

Threat of microplastic ingestion and chemical accumulation to cetaceans in the Republic of Korea

Byeongyong Park^{1,2}, Soobin Joo^{1,2}, Kyungsik Jo^{1,2} and TaeWon Kim^{1,2*}

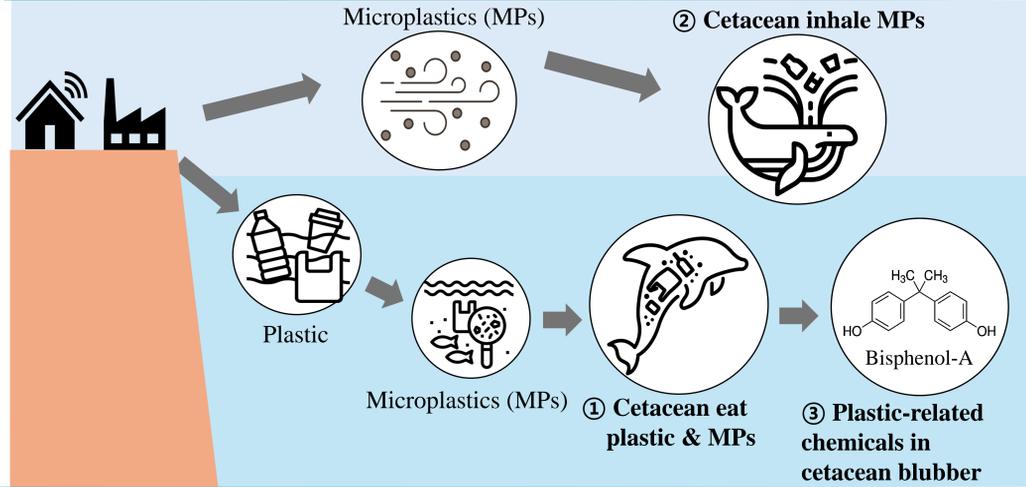
¹ Program in Biomedical Science and Engineering, Inha University, 100 Inha-ro, Michuhol-gu, Incheon 22212, Republic of Korea.
² Department of Ocean Sciences, Inha University, 100 Inha-ro, Michuhol-gu, Incheon 22212, Republic of Korea



Highlight

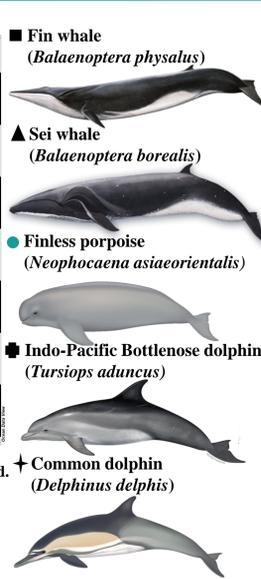
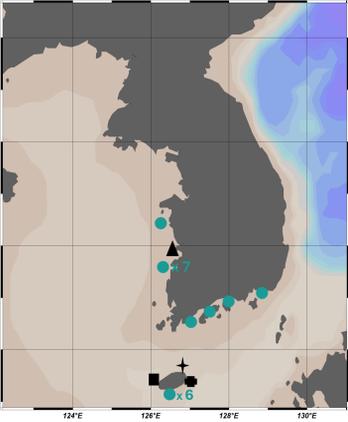
- Five species of cetaceans had microplastics in their digestive tracts, stranded in South Korea.
- The predominantly found microplastics were transparent to white, fragment-shaped polypropylene, and smaller than 200 μm.
- We compared and analyzed the microplastics in the lung tissues and digestive tracts of finless porpoises.
- The lungs had a higher polymer hazard index than the intestines, suggesting that inhaled plastics might be more hazardous than ingested ones.
- The number of microplastics in the digestive tracts of finless porpoises had a positive correlation with the amount of bisphenol A in the blubber.

