

Data sheet

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Subtitle: Amounts and composition of beach litter on reference beaches

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Front page photo: Photo by Anna Marie Plejdrup: Beach litter from monitoring of 100 m shoreline at Kofoeds Enge.

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Preface

This research note summarizes the results from the Danish national monitoring of marine litter at reference beaches in Denmark 2020. The purpose of the monitoring is to provide systematic and comparable data for assessment of the state, impact and trends of marine litter and thereby comply with the European Marine Strategy Framework Directive (MSFD). National monitoring of marine litter at beaches was initiated in Denmark in 2015, and on request from the Danish Environmental Protection Agency (EPA), the monitoring activities are performed by DCE - Danish Centre for Environment and Energy in cooperation with KIMO (Kommunernes Internationale Miljøorganisation) Denmark.

Summary

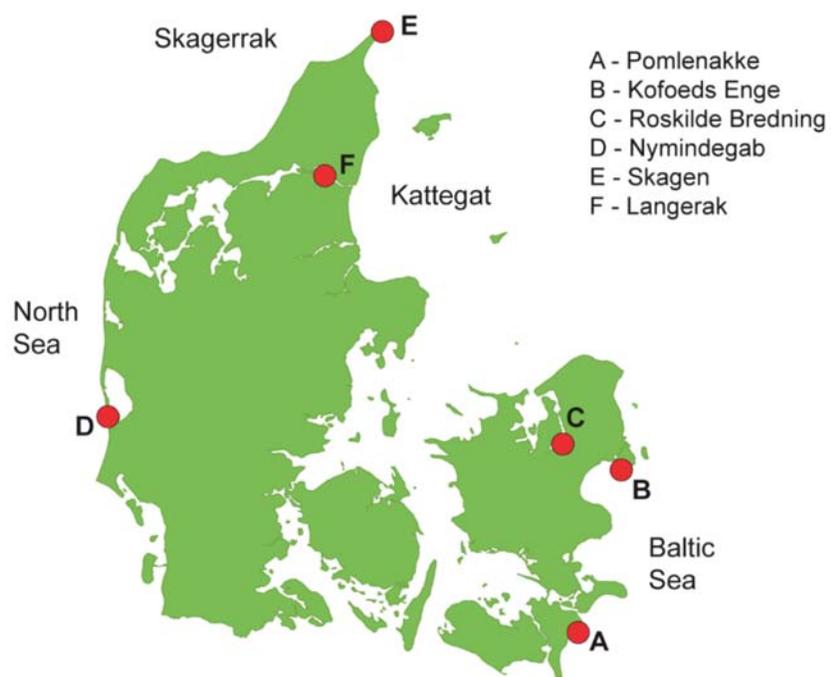
In this research note, the results from the Danish national monitoring of marine litter at reference beaches in Denmark 2020 are reported. The results of the monitoring surveys showed that plastic comprised the majority of all beach litter items, with an average of 82.7% of the registered litter (excl. paraffin/wax) for all the Danish reference beaches. The median number of litter items per 100 m beach was 42 items for the Danish reference beaches, but a large variation between surveys and between beaches was observed with generally higher litter amounts at beaches in the western part of Denmark compared to the eastern part. The amounts of beach litter were in all regions above the new threshold value of 20 litter items per 100 m beach length, which has been set forward by the EU TG-ML and adopted by the Marine Strategy Framework Coordination. The Top 15 lists showed that the most common type of litter items was plastic pieces 2.5-50 cm, which ranked highest at the Top 15 list for the regional assessment of the beaches belonging to Kattegat and The Northsea/Skagerrak and second for the Baltic Sea beaches. Besides this, also polystyrene pieces 2.5-50 cm, foamed sponges, and crisps packets/sweet wrappers, were present at the Top 15 lists for all three regions. Single-use-plastic (SUP) items were also found relatively abundant at the Danish beaches, with 4-5 different SUP litter item types occurring at the Top 15 lists for both Kattegat, The Northsea/Skagerrak and the Baltic Sea.

