Oil spill

Description:

The rapid assessment addresses the extensive damage caused by the oil spill to fishing grounds, resources, and coastal environments. It will evaluate the condition of mangroves, seagrass beds, rocky shores, corals, seafood, and water and sediment quality. The assessment aims to determine the potential ecological and public health impacts, evaluate the effectiveness of initial countermeasures, and provide baseline information for monitoring the medium and long-term effects of the spill.

Rapid Assessment of Impacted Rocky Shore Areas by MT Princess Empress Oil Spill in Oriental Mindoro

NARRATIVE REPORT

On March 3, 2023, Pola, Oriental Mindoro was declared under a state of calamity due to the incident involving the MT Princess Empress tanker containing 800, 000 liters of industrial fuel oil that sunk in the Balingawan point, Naujan, Oriental Mindoro. Oil spills could have a long-term impact on the marine environment, this may affect the population dynamics, interfere with the photosynthetic processes, sublethal effects which include reduced growth rates, loss of reproductive functions, and changes in the biochemical systems of an organism.

The rocky intertidal zone is one of the most vulnerable marine ecosystems that may be impacted by the oil spill. To determine the impact of the incident on the rocky shore areas of Pola, the University of the Philippines, Visaya in collaboration with the Mindoro State University conducted a rapid assessment.

On July 5, 2023, the rocky shore Mindoro team arrived at Pola and coordinated with Mr. Russel B. Tan, the Municipal Agriculture Officer. The team had a short meeting regarding the plan during the assessment.

July 6, 2023, the UPV rocky shore team arrived at Pola, on the same day ocular observations were conducted to identify impacted rocky shore areas. There are four selected sites which include Brgy. Misong, Brgy. Tagumpay, Brgy. Buhay na Tubig and Brgy. Calima. These sites are characterized by basalt and boulders rocks, traces of oil were also seen and observed during the assessment.

On July 7, 2023, before the actual assessment, the objectives, method, and protocol for the assessment were discussed and demonstrated by Dr. Karen Villarta-Lane and Dr. Acley Lane.

The team started assessing the Brgy. Misong which serves as site 1 followed by site 2 Brgy. Tagumpay, site 3 Brgy. Buhay na Tubig and Brgy. Calima as site 4. Three transects were laid parallel to the shore with 3 tidal height intervals, 0.50cm, 1m, and 1.5m for low shore transect, mid-shore transects, and high shore transects respectively. Quadrats with 0.25m2 were placed along with the 20 meters transect using random numbers. All invertebrates within the quadrat were identified, counted, and recorded. Representative samples per species were collected for further verification. The double-strung 100-point quadrat was used to determine the percentage cover of the abundant sessile species, algae, and oil cover.

Devices such as calibrated cross-staff and range finder were used to ensure the height consistency and slope, digital thermometer with thermocouple and non-thermocouple for air temperature, water temperature, and rock temperature, and GPS to track the exact location, aspect, and total area of the site. A portable drilling machine was also used to

place chips on the rocks that served as the markings on the site. For chlorophyll a, three samples of rock chips with 2cm2 were randomly collected at each tidal height using a hammer and chisel, rock chips were placed in a falcon tube and kept moist for chlorophyll extraction. After field assessments all the material used was rinsed with fresh water and the chlorophyll extraction was done using the cold methanol method and placed on a fridge. The assessment was conducted at 1 site each day and during the ebb tide.

As baseline information on rocky shore areas of Pola is not available, the team looked for the reference sites that are not affected by the oil spill but upon ocular checking the team found out that all the coastal barangays and rocky shores areas in Pola were impacted. The team decided to conduct an assessment in the Municipality of Mansalay, Oriental Mindoro. Two comparison sites were selected including the Brgy. Don Pedro and Sitio Palaypay, B. Del Mundo.

Brgy. Don Pedro is located at 12.47844° N, 121.44325° E facing northeast, the sampling site has a total area of 106. 36m2 while Palaypay has an area of 77. 812 m2 and located at 12.51854° N, 121.46384° E facing southeast. These sites are characterized by basalt rocks and tidal flats. The assessment was conducted on July 18 and 19, 2023 with the help of bantay dagat. The ocular observation was also done before the actual assessment.