Introduction

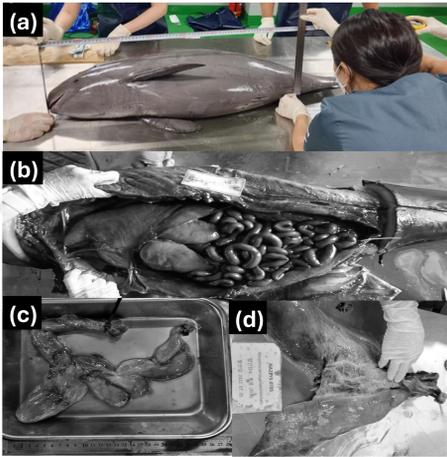


Materials & Methods

Study Site & Species

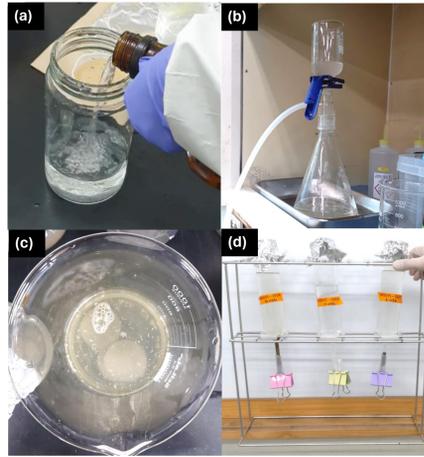


Necropsy & Sampling



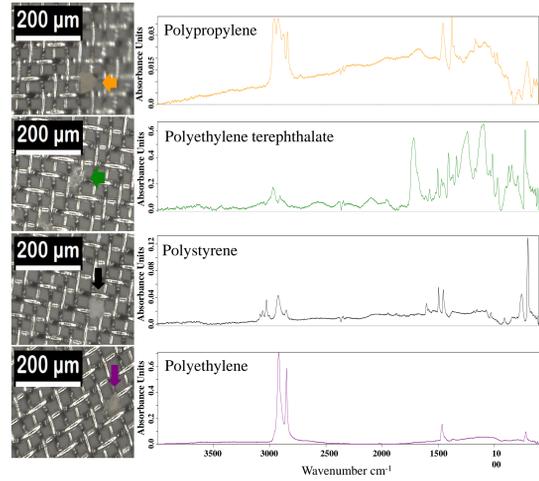
- Representative necropsy photos of finless porpoises used in this study: (a) measuring the length and external lesions; (b) removing the fat and muscle from the carcass; (c, d) stomach and lungs from the carcass.

Sample processing procedure



- For microplastic extraction (a) adding 300 ml of KOH to the sample to remove organic matter, (b) filtering after treatment, (c) adding 300 ml of H₂O₂, (d) performing density separation using a ZnCl₂ solution.

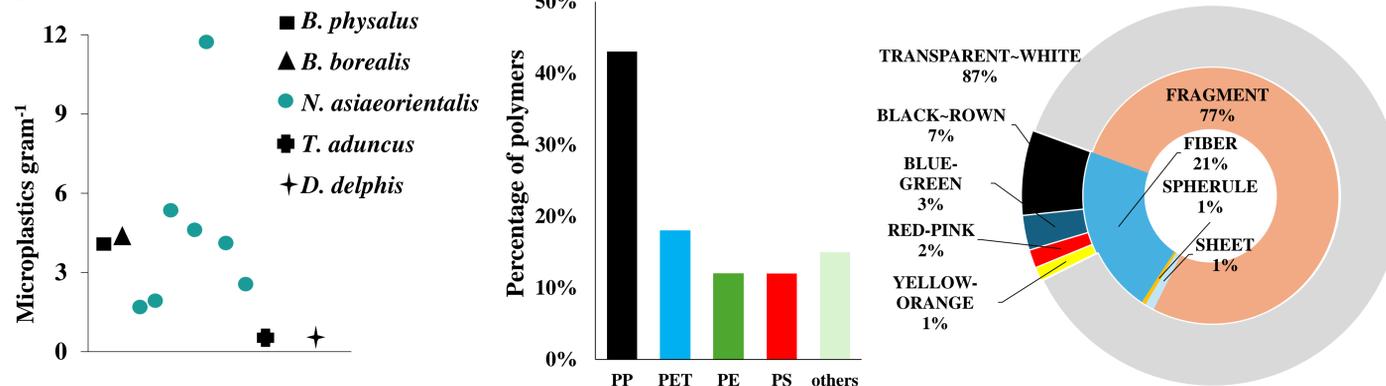
Microplastics Identification & Quantification



- Images of microplastics found in the samples and polymer spectra analyzed by μ-Fourier-transform infrared spectroscopy (FT-IR).

