



Monitoring of Seafloor Litter on the Dutch Continental Shelf

International Bottom Trawl Survey 2025, Dutch Beam Trawl Survey 2024

Author(s): Joey J.J. Volwater & Ralf van Hal

Wageningen Marine Research
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Summary

The Marine Strategy Framework Directive (MSFD) requires EU Member States to develop programmes of measures that aim to achieve or maintain Good Environmental Status (GES) in European seas. In order to be able to evaluate the quality status of marine waters on a regular basis and the effects of the measures taken, monitoring programmes have been established by the Member States for MSFD descriptors and indicators. The Dutch monitoring program for Marine Litter (Descriptor 10) includes the collection of data on the abundance, composition and distribution of macro litter on the seafloor. According to the Dutch program, the data on seafloor litter must be collected during statutory task fish surveys using a standardised Grand Ouverture Verticale (GOV) fishing net as part of the International Bottom Trawl Survey (IBTS), which is carried out yearly in the North Sea.

Anthropogenic pollution of the oceans, including marine litter, poses significant threats to wildlife, disrupts human activities, and reduces the recreational value of our coastlines. Marine litter affects all groups of marine wildlife through effects such as entanglement and ingestion. Various initiatives to reduce litter in the (marine) environment have been implemented or are currently under discussion. However, despite these management measures to decrease litter input and remove litter from the environment, litter is still found during seafloor monitoring.

This report presents the seafloor litter composition, abundance, and spatial distribution based on catches of the regular fish surveys; the IBTS and the Dutch Beam Trawl Survey (BTS). Only the catches on the Dutch Continental Shelf (DCS) are used for data analysis. To assess the status of seafloor litter on the DCS, the Dutch data are supplemented with those from international partners surveying the DCS within the IBTS.

The seafloor litter catches on the DCS consisted mainly of plastic items, accounting for 78% of the litter found in the IBTS and 76% in the BTS. The most commonly caught items were monofilaments, plastic sheets, and various types of (plastic) ropes and lines. A mean density of 66 litter items per km² over the years 2023-2025 was calculated for the IBTS on the DCS, whereby for the BTS a mean density of 166 litter items per km² over the last three years (2022-2024) was calculated on the DCS. It should be noted that the nets used in the IBTS (GOV) and BTS (beam trawl) are not designed to catch litter. For the GOV, the catchability of many benthic species (e.g. *Asteroidea*) is assumed to be less than 5% compared to a beam trawl (Piet et al., 2009), therefore the chance of catching a litter item when it is present in the trawl path is likely to be even smaller than 5%. Therefore, the fact that these items are caught despite the suggested low catchability indicates that many more litter items are likely in the trawl path, meaning current estimates significantly underestimate the actual amount of litter. The inclusion of the BTS data in recent years has improved the understanding of the litter types on the seafloor. The BTS catches a wider range of litter types and roughly three times more items per swept area compared to the IBTS. However, the abundance and density estimations of seafloor litter in this report have to be considered as a very low estimation of the total amount of a selection of litter types present on the DCS, rather than its actual status. This has been demonstrated in a new Dutch study using a benthic dredge for seafloor litter sampling, which showed much higher seafloor litter densities (Roos et al., 2023).

1 Introduction

The Marine Strategy Framework Directive (MSFD) requires EU Member States to develop programmes of measures that aim to achieve or maintain Good Environmental Status (GES) in European seas. In order to be able to evaluate the quality status of marine waters on a regular basis and the effects of the measures taken, monitoring programmes have been established by the Member States for MSFD descriptors and indicators. The Dutch monitoring program for Marine Litter (Descriptor 10) includes the collection of data on the presence, abundance and distribution of macro litter on the seafloor.

The oceans hold immense socio-economic importance, providing employment, food and recreation for a substantial portion of the world's population (Costanza, 1999). Yet, anthropogenic pollution abounds in our oceans, with marine litter threatening wildlife, hindering human activities and reducing the recreational value of our coasts (Fleet et al. 2009; Rangel-Buitrago et al. 2022). Sources of marine litter can originate both at sea or on land, although it is widely assumed that land-based sources contribute the majority of the pollution (Jambeck et al. 2015). Land-based sources and pathways of marine litter include sewage and river outlets, landfills and recreational activities along the coast (Viega et al. 2016). Through a complex network of ocean pathways, land-based litter originating from one country can end up in the waters of another, often far removed from the original source (Chassignet et al. 2021). Shipping, fisheries, aquaculture, offshore installations and illegal dumping all constitute some of the sources of sea-based marine litter (Skirtun et al. 2022; Viega et al. 2016).

Plastics represent the majority of marine litter (Galgani et al. 2015; Rangel-Buitrago et al. 2022; Barry et al. 2023). According to Meijer et al. (2021) between 0.8 to 2.7 million metric tonnes of post-consumer plastics enter the oceans solely by rivers every year. This has an impact on all groups of marine wildlife through effects such as ingestion, entanglement and substrate (Valderrama-Herrera et al. 2023; Kühn et al. 2022; Solomando et al. 2022; Freitas et al. 2023). Entanglement may restrict movement and inflict injuries, impairing an animal's ability to evade predators, acquire food, or increasing the potential for drowning. Ingestion of marine debris (both intentional and accidental) may cause a suppressed appetite or blockage of the gastrointestinal tract leading to malnutrition or harmful toxicological effects which in some cases may be lethal (Kühn et al. 2015; Rochman 2015; Thompson 2015). Increasing evidence also shows that plastic accumulates in predators (including humans) through trophic transfer when contaminated prey is consumed (Nelms et al. 2018; Hasegawa & Nakaoka 2021). Additionally, marine litter often provides a suitable substrate for many species of different phyla including Arthropoda, Mollusca, and Bryozoa. Through displacement by wind and currents, this litter can introduce and spread non-indigenous species (Curd et al 2023; Mancini et al. 2021; Mghili et al. 2023).

Various initiatives to reduce litter in the environment have been implemented or are currently under discussion. The taxation of single-use plastic carrier bags introduced in 2016 is a good example which led to a significant reduction of single-use carrier bags in litter at European level. On the first of July 2021 a national deposit regulation for small plastic bottles (0.5 L) was put in force by the Dutch government. Shortly after, on July 3rd 2021, single use plastics like cutlery, plates, straws, stirrers and cotton bud sticks were prohibited. Most recently, a deposit regulation for metal beverage cans came into effect on the first of April 2023. The initial results since the introduction of a deposit regulation are encouraging, with a reduction of 69% in small plastic bottles and a 70% reduction of metal beverage cans in litter (RWS, 2025). As part of the "European Green Deal" a new vision of the EU legislation on Packaging and Packaging Waste was proposed and has three main objectives: reducing the quantity of packaging, ensuring that all packaging on the EU market is recyclable, and increasing the use of recycled plastics. The awareness of plastic pollution is also growing globally. In 2022, the United Nations Environmental Assembly (UNEA) decided during an environmental summit in Nairobi (Kenya) that within two years there should be a global binding treaty to reduce plastic pollution. During that summit the UNEA member states unanimously chose the most ambitious options and because of that the upcoming treaty was seen as (one of) the most important "green deal" since the

2015 Paris climate agreement. During the recent summit (Aug 2025) in Geneva (Switzerland) the negotiations failed and the ambitious legally binding treaty was not signed.

The measures described above can help towards achieving GES for marine litter that is dictated by the European Marine Strategy Framework Directive (MSFD 2008/56/EC) to its EU member states. Top-down EU policies (e.g. MSFD) are seen as the most influential pieces of legislation (Frantzi et al. 2021). In addition, the MSFD requires monitoring of the amount of litter in the marine environment and, where possible, the evaluation of the effectiveness of the measures taken to reduce it. The monitoring requirements are divided in a number of categories: monitoring litter deposited onto the beach, in the water column and biota, and deposited on the seafloor. The beach litter monitoring conducted in the North Sea indicates that a large part of the North Sea litter washes ashore on beaches near the Skagerrak. This is consistent with models by Chassignet et al. (2021), which showed that a large amount of plastic waste from the Netherlands is displaced by currents to Germany, Denmark, and Norway. Monitoring of washed ashore litter results in the indicator on "Beach litter" (Boonstra & Hougee, 2024; OSPAR commission 2010; Schulz et al. 2019) while the monitoring in biota results in the indicator on "Plastic particles in fulmar stomachs" (de Bruin et al., 2025; Van Franeker et al. 2021; Kühn et al. 2022). In addition to these two indicators, there is a "Seabed litter" indicator describing the litter deposited on the seafloor (OSPAR commission 2017). Approximately 70% of marine litter sinks to the seafloor where it accumulates (Pham et al. 2014). Once deposited on the seafloor, marine litter can slowly degrade into microplastics. This microplastics degradation can occur through abrasion and/or temperature-dependent solar UV-radiation, and therefore the microplastics accumulate on the seafloor (Andrady 2015).

This report describes the methods used and presents and discusses the data collected for the Dutch part of the monitoring of litter deposited on the seafloor as commissioned by Rijkswaterstaat (RWS). The OSPAR commission proposed to collect seafloor litter by using the catches of the International Bottom Trawl Survey (IBTS). This is an internationally coordinated survey covering the Greater North Sea to get recruitment indices of the fish community, focussing on cod, haddock, Norway pout, saithe, whiting, mackerel, herring, and sprat. Despite the fact that the sampling gear is not optimal for sampling litter, the IBTS provides a good platform for internationally collected litter data. Data collection on board follows the CEMP Guidelines of Litter on the Seafloor (OSPAR, n.d.) and the most recent Working Group on Marine Litter (WGML) guidelines are included in the IBTS survey manual (ICES 2022). All international partners of the IBTS should follow these guidelines for seafloor litter collection, enabling the combination of the Dutch seafloor litter data from fishing hauls with those from the other partners on the Dutch continental Shelf (DCS). To get a better insight in the composition and amount of marine litter on the DCS, on board of the Dutch Beam Trawl Survey (BTS) the same guidelines (protocol) are followed. This report provides insight in and summarises the seafloor litter composition, abundance, and spatial distribution on the DCS.

The current focus on the DCS is a result of the way the MSFD is organised. Each European member state is only responsible for their part of the continental shelf and is obliged to report on their own part. Although data outside of the DCS are excluded from this report, Dutch litter data collected by Wageningen Marine Research (WMR) have been submitted to the ICES DATRAS database, and are used for the OSPAR North Sea wide seafloor litter assessments.

Aims

Since 2013, WMR has been collecting IBTS data on seafloor litter, which is provided to RWS and stored in the ICES DATRAS database. This data collection spans over ten years, with the most recent data collected in 2025. RWS requested WMR to report on the current status of seafloor litter on the DCS, including litter data from international IBTS partners and the Dutch BTS data. The core of this report focuses on the seafloor litter data collected on the DCS in quarter 1 (Q1) of 2025. Additionally, the data collected during the latest BTS in quarter 3 (Q3) of 2024 are reported. The objectives of this report are to:

- Provide insight into the composition and abundance of seafloor litter on the Dutch continental shelf.
- Assess the spatial distribution of seafloor litter on the Dutch continental shelf.