1 Danish reference beaches and monitoring methods

The Danish monitoring program for marine litter at beaches in 2020 includes five reference beaches. The beaches are Pomlenakke, Kofoeds Enge, Nymindegab, Skagen and Langerak (Figure 1.1). In addition, a sixth reference beach (Roskilde Bredning) has similarly to the other beaches been monitored systematically since 2015 as part of different projects (currently the MarinePlastic project), and is also included in this assessment. The beaches are located in different geographical regions with shorelines receiving marine litter from different local or transnational land-based or sea-based sources. All the beaches have been selected based on specific criteria, which are a rural and not easily accessible location with few visiting people. The six reference beaches belong geographically to three different marine sea regions, where Pomlenakke and Kofoeds Enge are located towards the Baltic Sea, Roskilde Bredning and Langerak towards Kattegat, and Skagen and Nymindegab towards the Northsea/Skagerrak.

The monitoring surveys are systematically carried out according to the Danish technical guideline for beach litter monitoring (Strand & Metcalfe, 2016), which is based on the EU and OSPAR technical guidelines for beach litter monitoring (OSPAR, 2010) but with some national modifications (e.g. with subcategories for some specific litter items to provide a more detailed classification system). The beaches have been surveyed three times annually in spring, summer and autumn, however, Roskilde Bredning has also been surveyed a fourth time during winter. As specified in the Danish technical guideline, the area for monitoring of beach litter is given by a specific 100 m stretch of the beach set by GPS mapping points, and the width is determined from the water line to the back of the beach.

Figure 1.1. Location of Danish reference beaches in the 2020 national monitoring program for marine litter on beaches.



The beach litter items collected during the surveys are counted and classified according to the national list of litter items (Strand & Metcalfe, 2016), which is largely based on the EU masterlist for litter codes (EU, 2013), but also with inclusion of some subcategories to perform a better classification of specific item types. The national litter list also contains a key for translation of litter items into OSPAR codes, so that items can be registered in both systems of G-codes and OSPAR codes for beach litter. The data used to prepare figures and tables for this report are based on G-codes for litter items, which has been extracted from the Marine Litter Watch database (http://www.eea.europa.eu/themes/coast_sea/marine-litterwatch, 5. November, 2020).

2 Amounts and material composition

The material composition for beach litter items registered from each of the surveys performed at the six Danish reference beaches in 2020 is shown in Figure 2.1. Plastic comprises the large majority of the beach litter items with an average of 82.7% of the registered litter (excl. paraffin/wax) for all the Danish reference beaches. At Nymindégab and Langerak, litter items consisting of plastic comprised as high as 96.8% and 95.3% in average, respectively, and the proportion was also high at Skagen (90.4%), Koføeds Enge (81.3%) and Roskilde Bredning (75.2%). The relatively lowest proportion of plastic was observed at Pomlenakke with an average of 59.5% of the total beach litter items. However, Pomlenakke also showed the largest variation with 87.2% (spring), 54.6% (summer) and 36.8% (autumn) between surveys. Glass/ceramics or processed wood were the second and third most dominant material types with in average 6.3% and 4.0% of the total beach litter at the Danish reference beaches in 2020. At Skagen, a relatively large amount of litter registered as glass/ceramics, which originates from a local source of construction-related waste, was present. Litter items consisting of metal (3.1%), paper/cardboard (1.4%), cloth/textile (1.4%) and rubber (1.1%) only comprised a low proportion of the total beach litter.

