

Inventory of the presence of plastics in the digestive tract of North Sea fishes

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Introduction

Plastic debris can be found in seas and oceans all over the world. Ingestion of the smaller parts by marine birds, turtles and mammals has been reported by various researchers. Ingested plastic particles can potentially reduce food uptake, cause blockage of the digestive tract, and be a source of contaminants like PCB's (Derraik, 2002). Of the Northern Fulmar in the North Sea, 95% has plastic in their stomach (Van Franeker et al., 2011). As for fish such data are not available, IMARES started an inventory in 2010 of the occurrence of plastics in the digestive track of North Sea fishes. To evaluate the likeliness of bioaccumulation of POPs through plastics, chemical analyses were performed on plastic debris collected from the water during the fishing trips. The research is still in progress, preliminary results are presented below.



Figure 1: Fish sampling areas: 1. Northern North Sea, 2. Central North Sea, 3. Southern North Sea

Table 1
Percentage of sampled fishes that contained plastics.

Fish species	Location	# of fish	% with plastics
Herring	Northern NS	375	0.80%
Grey Gurnard	Central NS	171	0%
Herring	Central NS	50	0%
Mackerel	Central NS	84	0%
Haddock	Central NS	100	In progress
Herring (juvenile)	Southern NS	66	0%
Herring	Southern NS	142	13%*
Horse mackerel	Southern NS	100	6%*
Cod	Southern NS	90	In progress
Whiting	Southern NS	100	In progress

* maximum value, the composition of the suspected particles still has to be analysed

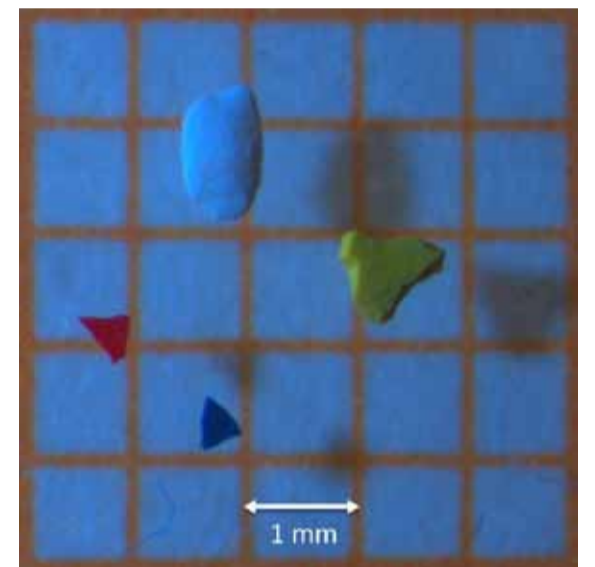


Figure 2: Plastic particles collected from fish intestines. White particle from Whiting (29.5 cm); Blue particle from Whiting (36.4 cm); Yellow & Red particles from Cod (90.5 cm)

Methods

Fish species (Table 1) were sampled from the northern, central and southern North Sea respectively (Fig. 1). After weighing and measuring the fish, the complete digestive tract was collected and the content was suspended in 10% KOH-solution to digest the organic matter. The remaining material was searched for plastics by stereo microscope, to collect even the very small particles. The plastics collected at sea were extracted with pentaan/dichloormethaan and extracts were analysed GCxGC-MS for organic compounds.

Preliminary results

Plastic particles were detected only in very few individual fishes (Table 1). In most cases only a single fragment per individual fish was found, probably small enough (<2 mm; Fig. 2) to be excreted. Our preliminary results could suggest that the percentage of fish containing plastics is somewhat higher in the southern part of the North Sea. However, composition of the material suspected to be plastics from these samples still has to be analysed. Chemical analyses revealed the presence of various organic chemicals in the plastic debris. Over 80% of the identified compounds were PAHs (related). Remarkable was the presence of Triclosan and the absence of PCBs in our samples (Fig. 3). The very low volumes of plastics that were detected so far in the fish with low frequency lead to the preliminary conclusion that plastics debris does not form a direct threat for the investigated north sea fish species.

References

- Derraik J.G.B., (2002) The pollution of the marine environment by plastic debris: a review. *Marine Pollution Bulletin* 44: 842-852
- Van Franeker, J.A., et al., (*in-press*) Monitoring plastic ingestion by the Northern Fulmar. *Environmental Pollution*

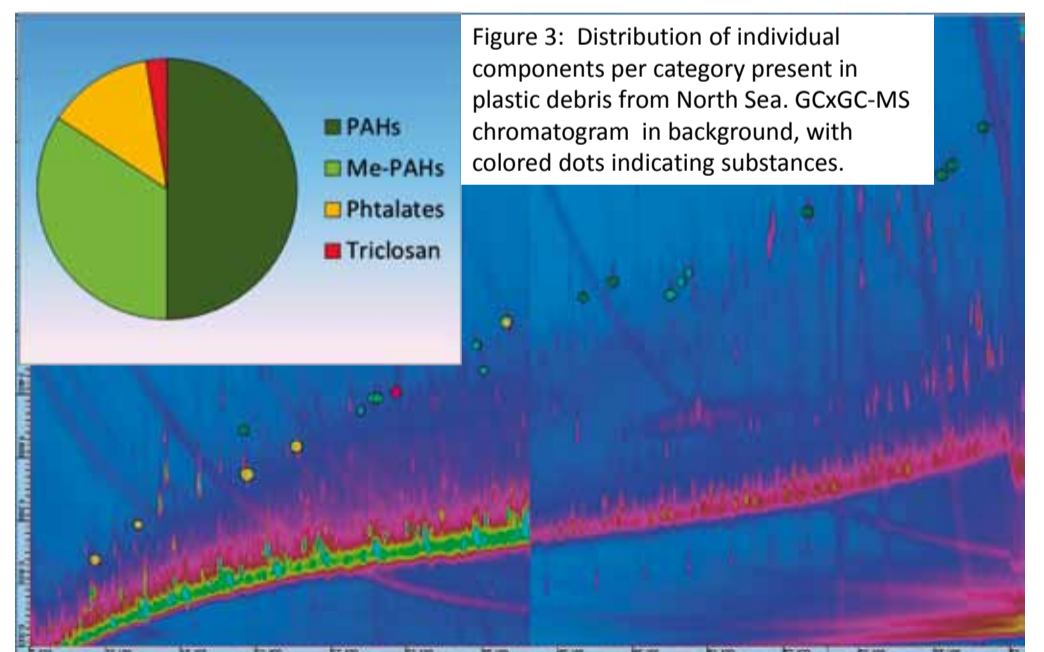


Figure 3: Distribution of individual components per category present in plastic debris from North Sea