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Supplementary information

Plastic pollution in the Arctic

In the format provided by the authors and unedited

Supplementary 1.

Records of plastic litter distributions and interactions between organisms and plastic debris in LITTERBASE

Over the last decade, the progress in marine litter research has increased exponentially making it difficult to keep track. As a response, the Alfred Wegener Institute devised the online portal LITTERBASE (http://litterbase.org), which provides regularly updated information on the global distribution and composition of litter pollution and its impacts on biota. The data presented in the portal are taken from peer-reviewed publications and reports and fed manually into a database using standardised protocols. Striving for a comprehensive picture, the scientific literature is continuously screened for new articles and bulk updates are performed periodically (Bergmann *et al.*, 2017).

The metadata for the distribution of man-made litter include bibliography, location, litter type, size class, amount unit (e.g., number or mass of items per kilometer, per square kilometer, per cubic meter) and biome (e.g., beach, sea surface, water column, seafloor). Some studies did not measure or calculate concentrations and reported only presence data. Including the locations of those findings, 62 studies were represented in Fig. 3. However, such studies were excluded from the assessment of the ranges of plastic debris concentrations in different ecosystem compartments. Moreover, the dataset was filtered by the most frequently used units (N km^{-2}, N m^{-3}, N kg^{-1}). The only exception is (Grøsvik *et al.*, 2018), which is the only study that reported plastic debris concentrations (in g m^{-3}) in the water column. Therefore, findings from 36 studies were evaluated when providing ranges in Fig. 1 and throughout the manuscript. The number of publications and sampling locations for each reporting unit is detailed in Supplementary Table 1 and Supplementary Table 2, respectively. The complete dataset of publications is listed in Supplementary data 1.

Supplementary Table 1. Number of publications evaluated when providing ranges in Fig. 1 and throughout the manuscript.

Reporting units	**Number of publications reporting from the marine compartments**					**Total number of publications**
	Sea ice	**Pelagic**	**Seafloor**	**Snow**	**Sea surface**	
g m^{-3}		1				1
Items			3		3	6
Items g^{-1}			6			6
Items km^{-1}					1	1
Items km^{-2}			7		4	11
Items m^{-3}	6	7	3	2	12	20
Kg km^{-2}			2			2
Other					1	1
Total number of publications	**6**	**8**	**20**	**2**	**20**	**43**

Supplementary Table 2. Number of sampling locations in the Arctic in peer-reviewed publications.

Row Labels	**Sea ice**	**Pelagic**	**Seafloor**	**Snow**	**Sea surface**	**Total number of locations**
g m^{-3}		1				1
items			9		16	25
Items g^{-1}			38			38

Items km^{-1}					27	27
Items km^{-2}			41		190	231
items m^{-3}	35	149	16	29	228	457
kg km^{-2}			5			5
Other					25	25
Grand Total	**35**	**150**	**109**	**29**	**486**	**809**

The following records of interactions between marine life and litter were entered: location and type of observed encounter (entanglement, ingestion, colonisation, other), species/taxon observed, effects (e.g., injury, mortality, growth, reproduction, behaviour), percentage of individuals affected, litter type, size, aquatic system, and biome. Only records which identified interactions with species (and some up to genus) taxonomic level were included in Fig. 4. Some studies reported multiple types of interactions and for one species or a species was reported for encountering several interactions and with plastic debris in different publications. Therefore, the sum of the numbers of interactions represent a higher number of species than specified in the text (Supplementary Table 1). The complete dataset of publications is listed in **Supplementary 2**.

Supplementary Table 3. The number of species, which was reported in publications to have interactions with plastic debris

Interaction	**Species count**
Colonisation	96
Coverage	5
Entanglement	9
Ingestion	31
Other	1
Total number of species	**131**

According to the standardised protocols of storing data in LITTERBASE, where the coordinates were not stated in the study, latitude and longitude were estimated based on the availability of location information given in the publication. For the current study, unless it was strictly specified as plastic (e.g., plastic fishing nets, nylon fishing line), litter concentrations or interactions with fisheries debris, ropes and fibers were not included into the datasets. The following litter categories were included: Fisheries plastics, plastic items and fragments, cigarette buds, plastic fibers, films, pellets and Styrofoam items.

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Supplementary Table 4. Summary of data and references used for ranges presented in Fig. 1 and in the manuscript text.

Ecosystem compartment	Minimum quantity	Maximum quantity
Sea surface microplastic	0 (Kanhai *et al.*, 2018; Yakushev *et al.*, 2021)	1,287 N/m-3 (Tekman *et al.*, 2020)
Sea surface plastic debris	0 (Ostle *et al.*, 2019; Pogojeva *et al.*, 2021)	7.966208 N/m2 (Pogojeva *et al.*, 2021)
Water column microplastic	0 (Kanhai *et al.*, 2018; Tekman *et al.*, 2020; Yakushev *et al.*, 2021)	375 N/m3 (Kanhai *et al.*, 2018)
Water column plastic debris	0.000011 g/m3 (Grøsvik *et al.*, 2018)	
Sediment microplastic	0 (Collard *et al.*, 2021; Huntington *et al.*, 2020)	16,041.45 N/kg (Huntington *et al.*, 2020)
Seafloor plastic debris	0 (Parga Martínez *et al.*, 2020; Purser *et al.*, 2013; Sen *et al.*, 2019; Tekman *et al.*, 2017)	24,500 N/km2 (Purser *et al.*, 2013)
Sea ice microplastic	31.7460317 N/m3 (Huntington *et al.*, 2020)	12,000,000 N/m3 (Peeken *et al.*, 2018)
Snow microplastic	0 (Bergmann *et al.*, 2019)	14,400 N/L (Bergmann *et al.*, 2019)

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