## Evaluating organic contaminants associated with nurdles along beaches of south Texas

Xiangtao Jiang, Kaijun Lu, Jace Tunnell, Zhanfei Liu

The University of Texas at Austin – Marine Science Institute; Port Aransas, Texas



## What is nurdle?

 Microplastics with ~4mm in diameter

Pre-produced/raw pellets used to make consumer goods



**Nurdle Patrol Group** 

- "Nurdle Patrol"
- Ingestion & adsorption
- "Vector effect"



Photo by Chris Jordan/USFWSHQ/Flickr

# PAHs & PCBs

- Polycyclic aromatic hydrocarbon (PAHs)
- Polychlorinated biphenyls (PCBs)

Hydrophobic Widely occurrence in environments

Persistent and toxic



# Sampling & measurements

- New high tide line 100 nurdles/site
- Pyr-GC/MS: plastic identification
- Ultrasonic extraction with DCM (30min \*3)
- GC/MS-quantification of PAHs and PCBs



## Nurdle classification





Lightly weathered





• Heavily weathered





• Different types

## Nurdle classification







#### Polymer/Additive

- 1 Linear low density polyethylene ; L-LDPE (C1-C40)
- 2 Polyethylene (high density); PE(HDPE) (C1-C40)
- 3 Foam (Blistered, polyethylene, SOFTLON Z HD30) (C1-C40)

## Nurdle classification





#### Polymer/Additive

- 1 Polypropylene(isotactic); iso-PP (C1-C40)
- 2 Polypropylene (random copolymer); PP (C1-C40)

### **Concentrations of PCBs**



 PCBs were detected in high concentrations (dominated by PCB 153 & PCB 138) at Galveston.

### **Concentrations of PAHs**



• Nurdles contained high concentrations of PAHs.



• PAHs on nurdles were dominated by ones with 4-6 rings, which were different from those in sediments.

#### **Sources of PAHs**



- Nurdles have different composition of PAHs with sediments.
- Weathering and plastic type would affect PAHs composition.

### PAH concentrations



 Heavily weathered nurdles have higher concentrations of total PAHs.

# **SEM analysis**



• Lightly weathered nurdle

- Heavily weathered nurdle
- Heavily weathered nurdle tends to have larger surface area

# PAHs bioavailability analysis



- Associated PCBs could not desorb from nurdles in GSF
- Associated PAHs could desorb from nurdles in GSF
- PAHs on lightly weather nurdles desorbed more (13% vs. 5%)

## Summary

- Nurdles were dominated by PE, with a small portion of PP.
- Relatively high concentrations of PAHs and PCBs were detected on nurdles.
- Weathering degree and plastic type may affect the concentration and composition of PAHs associated on nurdles.
- Part of associated PAHs on nurdles are bioavailable.

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