



Combining citizen-science with micro- and macroplastic research in Iceland

Belén García Ovide, Carlota Vialcho Miranda, Taïme Smit, Enorha Guimard, Charla Jean Basran



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Conservation, Research and Sailing at the edge of the Arctic

Ocean Missions is a non-profit organization based in Húsavík, northeast Iceland. We began our efforts because of the deep need for more conservation and sustainable tourism in the unique and fragile Arctic regions. We combine research and citizen science to spark a global wave of change to save our oceans.



Methods

On land

The OSPAR method consists of a 100 meter sampling transect, measured as a straight line parallel to the back of the beach. All visible litter items larger than 5 mm found on the beach surface within transect are collected, categorized, and entered in the OSPAR survey form.



On board

Water samples were collected at 12 nearshore locations on the N and NW coasts of Iceland to investigate the prevalence of floating mesoplastic (5–10 mm) and microplastic (0,3–5 mm) (collectively referred to as MP). This sampling strategy involved trawling 3 transects in a zig-zag pattern in each area using a low-tech aquatic debris instrument (LADI).

Additionally a high speed manta trawl was used to perform single line transects for a case study of Skjálfandi Bay during summers 2021-2023



4. Logging of MP count, size and particle type + storing of samples + spectrophotometry verification

3. Visual confirmation of MP particles using a stereoscope + testing (i.e. hot needle test)

2. Filtering samples through metal sieves (0,3 and 1mm) and separation of suspected MP particles

1. Sampling sea surface from Schooner Ópal with the manta trawl

Results (years 2019 - 2023)

Macroplastics

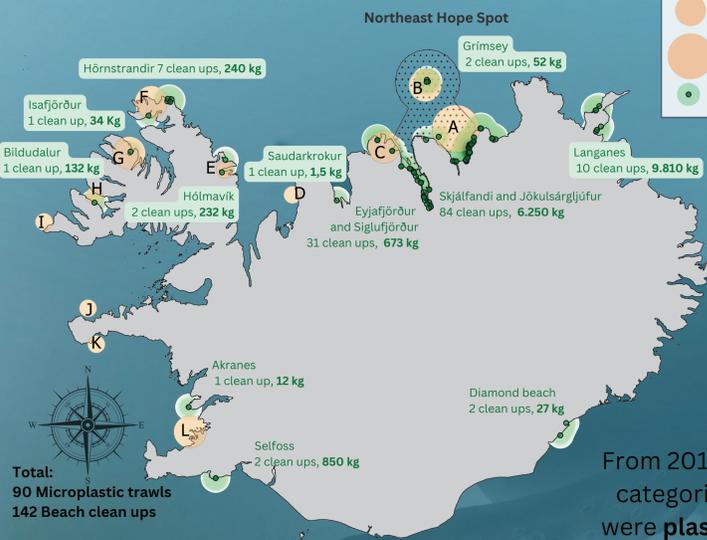


Fig 1: Map showing number of trawls in orange circles in each surveyed location (A-L). Beach clean up areas in green (number of clean ups in dark green points)

From 2019 to 2023 87,6% of all items categorized during OSPAR surveys were plastic (12.224) of which 48,27% were plastic fragments (5.901) and 22,48% were fisheries related debris (2.748) which was the largest single category by volume.



Meso and microplastics

72/90 trawls contained MP, though concentrations were highly variable.

Grímsey (B) had the highest average calculated concentration of MP/km² (10.847+/-9.021) followed by Eyjafjörður + Siglufjörður (C) with 6.532+/-4.468, Faxafloi (L) with 4.761+/- 4.051, N Snæfellsnes (J) with 4.549+/- 6.285, Skjálfandi Bay (A) with 4.043+/-1.614 and S Snæfellsnes (K) with 3.879+/-4.182

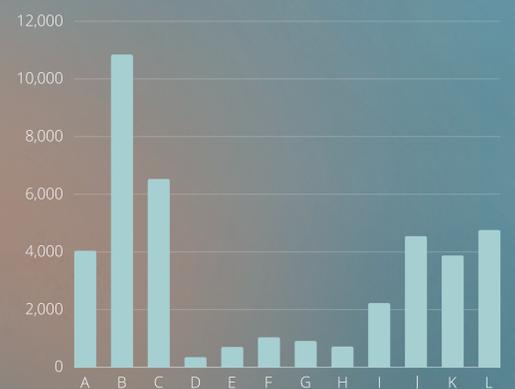


Fig 2. Average MP/km² per sample area

835 MP total particles were collected. 37,1% were lines apparently coming mainly from fishing gear (ropes and nets), followed by fragments (26,8%) and possible boat paint (18,2%). (Fig 3.)

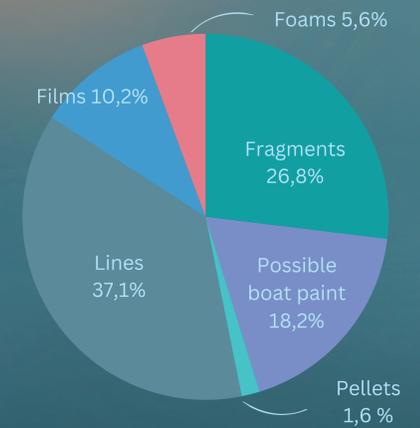


Fig 3. % of MP categories found with all samples combined

Overall, fishing lines were the most predominant type of MP, with them contributing 39% of particles collected during the Skjálfandi Bay case study, 59% in Grímsey and 42% in Snæfellsnes

Discussion and Conclusions

1. This is the first scientific estimation of floating MP in Icelandic coastal waters.
2. Varying amount of MP and wide confidence intervals demonstrate the heterogeneous distribution of MP particles in the dynamic sub-arctic marine environment.
3. Predominance of fishing-related lines suggested intensive fishing activities are likely a large contributor to MP in Icelandic waters, especially in the Hope Spot area.
4. Highest estimate of MP/km² corresponded with important bird nesting areas (eg, in Grímsey) and whale feeding grounds (eg, in Eyjafjörður).
5. Citizen science is powerful tool to engage people in ocean conservation, to educate and to facilitate scientific data collection.

Acknowledges

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PARTNERS



Stjórnarráð Íslands Umhverfis- og auðlindaráðuneytið