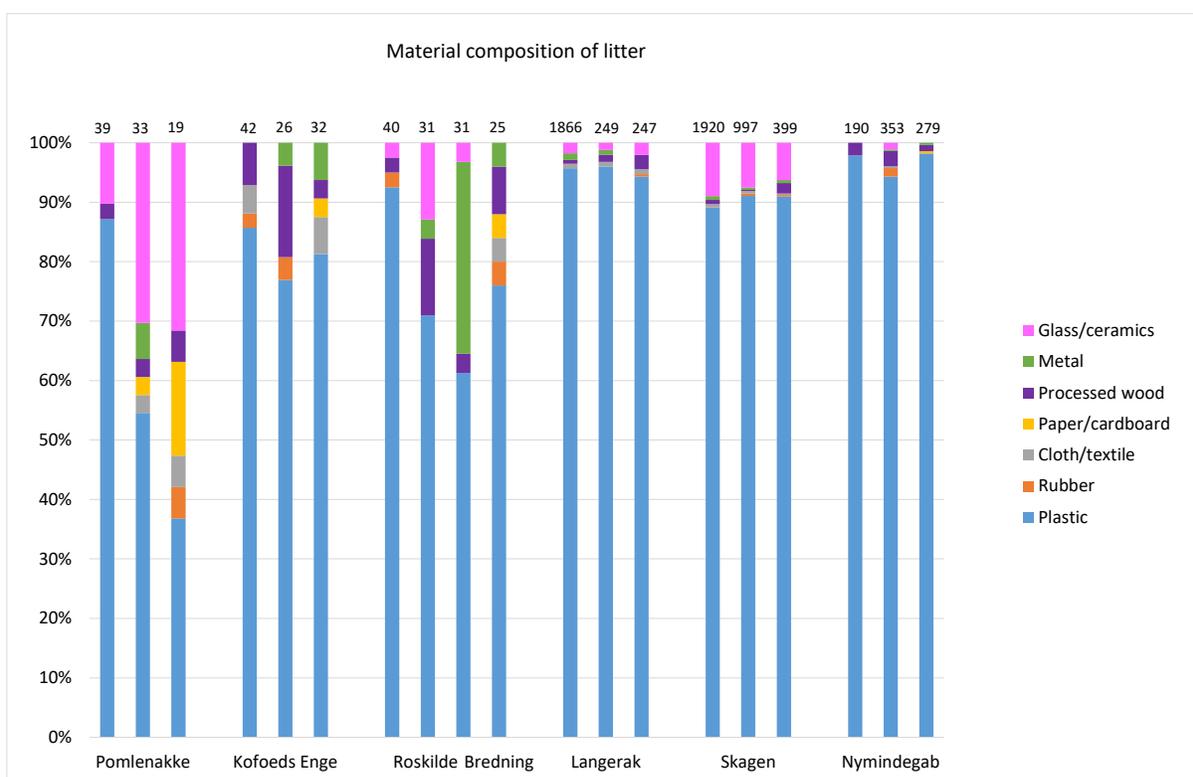


Figure 2.1. Material composition of beach litter items registered during monitoring surveys for marine litter at the Danish reference beaches in 2020. Each bar show results from an individual survey event, where the three bars from each beach represent the spring, summer and autumn survey, respectively. At Roskilde Bredning, a fourth survey was carried out during winter. The numbers at the top of the bars show the total number of items registered during the survey, excl. other solid litter waste (G213 paraffin/wax).

The total amount of litter items registered during 2020 at the Danish reference beaches was highly variable both between beaches, but also between surveys at the same beach. The median number of litter items (excl. paraffin/wax) registered per 100 m beach was 42 items for all 19 monitoring surveys (Table 2.1). However, large regional differences were observed, with generally much lower litter amounts at the beaches in east compared to the beaches in west. At the two beaches Pomlenakke and Kofoeds Enge towards the Baltic sea, a median number of 32 items per 100 m was observed (range 19-42 items per 100 m). At the two beaches Roskilde Bredning and Langerak in Kattegat the median number was 40 items per 100 m. There was, however, a large difference in the amounts observed between Roskilde Bredning and Langerak. In Roskilde Bredning the amount was relatively low (range 25-40 items per 100 m), while in Langerak the amount was relatively high (range 247-1866 items per 100 m), but also with a remarkable variation with substantially higher amounts in the spring survey. The two beaches Nymindegab and Skagen towards the Northsea/Skagerrak had the highest median amounts of litter with 376 items per 100 m (range 190-1920 items per 100 m). Similarly to Langerak, Skagen also showed a large variation between surveys with particularly high amounts of litter in the spring (n=1920) and summer, (n=997) surveys compared to the autumn survey (n=399).

The amounts of beach litter at the Danish reference beaches in 2020 were in all regions above the new threshold value of 20 litter items per 100 m beach length, which has been set forward by the MSFD Technical Group of Marine Litter and adopted by the Marine Strategy Framework Coordination Group (van Loon et al., 2020).

Table 2.1. Amounts of beach litter at Danish reference beaches in 2020. The median number of total litter items for each of the six beaches and the three regions as well as for all beaches in the Danish monitoring program is indicated per 100 m of beach (excl. items of paraffin/wax). The range shows the minimum and maximum number of total litter items per 100 m beach.