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- Compare the results of the IBTS and the BTS to provide a more detailed insight of the state of seafloor litter on the Dutch continental shelf.

2 Methods

2.1 International Bottom Trawl Survey

2.1.1 Dutch IBTS Q1

The International Bottom Trawl Survey quarter 1 (IBTS Q1) is carried out annually in January and February, and is performed by France, Scotland, Germany, Sweden, Norway, Denmark, and the Netherlands whereby all participating members follow the same guidelines (ICES, 2022). The survey design divides the North Sea into grids (ICES rectangles), each measuring 0.30° latitude by 1° longitude, which are distributed amongst the participating countries. Each rectangle needs to be sampled twice over the course of the IBTS but the allocation of rectangles among countries results in the majority of rectangles being sampled once by two different countries. The planned area for 2025 (**Figure 1.1**) remained nearly unchanged since the 2019 survey (van Hal, 2019). The main difference compared to the initial planning was that several rectangles allocated to Germany were included in the Dutch planning due to issues with the German vessel.

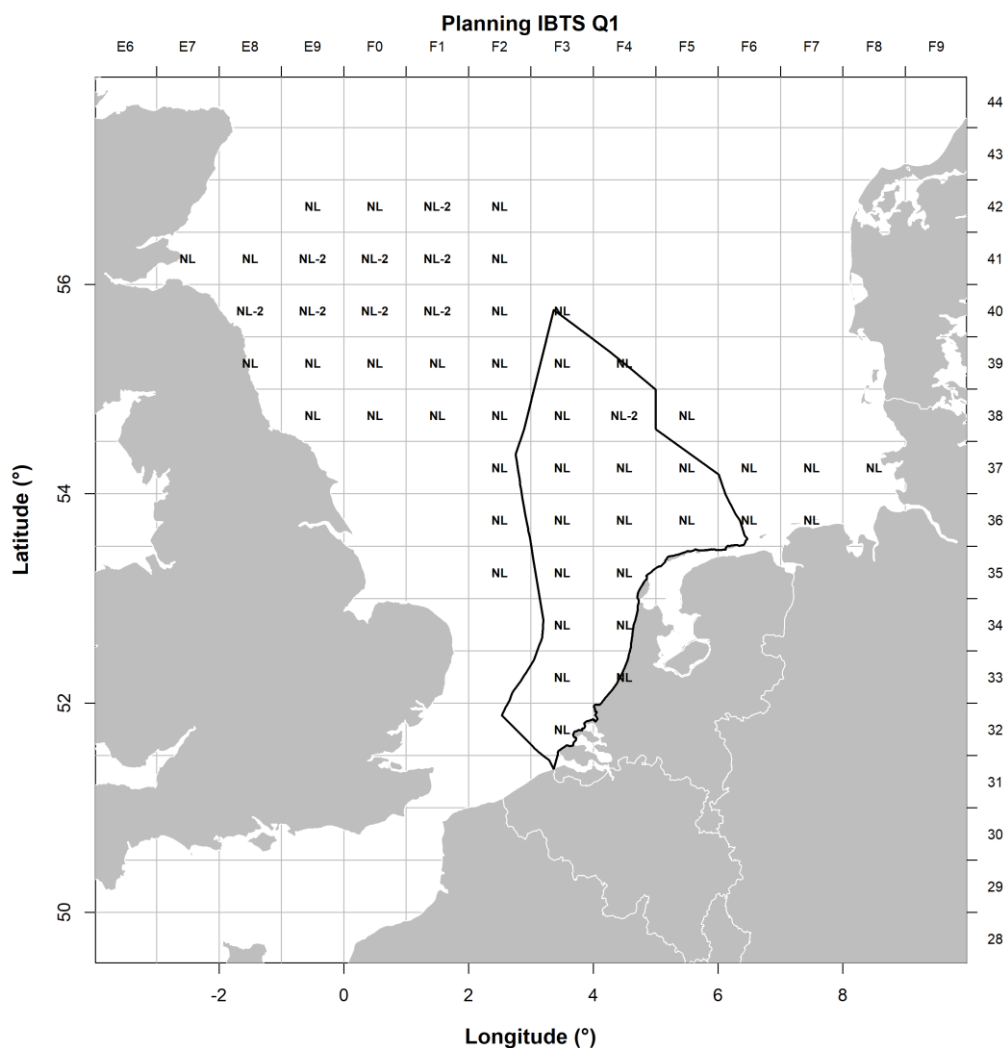


Figure 1.1 Planned ICES rectangles for the Dutch GOV hauls during the 2025 IBTS Q1. Rectangles marked with "NL" are those that should be covered once by the Netherlands and once by another participating country. Rectangles marked "NL-2" are those that should be covered twice by the Netherlands. Empty rectangles are covered by other participating countries. Thick black line indicate the outline of the DCS.

The sampling gear used for the IBTS is the Grand Ouverture Verticale (GOV), a (semi- pelagic) bottom trawl. The mesh size of the net is 100 mm and 10 mm in the cod-end. The headline of the net lies

about 5 m above the seafloor, which is particularly convenient for sampling pelagic fish species and species that dwell just above the bottom. However, as the ground rope of the GOV only touches the bottom, flatfish, benthic organisms, and seafloor litter can easily pass beneath it, resulting in a potentially significant proportion of these items escaping the net. For example, the proportion of small flatfish (<25 cm) going underneath the ground rope is assumed to be 50% (Piet et al. 2009). Due to the weak ground contact of the GOV, small flatfish, other small bottom dwelling species, and epibenthos are caught by the GOV in a rather random manner (<5% compared to a beam trawl, e.g. each item has less than 5% chance to be retained in the net). As a result, these catches are not representative of the actual presence of species on the seafloor (ICES 2003; Piet et al. 2009). This limitation is also likely to apply to the majority of types of marine seafloor litter.

Table 1.1 *Classification of marine litter items (ICES, 2022). The table presents six categories of litter (A-F) and their respective subcategory (red), as well as size categories (A-F) used in the categorisation of seafloor litter items caught during the IBTS (green).*

Litter overview			
A: Plastic	B: Metals	C: Rubber	Related size category
A1. Bottle	B1. Cans (food)	C1. Boots	A: < 5*5 cm = 25 cm ²
A2. Sheet	B2. Cans (beverage)	C2. Balloons	B: < 10*10 cm = 100 cm ²
A3. Bag	B3. Fishing related	C3. Bobbins (fishing)	C: < 20*20 cm = 400 cm ²
A4. Caps & Lids	B4. Drums	C4. Tyre	D: < 50*50 cm = 2500 cm ²
A5. Monofilament	B5. Appliances	C5. Glove	E: < 100*100 cm = 1 m ²
A6. Entangled filaments	B6. Car parts	C6. Other	F: > 100*100 cm = 1 m ²
A7. Synthetic rope	B7. Cables		
A8. Fishing net	B8. Other		
A9. Cable ties			
A10. Strapping band			
A11. Crates and containers	D: Glass/Ceramics	E: Natural products	F: Miscellaneous
A12. Diapers	D1. Jar	E1. Wood (processed)	F1. Clothing and rags
A13. Sanitary towel/tampon	D2. Bottle	E2. Rope	F2. Shoes
A14. Other	D3. Piece	E3. Paper and cardboard	F3. Other
A15. Medical masks	D4. Other	E4. Pallets	
A16. Other fishing related plastic		E5. Other	

The horizontal opening of the net is determined by the pressure on the two doors (otter boards), one on each side of the net. The horizontal opening of the net varies with depth. The width between the doors (door spread) is therefore measured continuously during each haul. The doors are connected to the net by a 10 m back strop and a 50 m sweep. This sweep moves over the seafloor creating a dust cloud, herding fish towards the actual net opening. The actual net opening (wing spread) varies with depth as well (van Hal, 2023; for more information about the net geometry). The wing spread is considered most relevant for seafloor litter as it is not expected that seafloor litter is herded towards the net by the dust cloud created by the sweeps. The standard haul duration is 30 minutes, with a fishing speed of approximately 4 knots (7.4 km/h). Trawling is only carried out during daylight hours.

The Netherlands uses the research vessel Tridens II (Tridens) for the IBTS each year. In 2015 and 2016, due to a refit of the Tridens, the English research vessel CEFAS Endeavour was hired. Since the refit of the Tridens, the Dutch GOV-net and otter boards, as well as a new SIMRAD net-geometry system attached to the doors have been used for the IBTS.

2.1.2 Sampling Litter

The IBTS manual for sampling seafloor litter data collection states that litter has to be collected in every haul (ICES 2022). On the Tridens the complete net is hoisted on board however a (part) of the ground rope is left hanging over the side and thus cannot be checked for the presence of litter. The

net is inspected and cleaned as much as possible after each haul by an assigned person. Since the ground rope is hanging over the side of the vessel, it is only inspected and cleaned once on board in case of maintenance or repairs. Litter items in the net and in the catch are collected after each haul. Each litter item is then classified (**Table 1.1**), weighed, its size is estimated, photographed (can be used to check the data in case of odd recordings), and in case of linear objects the length is measured. In case similar items are found in a single haul, these are recorded as a single category, weighed together and the number of individual items is registered. When organisms are attached to litter items, the different kind of species are recorded as well. Moreover, a more detailed description of the litter items is given for each haul. The latter in combination with the photos facilitate a post-survey quality check of the data.

2.1.3 Area Surveyed

Seafloor litter is presented as number of items per km². To be able to calculate items per km², knowledge on the surveyed area (total swept area) is required. The swept area of the GOV is variable, depending on the depth and the amount of fishing line used. For fish calculations, two swept areas are calculated: one based on door spread and the other on wingspread. The door spread is the area between the doors (otter boards) of the gear, which is relevant for fish that are herded together into the net. The wingspread is the area between the wings, which is considered to be the actual net opening. We assume that marine litter is not herded into the net by the doors and cables, and thus wingspread is considered the relevant measure for seafloor litter.

The SIMRAD net geometry system records the door spread only. Therefore, wingspread needs to be calculated based on this data. In some cases door spread is not recorded properly, and in these cases depth and line length are used to estimate door spread instead. The formulas are based on (1) recorded door spread during the Dutch IBTS on the research vessel *Tridens* in previous years, and (2) the information gathered during the two years the Dutch IBTS was executed using the CEFAS Endeavour using the English wingspread sensors.

The equation for door spread in case door spread is not recorded properly is fitted to data recordings as follows:

$$(1) \quad \text{Door spread} = 14.2 * \log(\text{Depth}) + 16.72 * \log(\text{Warp length}) + 18.49$$

Where Depth is the depth in meters and Warp length the length (m) of fishing line used. Once the door spread is known, wingspread (m) can be derived via the following equation:

$$(2) \quad \text{Wingspread} = \text{Door spread} * 0.18870 + 5.87280$$

To calculate the number of litter items per km², the number of items per haul needs to be divided by the swept area as follows:

$$(3) \quad \text{Number of litter items per km}^2 = \text{Litter items} / (\text{Wingspread (km)} * \text{Distance trawled (km)})$$

The above described data processing was for the Dutch litter data to obtain the number of litter items per km². Litter data from other IBTS partners from 2013 onwards were processed in the same way. However, the fitted constants in their formulas might slightly differ from the above mentioned values (ICES, n.d.).

