, 2002). Marine invertebrates, including most shellfish, metabolize petroleum compounds slowly and inefficiently; consequently, they tend to accumulate high concentrations and wide ranges of Poly aromatic hydrocarbon (Law and Hellou 1999). Most pelagic and benthic finfish that occur in relatively deep waters have a low exposure risk to spilled oil because they are highly mobile and often are able to avoid oiled areas (Moller et al. 1989; Law et al. 1997; Law and Hellou 1999). Crustaceans (lobsters, crabs, and shrimp) have a moderate risk of exposure because they are mobile but also inhabit the benthic habitats in shallow near shore and estuarine areas. Most mollusks, especially bivalves, are at high risk of contamination because they are sessile and unable to avoid exposure.

It was decided to monitor and determine whether the finfish and shellfish actually were contaminated by the oil spill and to characterize the extent and degree of contamination. Therefore the finfish, crustacean and mollusk samples were collected from three different locations.

Generally, two different types of evaluations can be conducted after oil spills following sensory and chemical analysis. Sensory testing determines whether seafood is tainted, i.e., if it has an off-odor or off-flavor.

One of the contractual employees of Thalainayeru campus (retired overseer), bought fish from the Nagore landing center where the oil leakage occurred and experienced the taint while consuming the fish after cooking. This cooked sample with oil taint was given to FQAM, FC&RI, Thoothukudi for chemical analysis. When an oil spill

occurs, local seafood resources may be exposed to petroleum compounds that affect their sensory qualities; that is, smell, taste, and appearance.

Sensory Evaluation carried out by the Faculty at Fish Processing Laboratory, Department of Fish Processing Technology, Dr. MGR Fisheries College and Research Institute, Thalainayeru

The collected samples were stored in insulated box with ice and transported to Quality control laboratory, TNJFU- Dr. MGR Fisheries College and Research Institute, Thalainayeru for sensory evaluation. The samples were cleaned and cooked separately for sensory analysis.

Samples collected from the different sites:



Samples : Finfish, Crustacean and Mollusc

S1- Nagore Landing centre

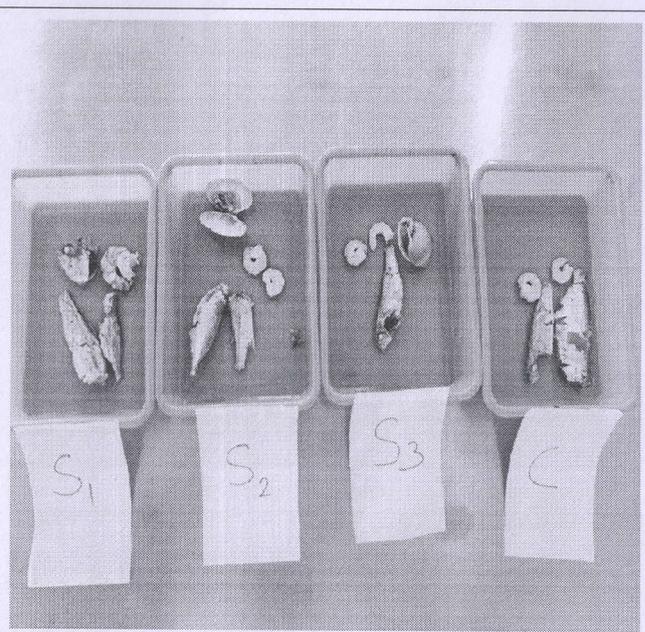
S2 – Kamanthapettai Landing centre

S3 – Mahalakshmi Nagar Landing centre

C – Vellapallam(Negative control sample) where no influence of the oil spill was noted