Beach/Region	Total litter items per 100 m	Range	Number of surveys
Pomlenakke	33	19-39	3
Kofoeds enge	32	26-42	3
Roskilde bredning	31	25-40	4
Langerak	249	247-1866	3
Skagen	997	399-1920	3
Nymindegab	279	190-353	3
Baltic Sea	33	19-42	6
Kattegat	40	25-1866	7
Northsea/Skagerrak	376	279-1920	6
DK	42	19-1920	19

3 Top 15 item lists

The Top 15 lists of the most frequent types of litter items in 2020 at the Danish reference beaches in the three regions at the Baltic Sea (Table 3.1), Kattegat (Table 3.2) and The Northsea/Skagerrak (Table 3.3.) show that some regional differences exists in the litter composition, but also that some litter types are found in relatively high occurrence at all beaches. The top 15 lists are produced by application of a ranking method in which all beaches contribute equally to the ranking, irrespective of the amounts of litter observed at the beaches (Strand, 2017). Hence, a ranking of the litter items is performed for all individual surveys and all beaches, and the sum of ranks for the different items determines the final ranking of Top 15 items for the region. This implies that in some cases the total number of registered items can be higher for an item with a lower ranking, if the amounts of this item type have been unequally distributed between the beaches.

Unidentified fragments of plastic or polystyrene are generally observed in high numbers in all regions, where plastic pieces 2.5-50 cm (G79) are the most common type at the beaches in Kattegat (Table 3.2) and The Northsea/Skagerrak (Table 3.3), and is ranked second at the Top 15 list for the beaches in the Baltic Sea (Table 3.1). Polystyrene pieces 2.5-50 cm (G82) are ranked as the most frequently occurring litter type at the Baltic Sea, and is ranked second at Kattegat and as number 10 at The Northsea/Skagerrak, respectively. A comparison of the Top 15 lists for the three Danish regions shows that besides plastic and polystyrene fragments, two other litter types are present at all Top 15 lists, which are foamed sponges (G73) and crisps packets/sweet wrappers (G30).

Table 3.1 Top 15 list of the most frequently occurring beach litter items in the Baltic Sea (Pomlenakke and Kofoeds Enge). The total number of items indicate the sum of all registered items of the specific litter type during all monitoring surveys in the region in 2020. The number of items per 100 m indicates the average number. Ranking of litter items is performed according to the recommended procedure from DCE presented to the HELCOM working group for marine litter at beaches, EN-Litter (Strand, 2017).

Baltic Sea Top15					
Top No.	Material	G-kode	Litter type	Total number of items	Number of items per 100 m
1	Plastic	G82	Polystyrene pieces 2.5 cm > < 50 cm	36	6
2	Plastic	G79	Plastic pieces 2.5 > < 50 cm	27	4.5
3	Plastic	G50	String and cord (diameter less than 1cm)	13	2.2
4	Plastic	G73	Foam sponge	8	1.3
5	Processed wood	G171	Other wood < 50 cm	5	0.8
6	Plastic	G30	Crisps packets/sweets wrappers	6	1
7	Plastic	G33	Cups and cup lids	3	0.5
8	Cloth/textile	G145	Other textiles (incl. rags)	5	0.8
9	Plastic	G87	Masking tape	3	0.5
10	Plastic	G10	Food containers incl. fast food containers	3	0.5
11	Metal	G177	Foil wrappers, aluminum foil	3	0.5
12	Paper/Cardboard	G158	Other paper items	3	0.5
13	Plastic	G3	Shopping Bags incl. pieces	4	0.7
14	Rubber	G125	Balloons and balloon sticks	3	0.5
15	Metal	G175	Cans (beverage)	2	0.3

Table 3.2. Top 15 list of the most frequently occurring beach litter items in Kattegat (Roskilde Bredning and Langerak). The total number of items indicate the sum of all registered items of the specific litter type during all monitoring surveys in the region in 2020. The number of items per 100 m indicates the average number. Ranking of litter items is performed according to the recommended procedure from DCE presented to the HELCOM working group for marine litter at beaches, EN-Litter (Strand, 2017).

