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Wool in Marine Environments

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A Global Challenge

Microplastic pollution has emerged as one of the most critical global challenges of our times. It is estimated that 12.2 million tonnes of plastic enter the global marine environment each year. Of this, 3.2 million tonnes are estimated to be primary microplastics, i.e. particles less than 5mm in size released directly into the environment.

Major sources of primary microplastics are road abrasion of synthetic tires and the shedding of fibres during washing of textiles such as nylon, acrylic and polyester.[1]

Microplastic fibres, or microfibres, are shed from clothing during machine washing and enter waterways in laundry wastewater streams. In marine systems, these fibres may be ingested by aquatic organisms and enter the food chain or accumulate on the ocean floor.

The full impacts on marine ecosystems are not yet known, but the risk to the environment and potentially to human health through drinking water and eating seafood are a significant concern.

A Natural Fibre Solution

One proposed strategy against the problem is to increase the use of natural fibres in apparel. To date, scientific reporting on microfibres has not included data on microfibres of natural origin, and the textile industry is seeking evidence that fibres such as wool and cotton do not similarly contribute to pollution of marine environments.

Until research results become available, independent sources provide some confidence that fibres shed during washing of wool clothing are unlikely to contribute to persistent pollution as do those from synthetic clothing:

1. Wool has been shown to be biodegradable in marine environments, in laboratory and on-site testing.[2]
2. In vitro experiments in New Zealand showed surface damage to wool fibres after 21 days incubation in sea water.
3. Visual observations, microscopic studies and microbial analyses confirmed the action of the wool degrading bacteria. In contrast to terrestrial biodegradation, degradation of wool in the marine environment was not dominated by actinomycete and fungal components of the microflora but by marine bacteria.
4. Preliminary data showing that, if ingested, the proportion of natural microfibres in the digestive tract of birds declined from oesophagus to stomach to intestine indicates that they are likely being digested naturally within organisms.[5]

Natural fibres decompose naturally

A study supported by the US EPA Mote Marine Laboratory has reported 'decomposition rates' for a range of household and other items of marine debris.[2,3] Decomposition was estimated as the time it takes for the item to be no longer visible.

Plastics do not biodegrade the way natural materials do. They break down into smaller and smaller pieces and never completely go away.

1. Times for cotton and wool garments were, respectively, less than 6 months and 1 to 5 years (Table 1).

2. NOAA[4] notes that for plastic items such as nylon fabric and disposable diapers, the estimates are for the time it takes for these items to degrade to microplastic form, not to return to nature.

3. Plastics do not biodegrade the way natural materials do. They are broken down into smaller and smaller pieces by the action of sunlight, wind and waves, but they never completely go away.

Table 1. Examples of the rate of decomposition of items of marine debris relevant to apparel and footwear.

MARINE DEBRIS	TIME TO 'DISAPPEAR'
Cotton shirt	2-5 months[2]
Wool sock	1-5 years[2]
Nylon fabric	30-40 years[3]
Leather	50 years[3]
Rubber boot sole	50-80 years[3]
Disposable diaper	450 years[3]

About IWTO

With a world-wide membership encompassing the wool pipeline from sheep to shop, the International Wool Textile Organisation represents the interests of the global wool trade. By facilitating research and development and maintaining textile industry standards, IWTO ensures a sustainable future for wool.
To learn more about IWTO and its activities, visit www.iwto.org.

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[1]Eunomia (2016). Plastics in the Marine Environment. Eunomia Research & Consulting Ltd, Bristol UK, June 2016. www.eunomia.co.uk Accessed November 2018 http://www.eunomia.co.uk/reports-tools/plastics-in-the-marine-environment/

[2]Brown R.M. (1994). The Microbial Degradation of Wool in the Marine Environment. Thesis for the degree of Master of Science in Microbiology, University of Canterbury, New Zealand.

[3]NOAA (2007). NOAA 101 Clean Guide. National Oceanic and Atmospheric Administration Marine Debris Program, US Department of Commerce

[4]Ocean Conservancy & NOAA (2013). Talking Trash & Taking Action. Publication of the Talking Trash & Taking Action Educational Program of the Ocean Conservancy and National Oceanic and Atmospheric Administration Marine Debris Program https://marinedebris.noaa.gov/talking-trash-and-taking-action

[5]Zhao, S., Zhu, L., Li, D., 2016. Microscopic anthropogenic litter in terrestrial birds from Shanghai, China: not only plastic but also natural fibers. Sci. Total Environ. 550, 1110–1115. https://doi.org/10.1016/j.scitotenv.2016.01.112.