2.1.4 Data Analysis

The data analysis is done in two parts: (1) the Dutch IBTS 2025 Q1, and (2) the status of seafloor litter on the DCS (international data). The litter data of the Dutch IBTS 2025 Q1 is shown as the spatial distribution of litter items per km². To focus on the Dutch continental shelf, further analyses were done with DCS data, including the data of the international IBTS partners on the DCS. Litter data of the international IBTS partners on the DCS were downloaded from ICES DATRAS database from 2013 onwards (Annex 1). However, not all available data could be used for the litter DCS data analysis

due to inconsistencies in the counting of items. For some years, only the presence of seafloor litter and litter items were recorded resulting in only 0 or 1 as possible counts. While the Netherlands started to count litter items from 2013 onwards (except A5 “Monofilaments”, from 2014 onwards), most countries started to count single litter items a couple of years later. For example, France only started to count A2 “Sheets” in 2015 and Germany in 2018. An overview of the seafloor litter data used for this analysis is shown in **Table 1.2**.

Table 1.2 International seafloor litter data on the DCS. The table shows the seafloor litter data (number of hauls) per country per year on the DCS of which count data were available.

Country	Institute	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Denmark*	DTU-AQUA							3	4	4	4	4
France	IFREMER	19	19	13	17	17	13	14	12	12	12	12
Germany**	vTI					3						
The Netherlands	WMR	12	12	19	18	17	17	16	19	19	20	18

*Denmark only started to count marine seafloor litter in 2021.

**Germany only executed three hauls on the DCS in 2019 as they swapped area with Denmark that year.

To account for year-to-year variations, the DCS litter data of the three most recent years (2023-2025) are presented as figures, showing the composition of the seafloor litter by categories A-F and the Top-10 most commonly caught litter types. To calculate the percentage per litter category or litter type, mean values per km² were taken based on all individual hauls executed on the DCS for the period 2023 – 2025. Spatial distribution of number of litter items per km² per ICES rectangle was shown by taking the mean value of total litter count per ICES rectangle. Densities per ICES rectangle were only based on hauls executed on the DCS, even if an ICES rectangle partly overlapped the DCS. To define hauls that were executed on the DCS, the outline of the DCS as shown in **Figure 1.1** was used.

2.2 Beam Trawl Survey

In addition to the IBTS data, the BTS (Q3) is included in the marine seafloor litter report to expand the dataset and to get better insights in the amount of marine litter on the DCS. The BTS is carried out annually from July until September. The survey design is similar to the IBTS, except that this survey is only performed by the Dutch and that not all ICES rectangles need to be sampled twice a year (**Figure 1.2**). Instead, in the south-eastern North Sea and in the German Bight a minimum of two and a maximum of four hauls has to be performed per rectangle. The research vessel *Tridens* is also used for the BTS each year, where a beam trawl of 8 m with a 40 mm cod-end mesh size is used. This gear has better bottom contact and is therefore assumed to have higher catches of seafloor litter than the GOV used in the IBTS (Van der Sluis & van Hal 2014). Although the beam trawl has better bottom contact than the GOV, there might be a higher escapement of small litter items since the cod-end mesh size of the beam trawl is larger compared to the GOV (10 mm). Like for the GOV, only a selection of the types of litter items present retain in the net. Litter items are recorded following the same methodology to that of the IBTS. Seafloor litter caught with the beam trawl is also presented as number of items per km², the net width of the beam trawl is fixed and the surveyed area is therefore calculated by making use of the following equation:

$$(1) \quad \text{Number of litter items per km}^2 = \text{Litter items} / (\text{Beam trawl width (km)} * \text{Distance trawled (km)})$$

Data analysis for the DCS is performed in a similar way as described for the IBTS (section 2.1.4), except that it is exclusively based on Dutch hauls since it is only performed by the Dutch. In addition, only the data of 2020-2024 were used since consistent marine litter recording during the southern part of the BTS started in 2020.

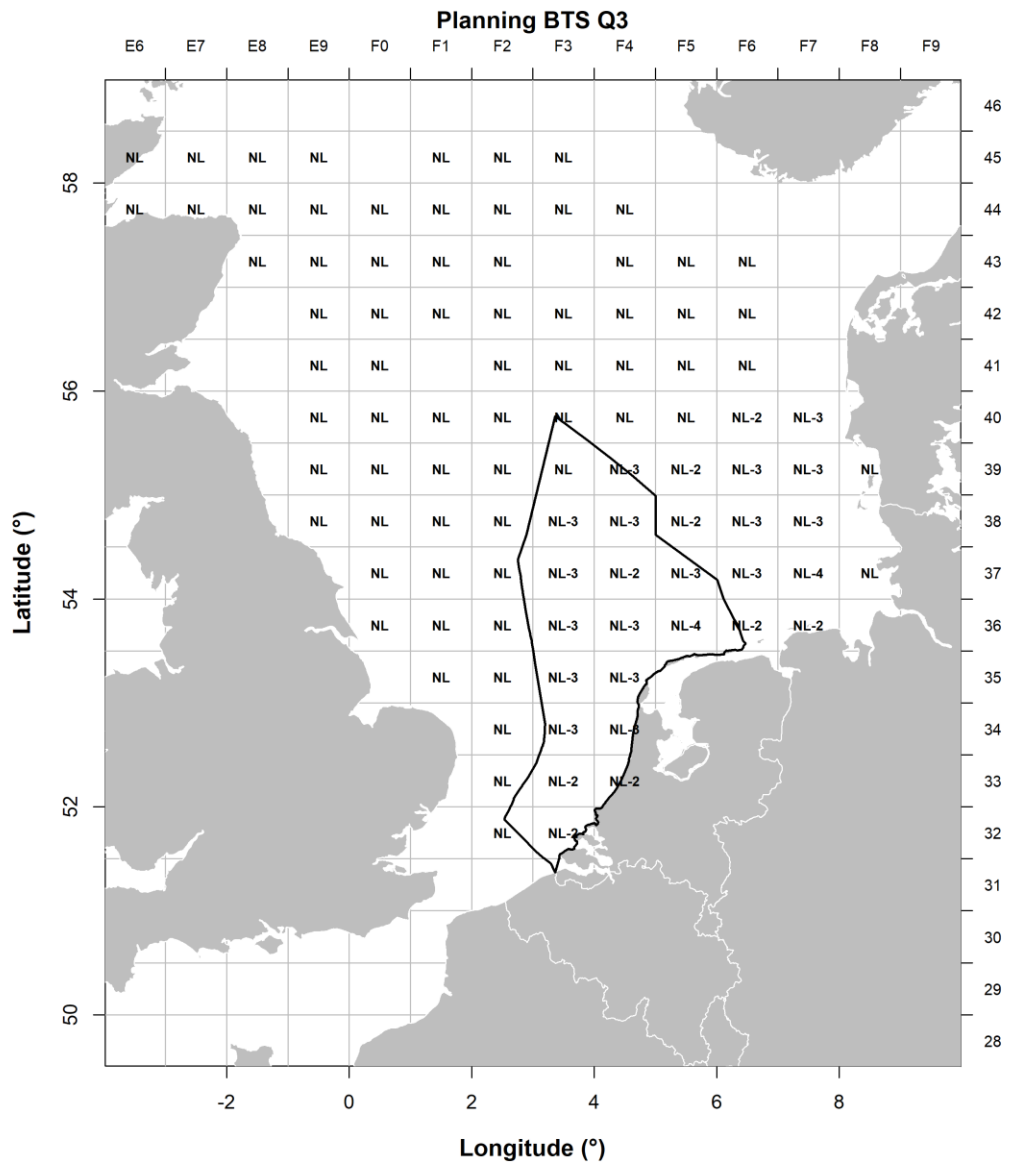


Figure 1.2 *Planned ICES rectangles for the Dutch bottom trawl hauls during the 2024 BTS Q3.* Rectangles marked "NL" are those that should be covered once, rectangles marked "NL-2" should be covered twice, etc. Empty rectangles are those that are not covered at all. The thick black line indicates the outline of the DCS.

3 Results

3.1 International Bottom Trawl Survey

3.1.1 Dutch IBTS Q1 2025

The Dutch IBTS 2025 Q1 performed 63 valid hauls, of which 18 were conducted on the Dutch continental shelf. Almost all hauls lasted the standard 30 minutes.

The spatial distribution of litter caught during the Dutch IBTS 2025 is presented in **Figure 3.1**. The small crosses represent hauls without litter items in the catch, empty hauls. There was one empty haul (0 items/km²) located on the DCS, sixteen in British waters (central part) and one in German waters. The haul with the highest amount of items per km² was located in the south in front of the coast of the Netherlands near the harbour of Rotterdam (33F4), with 383 litter items per km².

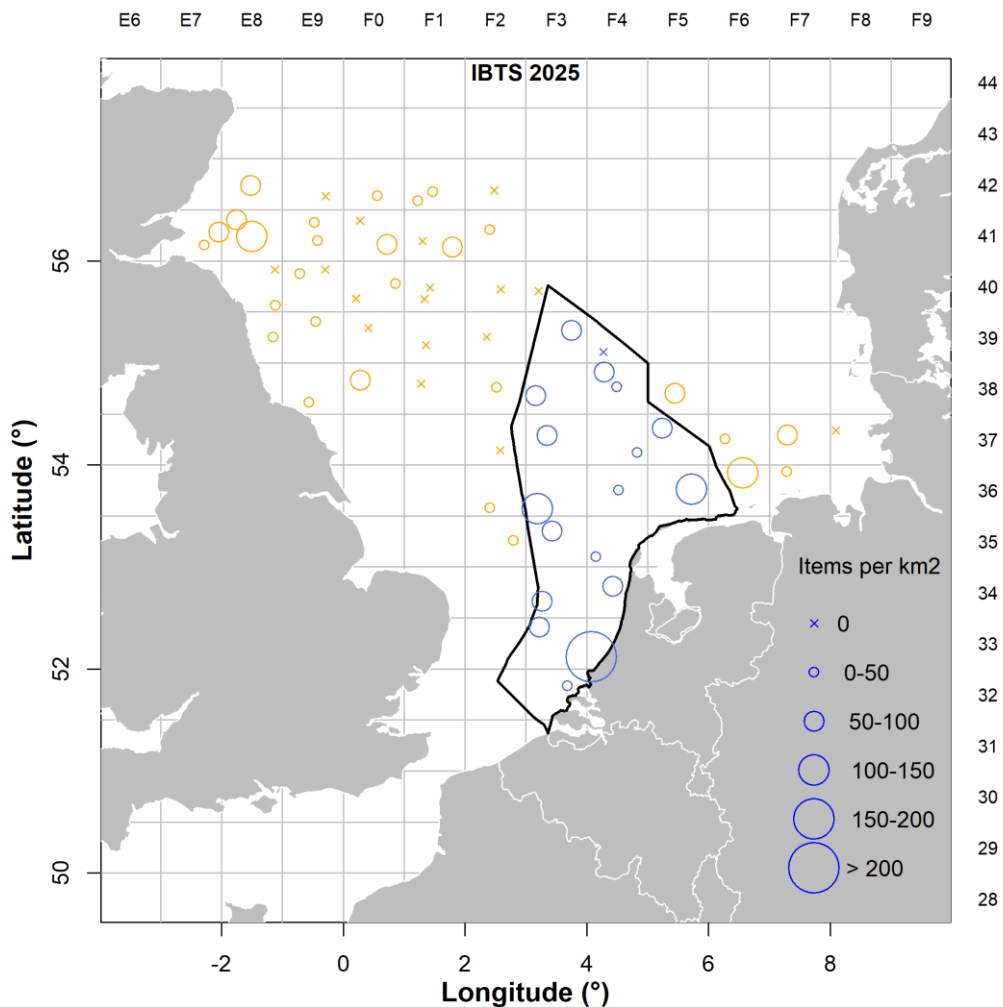


Figure 3.1 Executed Dutch GOV hauls and total counts per km² during the 2025 IBTS. GOV-hauls executed on the DCS (blue) and GOV-hauls executed by the Netherlands (WMR) outside the DCS (orange). The size of the circles indicates the number of items caught per km². The small crosses represent hauls without litter items in the catch, empty hauls.