Kattegat Top15					
Top No.	Material	G-kode	Litter type	Total number of items	Number of items per 100 m
1	Plastic	G79	Plastic pieces 2.5 > < 50 cm	900	128.6
2	Plastic	G82	Polystyrene pieces 2.5 cm > < 50 cm	146	20.9
3	Plastic	G67	Sheets, industrial packaging, plastic sheeting	318	45.4
4	Plastic	G70	Shotgun cartridges	55	7.9
5	Plastic	G30	Crisps packets/sweets wrappers	181	25.9
6	Plastic	G4	Small plastic bags, e.g. freezer bags incl. pieces	68	9.7
7	Plastic	G10	Food containers incl. fast food containers	52	7.4
8	Plastic	G124	Other plastic/polystyrene items (identifiable)	73	10.4
9	Processed wood	G171	Other wood < 50 cm	18	2.6
10	Plastic	G73	Foam sponge	152	21.7
11	Plastic	G3	Shopping Bags incl. pieces	45	6.4
12	Glass/ceramics	G200	Bottles incl. pieces	29	4.1
13	Plastic	G33	Cups and cup lids	25	3.6
14	Plastic	G21	Plastic caps/lids drinks	22	3.1
15	Plastic	G95	Cotton bud sticks	31	4.4

Table 3.3. Top 15 list of the most frequently occurring beach litter items in the Northsea/Skagerrak (Skagen and Nymindégab). The total number of items indicate the sum of all registered items of the specific litter type during all monitoring surveys in the region in 2020. The number of items per 100 m indicates the average number. Ranking of litter items is performed according to the recommended procedure from DCE presented to the HELCOM working group for marine litter at beaches, EN-Litter (Strand, 2017).

Northsea-Skagerrak Top15					
Top No.	Material	G-kode	Litter type	Total number of items	Number of items per 100 m
1	Plastic	G79	Plastic pieces 2.5 > < 50 cm	829	138.2
2	Plastic	G50	String and cord (diameter less than 1cm)	307	51.2
3	Plastic	G53	Nets and pieces of net < 50 cm	461	76.8
4	Plastic	G67	Sheets, industrial packaging, plastic sheeting	160	26.7
5	Plastic	G95	Cotton bud sticks	748	124.7
6	Plastic	G124	Other plastic/polystyrene items (identifiable)	104	17.3
7	Rubber	G125	Balloons and balloon sticks	75	12.5
8	Plastic	G73	Foam sponge	83	13.8
9	Plastic	G21	Plastic caps/lids drinks	128	21.3
10	Plastic	G82	Polystyrene pieces 2.5 cm > < 50 cm	54	9
11	Plastic	G30	Crisps packets/sweets wrappers	67	11.2
12	Plastic	G23	Plastic caps/lids unidentified	99	16.5
13	Plastic	G35	Straws and stirrers	56	9.3
14	Plastic	G66	Strapping bands	38	6.3
15	Plastic	G49	Rope (diameter more than 1cm)	70	11.7

Fishery-related waste comprise a significant fraction of the beach litter from Northsea/Skagerrak, where string and cord with diameter less than 1 cm (G50) and nets and pieces of net < 50 cm (G53) are ranked as second and third on the Top 15 list. String and cord are also frequently observed at the Baltic Sea, where it is the third most common litter type. In contrast, these fishery-related waste items are not present at the Top 15 list from Kattegat, where the two beaches Roskilde Bredning and Langerak to a larger extent seem to receive litter from local sources in-land and from inner Danish marine waters. Shotgun cartridges (G70) from hunting are oppositely only present at the Top 15 list for Kattegat, where they rank no. 4, and are not present at the Top 15 list the two other Danish regions. This is despite that at Kofoeds Enge, shotgun cartridges are present in relatively high amounts and ranked as the fourth most common litter type, but due to no findings of this litter type at Pomlenakke, shotgun cartridges drop off from the Top 15 list for the Baltic Sea. Litter of single-use-plastic (SUP) is present at the Top 15 lists from all Danish reference beaches in 2020 and includes besides crisps packets/sweet wrappers (G30), also cotton bud sticks (G95), balloons and balloon sticks, incl. balloon strings (G125), cups and cup lids (G33), food containers, incl. fast food containers (G10), plastic caps/lids drinks (G21), straws and stirrers (G35), and shopping bags incl. pieces (G3). In all of the three Danish regions, 4-5 of these different SUP item types occur at the Top 15 lists for the most commonly observed beach litter.

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