Sample processing : Steam cooking of samples separately



Cooked sample ready for panelist to conduct sensory evaluation

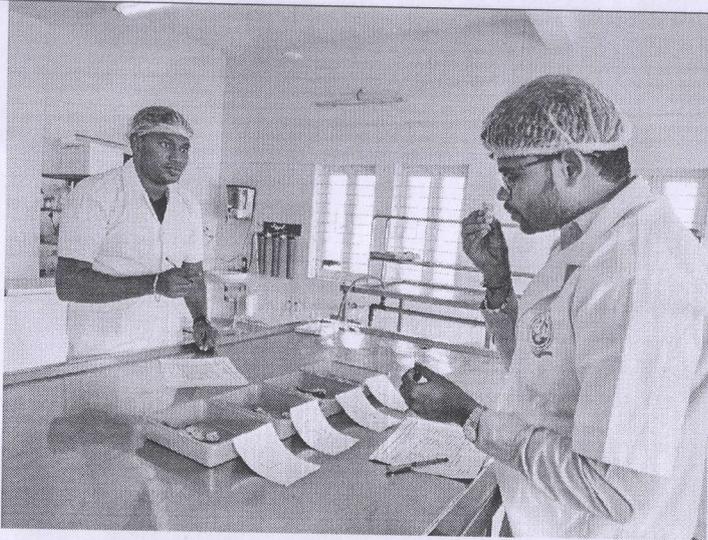
Sensory panels

Objective sensory evaluation of seafood was conducted using a panel of trained and experienced analysts. A trained "facilitator" coordinated the sensory analysis. The facilitator conducted the testing, including receiving, preparing, and presenting samples to the sensory panel and collecting the resulting data in a scientific and unbiased manner. There were four panelists and one facilitator participated in the sensory evaluation using Duo-Trio statistical sensory evaluation method. It is an overall difference test which determines whether or not a sensory difference exists between two samples particularly when comparing with control sample (from Vellapallam landing centre) which was unaffected by the oil spill.



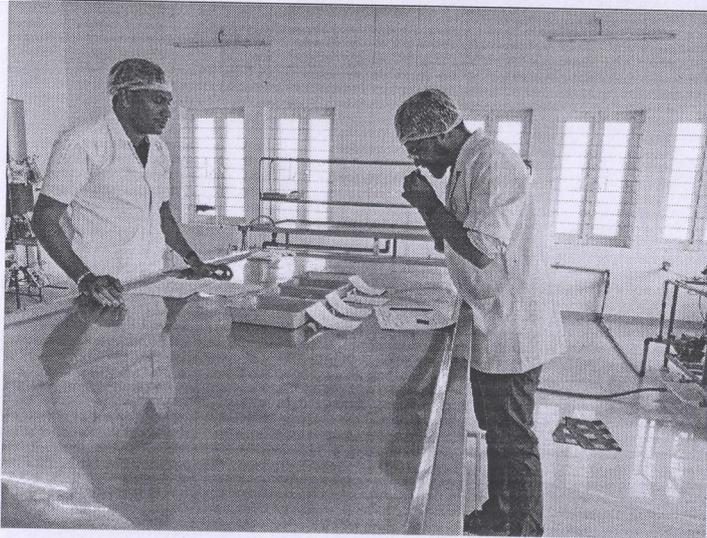
Panelist : Dr. M. Pechimuthu
Assistant Professor, Department of
Fish Pathology & Animal Health
(Right)

Facilitator: Mr. V. Vijayarahavan,
Assistant Professor, Department of
Fish Processing Technology (Left)



Panelist: Mr. P. Yuvarajan, Assistant
Professor and Head, Department of
Aquaculture. (Right)

Facilitator: Mr. V. Vijayarahavan,
Assistant Professor, Department of
Fish Processing Technology. (Left)



Panelist: Mr. K. Kavinesan,
Assistant Professor, Department of
Fish Processing Technology. (Right)

Facilitator: Mr. V. Vijayarahavan,
Assistant Professor, Department of
Fish Processing Technology. (Left)



Panelist: Ms. G. Feroline Jessina,
Assistant Professor, Department of
Fish Pathology & Animal
Health. (Right)

Facilitator: Mr. V. Vijayarahavan,
Assistant Professor, Department of
Fish Processing Technology. (Left)

Results

The sensory testing panelists' final results have been attached.

Objective Sensory Evaluation of Seafood for Presence of Petroleum Taint

Method: The U.S. Food and Drug Administration (USFDA) and National Oceanic and Atmospheric Administration (NOAA's)

Sample: Finfish and Crustacean
Location: Nagore, Tamil Nadu

Date of sampling : 15/03/2023

Sl.No.	Sample	Comparison	Taint odour	Result
1	Finfish	S1	Present / Absent	Pass / Fail
2	Crustacean	S1	Present / Absent	Pass / Fail
3	Molluscs	S1	Present / Absent	Pass / Fail
4	Finfish	S2	Present / Absent	Pass / Fail
5	Crustacean	S2	Present / Absent	Pass / Fail
6	Molluscs	S2	Present / Absent	Pass / Fail
7	Finfish	S3	Present / Absent	Pass / Fail
8	Crustacean	S3	Present / Absent	Pass / Fail
9	Molluscs	S3	Present / Absent	Pass / Fail

Tainted: Tainted seafood is defined as containing abnormal odor or flavor not typical of the seafood itself (ISO 1992).