3.1.2 Seafloor litter on the Dutch Continental Shelf

This section analyses all available and usable seafloor litter data for the Dutch continental shelf for the three most recent years, 2023-2025. A total of 105 hauls were conducted on the Dutch continental shelf for these three years during the IBTS by Denmark, France, and the Netherlands, covering a swept area of around 7 km² in which a total of around 400 litter items were caught. The general composition of seafloor litter and the Top-10 litter types were calculated by mean values. Since the dataset contains a large amount of zero values, the median might give a biased (zero) outcome. Therefore, mean values are used.

3.1.2.1 Material composition

Plastic was the most dominant category of seafloor litter on the DCS in the IBTS, accounting for 78% of the caught litter items (**Figure 3.2**). "Natural products" and "Metals" were the second and third most dominant litter categories, responsible for 15% and 3% of all litter items caught, respectively. "Miscellaneous" were representing 2% of the litter items and rubber and glass were each representing 1% or less of the litter items.

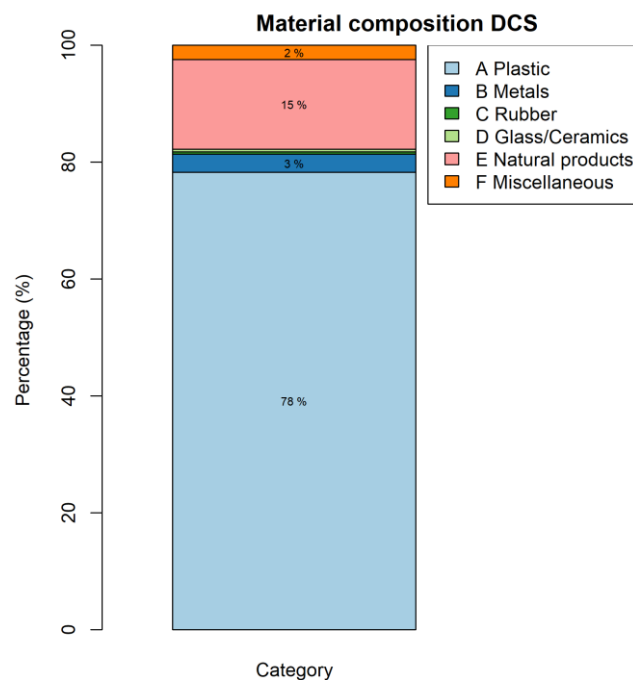


Figure 3.2 **Material composition of the seafloor litter in the catches of the IBTS on the DCS in 2023-2025.** The percentages are based on mean values per km² per litter category. The litter categories for which no percentages are indicated are: F – Miscellaneous (2%), C – Rubber (0.5%) and D – Glass/Ceramics (0.5%).

3.1.2.2 Top-10 litter types

Based on the mean values per litter type, a Top-10 of most dominant litter types caught in the IBTS on the DCS was compiled (**Figure 3.3**). The Top-10 is dominated by plastic litter types and these 10 litter types account for 93% of the total litter items caught. Only three litter types were made of other materials than plastics, respectively "Wood (processed)" (E1), "Metal - Other" (B8), and "Miscellaneous - Other" (F3). The most dominant litter type was "Monofilament" (A5), representing 24% of the litter items caught. Followed by "Sheet" (A2), "Synthetic rope" (A7), "Wood (processed)" (E1), and "Bag" (A3), accounting for 20%, 14%, 14% and 6% of the litter items caught. The other litter types in the Top-10 list were each responsible for 5% or less of the items caught on the DCS.

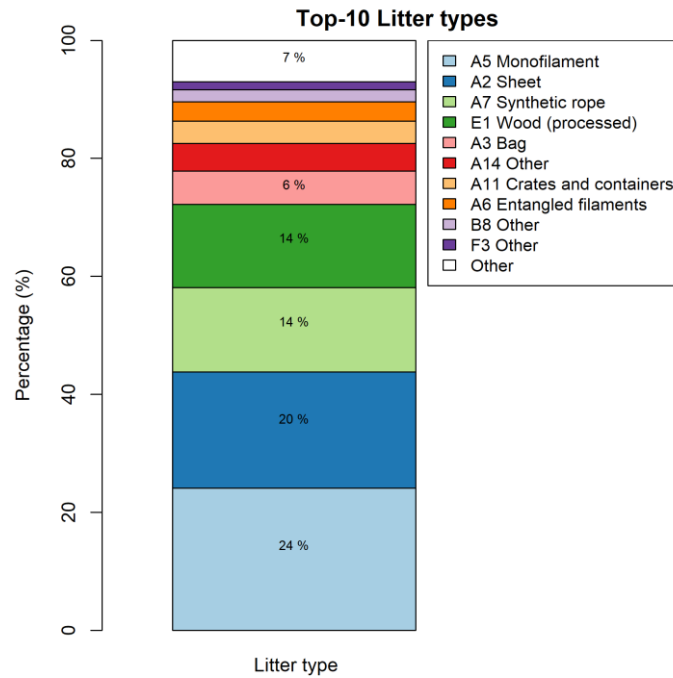


Figure 3.3 Top-10 list of litter items in the catches of the IBTS on the DCS in 2023-2025. The percentages are based on mean values per km² per litter type. The Top-10 litter types for which no percentages are indicated are: A14 – Other (5%), A11 – Crates and Containers (3%), A6 – Entangled filaments (3%), B8 – Other (2%) and F3 – Other (2%).

3.1.2.3 Abundance and spatial distribution of seafloor litter

Litter was found in 89% of the IBTS hauls on the DCS in the period between 2023 and 2025 (**Table 3.1**). The maximum recorded amount was 383 litter items per km² (total count), this number was dominated by “Wood (processed)” (E1) and recorded by The Netherlands.

Table 3.1 IBTS summary table of the densities of seafloor litter on the DCS in the period 2023-2025. The minimum (Min), median, weighted mean per ICES rectangle, mean, 90th percentile, maximum (Max), percentage of total count and the percentage of hauls with at least one item present shown for total count, the different litter categories and the Top-10 litter types (see Annex 3 for photo examples). Statistics are based on a total of 105 hauls, containing a total of 400 items.

Items per km ²	Min	Median	Weighted mean	Mean	90th percentile	Max	% of Total Count	% of hauls with >0 item(s) present
Total count	0	48	71	66	147	383		89
Litter categories								
A - Plastic	0	40	56	52	105	347	78	85
B - Metals	0	0	3	2	0	57	3	8
C - Rubber	0	0	0	0	0	17	0	2
D - Glass	0	0	0	0	0	18	0	2
E - Natural	0	0	9	10	19	319	15	18
F - Miscellaneous	0	0	1	2	0	63	2	8
Top - 10 Litter types								
A2_Sheet	0	0	13	13	35	193	20	46
A3_Bag	0	0	3	4	16	50	6	18
A5_Monofilament	0	0	20	16	47	112	24	47
A6_Entangled filaments	0	0	2	2	8	51	3	10
A7_Synthetic rope	0	0	9	9	33	80	14	35
A11_Crates and containers	0	0	2	2	0	116	4	5
A14_Other	0	0	3	3	16	34	5	17
B8_Other	0	0	3	1	0	48	2	6
E1_Wood (processed)	0	0	8	9	16	319	14	14
F3_Other	0	0	1	1	0	47	1	4

The ratio of the mean and median values in **Table 3.1** do not indicate that high (international) values influence the overall mean result significantly. Despite the WGML guidelines, the best way to count the number of individual monofilaments or sheets correctly and in a consistent way is still under discussion. The guideline states that if items are entangled but recognisable as separate items, they should be counted as separate items. Annex 2 shows some examples of entangled monofilaments and synthetic rope. Where the Netherlands counted all of these examples as "Entangled items" (A6), some international partners might have separated some of these items and counted them as multiple litter items ("Monofilaments" (A5) and/or "Synthetic rope" (A7)).

The spatial distribution on the Dutch continental shelf, based on the IBTS, is presented as litter items per km² per ICES rectangle. Light colours (green) represent low numbers of items, and dark (purple) colours represent high numbers of litter items. The amount of litter items per ICES rectangle is shown as the mean number of litter items per km² over the last three years (2023-2025). Highest densities were recorded in the 33F4 rectangle in front of the Dutch coast (port of Rotterdam). However, the spatial distribution of litter seems more or less random, no clear pattern or litter hotspot can be distinguished (**Figure 3.4**). Likewise, no strong pattern is identifiable when comparing the total count of litter items on the DCS over time (2015 – 2025), though the total count of litter items tends to be lower in the most recent years (**Figure 3.5**).

