



Evidence-Based-Policy for Environmentally Sound Management of Plastics in Asia-Pacific Region

MONDAY, 19 SEPTEMBER 2022 | 16:00 - 17:30 KST

TS-5.2 - Room 104-105,
The Busan Exhibition & Convention Center, Busan, Republic of Korea





7TH INTERNATIONAL MARINE DEBRIS CONFERENCE
18th - 23rd September 2022
BUSAN, REPUBLIC OF KOREA



Microplastic Pollution in Coastal Water Environments Due to a Maritime Disaster: X-Press Pearl Shipwreck Case Study

Avanthi Deshani Igalavithana, MGYL Mahagamage,
Pradeep Gajanayake, Fujio Kojima, Yu Fukunaga, Amila Abeynayaka*

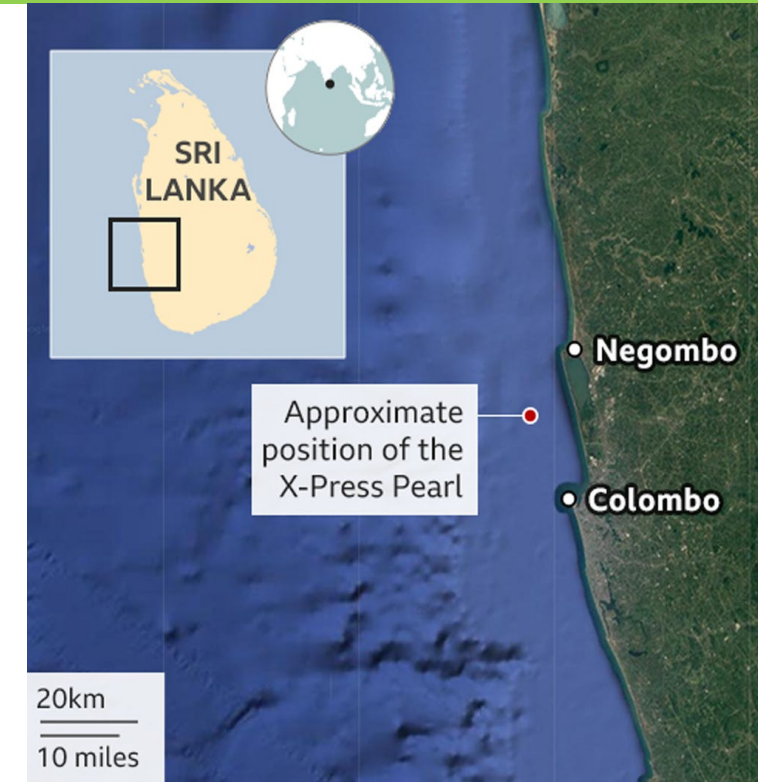
Department of Biosystems Technology, Faculty of Technology, University of Sri Jayewardenepura, Sri Lanka

*Institute for Global Environmental Strategies, Japan
Correspondence: abeynayaka@iges.or.jp



X-Press Pearl Shipwreck

- The Singapore-flagged cargo vessel was carrying a consignment of hazardous chemicals
- Ship caught fire on May 20, 2021 at 9.5 nautical miles (17.6 km; 10.9 mi) northwest of the Colombo Port
- On May 25, 2021, a large explosion took place inside the vessel and all 25 crew members were evacuated safely from the vessel
- Nitric acid, ethanol, lead ingots, dust urea, frilled urea, **low-density polyethylene**, epoxy resins, sodium methoxide, caustic soda, aluminum processing byproducts, raw materials for cosmetics, food items and general cargo