Sensory Testing Facilitator	Sensory Testing Panelist
Signature: <i>V. Vijayarahavan</i>	Signature: <i>G. Feroline Jessina</i>
Name: V. Vijayarahavan	Name: G. Feroline Jessina
Designation: Asst. Professor, CPPT	Designation: Assistant Professor, Dr. M. S. F. C. S. T., Thalassery.

Objective Sensory Evaluation of Seafood for Presence of Petroleum Taint

Method: The U.S. Food and Drug Administration (USFDA) and National Oceanic and Atmospheric Administration (NOAA's)

Sample: Finfish and Crustacean
Location: Nagore, Tamil Nadu

Date of sampling : 14.03.2023

Sl.No.	Sample	Comparison	Taint odour	Result
1	Finfish	S1	Present / Absent	Pass / Fail
2	Crustacean	S1	Present / Absent	Pass / Fail
3	Molluscs	S1	Present / Absent	Pass / Fail
4	Finfish	S2	Present / Absent	Pass / Fail
5	Crustacean	S2	Present / Absent	Pass / Fail
6	Molluscs	S2	Present / Absent	Pass / Fail
7	Finfish	S3	Present / Absent	Pass / Fail
8	Crustacean	S3	Present / Absent	Pass / Fail
9	Molluscs	S3	Present / Absent	Pass / Fail

Tainted : Tainted seafood is defined as containing abnormal odor or flavor not typical of the seafood itself (ISO 1992).

Sensory Testing Facilitator

Signature: *[Signature]*

Name: *[Name]*

Designation: *[Designation]*

Sensory Testing Panellist

Signature: *[Signature]*

Name: *[Name]*

Designation: *[Designation]*

Objective Sensory Evaluation of Seafood for Presence of Petroleum Taint

Method: The U.S. Food and Drug Administration (USFDA) and National Oceanic and Atmospheric Administration (NOAA's)

Sample: Finfish and Crustacean
Location: Nagore, Tamil Nadu

Date of sampling : 14/03/2023

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Sensory Testing Facilitator

Signature: *[Signature]*

Name: *[Name]*

Designation: *[Designation]*

Sensory Testing Panellist

Signature: *[Signature]*

Name: *[Name]*

Designation: *[Designation]*

Objective Sensory Evaluation of Seafood for Presence of Petroleum Taint

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5	Crustacean	S2	Present / Absent	Pass / Fail
6	Molluscs	S2	Present / Absent	Pass / Fail
7	Finfish	S3	Present / Absent	Pass / Fail
8	Crustacean	S3	Present / Absent	Pass / Fail
9	Molluscs	S3	Present / Absent	Pass / Fail

Tainted : Tainted seafood is defined as containing abnormal odor or flavor not typical of the seafood itself (ISO 1992).

Sensory Testing Facilitator

Signature: *Vijayarajan*
Name: *V. Jayarajan*
Designation: *Asst. Professor, DFPT*

Sensory Testing Panellist

Signature: *P. Yuvarajan*
Name: *P. Yuvarajan*
Designation: *Assistant Professor, DPA,
Dr MGR FC&RI, Thalainayaru*

Conclusion:

The first oil spill occurred on 02/03/2023 and continued up to 4.3.2023. On 5.3.2023 the leakage was rectified. But the recurrence of oil leakage occurred on 11.3.2023. The seafood samples were collected from the landing centers on 12.3.2023.

Based on the sensory evaluation report it is observed that there is no abnormal petroleum taint in the seafood samples viz. finfish, crustacean and mollusks collected from the three different fish landing centres of Nagapattinam viz. Nagore, Kamanthapettai, and Mahalakshmi Nagar.

S. Balasundi
15/3/2023

Dean i/c
Dr. MGR FC&RI, Thalainayaru