Results

A total of 39 species were identified in the two-study area, 31 species in the affected area, and 28 identified species on the reference site. All the identified species were classified according to their phylum, feeding habit, and behavior.

Table 1. Identified Species and Its Classification

Classification	Phylum	Class	Species	Feeding habit	Mobile/Sessile
Invertebrates	Mollusca	Polyplacaphora	*Acanthopleura japonica*	Grazer	Mobile
Invertebrates	Cnidaria	Anthozoa	*Anthopleura dixoniana*	Predators	Sessile
Invertebrates	Mollusca	Bivalvia	*Bivalve*	Filter feeder	Sessile
Invertebrates	Mollusca	Gastropoda	*Cellana radiata*	Grazer	Mobile
Invertebrates	Mollusca	Gastropoda	*Ceritium sp.*	Grazer	Mobile
Invertebrates	Arthropoda	Thecostraca	*Chthamalus malayensis*	Filter feeder	Sessile
Invertebrates	Arthropoda	Malacostraca	*Crab 1*	Scavengers	Mobile
Invertebrates	Arthropoda	Malacostraca	*Crab 2*	Scavengers	Mobile
Invertebrates	Arthropoda	Malacostraca	*Crab 3*	Scavengers	Mobile
Invertebrates	Arthropoda	Malacostraca	*Crab 4*	Scavengers	Mobile
Invertebrates	Arthropoda	Malacostraca	*Crab 5*	Scavengers	Mobile
Invertebrates	Mollusca	Gastropoda	*Echinolittorina malaccana*	Grazer	Mobile
Invertebrates	Mollusca	Gastropoda	*Echinolittorina melanacme*	Grazer	Mobile
Invertebrates	Mollusca	Gastropoda	*Echinolittorina placida*	Grazer	Mobile
Invertebrates	Mollusca	Gastropoda	*Echinolittorina radiata*	Grazer	Mobile
Invertebrates	Mollusca	Gastropoda	*Echinolittorina trochoides*	Grazer	Mobile
Invertebrates	Mollusca	Gastropoda	*Echinolittorina ziczac*	Grazer	Mobile
Invertebrates	Arthropoda	Maxillopoda	*Goose barnacles*	Filter feeder	Sessile
Invertebrates	Arthropoda	Malacostraca	*Ligia exotica*	Grazers	Mobile
Invertebrates	Mollusca	Gastropoda	*Limpet 4*	Grazers	Mobile
Invertebrates	Mollusca	Gastropoda	*Littorina sp.*	Grazer	Mobile
Invertebrates	Mollusca	Gastropoda	*Lunella cinerea*	Grazers	Mobile
Invertebrates	Mollusca	Gastropoda	*Morula marginal*	Scavengers	Mobile
Invertebrates	Mollusca	Gastropoda	*Morula musiva*	Scavengers	Mobile
Invertebrates	Mollusca	Bivalvia	*Mytilus spp.*	Filter feeder	Sessile
Invertebrates	Mollusca	Gastropoda	*Nerita costata*	Grazers	Mobile
Invertebrates	Mollusca	Gastropoda	*Nerita exuvia*	Grazers	Mobile
Invertebrates	Mollusca	Gastropoda	*Nerita undata*	Grazers	Mobile
Invertebrates	Echinodermata	Asteroidea	*Patriela exigua*	grazer	Mobile
Invertebrates	Mollusca	Gastropoda	*Patteloida saccharina*	Grazer	Mobile
Invertebrates	Mollusca	Gastropoda	*Peasiella spp.*	Grazer/Herbivores	Mobile
Invertebrates	Mollusca	Gastropoda	*Pictocolumbella ocellata*	Predators	Mobile
Invertebrates	Mollusca	Gastropoda	*Planaxis sulcatus*	Grazer	Mobile
Invertebrates	Mollusca	Bivalvia	*Saccostrea cucullata*	filter feeder	Sessile
Invertebrates	Mollusca	Gastropoda	*Siphonaria javanica*	Grazer	Mobile
Invertebrates	Mollusca	Bivalvia	*Snail 4*	filter feeder	Mobile
Invertebrates	Mollusca	Gastropoda	*Strigatella paupercula*	Grazer	Mobile
Invertebrates	Arthropoda	Thecostraca	*Tetraclita japonica*	filter feeder	Sessile
Invertebrates	Mollusca	Gastropoda	*Thais clavigera*	Scavengers	Mobile

Figure 1. below shows that majority of the identified species are under phylum Mollusca and Phylum Arthropoda having the same percentage composition of 37.50% and 12.50 % are under Phylum Cnidaria and Echinodermata. Among all the species 58% are grazers whereas 10% are predators. Only 17% of the species are sessile and most of them are mobile with 82 % .