Source: MarineTraffic



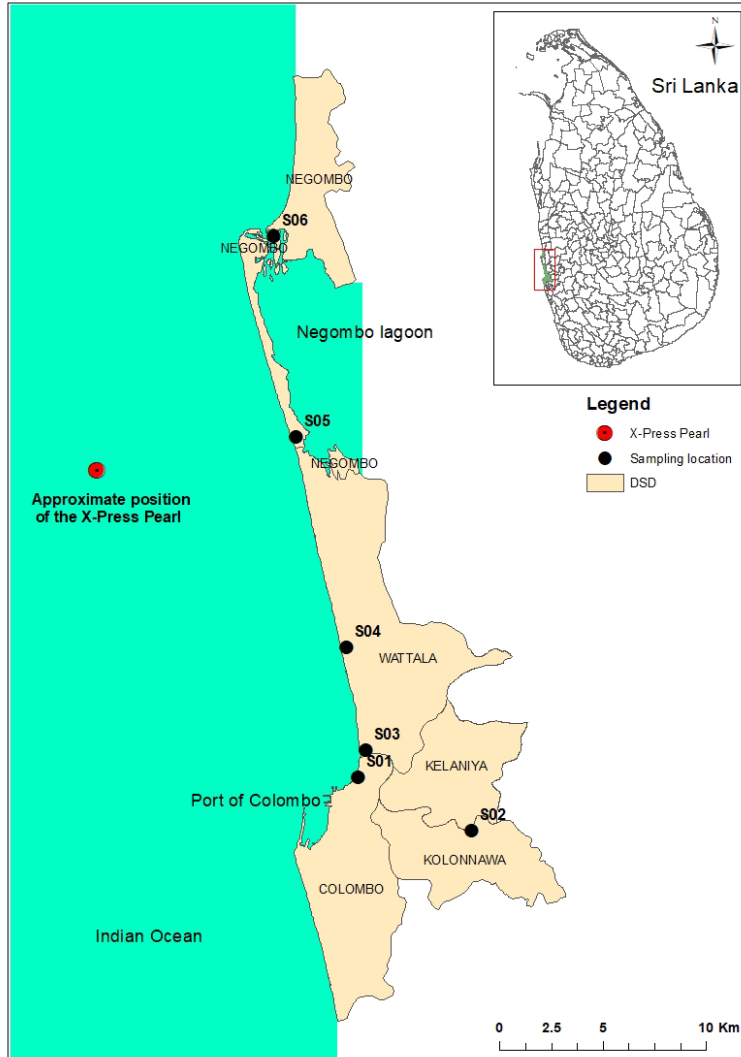
X-Press Pearl Shipwreck

- The burned plastics are polluted the air
- Spreading of plastic pellets is having the most disastrous impacts
- Cleaning efforts could be able to removed around half the plastic beads, rest mixed with sand and in the coral beds, continuing to kill ocean life for many more years

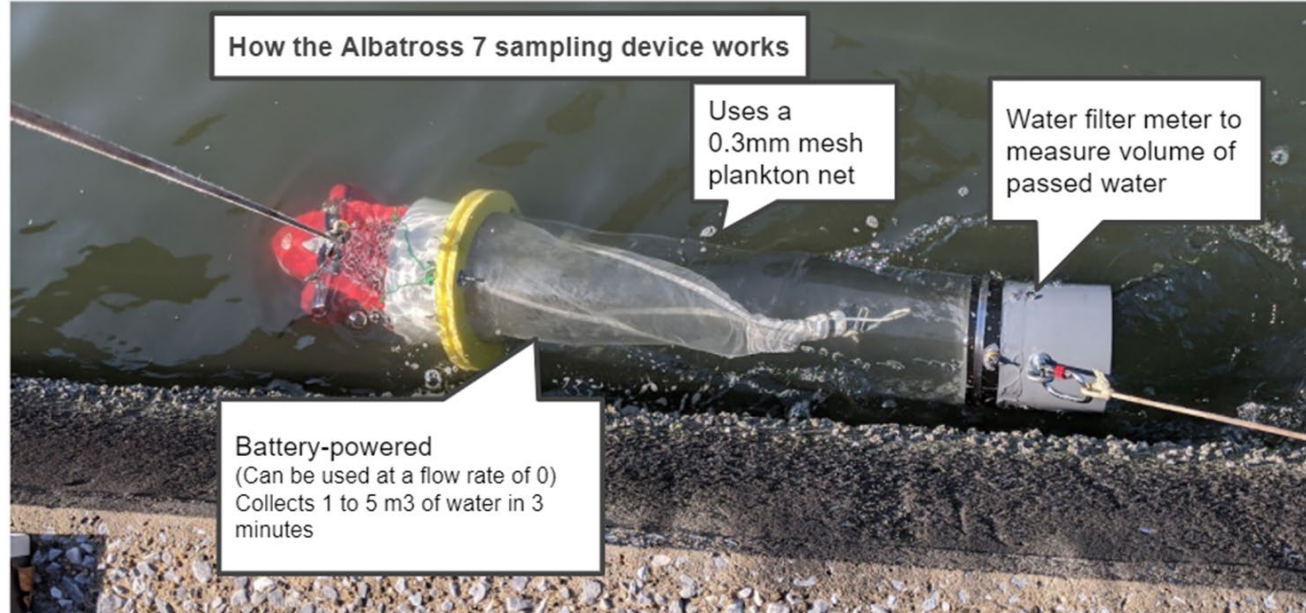


Sampling Locations & Sampling Method

Coastal water sampling - July 16, 2021 (One month after the disaster)