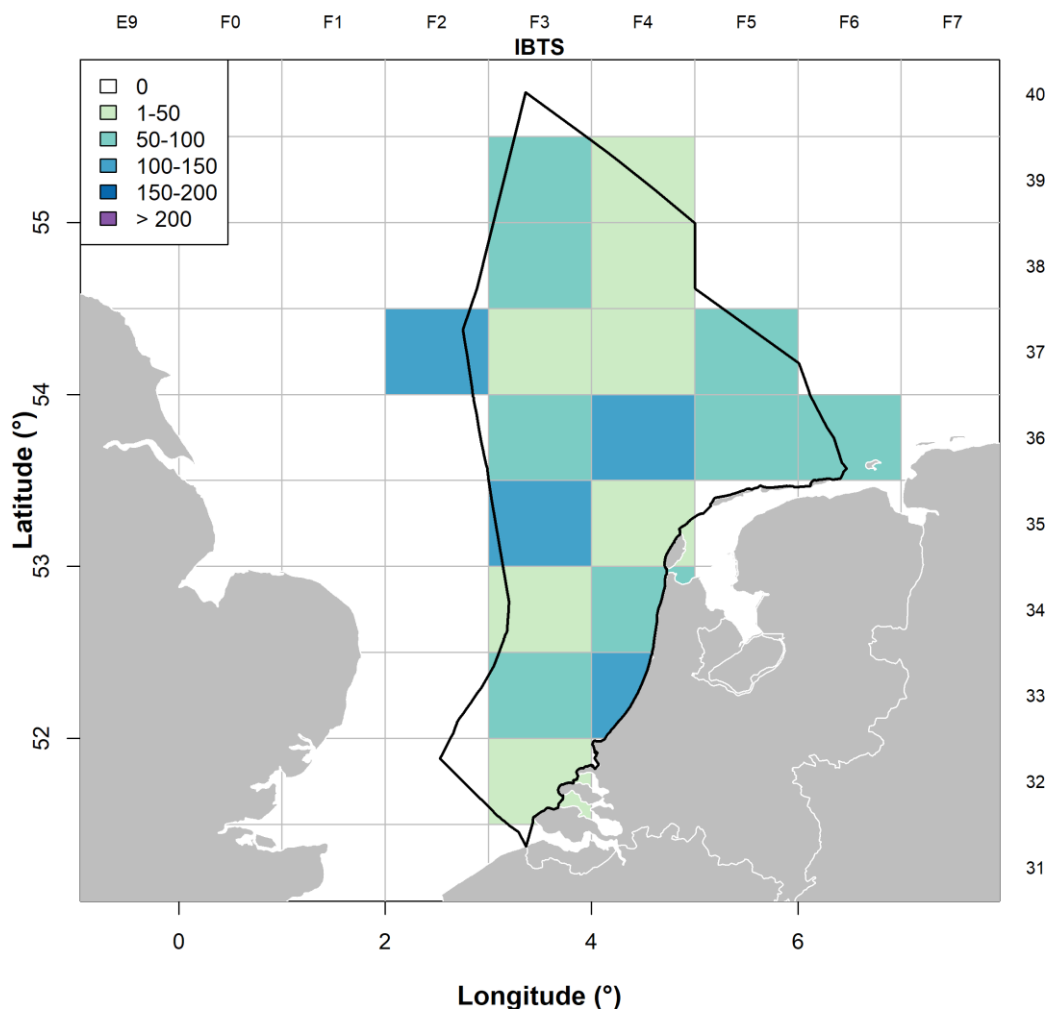


Figure 3.4 Density of litter items per km² per ICES rectangle in the IBTS on the DCS. The different colours represent the numbers (total count) of litter items per km². This is calculated as the mean value per ICES rectangle for the period 2023-2025.

Seafloor litter on the DCS 2015 - 2025

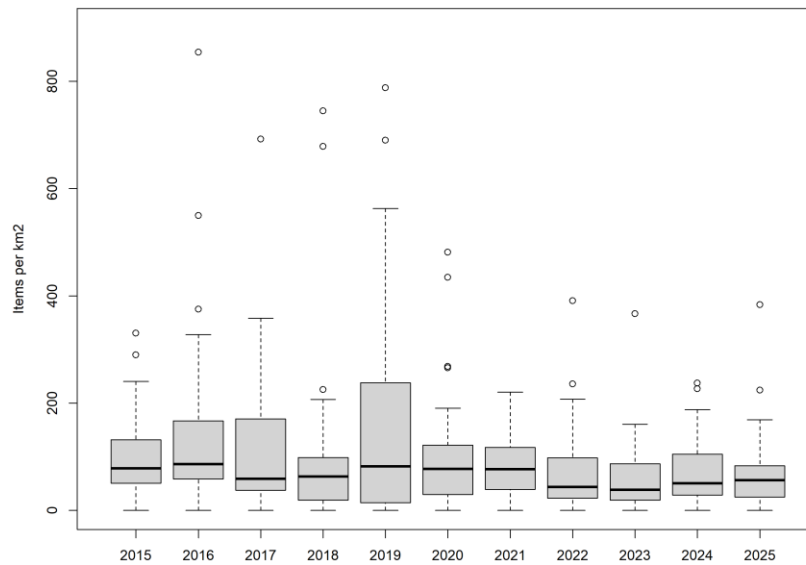


Figure 3.5 *Boxplot of the seafloor litter densities for all IBTS hauls conducted on the DCS each year (2015-2025). The data selection as shown in Table 1.2 was used. French data has been included since 2015, and data from Germany and Denmark has also been included since 2019.*

3.2 Beam Trawl Survey

3.2.1 BTS Q3 2024

The Dutch BTS 2024 Q3 performed 144 valid hauls, of which 46 were conducted on the Dutch continental shelf (**Table 3.2**). As presented in **Figure 1.2**, the planned area and amount of hauls per ICES rectangle for 2024 remained unchanged compared to previous years (Volwater & van Hal, 2022; 2023; 2024). The executed hauls and spatial distribution of litter caught during the Dutch BTS 2024 are presented in **Figure 3.6**. There were only three empty hauls (0 items/km²), all located on the DCS. The hauls with the highest amount of items per km² (> 1000 items/km²) were located in ICES rectangle 43E8 and 39E9 (UK EEZ), both close to the coast and an estuary. The highest amount of litter items recorded on the DCS in the Dutch BTS Q3 2024 was 545 items per km², found off the Dutch Coast (36F4).

Table 3.2 *BTS seafloor litter data on the DCS. The table shows the seafloor litter data (number of hauls) per year on the DCS of which count data were available.*

Country	Institute	2020	2021	2022	2023	2024
The Netherlands	WMR	47	38	39	33	46

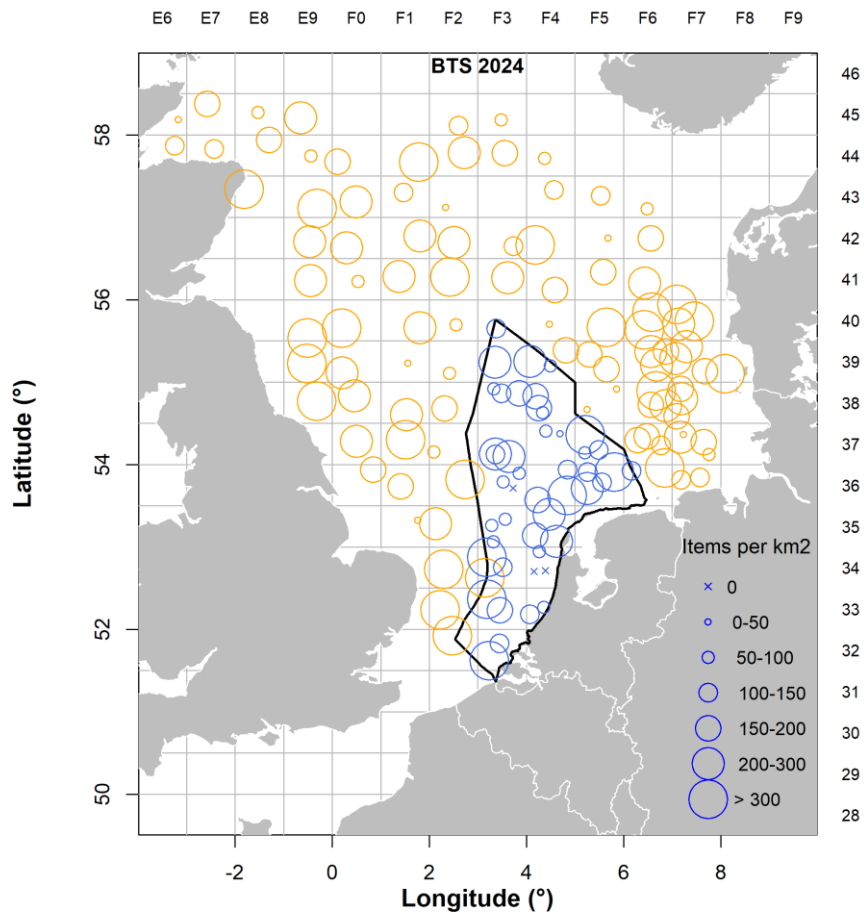


Figure 3.6 Executed beam trawl hauls and total items per km² during the 2024 BTS. BTS hauls executed on the DCS (blue) and outside the DCS (orange) are presented. The size of the circles indicates the number of items caught per km². The small crosses represent hauls without litter items in the catch, empty hauls.

3.2.2 Seafloor litter on the Dutch Continental Shelf

The analysis in this section was done with all available and usable seafloor litter data on the Dutch continental shelf for the last three years, 2022-2024. In total, 118 hauls were conducted on the Dutch continental shelf for these three years, combined accounting for a swept area of 3.59 km². The general composition of seafloor litter and the Top-10 litter types were calculated by mean values. Since the dataset contains a large amount of zero values, the median might give a biased (zero) outcome. Therefore, mean values are used.

3.2.2.1 Material composition

Plastic was the most dominant category of seafloor litter on the DCS in the BTS, accounting for 76% of all litter items (**Figure 3.7**). "Natural products" (E) was the second most dominant category, responsible for 12% of all litter items caught. "Metals" (B) represented 4%, "Miscellaneous" (F) and "Glass/Ceramics" (D) represented each 3% of the litter items, while "Rubber" (C) was representing around 2% of the total litter items.

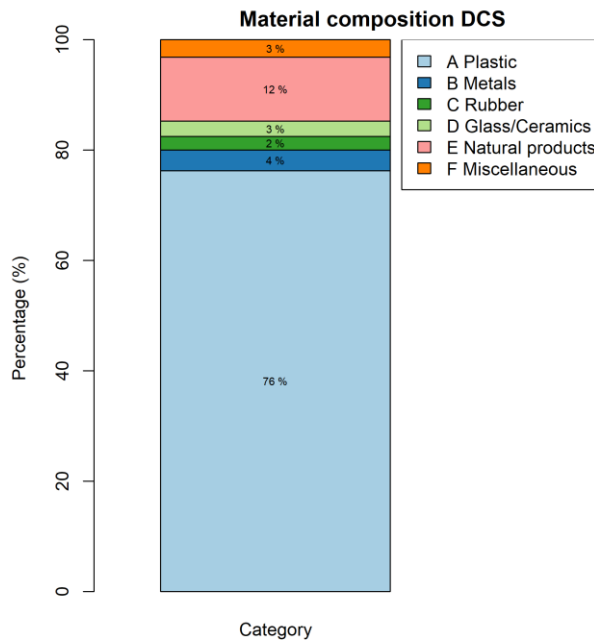


Figure 3.7 Material composition of the seafloor litter in the catches of the BTS on the DCS in 2022-2024. The percentages are based on mean values per km² per litter category.

3.2.2.2 Top-10 litter types

Based on the mean values per litter type, a Top-10 of most dominant litter types caught in the BTS on the DCS was compiled (**Figure 3.8**). The Top-10 is dominated by plastic litter types, six out of the ten litter types in this list were made of plastic. The other four types were "Wood (processed)" (E1), "Other (Natural products)" (E5), "Cans (beverage)" (B2), and "Other (rubber)" (C6). The most dominant litter type was "Monofilament" (A5), accounting for 25% of the litter items caught. This is followed by "Sheet" (A2), "Entangled filaments" (A6), "Wood (processed)" (E1) and "Synthetic rope" (A7), accounting for 22%, 9%, 7% and 6% of the litter items caught, respectively. The remaining Top-10 litter types were each responsible for 6% or less of the total litter items caught on the DCS.