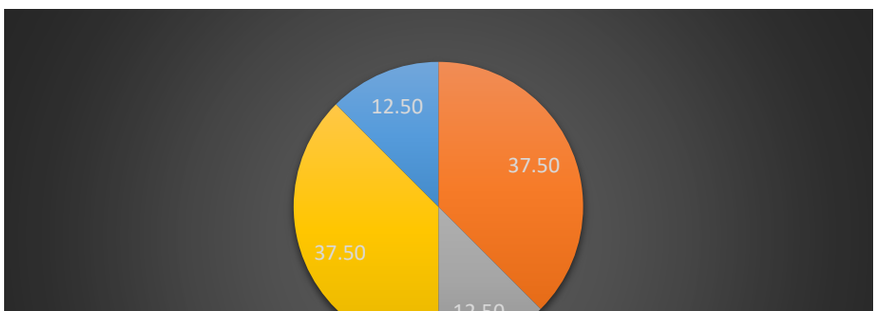
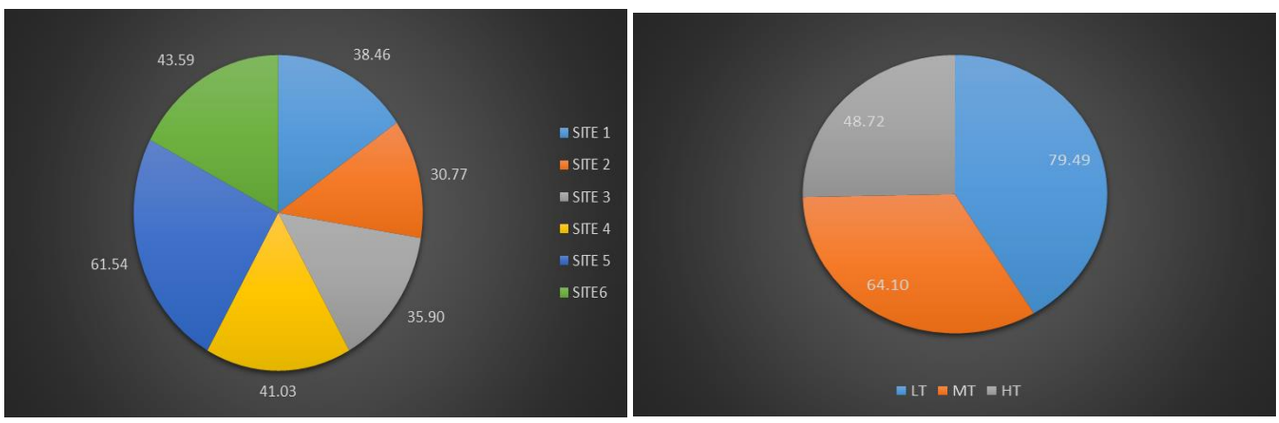


Figure 2. Shows the species distribution each sites and each level (A) shows that reference site, Don Pedro has the highest species distribution with 56.10% and (B) shows that 87.80% of the species found in the low shore transect followed by mid-shore transect and high shore transect with 58.54% and 46.34% respectively.

