
Microplastic in tissue of naturally exposed fish from a plastic polluted coastal ecosystem- An investigation of the evidence for bioaccumulation

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Abstract

Microplastic (MP) ingestion by marine organisms has been well documented in the last decade, including in coastal Atlantic cod (*Gadus morhua*). Bioaccumulation of MP has however not been well investigated. If bioaccumulation occurs, one expects older individuals to have higher concentrations of the contaminant in one or several tissues, provided exposure to the contaminant. The study area is a heavily plastic-polluted area in the Sotra region in western Norway. These areas receive and trap large amounts of marine debris transported with the coastal current. The cod is a central species in the Norwegian coastal food web, and spends its lifecycle in one area, eating polychaetes, crustaceans and fish, and is thus likely exposed to plastic through both water and food. We used muscle tissue (93.50 ± 21.82 g) of 23 healthy cod ($k\text{-factor} = 1.05 \pm 0.18$) with a length of 40-73cm and an estimated age of 3-5 years old was used. The dissection, extraction by gentle enzymatic and oxidative treatments, and chemical identification of MP ($> 20\mu\text{m}$) were performed in NORCE PlastLab based on previously published methods. Particle size and polymer types were determined using μFTIR . 36 MP particles, dominated by fragments, ($175.11 \pm 222.11\mu\text{m}$) were observed in nine of the 23 examined fish. Six polymers were detected, PP and PE dominating with 33.3% and 30.6%, respectively. MP particles were found in fish from 40 and 56cm. Zero MP was also observed in fish of all sizes. This study did not find evidence of MP bioaccumulation in cod muscle tissue after 3-5 years old, in a plastic-polluted area, suggesting either that bioaccumulation does not occur or that there may be other primary target organs for MP bioaccumulation in cod. Wet traps showed low levels of MP particles ($n=2$), suggesting the PlastLab is sufficient to reduce airborne contamination.

Keywords: Norwegian coastal food chain, Atlantic cod, bioaccumulation

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