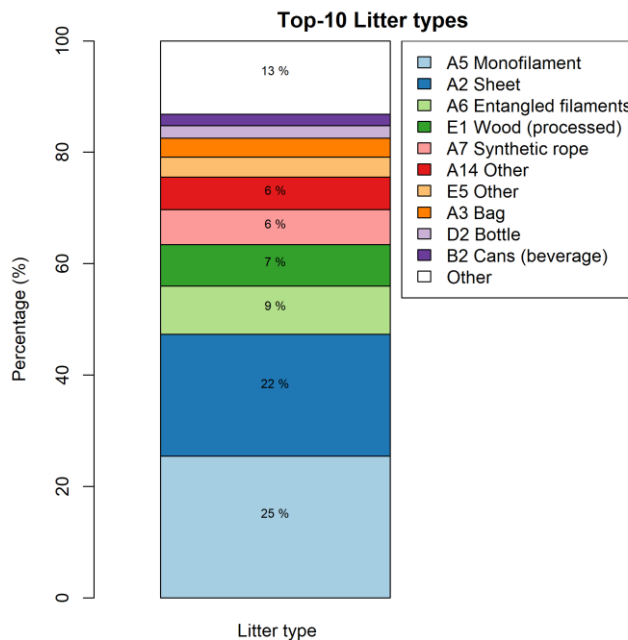


Figure 3.8 Top-10 list of seafloor litter items in the catches of the BTS on the DCS in 2022-2024. The percentages are based on mean values per km² per litter type. The Top-10 litter types for which no percentages are indicated are: E5 – Other (4%), A3 – Bag (4%), D2 - Bottle (2%) and B2 – Cans (2%).

3.2.2.3 Abundance and spatial distribution of seafloor litter

Litter was found in 95% of the BTS hauls on the Dutch continental shelf in the period 2022-2024 (**Table 3.3**). The maximum amount recorded was 756 litter items per km² (total count). Since the number of hauls per ICES rectangle in the BTS was not equally distributed (**Figure 1.2**), the weighted mean for total count, each litter category, and the Top-10 litter items was calculated to correct for this.

Table 3.3 *BTS summary table of the abundance of seafloor litter on the DCS in the years 2022-2024. The minimum (Min), median, weighted mean per ICES rectangle, mean, 90th percentile, maximum (Max), percentage of total count and the percentage of hauls with at least one item present shown for total count, the different litter categories and the Top-10 litter types (see Annex 3 for photo examples). Statistics are based on a total of 118 hauls.*

Items per km ²	Min	Median	Weighted mean	Mean	90 th percentile	Max	% of Total Count	% of hauls with >0 item(s) present
Total count	0	140	171	166	341	756		95
Litter categories								
A - Plastic	0	101	142	126	264	756	76	93
B - Metals	0	0	6	6	32	105	4	15
C - Rubber	0	0	4	4	26	105	2	11
D - Glass	0	0	2	5	0	260	3	7
E - Natural	0	0	12	19	66	328	12	27
F - Miscellaneous	0	0	5	5	0	100	3	9
Top-10 Litter types								
A2_Sheet	0	28	39	36	79	315	22	56
A3_Bag	0	0	6	6	31	62	3	16
A5_Monofilament	0	29	48	42	113	328	25	53
A6_Entangled filaments	0	0	17	14	36	252	9	31
A7_Synthetic rope	0	0	12	10	34	126	6	23
A14_Other	0	0	11	10	33	229	6	22
B2_Cans (beverage)	0	0	3	3	0	67	2	8
D2_Bottle	0	0	2	4	0	260	2	5
E1_Wood (processed)	0	0	6	12	36	225	7	21
E5_Other	0	0	4	6	9	197	4	10

The spatial distribution on the Dutch continental shelf based on the BTS is shown as litter items per km² per ICES rectangle, with the same colour legend as in **Figure 3.4**. The amount of litter items per ICES rectangle is shown as the mean number of litter items per km² for the last three years, 2022-2024. No clear pattern or litter hotspot can be identified, but the spatial distribution tends to show higher densities of marine litter closest to the coast and near river mouths/estuaries (**Figure 3.9**). Highest densities were recorded in ICES rectangles 33F3 and 35F4. No strong pattern is identifiable when comparing the total count of litter items on the DCS over time since only four years of data are available (**Figure 3.10**).

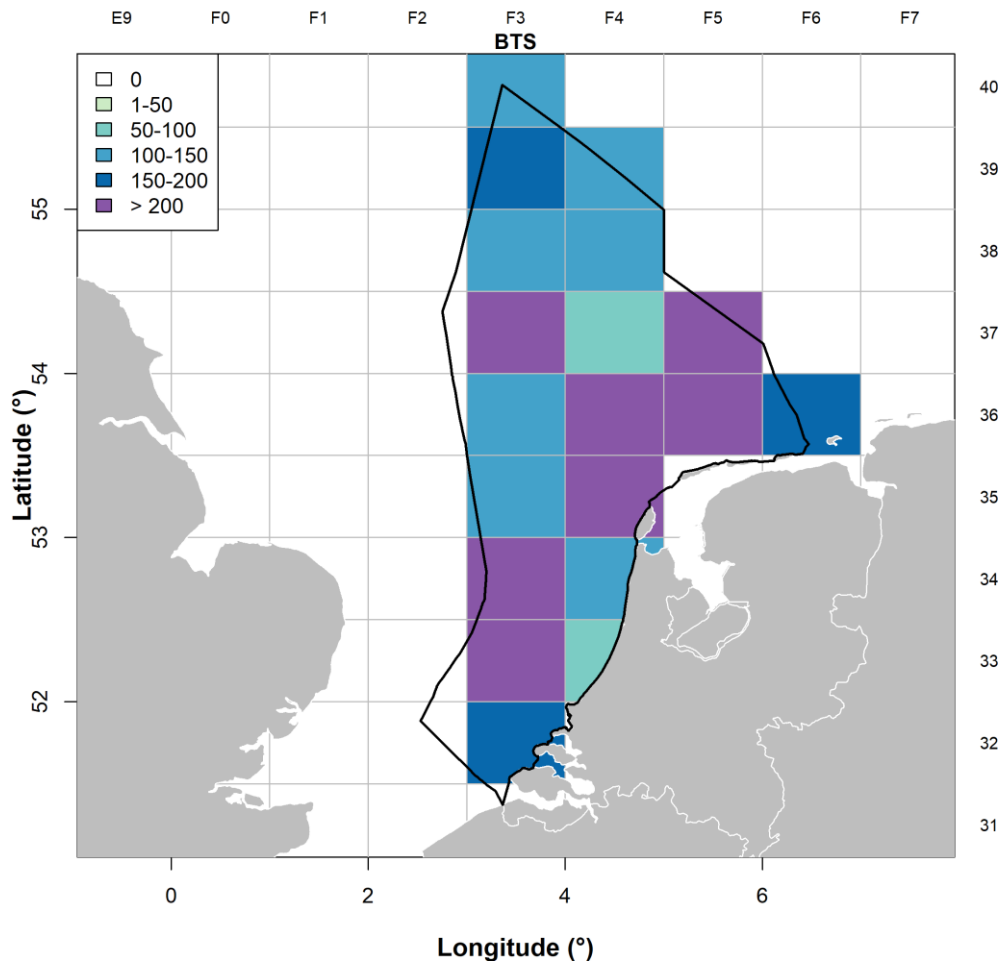


Figure 3.9 Density of litter items per km² per ICES rectangle in the BTS on the DCS. The different colours represent the numbers (total count) of litter items per km². This is calculated as the mean value per ICES rectangle for the period 2022-2024.

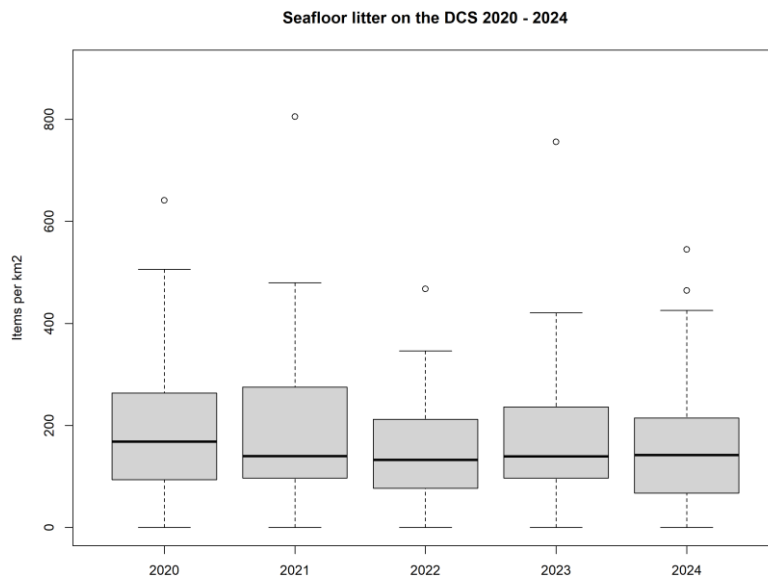


Figure 3.10 Boxplot of the seafloor litter items per km² for all BTS hauls conducted on the DCS each year (2020-2024). The number of hauls per year is: 2020, 47; 2021, 38; 2022, 39; 2023, 33; 2024, 46.

3.3 Comparison IBTS and BTS

The composition of the litter caught on the DCS is generally comparable between the two surveys, whereby plastics account for around 75-80% of the litter caught in both surveys (IBTS: 78%, BTS: 76%). Litter categories such as natural products, rubber, and metals (that might be partly buried in the top layer of the seafloor) were caught more often in the BTS. The beam trawl used in this survey scrapes the top layer of the seafloor and therefore also catches items that are (partly) buried in this top layer. The Top-10 litter types caught in both surveys are comparable, although the relative abundances of litter types differ. "Monofilament" (A5) and "Sheet" (A2) represent about 45-50% of the litter items in both surveys based on mean results. However, using the median results, these two types represent 100% of the litter found on the seafloor. The amount of litter items (Total Count) caught per km² is significantly larger in the BTS than in the IBTS (**Figure 3.11**), with respectively an average of 66 and 166 items per km². Furthermore, on the DCS, litter was caught in 95% of the BTS hauls but only in 89% of the IBTS hauls. Differences in the presence and absence of litter items per litter category between the BTS and the IBTS (**Table 3.1; Table 3.2**) indicate that the BTS has a higher chance of catching a litter item, even though a BTS haul (± 0.03 km²) covers approximately half of the area of an IBTS haul (± 0.06 km²). Both surveys also show spatial differences, the BTS tends to show higher densities of marine litter closest to the coast and near river mouths/estuaries, whereas the finding of litter in the IBTS seems more or less random whereby no clear pattern or litter hotspot can be distinguished.