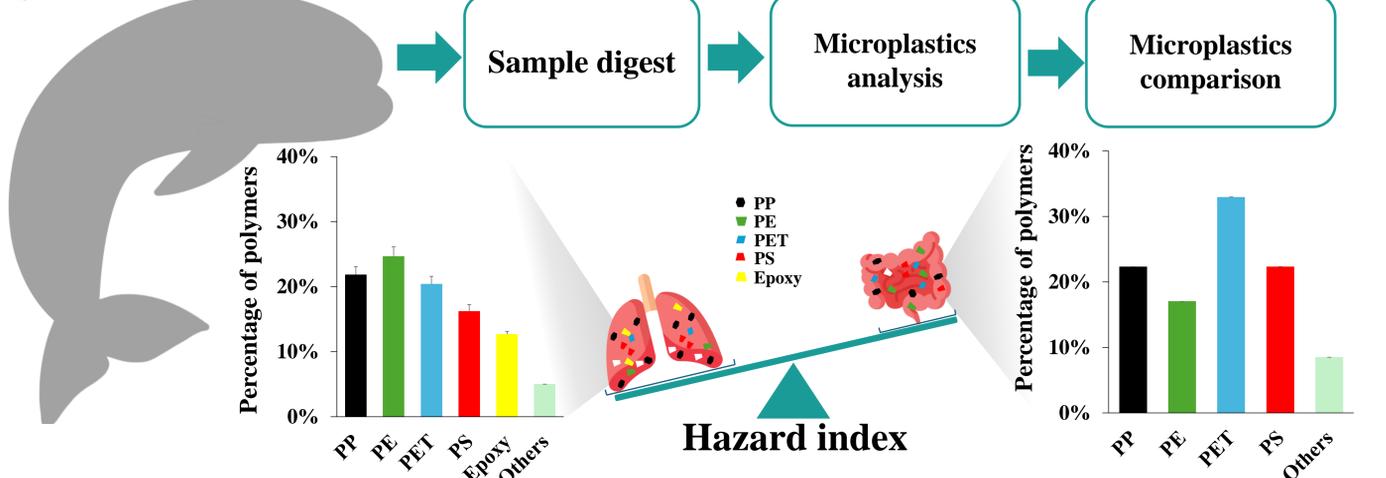
Result

① Result



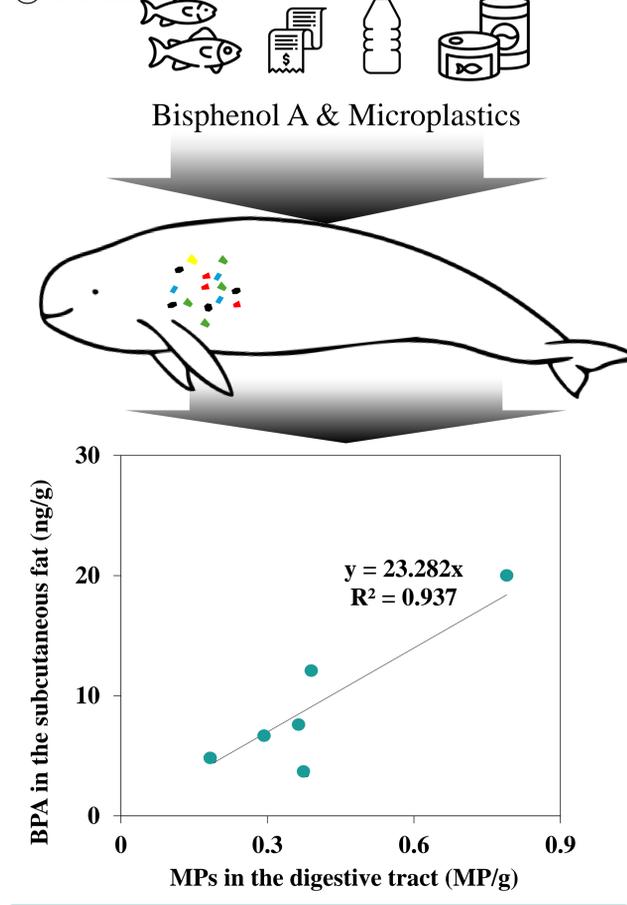
- The physical characteristics of the plastics found in cetaceans that died in South Korea are similar.
- There is no significant difference in the number of microplastics between the stomach contents and intestinal contents of finless porpoises (independent samples *t*-test, *t* = 0.761, *n* = 6, *p* = 0.733, respectively).

② Result



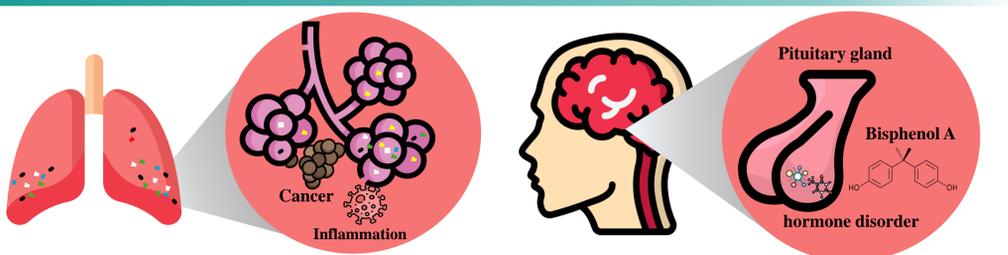
- To compare the microplastic intake through breathing and ingestion in finless porpoises, we compared the characteristics of microplastics and the polymer risk index between lung tissues and intestinal contents (Mann-Whitney-*U*, *p* = 0.016, respectively).

③ Result



- To confirm the hazards of plastics, we analyzed the MPs in the digestive tract and BPA in the blubber of finless porpoises.
- The higher the MPs in the digestive tract, the greater the amount of BPA accumulation in the blubber.

Discussion



- Epoxy can cause lung inflammation, inhibit cell growth and proliferation, and cause cancer.
- Although BPA is being restricted, it is a substance whose accumulation in cetaceans has steadily increased until recently, and this accumulation can affect reproduction and hormone levels.

Summary

- Whales can be affected by plastic pollution in various ways, including through land, sea, and air.
- The physical impacts of plastic, such as entanglement or entrapment, as well as chemical effects, can have serious consequences on their bodies.
- Although whales live in the ocean, they consume similar organisms and breathe the same air as humans. Therefore, research on cetaceans is important for understanding the potential impacts on humans in the future.

QR Zone

E-mail: whale.park@inha.edu
 Instagram: whale._park
 Phone number: +82 10 9218 5783

Contact code: Researchgate code: