



MICROPLASTIC PARTICLES IN NORTH SEA SEDIMENTS 2015

Scientific Report from DCE - Danish Centre for Environment and Energy

No. 178

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Data sheet

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Abstract: Contents and composition of microplastic particles have been analysed in ten sediment samples from the Danish part of the open North Sea in 2015. The contents of microplastic particles in the size range 20-5000 µm were determined to be in the range of 192-675 particles per kg dry weight sediment, dominated by blue and black coloured particles, mainly as fibres, and particle sizes < 300 µm were dominating.

Keywords: Microplastic, marine litter, North Sea

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Front page photo: Test sieves used for size fractionation of sediment samples. Photo: Jakob Strand

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Preface

This assessment report describes results of the national monitoring programme on microplastic in North Sea sediments, which has been performed by DCE - Danish Centre for Environment and Energy at Aarhus University. The national monitoring programme using the environmental indicator “microplastic” has in 2015 been initiated by the Danish Nature Agency at the Ministry of Environment and Food, so it can be used for the national implementation of EU’s Marine Strategy Framework Directive (MSFD) in relation to assessments of characteristics, state, impact and trends of litter in the marine environment.

Summary

The presence of microplastic particles in the size range of 20-5000 μm have been studied in sediment collected at ten stations in August 2015 in the Danish part of the open North Sea. The contents and composition of microplastic particles in all samples with volume of 50 ml were determined by visual identification using microscopy after the samples had been chemically digested to remove natural organic matter, density fractionated with saturated saline solution and size fractionated in six size classes using test sieves.

The study showed that particles identified as microplastic particles occurred in all ten sediment samples. 90-100 % of all identified microplastic particles were fibres, i.e. elongated filaments, and they were thereby the dominating type of microplastics followed by plastic films/fragments that contributed with up to 8 %. The contents of microplastic particles were in the range 192-675 particles per kg dry weight and 260-980 particles per litre wet sediment. In addition, another significant group of the particles was characterised as of "uncertain origin", because they most likely consisted of remains from natural organic matter, but it could not be fully excluded that they consisted of synthetic polymers.

Microplastic particles in the size range of 20-300 μm dominated with 69-97 % in the sediment samples. The smallest particles in the size fraction 20-38 μm contributed with 5-44 % of the particles identified as microplastic in the different samples. Particle sizes > 1000 μm only contributed with 0-5 % of the identified microplastic particles. No plastic particles > 5 mm were found in the samples.

Regarding colour composition, blue microplastic particles were with 44 % on average the most frequent group, followed by black particles with 25 % on average. Some particles with other colours of e.g. white, red, grey, brown, green, pink and violet were also identified as microplastic.

No clear spatial trends west-east or north-south were found when all the samples from the North Sea were compared.

Sammenfatning

Forekomsten af mikroplastpartikler i størrelsesintervallet 20-5000 μm er blevet undersøgt i sedimentprøver, som blev indsamlet på ti stationer i august 2015 i den danske del af Nordsøen. For hver prøve blev indholdet og sammensætningen af mikroplastpartikler visuelt identificeret ved mikroskopi i en prøve bestående af 50 ml sediment, efter at prøven var blevet behandlet kemisk for at fjerne naturligt organisk materiale, udrystet med mættet saltvand og til sidst størrelsesfraktioneret med testsigter i seks størrelsesintervaller.

Undersøgelserne viste, at partikler, som visuelt blev bestemt som mikroplast, forekom i alle prøverne. Fibre udgjorde 90-100 % af partiklerne og var dermed den dominerende type af mikroplast, efterfulgt af 0-8 % plastfragmenter og flager. For de mere sikkert identificerede mikroplastpartikler lå niveauet af mikroplast i prøverne på 192-675 partikler per kg tørvægt og 260-980 partikler per liter vådt sediment. Derudover blev der fundet en væsentlig gruppe af partikler af mere usikker oprindelse: det blev vurderet, at de sandsynligvis bestod af naturligt partikulært materiale, uden at det kunne udelukkes, at de egentlig bestod af syntetiske polymer materialer som i mikroplast.

En opdeling af mikroplast på de seks størrelsesfraktioner viste, at partikelstørrelser på 20-300 μm dominerede med en andel på 69-97 %. De mindste partikler med størrelser på 20-38 μm og 38-100 μm bidrog med henholdsvis 4-44 % og 17-55 %, mens partikler $> 1000 \mu\text{m}$ kun bidrog med 0-5 % af de identificerede mikroplastpartikler. Der blev ikke fundet plastpartikler $> 5 \text{ mm}$.

Med hensyn til farvesammensætning af mikroplast, så udgjorde blå partikler med en andel på 44 % i gennemsnit den største gruppe, efterfulgt af sorte partikler med en andel på 25 % i gennemsnit. Kun enkelte partikler med andre farver som hvid, rød, grå, brun, grøn, pink og violet blev identificeret som mikroplast.

Der var ingen tydelige vest-øst eller nord-syd gående spatiale trends ved sammenligning af resultaterne fra de ti prøvetagningsstationer i Nordsøen.

1 Introduction

Most plastics are materials that are persistent for many years – possibly as much as hundreds – when released to the marine environment. With time plastics in the environment can fragment into smaller pieces of microscopic plastic particles that, when smaller than 5 mm in size, are called microplastics. Other small man-made microplastic particles that can be found in the marine environment are categorised as primary microplastics due to the fact that they are produced and used in e.g. industrial abrasives or cosmetics or as pellets used for production of plastic materials.

In 2015, microplastics in sediments, i.e. amounts, distribution, trends and if possible, composition in marine environments, have as a new and emergent environmental issue been included as part of the national monitoring and management plans in Denmark, which have been developed by the Danish Nature Agency at the Ministry of Environment and Food. Microplastics in sediments will be used together with four other marine litter indicators for the national implementation of EU's Marine Strategy Framework Directive (MSFD) (NST 2012a).

The five national marine litter indicators for the period 2015-2017 are:

- Beach litter (new national sampling campaigns established)
- Sea floor litter (sampling coordinated with the national BITS and IBTS trawl surveys)
- Plastic particles in fulmars' stomachs (sampling opportunity based)
- Microplastic in sediments (sampling coordinated with the national contaminant monitoring)
- Microplastic in fish stomachs (sampling coordinated with national fish stock surveys).

Marine litter has with descriptor 10 in the MSFD (EU 2008) been recognized as an important environmental pressure factor and identified as one of the eleven qualitative descriptors which is needed to describe what the environment should look like to achieve or maintain good environmental status (GES) in the marine environment by 2020 (EU 2010). In descriptor 10, one of the elements in criteria 10.1 on "Characteristics of litter in the marine and coastal environment" concerns the microplastic indicator defined by "the amount, distribution and, where possible, composition of micro-particles (in particular microplastics)". The overall target for the MSFD indicators for GES has been defined as "decreasing trends in amounts of litter items". Subsequently, the MSFD implies establishment of monitoring programmes for assessments, enabling the state and impact of the marine waters to be evaluated on a regular basis.

In line with this, the international commissions for protecting the marine environments in the northeast Atlantic (OSPAR) and the Baltic Sea (HELCOM) have as part of their Regional Action Plans (RAPs) also recommended the microplastic indicator as a relevant indicator for assessing state, impact and trends of marine litter in their sea regions (OSPAR 2014; HELCOM 2015). It is recognized that there is a need for further experience with how assessments using the microplastic indicator including defining adequate monitor-

ing strategies best can be performed, e.g. in relation to national monitoring programmes and project surveys.

In Denmark, it has been recognized that today there is only a limited amount of data and other information available about the regional differences in amounts, composition, impact and sources of marine litter in the Danish parts of the Baltic Sea and the North Sea (NST 2012b), so there is a need for a more systematic monitoring. Regarding microplastics in sediment, some project data exist from a more research-oriented survey in 2012-2013 in the Danish waters covering samples from both the Baltic Sea, inner Danish waters and the North Sea. This study found levels of microplastics (sizes 38-1000 μm) in sediments in the range of 58-3622 particles per kg dry weight (Strand et al. 2013). Other Nordic studies have also shown that microplastic particles are widely found in Skagerrak, Kattegat and the Baltic Sea, although most studies have focussed on occurrence of microplastic in the water column and to lesser extent in sediments and biota (Strand et al. 2015).

This report describes the results of the national monitoring in 2015 on microplastics in sediments from the Danish part of the open North Sea that can be used as initial baseline levels for amounts (i.e. contents) and composition of microplastics in Denmark.

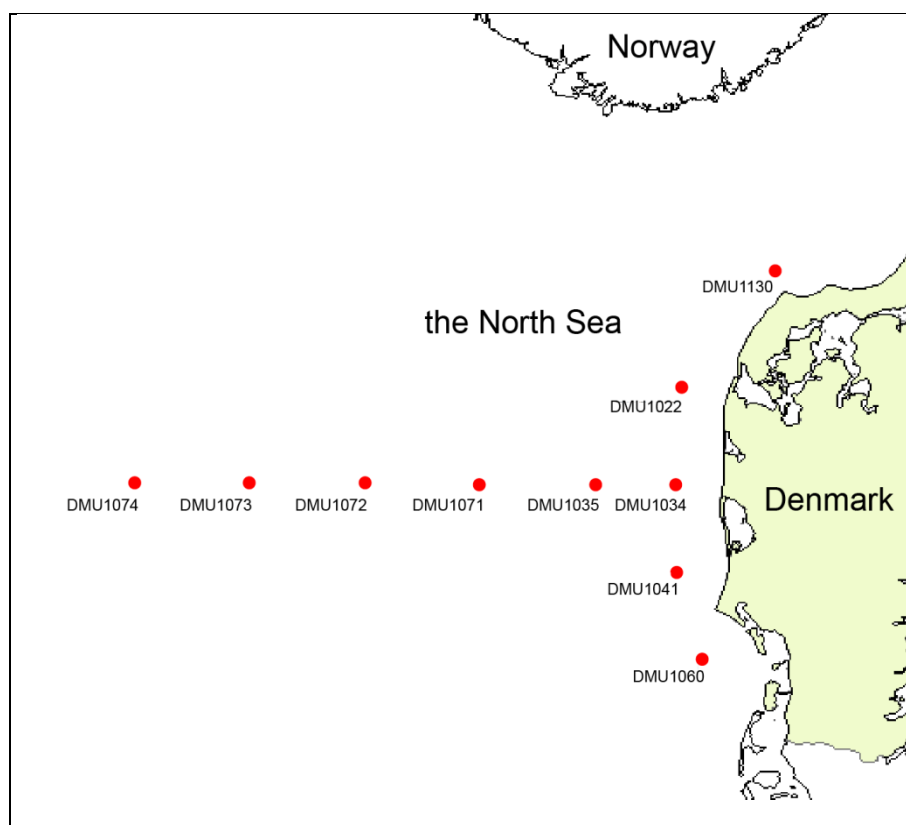
2 Stations and methodology

Sediment samples from ten stations in the Danish part of the open North Sea (figure 2.1) were collected during a national monitoring cruise with the vessel I/F Poul Løwenørn in the period 25-29 August 2015. For more detailed station information, see *Appendix 1*.

From each station, 4-5 subsamples of sediment consisting of the top 2 cm layer were pooled into one representative sample. The subsamples were collected using HAPS bottom corer with a diameter of 13.5 cm corresponding to a surface area of 0.0143 m².

The sediment samples were then frozen in Rilsan[®] plastic bags and transported to the laboratory, where the samples were divided into subsamples for both microplastic analyses as well as analyses for different prioritized hazardous substances and supporting parameters for describing sediment characteristics. All analysed sediment samples appeared to be from relatively sandy areas with low content of organic carbon (TOC) < 0.3 % and fine silt particles (< 63 µm) < 15%; see also *Appendix 1*.

Figure 2.1. North Sea sampling stations for ten sediments analysed for microplastics in 2015.



2.1 Methodology for microplastic analyses

Sediment samples consisting of ~50 ml (~100 g wet weight (ww)) were first digested by two hours of thoroughly shaking with 100 ml of a 30 % VIP1 solution (industrial agent from NOVODAN aps, Denmark) consisting of ~3 % potassium hydroxide, ~1 % potassium tripolyphosphate, ~1 % potassium silicate and ~7 % sodium hypochlorite, so dominant fractions of natural organic matter were decomposed. Similar treatment of different types of common plastic materials showed no larger external changes in the particle structure

and colour (Strand et al. 2013). The chemical digestion step was followed by five minutes of ultrasonic treatment. The remaining particles were then allowed to settle in the glass for five minutes. Consequently, the supernatant was removed into a new glass. The remaining sediment sample was then treated two times with saturated saline solution, to separate particles according to density, by adding 100 ml of saline solution, followed by ten minutes of shaking and consequently five minutes of ultrasonic treatment. The sample was allowed to sediment for five minutes after each of the two steps. Pooled supernatant was divided into six size fractions, i.e. 20-38, 38-100, 100-300, 300-1000 and 1000-5000 μm , by being flushed with filtered freshwater through the sediment test sieves (Retsch) placed on top of each according to decreasing mesh size. The remaining sediment sample was also flushed through the test sieves of sizes 300-1000 and 1000-5000 μm .

For each size fraction, particles retained on the test sieves and regarded as of synthetic origin were visually identified based on their relatively homogeneous texture and structure using a stereo microscope (20-50x magnification). The identified microplastic particles were isolated, counted and characterized with respect to their colour and type/shape, i.e. as elongated filaments (i.e. “fibres”), plastic film and plastic fragments, granules or round spherules according to the descriptions adopted from EU guidance on monitoring of marine litter (EU 2013) (*figure 2.2*). Plastic film and plastic fragments were counted as one category, as they were relatively difficult to distinguish from each other, especially at sizes less than 300 μm . This group also only represented a minor group compared to other identified types of microparticles. An additional group of particles was characterised as particles of “uncertain origin”, as during the visual microscope analyses it was not possible to properly assess whether they consisted of remaining natural matter or were made of synthetic polymer materials. This “uncertain” group consisted mainly of transparent fibres.

From the fractions of 20-38 and 38-100 μm , only fibres longer than 100 μm were isolated and counted.

The following fractions were stored for potential, later analysis by Fourier transform infrared (FT-IR) spectroscopy:

- 1) all isolated particles of plastic origin including particles categorised as “uncertain origin”.
- 2) all remains of samples from size fractions 20-38 and 38-100 μm .

		CATEGORIES FOR MICROPARTICLES	
		Material	Description
Size	Record size of each item. Minimum resolution is to allocate in to bin sizes of 100 μm	Plastic	Plastic fragments rounded
			Plastic fragments subrounded
			Plastic fragments subangular
Type	Plastic fragments, pellets, filaments, plastic films, foamed plastic, granules, and styrofoam		Plastic fragments angular
			cylindrical pellets
			disks pellets
Shape	For pellets: cylindrical, disks, flat, ovoid, spheruloids; For fragments: rounded, subrounded, subangular, angular; For general- irregular, elongated, degraded, rough, and broken edges		flat pellets
			ovoid pellets
			spheruloids pellets
			filaments
			plastic films
Colour	Transparent, crystalline, white, clear-white-cream, red, orange, blue, opaque, black, grey, brown, green, pink, tan, yellow		foamed plastic
			granules
			styrofoam
		Other	Other (glass, metal, tar)

Figure 2.2. Table 9 from "Guidance on Monitoring of Marine Litter in European Seas" (EU 2013).

For quality assurance of the analyses, all glassware was cleaned and baked in the oven at 450 °C prior to the start of the microplastic analysis, and all the reagents were filtered using 20 μm mesh sizes. Additionally, the risk for airborne particulate contamination was controlled every day of sample analysis, by leaving two open Petri dishes with filtered water that were put out every day prior to the start of the sample preparation and analysis. On a daily basis, 2-8 particles on average were recorded in the Petri dishes that all days were dominated by transparent fibre particles (70-100 %). Data for all analysed samples were therefore assessed to have adequate quality, because the potential, airborne contamination did not exceed 10 % of the total amount of the collected microparticles from the samples analysed the same day. Two replicate samples were analysed for sample DMU1073 only, and average data are reported in the result section whereas data for both replicates are shown in Appendix 2.

The characterisation of colours of microplastic particles was performed according to the colour codes listed in the EU guidance document (see table in *figure 2.2*), and were as following: transparent, crystalline, white, red, orange, blue, black, grey, brown, green, pink and yellow.

3 Results

Microplastic particles were found in all ten analysed sediment samples from the North Sea with a total sum of 393 particles identified as microplastics plus 605 particles characterised as of more “uncertain origin”.

The predominant type was fibres (i.e. elongated filaments), accounting for 90-100 % of particles identified as microplastics in the sediment samples, with the shape category of “plastic film/fragments” also present in several samples, accounting for up to ~ 8%. No particles categorized as “granules” or “spherules” were identified. The particles categorised as of “uncertain origin”, i.e. it could not be fully excluded that they consisted of synthetic plastic materials, were in the percent range of 45-72 % of the total number of particles characterized in the samples (*table 3.1*). The group of particles characterized as of “uncertain origin” was excluded from the further analyses of contents and composition of microplastic particles in the sediments.

Table 3.1. Distribution of microplastic particles in analysed North Sea sediments characterized according to their type. The group of particles characterised as of “uncertain origin” is not included in further data analyses, although it was assessed that it could not be fully excluded that they consisted of plastic materials.

Station ID	Fibres/ filaments	Plastic films/ fragments	Granules	Uncertain origin
DMU1074	50.7 %	4.5 %	0 %	44.8 %
DMU1073	41.9 %	2.5 %	0 %	55.5 %
DMU1072	49.3 %	0 %	0 %	50.7 %
DMU1071	44.1 %	0 %	0 %	55.9 %
DMU1035	50.0 %	0 %	0 %	50.0 %
DMU1034	35.4 %	2.5 %	0 %	62.0 %
DMU1130	42.1 %	0 %	0 %	57.9 %
DMU1022	34.7 %	0 %	0 %	65.3 %
DMU1041	28.2 %	0 %	0 %	71.8 %
DMU1060	27.6 %	0.9 %	0 %	71.6 %
Average	40.6 %	0.9	0 %	58.6 %

The results of contents and composition of microplastic particles are presented following the directions from western to eastern stations, and from northern to southern stations (see *figure 2.1*).

3.1 Contents of microplastic in North Sea sediments

The contents of microplastic particles in the North Sea sediment samples were determined as numbers of particles per dry weight and per volume of wet sediment and grouped into each size interval and colour fractions, see also *Appendix 2*.

Microplastic particles with sizes of 20-5000 μm were present in the range of 192-675 particles per kg dry weight and 260-980 particles per litre wet sediment representing particles from all size fractions (*figures 3.1* and *3.2*). No plastic particles above 5000 μm were found in the sediment samples. The lowest density of particles was found at station DMU1035 and the highest levels at DMU1071, DMU1022 and DMU1073, but no clear spatial west-east or north-south trends seem to occur in the dataset. Normalisation of microplastic densities to either volume or mass units did have some

influence when comparing levels between the stations, solely depending on the dry weight content of the samples.

Figure 3.1. Total number of microplastic particles per size fraction at each North Sea station, determined per kilogram sediment, dry weight (dw).

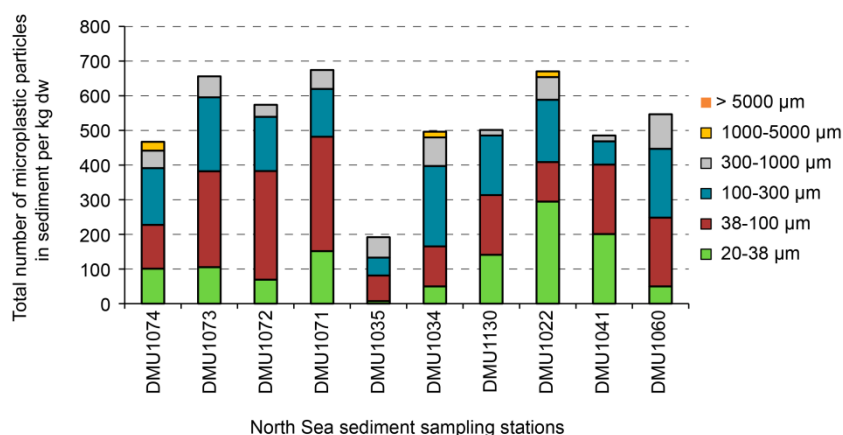
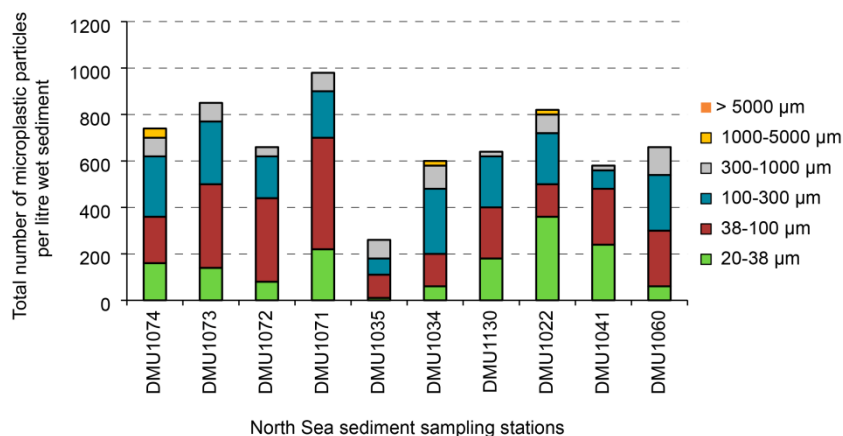


Figure 3.2. Total number of microplastic particles per size fraction at each North Sea station, determined per litre wet sediment.



The levels of microplastic particles in the North Sea sediments were within the range of microplastics in sediment found in a previous study from Danish waters in 2012-2013, where 58-3622 particles per kg dry weight were found (Strand et al. 2013). However, the levels found in the North Sea sediments from 2015 seem to be in the upper range when compared, especially if taking into account that the previous study only analysed for microplastics in the size range 38-1000 µm and if considering normalisation of the North Sea data to adjust for the low content of TOC or < 63 µm particles in the sediment samples.

3.2 Composition of microplastics in North Sea sediments

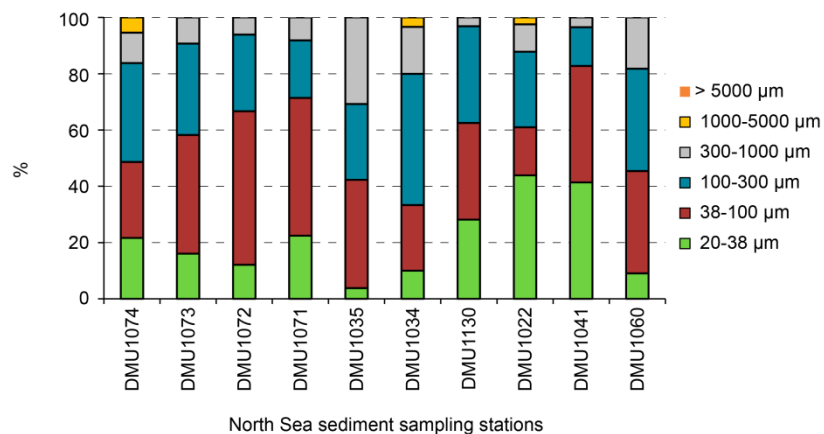
The composition of microplastics in sediments can be assessed according to distribution between the different categories of type, size and colour. The distribution between different types of microplastics has already been described in *table 3.1* which showed that fibres were the dominant type, followed by particles characterized as plastic films/fragments, and no granules were found.

3.2.1 Composition according to size fractions

Microplastic particles in the size range of 20-300 µm contributed with 69-97 % of particles in the sediment samples. The smallest particles being the size fraction 20-38 µm and 38-100 µm, where only fibres were registered in this study, contributed with 4-44 % and 17-55 %, respectively, of all identi-

fied microplastic particles. Particle sizes > 1000 μm only contributed with 0-5 % of the number of the identified microplastic particles (*figure 3.3*). No clear spatial trends from west-east or north-south appear in the dataset for composition of size fractions, although the smallest size fraction of 20-38 μm was relatively more frequent at the three of five more coastal stations, i.e. at DMU1030, DMU1022 and DMU1041.

Figure 3.3. Composition of the total number of microplastic particles per size fraction at each North Sea station.



3.2.2 Composition according to colour fraction

Blue microplastic particles were with 44 % (range 12-63 %) the most frequent group of particles identified as microplastics followed by black with 25 % (range 5-54 %). Some particles with colours of e.g. white, red, grey, brown, green, pink and violet were also identified as microplastics (*figure 3.4*). No clear spatial trends from west-east or north-south appeared in the dataset for the colour fractions when comparing the data between stations.

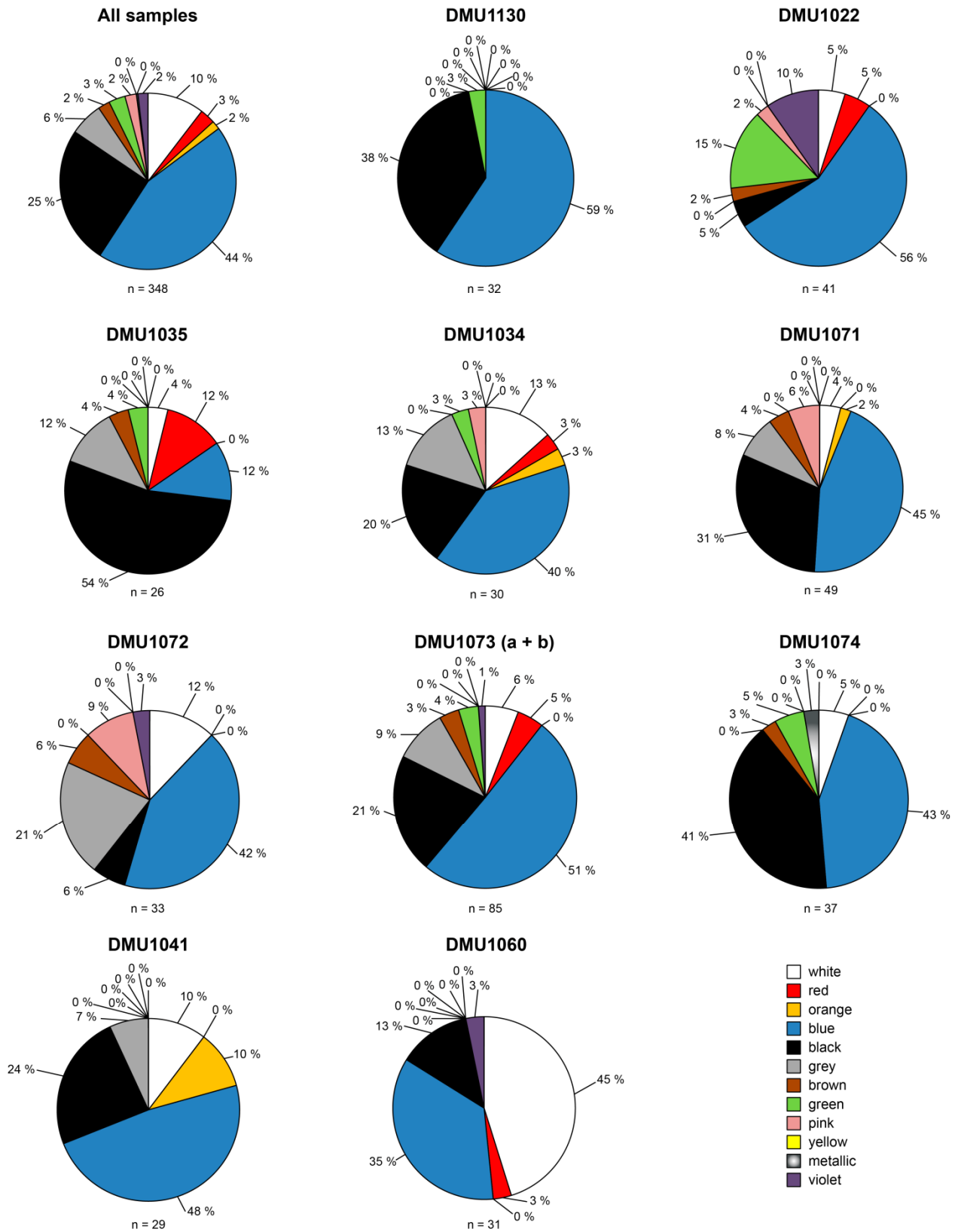


Figure 3.4. Fraction of microplastic particles per colour at each North Sea station.

4 Conclusions

The analyses performed of microplastics in sediments showed that:

- Microplastic particles were found in all ten analysed sediment samples from the Danish part of the open North Sea. The content of microplastic particles with sizes of 20-5000 μm was in the range 192-675 particles per kg dry weight and 260-980 particles per litre wet sediment.
- Fibres, i.e. elongated filaments, were the dominating type of identified microplastic particles contributing with 90-100% followed by plastic films/fragments (0-8 %). In addition, another significant group of particles, mainly transparent fibres, was characterised as of “uncertain origin” and not surely as microplastic, because they likely consisted of natural matter. However, it could not be fully excluded that they consisted of synthetic polymer materials.
- Microplastic particles in the range of 20-300 μm contributed with 69-97 % of the particles. The smallest particles the size fraction 20-38 μm contributed with 4-55 % of all the particles. Particle sizes > 1000 μm contributed only with 0-5% of the total number of the identified microplastic particles.
- Blue microplastic particles were with 44 % on average the most frequent colour fraction followed by black particles contributing with 25 % on average. Some particles with other colours, e.g. white, red, grey, brown, green, pink and violet, were also identified as microplastics in the samples.
- No clear spatial trends from west-east or north-south between the sampling stations appeared in the dataset.

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<http://norden.diva-portal.org/smash/get/diva2:824655/FULLTEXT01.pdf>

Appendix 1 - Sampling stations and sediment characteristics

Table A1.1. North Sea sampling stations for the sediments analysed for microplastics in 2015.

Station ID	Cruise station number	Date	Position N	Position E	Depth (m)
DMU1130	3	25-08-2015	57°13.701N	008°31.958E	24.2
DMU1022	4	26-08-2015	56°38.909N	007°46.389E	28.1
DMU1034	17	27-08-2015	56°10.163N	007°43.653E	27.4
DMU1035	16	27-08-2015	56°10.037N	007°04.827E	33.2
DMU1071	13	27-08-2015	56°08.741N	006°08.676E	42.4
DMU1072	8	27-08-2015	56°07.515N	005°12.041E	44.6
DMU1073	9	28-08-2015	56°05.556N	004°16.035E	59.8
DMU1074	10	28-08-2015	56°03.231N	003°20.680E	70.5
DMU1041	18	29-08-2015	55°44.372N	007°45.553E	19.9
DMU1060	20	29-08-2015	55°19.106N	007°58.370E	17.9

Table A1.2. Sediment characteristics of analysed samples from the North Sea. TOC: Content of Total Organic Carbon.

Station ID	DCE sample ID	Wet weight (g) of 50 ml sample	Dry weight content (% of wet weight)	TOC (% of dry weight)	< 63 µm fraction (% of dry weight)
DMU1130	2015-14308	83.00	76.9	< 0.2	1.5
DMU1022	2015-14309	72.19	84.7	< 0.2	5.2
DMU1034	2015-14310	74.45	81.2	< 0.2	2.5
DMU1035	2015-14311	86.93	77.9	< 0.2	4.1
DMU1071	2015-14312	94.41	76.9	0.2	13.6
DMU1072	2015-14313	72.77	79.0	< 0.2	5.6
DMU1073-a	2015-14314	75.64	79.9	0.2	4.7
DMU1073-b *	2015-14314	86.26	80.2	< 0.2	5.6
DMU1074	2015-14315	101.09	78.4	0.27	14.0
DMU1041	2015-14316	74.21	80.5	< 0.2	2.1
DMU1060	2015-14317	74.54	81.0	< 0.2	2.4

* Replicate data for sample wet weight and dry weight content, but not for TOC and < 63 µm fraction of sample DMU1073-a,b.

Appendix 2 - Data tables for microplastics in sediment samples from the North Sea

Table A2.1. Contents of microplastic particles (particles per kg dry weight (DW)) per size fraction in analysed North Sea sediment samples. "Uncertain" particles are not included. Replicate data for sample DMU1073-a,b.

Size fractions (μm)	DMU 1074	DMU 1073-a	DMU 1073-b	DMU 1072	DMU 1071	DMU 1035	DMU 1034	DMU 1130	DMU 1022	DMU 1041	DMU 1060
20-38 μm	101	66	145	70	151	7	50	141	294	201	50
38-100 μm	126	265	289	313	331	74	116	172	114	201	199
100-300 μm	164	281	145	157	138	52	232	172	180	67	166
300-1000 μm	50	50	72	35	55	59	83	16	65	17	99
1000-5000 μm	25	0	0	0	0	0	17	0	16	0	0
> 5000 μm	0	0	0	0	0	0	0	0	0	0	0
Total sum	467	662	651	574	675	192	496	501	671	485	514

Table A2.2. Contents of microplastic particles (particles per kg dry weight (DW)) grouped per colour in analysed North Sea sediment samples. "Uncertain" particles are not included. Replicate data for sample DMU1073-a,b.

Colour fractions	DMU 1074	DMU 1073-a	DMU 1073-b	DMU 1072	DMU 1071	DMU 1035	DMU 1034	DMU 1130	DMU 1022	DMU 1041	DMU 1060
White	25	33	43	70	28	7	66	0	33	50	232
Red	0	33	29	0	0	22	17	0	33	0	17
Orange	0	0	0	0	14	0	17	0	0	50	0
Blue	202	414	260	244	303	22	199	298	376	234	182
Black	189	149	130	35	207	103	99	188	33	117	66
Grey	0	0	116	122	55	22	66	0	0	33	0
Brown	13	17	29	35	28	7	0	0	16	0	0
Green	25	0	43	0	0	7	17	16	98	0	0
Pink	0	0	0	52	41	0	17	0	16	0	0
Yellow	0	0	0	0	0	0	0	0	0	0	0
Metallic	13	0	0	0	0	0	0	0	0	0	0
Violet	0	17	0	17	0	0	0	0	65	0	17
Total sum	467	662	651	574	675	192	496	501	671	485	514

Table A2.3. Contents of two types of microplastic particles characterised as of "uncertain origin" (particles per kg dry weight (DW)). Replicate data for sample DMU1073-a,b.

	DMU 1074	DMU 1073-a	DMU 1073-b	DMU 1072	DMU 1071	DMU 1035	DMU 1034	DMU 1130	DMU 1022	DMU 1041	DMU 1060
Transparent fibres	303	613	694	418	744	140	712	454	883	1054	1193
Other particles of uncertain origin	76	215	116	174	110	52	99	235	376	184	182

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MICROPLASTIC PARTICLES IN NORTH SEA SEDIMENTS 2015

Contents and composition of microplastic particles have been analysed in ten sediment samples from the Danish part of the open North Sea in 2015. The contents of microplastic particles in the size range 20-5000 µm were determined to be in the range of 192-675 particles per kg dry weight sediment, dominated by blue and black coloured particles, mainly as fibres, and particle sizes < 300 µm were dominating.