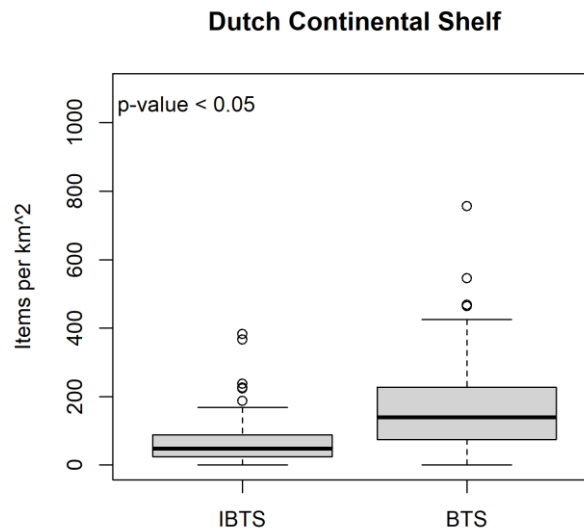


Figure 3.11 *Boxplot of the Total Count of litter items per km² for the IBTS (left) and the BTS (right). For both surveys the data of the last three years was used, however the selected years are not the same. For the IBTS the years 2023-2025 and for the BTS the years 2022-2024 were used.*

4 Discussion and Conclusions

The overall composition of seafloor litter on the Dutch continental shelf as presented in this report is in line with those of previous years, however the data of the DCS shows a substantial reduction in the percentage of plastics: 76% (BTS) and 78% (IBTS) compared to 87% and 83% in the previous report (Volwater & van Hal, 2024). Yet, Monofilaments, plastic sheets, and various types of (plastic) ropes/lines were still the most commonly caught litter types. An increase was observed in the litter categories "E1 - Wood (processed)" and "E5 - Other" (natural products) for respectively the IBTS and BTS. The classification of processed wood is rather subjective and can differ from person to person, and so from year to year depending who is responsible for the classification of marine litter on board. The same argument is applicable on coal which dominated the litter category "E5 - Other" in the BTS. It can be hard to distinguish between coal (and wood) as a natural or processed source, especially in case these items have been degraded on the sea floor and only fragments are caught (see Annex 4 for some photo examples). Additionally, within the IBTS coal was not recorded consistently in 2021, in the most recent DCS data this year is not taken into account anymore and is replaced by 2024, in which coal is recorded consistently. Above mentioned have resulted in an increase in some of the categories of natural products and therefore in the substantial reduction in the percentage of plastics in the IBTS and BTS.

Single-use plastics like cups, plates, drink bottles, caps/lids, and cigarette butts, which are commonly found on beaches (Boonstra & Hougee, 2021; Scotti et al. 2021), were rarely or not caught by the IBTS and BTS. This could indicate a difference in the spatial distribution of litter items. However, for some of these items, the monitoring methods used in the surveys likely result in their low detection rates. Drink bottle caps and cigarette butts, for instance, cannot be retained by the mesh size of the cod-end and are therefore not represented in the catches. Because of the low amount of single-use plastics that are caught with this method, the management measures banning these types of plastics cannot be evaluated using the data retrieved from the fish surveys.

The observed dominance of plastic items in the survey catches is comparable to most studies on seafloor litter (Alvito et al. 2018; Barry et al., 2023; García-Alegre et al. 2020; Kammann et al. 2018; Spedicato et al. 2019; Meyerjürgens et al. 2022; Vanavermaete et al. 2023). Many studies reported that most of the litter items found on the seafloor originated from the fishing industry, dominated by fishing lines (e.g. Buhl-Mortensen & Buhl-Mortensen 2017; Consoli et al. 2018; Gutow et al. 2018; Pham et al. 2014). It is impossible to discriminate monofilament used by the fishing industry from those used in other sectors, e.g. aquaculture. However, it is very likely that many, if not most, of the monofilaments and synthetic ropes caught in the IBTS and BTS originate from the fishing industry, predominantly being dolly rope. Experiments are currently being carried out to replace dolly rope with other materials. For instance, yak leather seems to be used in some commercial fisheries (OSPAR, 2025).

The overall composition of litter on the seafloor is comparable between studies. However, comparing seafloor litter studies in terms of litter presence and density is not straightforward due to the use of different gears and sampling substrates (Canals et al. 2021). The percentage of hauls on the DCS containing litter is amongst the highest values reported, with 89% in the IBTS and 95% in the BTS. In other studies, the percentage of hauls including litter items ranges from approximately 8% in the Flemish Pass (Carcia-Alegre et al. 2020) to as high as 90% in the northern Mediterranean (Spedicato et al. 2019). Studies from areas comparable to the DCS report proportions of 53% in the North and Baltic Seas (Kammann et al. 2018; Zablotzki et al. 2019), 63% in the waters surrounding the UK (Maes et al. 2018), and approximately 80% in the German Bight (Meyerjürgens et al. 2022). Furthermore, large differences in litter densities are reported, ranging from a mean number of 1.4 items per km² in the Flemish Pass (Carcia-Alegre et al. 2020) to as high as 1835 items per km² in the North and Irish Seas (Maes et al. 2018). The study of Kammann et al. (2018) also used a GOV and identified a litter density of 16.8 litter items per km² in the German part of the North Sea. Meanwhile,

the study of Vanavermaete et al. (2023) within the Belgium BTS reported a mean of 220 ± 5 items per km².

The categorization of litter items has been an issue since the start of the monitoring in 2013. A guideline has been provided by ICES (ICES 2022) and was refined by the WGML in recent years, solving a number of the classification issues. Counting litter items in case of entanglement is still an ongoing issue in the methodology. The guideline states: "If two or more items are heavily entangled, all items should still be counted separately, or, if not possible, estimated, with the exception of entangled monofilaments (category A6). When monofilaments are entangled, each tangle should be counted as being one item". However, this guideline is not yet carried out consistently by the different IBTS partners. In Annex 2, examples of this issue are given. Fully disentangling "Entangled filaments" might result in a higher count of separated monofilaments, which potentially increase the number (density) of litter items in these hauls than has currently been reported. Disentangling all litter items would cause a disproportionately high effort and is not possible in all cases (**Photo 1 of Annex 2**), and would still lead to arbitrary decisions. Usually, monofilaments that are recognisable as separate items are counted as separate items, while heavily entangled items that are not recognisable as separate items are counted as a single item. This same discussion occurs for (degrading) "Synthetic rope" (A7). The question remains whether to record it as a synthetic rope or as multiple monofilaments (**Photo 2 Annex 2**). This becomes even more complex since most monofilaments originate from the degradation of synthetic rope. Monofilaments and synthetic rope form the majority of the counts of litter items (38% IBTS, 31% BTS). As a consequence, these items determine if a location is seen as litter hotspot, potentially affecting summary statistics and possible trend analysis. In addition to the described issues in determining the correct number of items and the arbitrary decision-making process in the counting method, there is a methodological issue that impacts the counts. Cleaning the net of the GOV (and beam trawl) is nearly impossible, especially since the person cleaning the net has to be outside on deck during potentially bad weather conditions, particularly during winter months. Monofilament/ropes easily wrap around the fishing net, ground rope chain, and the bobbins. Disentangling each single monofilament from the fishing gear is nearly impossible and is even less likely to be done in bad weather conditions. This results in the accumulation of attached items in the fishing gear. These items are often taken out when a significant entanglement forms. The entangled items can loosen on rough ground and end up in the cod-end or it can be taken out when parts of the net have to be repaired. Repairing the net has yet another impact and can influence the litter counts. Own (netting) materials (ropes, strapping bands) originating from the vessel used for the (I)BTS can be mixed in with the litter which can have an influence on the results. Based on some photos of the litter items made available by the French surveyors in 2019, own materials clearly impacted the French counts. The actual counts of litter items are thus heavily influenced by methodological aspects rather than by the amount of litter on the seafloor.

The overall data of the two gears used in the surveys indicates a higher catchability of litter items in the beam trawl (BTS) than in the GOV used during the IBTS. Despite that, the beam trawl also catches only a part of the litter present in the trawl path. This is one of the issues in using trawls of fish surveys for monitoring seafloor litter as pointed out by Canals et al. (2021). The data of both gears therefore present an underestimation of the actual amount of litter items on the seafloor. The underestimation resulting from the IBTS data is greater compared to the underestimation introduced when using BTS data. It is suggested to use a conversion factor to raise the values of the IBTS data to the levels of the BTS values, to reduce the degree of underestimation. However, there are some issues to this approach:

- A straightforward conversion factor cannot be used to raise the hauls without litter (zero haul), despite the fact that it is very likely that there was litter in the trawl path. This is indicated by the higher percentage of BTS hauls containing litter and the fact that each BTS haul covers a smaller area of seafloor than IBTS.
- In the comparison between both surveys, there is a seasonal difference, which may influence the amount of litter accessible (e.g. storms). Seasonality also affects the amount of fish caught, which in turn influences the amount of litter that is retained in the cod-end.
- The two gears are not always used to fish on the same sediment and habitat types. It is suggested that this has little impact at the level of the DCS, where both gears can be used

more or less on the same grounds (sand). On the larger spatial scale (North Sea level) of both surveys, however, this could hamper the comparison.

- The higher vertical net opening of the IBTS is likely to result in the retention of higher amounts of floating litter, while simultaneously the larger length of the net and the larger mesh size in the first part of the belly of the net are likely to result in a lower retainment of heavier items. This suggests that different conversion factors would be required for different litter types caught by the BTS.

The differences in fishing locations between the BTS and the IBTS pose an issue in the comparison of these two gear types. Additionally, the effect of the actual fishing locations also influences the comparison of the IBTS catches between years. The actual fishing locations of the IBTS are semi-randomly chosen within a rectangle and therefore differ between years. Litter items can easily be transported from a low-density site by e.g. bottom currents to a site where seafloor structures retain the litter items and form a litter hotspot (Canals et al. 2021). This retainment of litter items is observed in the catches of the IBTS, where in cases that much organic debris (benthos, shells, seaweed e.d.) is retained in the IBTS net, it is more likely to have higher amounts of litter. Unfortunately, habitat characteristics are not recorded in the IBTS (e.g. by side-scan sonar or multibeam), nor are the amounts of debris in the catches thus analyses on this level are not possible. It is known that these habitat characteristics can vary at a small local scale, and with that likely the amount of litter on the sea floor. This might be the explanation for the empty hauls close to larger catches on the Dutch continental shelf in earlier years.

Usually, a trend analysis of the abundance of seafloor litter would be common practice. The package "litteR" is designed for this kind of analysis (Walvoort & van Loon 2018). However, there are several limitations to this approach that would not add valuable/reliable information to this report and is therefore not presented. The goal of a trend analysis is to get statistical support for a potential trend in the amount of litter on the seafloor, or at least of a consistent part of the litter on the seafloor. It is widely accepted that with the GOV, which is not designed to catch litter, the probability of catching a litter item when it is present in the trawl path is low and varies with litter types and sizes. The GOV is designed to avoid retainment of larger object (stones) by hopping over these, otherwise the gear gets ripped and the haul becomes invalid. As a result, the bottom contact of the gear is minimal, and earlier analysis indicated that the catchability of the GOV for many benthic species was less than 5% (ICES 2003). Therefore, the probability of catching small items on the seafloor is assumed to be random and low. The fact that most items caught are relatively small indicates that it is likely that there are many more items in the trawl path and that current values are a large underestimation of the actual litter present on the seafloor. This was shown clearly when the GOV was used to fish in the area where the container vessel MSC Zoe lost its cargo in 2019. While beam trawls were catching large amounts of items from the cargo, only three items were caught in the two hauls with the GOV (extended in duration) (van Hal 2019). This issue has been recognized in the second OSPAR intermediate assessment (EIHA 19/07/19-Add.1). Due to the low catchability there is a large chance that the zeros (no litter in a GOV-haul) are actually false zeros (no litter caught, while there were multiple items of litter on the seafloor). As a consequence of these limitations it was decided to not present a trend analysis of the GOV data on the DCS within this report. However, beam trawl data, which is assumed to give a better picture of litter types and counts on the seafloor, can be used in the future for trend analysis.