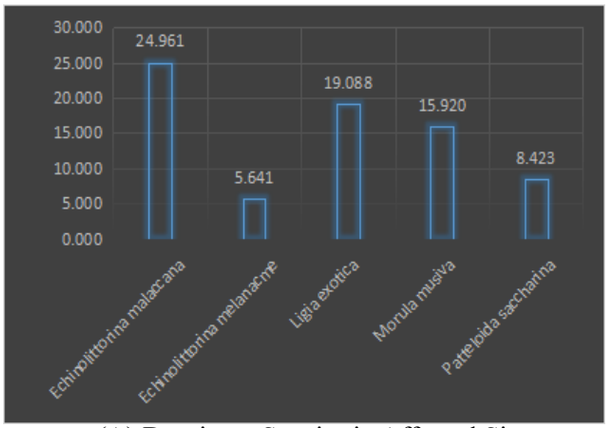


(A)Species Distribution per site

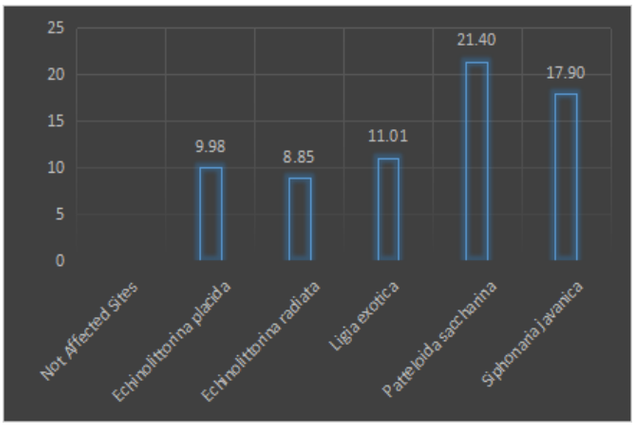
(B)Species Distribution per Tidal Height

Figure 2. Species Distribution

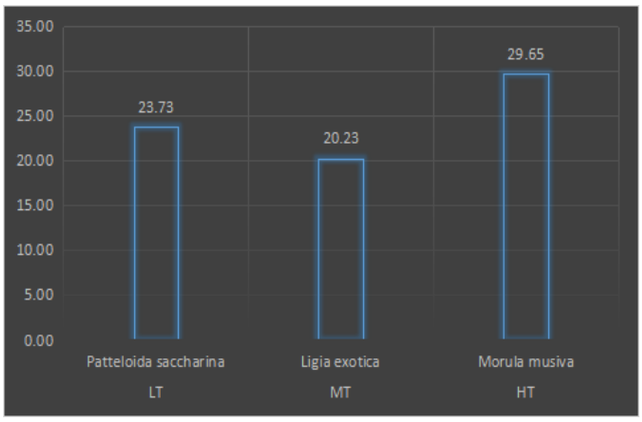
Echinolittorina malacanna dominated the affected sites with 24.96 % while *Patteloida saccharina* with 21.40% dominated the reference sites. Each tidal height has a different dominating species, 23.73% of *Patteloida saccharina*, 20.23% of *Ligia exotica* and 29.65% of *Morula musiva* dominates the low shore transect, mid-shore transect and high shore accordingly. However, overall result on the species abundance shows that, Morula musiva has the least number of individuals while Ligia exotica dominated among six sites with 18.96%.



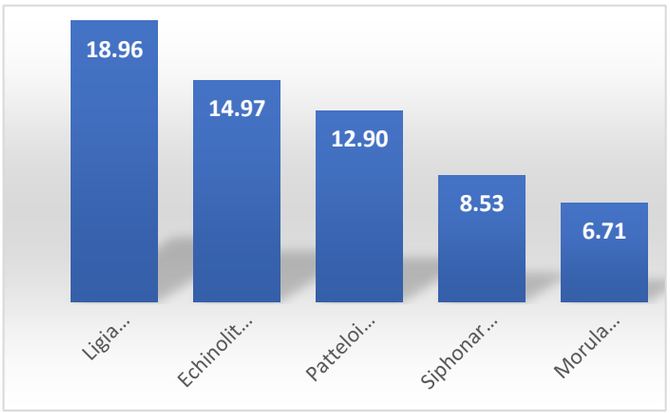
(A) Dominant Species in Affected Sites



(C) Dominant Species in Reference Sites



(B) Dominant Species in per Tidal Height



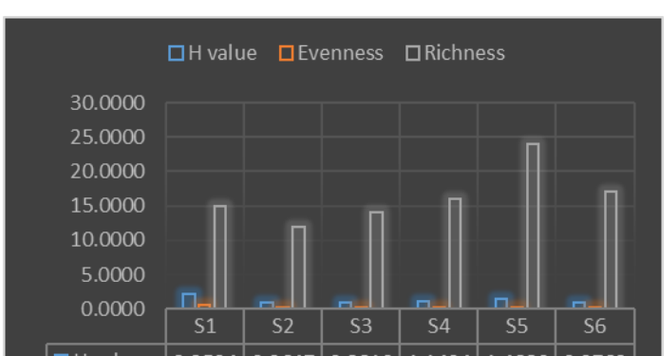
(A) Dominant Species among

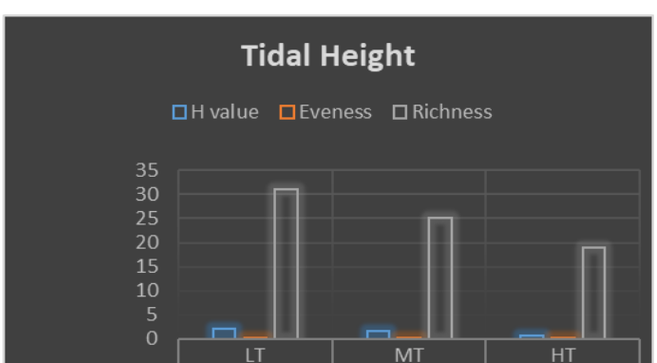
Figure 3. Species Abundance

Species Abundane and Diversity

Using Shannon diversity index Figure 4 (A) revealed that Site 1 has the highest species diversity with 2.26 H-value while the lowest was site 3 with 0.88 H-value. Species diversity in each tidal height shows that (B) Low shore transect has the most diverse species followed by mid-shore transect with 2.19 and 1.73 H-value respectively. High shore transect has the lowest species diversity among tidal height.

In overall diversity indices, affected sites are more diverse compared to reference sites however, the result may vary because reference area has only two sites compared to the affected area having four different sites.





The summary of findings revealed that 66% of the oil was found in mid-shore transects and 54% was in the low shore transects. Meanwhile, 93% of algae and lichens constituted at the low shore, 37% at mid transects and the lowest percentage cover was in high transects.

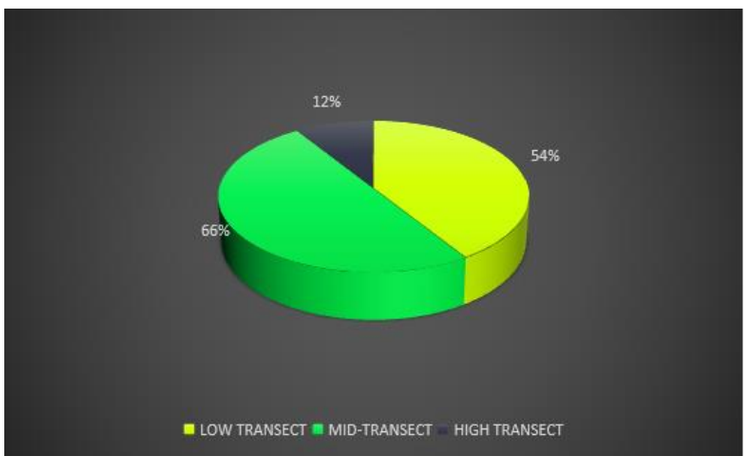


Figure 5. Oil Percentage cover

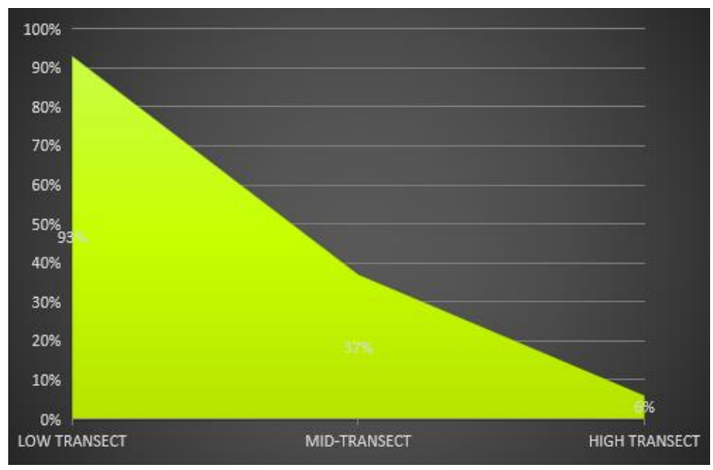


Figure 5. Algae and Lichens Percentage cover

Chlorophyll *a* Analysis

The extracted chlorophyll from rock chips was measured using spectrophotometer at 665 nm and 750nm absorbance. 10% HCl was added to for phaeophytin, and concentration was computed using this formula:

Chlorophyll *a* (µg cm-2) = 13.9 [3.0 (c665 – 750) – (p665-750)] x V / 4 x a

where **13.9** is the spectrophotometric constant for methanol, **3.0** is the correction factor, **c665 –750** is the chlorophyll *a* reading before addition of HCl, **p665 – 750** is the phaeophytin *a* reading after acidification, **V** is the volume of methanol (ml), **4** is the cell path length (cm) and **a** is the area of the rock chip (cm^2)

With the result

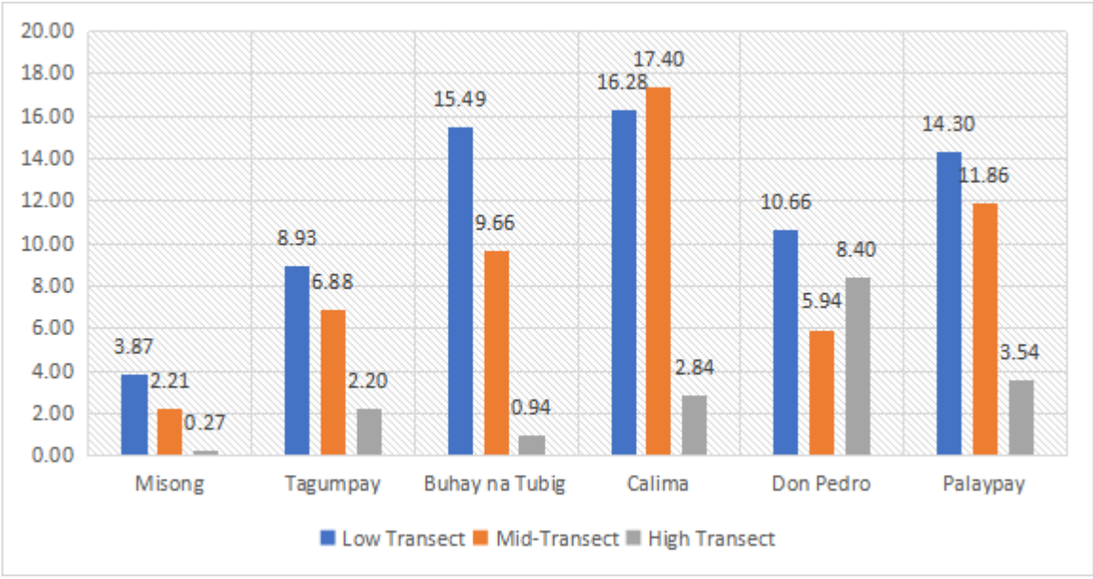


Figure: Chlorophyll *a* value of Sites per Tidal height

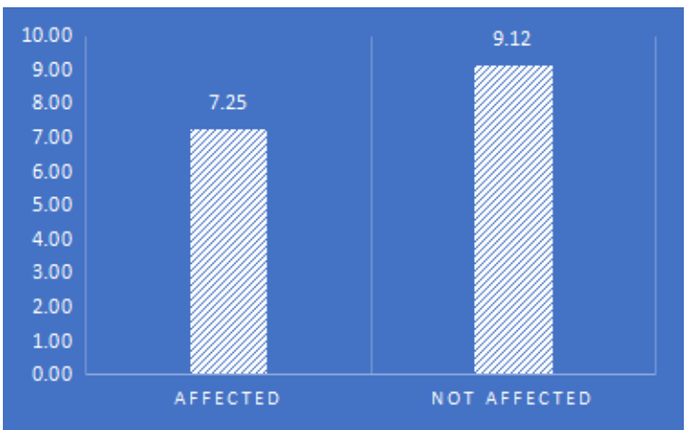


Figure: Chlorophyll *a* value of Affected and not Affected site

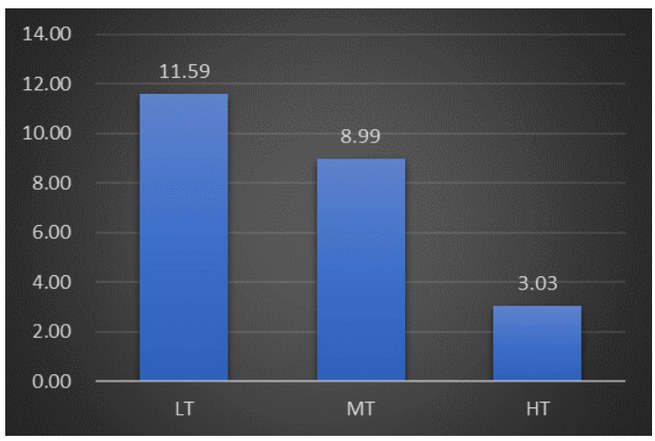
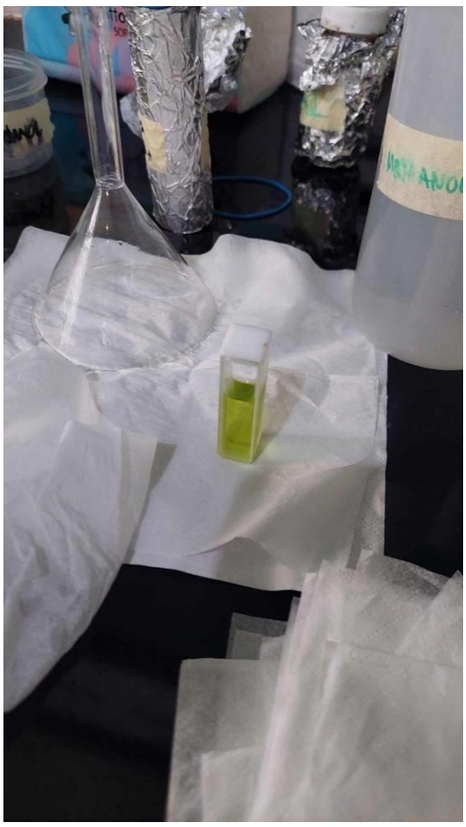


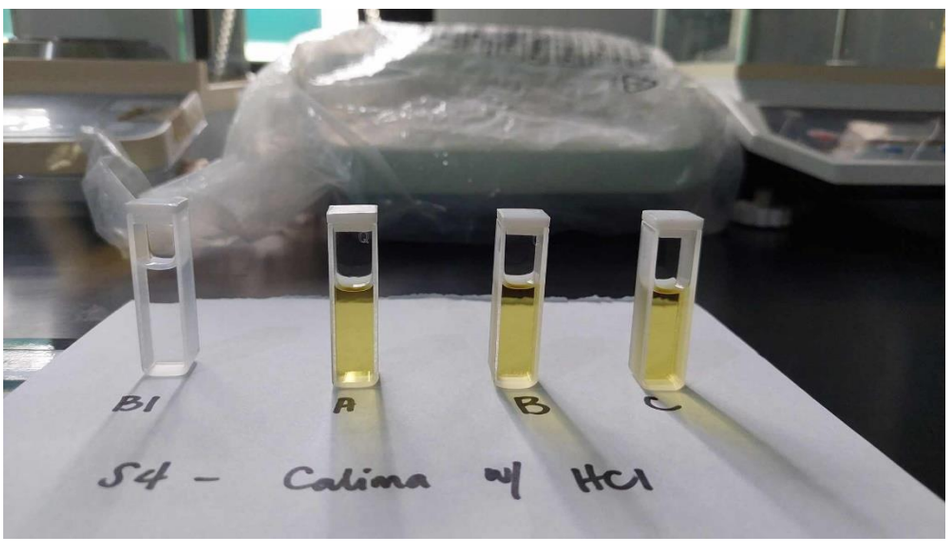
Figure: Chlorophyll *a* value per Tidal Height

Rocky shore Team

Actual Assessment

Chlorophyll *a* Analysis





Traces of Oil spill

Identified Species