TMs originate from natural and anthropogenic oil releases into the marine environment, which are formed after liquid petroleum is transformed by various processes. The hazardous or toxic substances of TM may have severe short or long-term impacts on marine ecosystems and economy, depending on weather conditions, location and the ecological sensitivity of the area of deposition. Even in the absence of acute toxicity, oil persistence in sediments can induce long-term ecological effects through complex biological interactions. The bioavailable oil fractions can cause chronic sub-acute toxicological effect (poor health, reduced growth and reproduction, low recruitment rates), which can alter population dynamics and disrupt trophic interactions and the structure of natural communities within ecosystems[2]. The 1991 Gulf war oil spill was the world’s largest oil spill, which released about 10.8 million barrels of crude oil and a large amount of ash fallout. Large quantities of oil were transported to southeast by northwest winds and regional circulation patterns, affecting virtually most of the beaches, particularly west coast of Qatar. Two decades ago, Al-Madfa et al[1] reported that north and northwestern coasts of Qatar were severely affected by 1991 Gulf war oil spill. GC-MS and CHEMSIC source identification method on oil residues along the northwestern coast of Qatar revealed that the oil residues were originated from two different sources such as Saudi Arabia and Kuwait crude oils[3]. Recent GC-MS analysis of hoptane fingerprint of the tar samples collected from the Ras Rakan Island closely matched the Basrah and Kuwait crude oil fingerprints, confirming that these tarmats might have formed from the 1991 Gulf War oil spill[4]. Qatar coast is continuously exposed to new oils spills as well in addition to earlier oil spills, making it mandatory to monitor and detect long-term fate of TMs along the Qatar coast.

In the September 2019 field campaign, we have covered over 250 km of coastline from Abu Samara to Al Ruwais along the west coast of Qatar.

At each beach, TMs were sampled from three transects (low tide, high tide and high and low tide) with transect width based on Galgani et al[5].

- TM samples were analyzed through ATR-FTIR spectroscopy using a Thermo Scientific Nicolet iS10 spectrometer with an ATR monolithic diamond crystal accessory. TM were sliced in half using a solvent-rinsed razor blade and a small internal section (~5 mm dia.) was removed and placed on the ATR crystal for analysis[5].

- Absorbance spectra were collected using 32 scans at 2 cm⁻¹ resolution measuring between 400 and 4000 cm⁻¹.

- A background atmospheric spectrum was subtracted from all sample spectra.

- Notable peaks include O-H stretching at approximately 3390 cm⁻¹, C=O stretching at 1712 cm⁻¹, C=O stretching at 1608 cm⁻¹, CH2 and CH3 bending at 1460 cm⁻¹, CH3 bending at 1376 cm⁻¹, and the C- OH stretching in alcohols at 1024 cm⁻¹.

- Peaks were integrated using Omnic software and the integrated areas of the absorbance were normalized to the C-H peak at 2910 cm⁻¹.

### RESULTS AND DISCUSSION

3. SAMPLING AND ANALYTICAL METHODS

3.1 Sampling

- **Figure 2 (a)**: Sampling transect in low tide, high tide and high and low tide line.

- **Figure 2 (b-c)**: Tarmats observed at Abu Samara and Al Zubara, respectively.

- **Figure 4**: Representative ATR-FTIR spectra of TM samples.

### CONCLUSION

- TM contamination pattern along the west coast of India showed that the northern part of the study area was highly contaminated than southern and central parts.

- The distribution of TM along the Qatar coast is as follows: Low tide> high tide> high and low tide.

- Oxygen-containing functional groups were observed in the ATR FTIR spectra of all TM samples as evidenced by a O-H stretching band at 3390 cm⁻¹, C=O stretching at 1712 cm⁻¹ and C=O-H stretch at 1024 cm⁻¹.

- Further examination of different TMs revealed differences in absorbance of functional groups between 600 and 1350 cm⁻¹ that could be used to distinguish between samples.

### ACKNOWLEDGMENT

This work is funded by the Qatar Petroleum for the project Tarmats of Qatar Coast: Resilience to Weathering Processes and Quantification of Environmental Hazards (QUST-ESC-QP-TM-10/19) and Variability in genomic patterns of bacterial communities related to tarmats and the chemical quantification of total hydrocarbons in tarmats along the Qatar coast (QUST-2-ESC-2019-3).

### REFERENCES


