

Coffee time trivia question – October 12th, 2017

What takes the longest to decompose in the marine environment?

- A) Plastic Bag
- B) Disposable Diapers
- C) Monofilament fishing line (made of one strain of polymer)
- D) Leather

C) Monofilament fishing line

According to the New Hampshire Department of Environmental Services, these are the times that marine debris takes to decompose:

Glass Bottle	1 Million years
Monofilament fishing line	600 years
Plastic Beverage Bottles	450 years
Disposable Diapers	450 years
Leather	50 years
Plastic Bag	10-20 years

Most of the plastic entering the sea is not directly decomposed but broken down to pieces (which have also been found in sea salt available to buy in stores). The problem is also, that when the plastic is being biodegraded, its monomers are harmful to the organisms e.g. when polycarbonate is exposed to seawater Bisphenol A (a substance acting like a female hormone) can be produced.

The numbers above are only estimates of the possible duration of the decomposition process. Niaounakis states in his book that there is not distinction between degradable and nondegradable plastics. Moreover, there exist different types of degradation of plastics other than biodegradation (e.g. photodegradation and thermodegradation).

In the past, decomposition of plastics has been measured in different ways. Anthony Andrady published a paper, in which he presents work which was done over the course of a year. The degradation of plastic in air was compared to the degradation of plastic in a marine environment. For this, he used different commercially available materials and exposed them on top of a roof and in a tank with fresh seawater. Samples were taken over the course of a year and from tensile tests, estimates were made towards degradability.

References:

- 1) https://www.des.nh.gov/organization/divisions/water/wmb/coastal/trash/documents/marine_debris.pdf, exact numbers from Mote Marine Laboratory, 1993
- 2) <https://www.nature.com/articles/s41598-017-09128-x> (microplastics in spanish table salts)
- 3) Michael Niaounakis, Management of Marine plastic debris, 2017, Hardcover ISBN: 9780323443548

- 4) Andrady, Anthony L. "Environmental degradation of plastics under land and marine exposure conditions." Proceedings of the Second International Conference on Marine Debris. Vol. 2. No. 7. 1989.