Albatross Sampler



Sample Preparation & Microplastic Analysis

Chemicals used for density separation

- Water surface sample: NaCl, 1.2 g/cm³
- Water bottom sample: NaI, 1.5 g/cm³

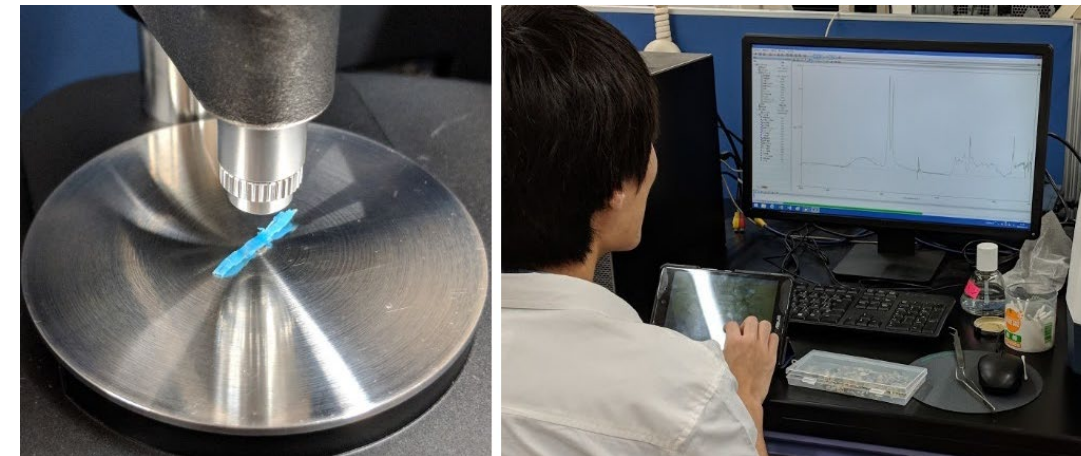
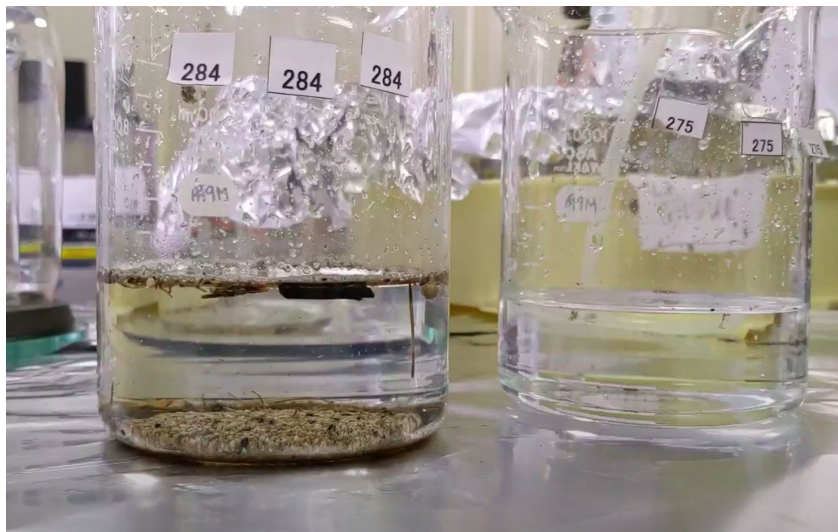
Chemicals and conditions for water purification

- 30 wt% H₂O₂ + 0.05 M Fe(II) (1:1)
- 50 °C, 1h

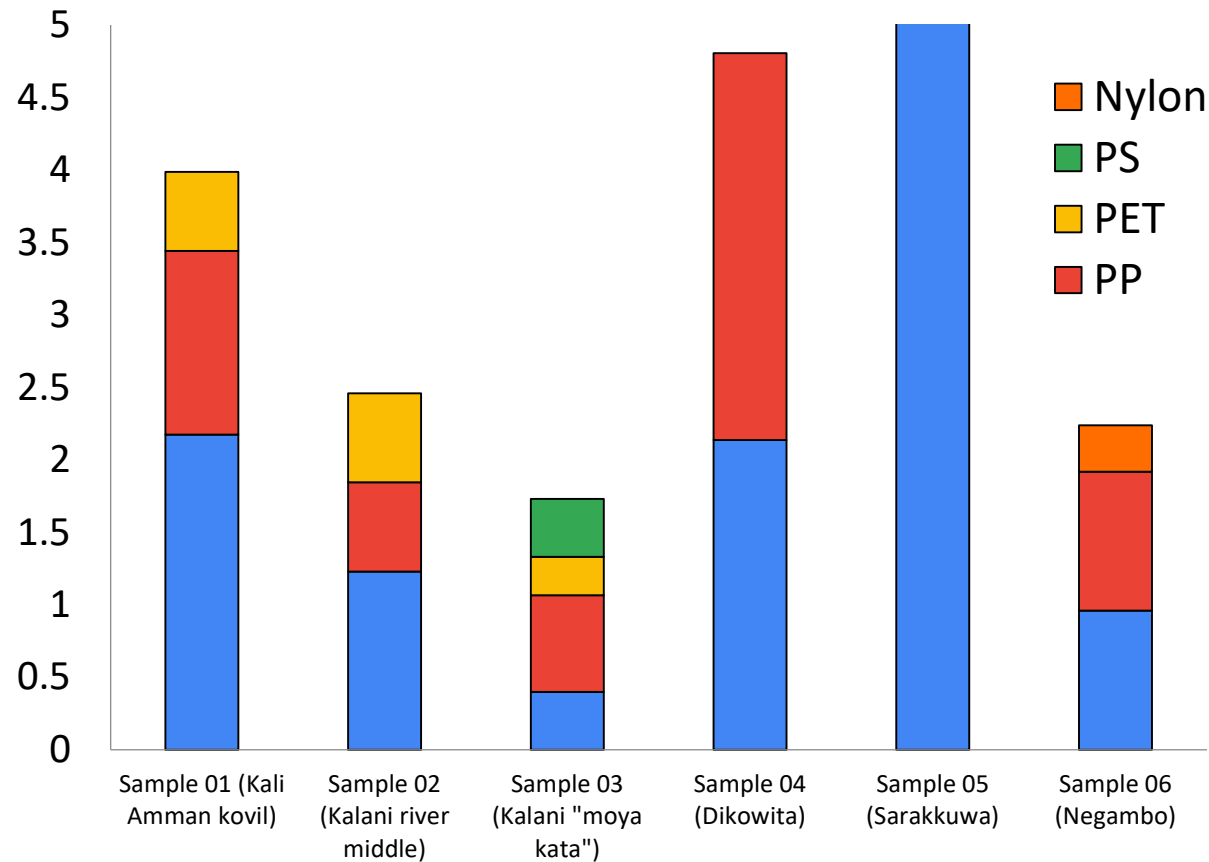
Stereomicroscope



FT-IR

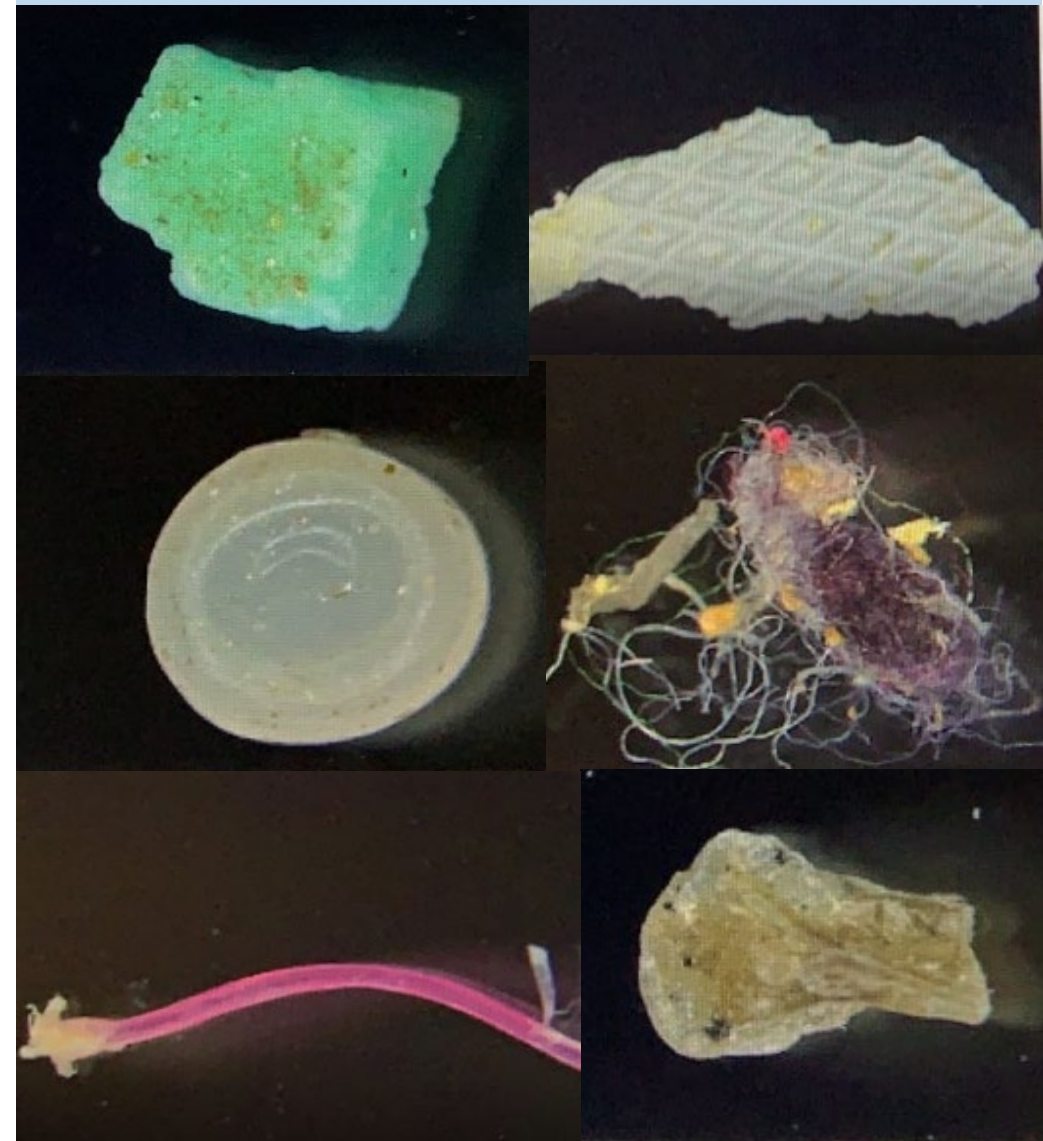


Results and Discussion



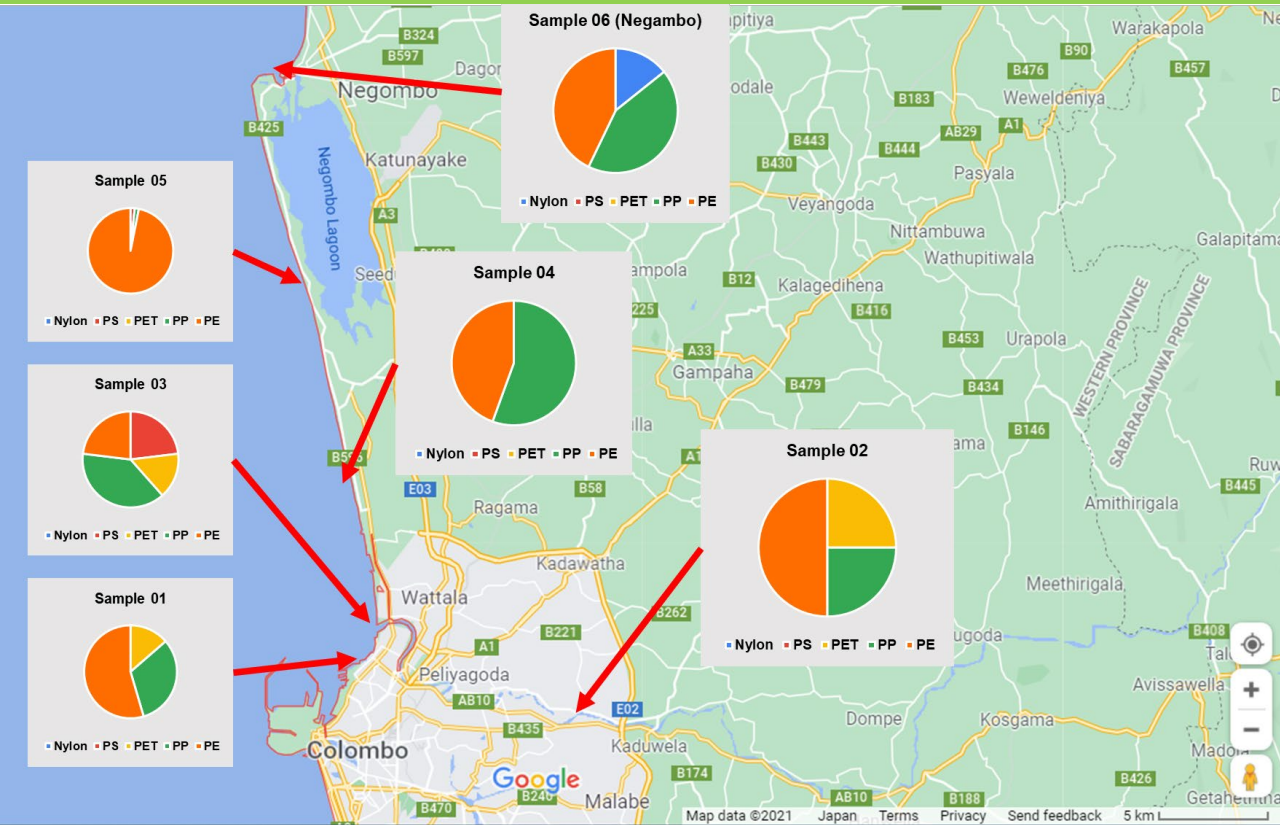
Polystyrene
Polyethylene terephthalate
Polypropylene
Polyethylene

