
The western Mediterranean Sea under study: GES or non-GES regarding floating microplastics

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Abstract

The western Mediterranean Sea faces significant environmental challenges due to the accumulation and dispersion of floating microplastics. This study investigates the spatial and temporal variability of microplastic pollution in the Spanish Mediterranean Sea, assessing its compliance with the Good Environmental Status (GES) criteria of the MSFD and Barcelona Convention. Data from 668 sea surface water samples collected from the Spanish Mediterranean Sea from 2017 to 2023 were analyzed. A mean abundance of 0.24 ± 1.80 sea surface microplastic items/m² was quantified, with significant differences among localities, zones, areas, and macro-areas (KW, p-value < 0.05). Regarding localities, the highest abundances were observed in the protected area of the Columbretes Islands (14.26 ± 8.66 items/m²) and the lowest abundances were given in Fuengirola ($0.0008 \pm \text{ND}$ items/m²). In terms of area, the Valencian Community had the highest abundances (0.76 ± 0.55 items/m²), while Andalusia recorded the lowest ($0.01 \pm \text{ND}$). Sea surface waters around the Peninsular coast had higher abundances (0.41 ± 0.27 items/m²) than around the Balearic Islands (0.21 ± 0.06 items/m²). Fragments and films were the main categories of microplastics, accounting 72% and 15%, respectively. In 2017 the highest abundances were observed (0.85 ± 0.5 items/m²) and the lowest in 2022 (0.07 ± 0.01 items/m²). Despite significant yearly differences (KW, p-value < 0.05), no temporal trend was observed (MK, p-value > 0.05). When evaluating GES, 98% of the stations were classified as having a moderate to very poor condition, while only 2% were in good or high status. The study confirms the non-achievement of GES in the Spanish western Mediterranean coastal waters and indicates that concerted efforts are required at a local, regional, and international level to reduce plastic waste generation as well as the need to implement mitigation measures to prevent marine plastic pollution.

Keywords: Plastic pollution, microplastics, Sea surface, western Mediterranean, MSFD, GES

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