Stereomicroscopic images

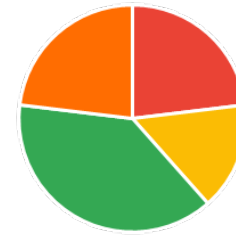


Results and Discussion

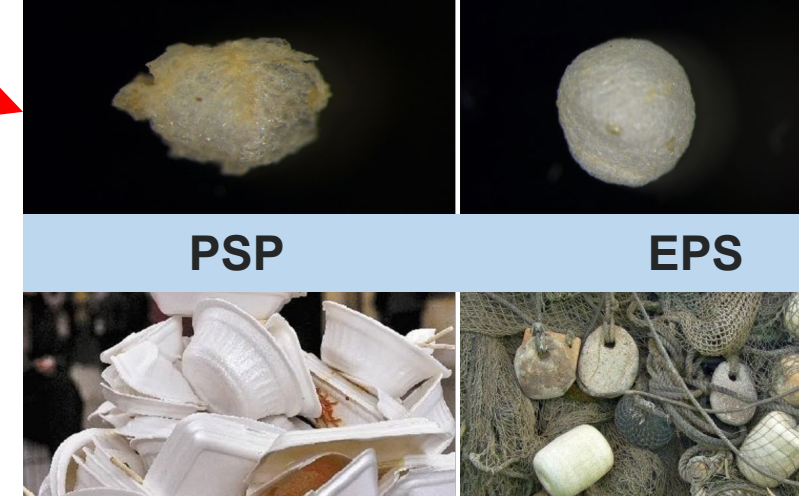
Source Tracking



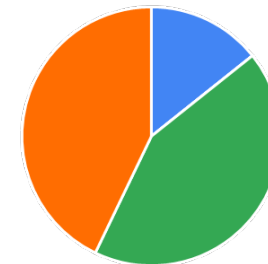
Sample 03 (Kalani "moya kata")



■ Nylon ■ PS ■ PET ■ PP ■ PE



Sample 06 (Negambo)



■ Nylon ■ PS ■ PET ■ PP ■ PE

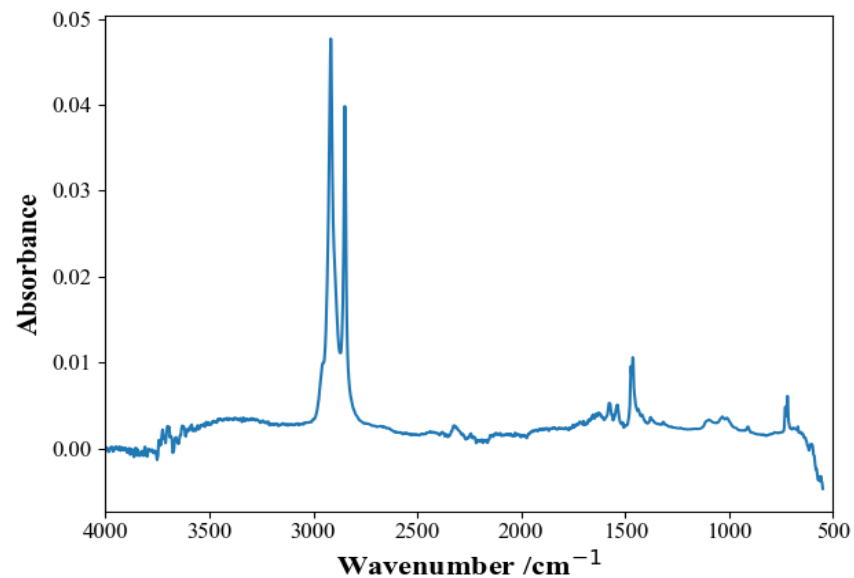
- Styrofoam gained more attention
- Which type of Styrofoam is contributing more?
- Polystyrene sheets (food packaging)
- or the EPS (such as fisherman buoyant)
- Policy measures

Fishing gear in the lagoon?

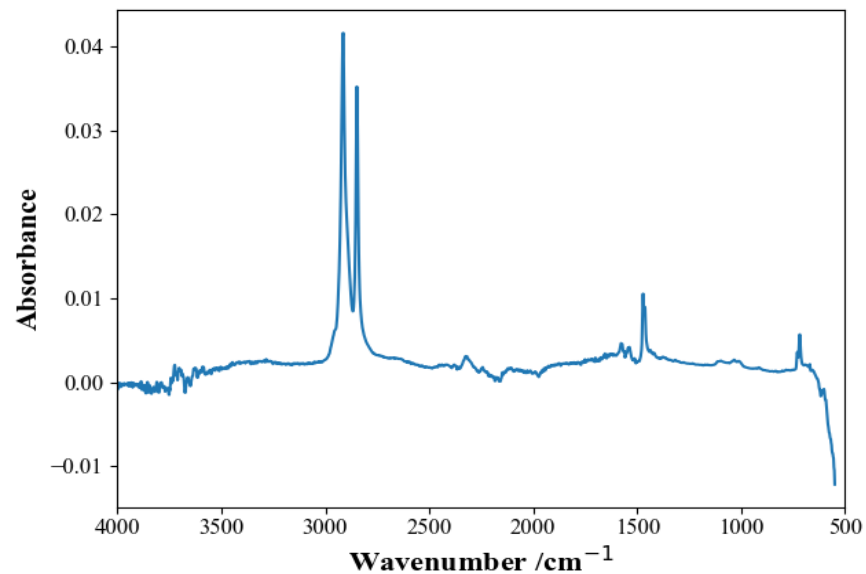
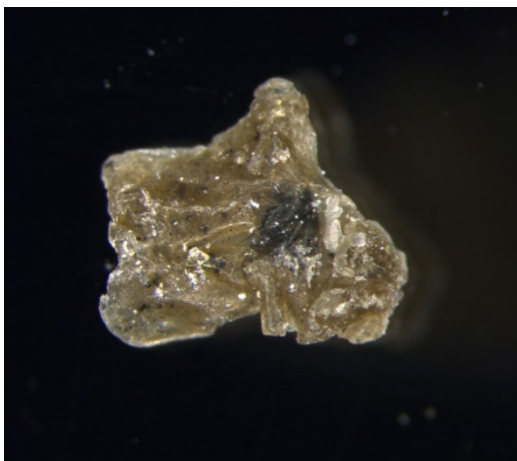
Results and Discussion

Source Tracking

Pellet



Burned Pellet



Conclusions

- Microplastics with diriment polymers (sources) in both coastal and freshwater environments present
- Very high concentration was reported near the shipwreck highest effected area
- Burnet pellets were able to detected and confirmation through FT-IR
- Source tracking
 - PE pellets un-burnt (from the ship)
 - PE pellets burnt
 - Polystyrene (both fishing buoyant and food packaging. Flowing through Kelani river and from the ocean (the mixing zone of the Kelani river mouth)
 - Nylon fibre from the ropes (probably from Negombo lagoon fishing nets)
- Accidental spills (such as X-press pearl) could increase very high degree MPs concentrations compared to the background

Thank you