The definition of Good Environmental Status (GES) for marine litter is that "The composition, amount and spatial distribution of litter on the coastline, in the surface layer of the water column, and on the seabed, are at levels that do not cause harm to the coastal and marine environment." (Commission decision (EU 2017/848 of 17 May 2017). It is not yet defined what these levels are and the current approach is to try to reduce the amount of litter in the environment. Previous studies (Maes et al. 2018; Urban-Malinga et al. 2018), along with the results in this report, demonstrate that despite the management measures aimed at decreasing the input of litter and removing the litter from the environment, there still is litter on the seafloor. The indicators proposed for the MSFD should be able to detect a reduction in litter related to management measures. A situation with a relatively low amount of (or without) litter in the marine environment has not been realized yet and it is unlikely to be realized within a short timeframe (van Loon et al. 2020). Despite the fact that there still is litter in

the marine environment there are some hopeful indications towards a North Sea with less litter. A long term trend analysis of beach litter shows that the amount of litter items on the Dutch beaches has significantly decreased over a 20 year period, which is attributed to the implementation of effective policy (Boonstra et al. 2021).

To conclude, a relatively low number of litter items found per haul, a low probability of catching an item when it is present in the trawl path, and the spatial differences in fishing location (habitat, seafloor structures) make it difficult to draw conclusions on the absolute amounts of litter on the seafloor of the Dutch continental shelf. Since the catchability issue with the GOV net is hard to solve and difficult to incorporate in the analyses, it might be worthwhile to find or develop other methods for detecting the abundance of litter on the seafloor. Incorporating litter data of the BTS indicates that seafloor litter is more abundant than IBTS data indicate, as was found already in a previous study (O'Donoghue & van Hal, 2018). A recent study by Van Rossum & Boer (2023) confirmed these findings and found that the beam trawl appears to catch seven times more litter than the GOV net at the North Sea level. However, it is assumed that even the BTS beam trawl gives an underestimation of the actual litter present on the seafloor. Therefore, the use of additional methods to collect seafloor litter might give a better understanding of the actual amount and composition of litter on the DCS. Recently, Roos et al. (2023) published a pilot seafloor litter study using a benthic dredge, demonstrating that the amounts of seafloor litter <20 cm is much higher than found with the GOV (IBTS) and beam trawl (IBTS). A dedicated video survey with an epibenthic video sledge was used in the southernmost North and Baltic seas to make video recordings of the seafloor. The estimated litter density was significantly higher, 305 (North Sea) and 527 (Baltic Sea) items per km², compared to bottom trawl studies (Nogueira et al., 2023). In areas with relatively low litter densities the usage of underwater television surveys (UWTV) may be limited as an alternative to trawling (Noren et al., 2025). Finally, it remains to be proven that "marine litter hotspots" actually exist, and whether these hotspots shift over time, which seems to be suggested by the second OSPAR intermediate assessment. A recent study by Meyerjurgens et al. (2023) found no evidence of permanent accumulation areas in the North Sea and the Skagerrak.

5 Recommendations

- Reconsidering the goals and purpose of the monitoring of litter. The use of the IBTS as monitoring platform only provides indicative results of a small part of the litter composition. For the evaluation of specific management measures the IBTS data is questionable and it is also unsuitable to produce a good estimation of the litter present on the seafloor. Its best use, other than to raise awareness, would most likely be as an indication of very large changes in the litter part caught by the IBTS, in this case being a large change in the amount of monofilament and synthetic rope in the marine environment.
- Experiences from WMR, and a recent Dutch comparative study (Van Rossum et al., 2023) confirm that BTS data are more suitable to be used for a Dutch trend analysis of seafloor litter on the DCS in the future than GOV data.
- Follow the progress of alternative methods of collecting seafloor litter data and explore the application of alternative methods on the DCS. The use of additional methods to collect seafloor litter might give a better understanding of the actual amount and distribution of litter items on the Dutch continental shelf. However, in the EU Technical Group on Marine Litter (TGML), The Netherlands have expressed its doubts if video monitoring will be useful in the often turbid Dutch North Sea areas and the recent Swedish study indicated that in areas with low litter abundances their video survey could not replace the trawl surveys.
- The IBTS coordination group (IBTSWG) has made the step to implement the new survey trawl into the survey from 2026 onwards. The implementation will occur in small steps, first taking over a maximum of 25% of the stations. The new survey gear with an adjusted ground gear likely impacts the amount of litter items caught, requiring adjustments of the methods from next year onwards.

6 Quality Assurance

Wageningen Marine Research utilises an ISO 9001:2015 certified quality management system. The organisation has been certified since 27 February 2001. The certification was issued by DNV.

References

- Alvito, A., Bellodi, A., Cau, A., Moccia, D., Mulas, A., Palmas, F., Pesci, P. & Follesa, M. C. (2018). Amount and distribution of benthic marine litter along Sardinian fishing grounds (CW Mediterranean Sea). *Waste management*, 75, 131-140.
- Andrady, A. L. (2015). Persistence of plastic litter in the oceans. In *Marine anthropogenic litter* (pp. 57-72): Springer, Cham.
- Barry, J., Rindorf, A., Gago, J., Silburn, B., McGoran, A., & Russell, J. (2023). Top 10 marine litter items on the seafloor in European seas from 2012 to 2020. *Science of the Total Environment*, 902, 165997.
- Boonstra, M., Hougee, M. 2024. OSPAR Beach Litter Monitoring in the Netherlands. Update 2022. North Sea Foundation, Utrecht.
- Boonstra, M., van Galen, E., van Hest, F. (2021). *Goed op weg naar een schone Noordzee, 2021*. Stichting De Noordzee, Utrecht.
- Buhl-Mortensen, L., & Buhl-Mortensen, P. (2017). Marine litter in the Nordic Seas: Distribution composition and abundance. *Marine Pollution Bulletin*, 125(1-2), 260-270.
- Canals, M., Pham, C. K., Bergmann, M., Gutow, L., Hanke, G., Van Sebille, E., ... & Giorgetti, A. (2021). The quest for seafloor macrolitter: a critical review of background knowledge, current methods and future prospects. *Environmental Research Letters*.
- Chassignet, E.P., Xu, X., & Zavala-Romero, O. (2021). Tracking Marine Litter With a Global Ocean Model: Where Does It Go? Where Does It Come From?. *Frontiers in Marine Science*, 8, 414.
- Consoli, P., Andaloro, F., Altobelli, C., Battaglia, P., Campagnuolo, S., Canese, S., ... & Romeo, T. (2018). Marine litter in an EBSA (Ecologically or Biologically Significant Area) of the central Mediterranean Sea: Abundance, composition, impact on benthic species and basis for monitoring entanglement. *Environmental Pollution*, 236, 405-415.
- Costanza, R. (1999). The ecological, economic, and social importance of the oceans. *Ecological economics*, 31(2), 199-213.
- Curd, A., Droual, G., & Le Moigne, M. (2023). CLEANATLANTIC. Investigation of seafloor litter for the presence of Non-Indigenous Species during French annual fisheries surveys in the North Sea, English Channel, Celtic Sea and Bay of Biscay 2021-2022.
- de Bruin, S., van Franeker, J. A., Meijboom, A., Jensen, J. K., Jacobsen, B., & Kühn, S. (2025). Plastics in stomachs of northern fulmars (*Fulmarus glacialis*) collected at Flemish Cap, Grand Banks of Newfoundland. *Marine Pollution Bulletin*, 215, 117894.
- Fleet, D., van Franeker, J., Dagevos, J., Hougee, M. (2009). Marine Litter. Thematic Report No. 3.8. In: (Eds), (2009). *Quality Status Report 2009*. WaddenSea Ecosystem No. 25. Common Wadden Sea Secretariat, Trilateral Monitoring and Assessment Group, Wilhelmshaven, Germany.
- Frantzi, S., Brouwer, R., Watkins, E., van Beukering, P., Cunha, M.C., Dijkstra, H., ... & Triantaphyllidis, G. (2021). Adoption and diffusion of marine litter clean-up technologies across European seas: Legal, institutional and financial drivers and barriers. *Marine Pollution Bulletin*, 170, 112611.
- Freitas, T. B., Leite, T. S., de Ramos, B., & Proietti, M. C. (2023). Understanding the interactions between cephalopods and marine litter: A research evaluation with identification of gaps and future perspectives. *Marine Pollution Bulletin*, 190, 114814.
- Galgani, F., Hanke, G., & Maes, T. (2015). Global distribution, composition and abundance of marine litter. In *Marine anthropogenic litter* (pp. 29-56): Springer, Cham.
- García-Alegre, A., Román-Marcote, E., Gago, J., González-Nuevo, G., Sacau, M., & Muñoz, P.D. (2020). Seabed litter distribution in the high seas of the Flemish Pass area (NW Atlantic). *Scientia Marina*, 84(1), 93-101.
- Gutow, L., Ricker, M., Holstein, J.M., Dannheim, J., Stanev, E.V., & Wolff, J.O. (2018). Distribution and trajectories of floating and benthic marine macrolitter in the south-eastern North Sea. *Marine pollution bulletin*, 131, 763-772.
- Hasegawa, T., & Nakaoka, M. (2021). Trophic transfer of microplastics from mysids to fish greatly exceeds direct ingestion from the water column. *Environmental Pollution*, 273, 116468.

-
- ICES (n.d.). ICES Data Centre – DATRAS.
https://www.ices.dk/data/Documents/DATRAS/Swept_area_km2_algorithms_pdf.pdf
- ICES. (2003). Study Group on Survey Trawl Gear for the IBTS Western and Southern Areas ICES, Copenhagen.
- ICES. (2022). ICES manual for seafloor litter data collection and reporting from demersal trawl samples. ICES Techniques in Marine Environmental Sciences Vol. 67. 16 pp.
<https://doi.org/10.17895/ices.pub.21435771>
- Jambeck, J.R., Geyer, R., Wilcox, C., Siegler, T.R., Perryman, M., Andrady, A., . . . Law, K.. (2015). Plastic waste inputs from land into the ocean. *Science*, 347(6223), 768-771.
- Kammann, U., Aust, M.O., Bahl, H., & Lang, T. (2018). Marine litter at the seafloor—Abundance and composition in the North Sea and the Baltic Sea. *Marine pollution bulletin*, 127, 774-780.
- Kühn, S., Van Franeker, J.A. and Van Loon, W. (2022). *Plastic Particles in Fulmar Stomachs in the North Sea*. In: OSPAR, 2023: The 2023 Quality Status Report for the Northeast Atlantic. OSPAR Commission, London.
- Maes, T., Barry, J., Leslie, H., Vethaak, A., Nicolaus, E., Law, R., . . . Thain, J. (2018). Below the surface: Twenty-five years of seafloor litter monitoring in coastal seas of North West Europe (1992–2017). *Science of the Total Environment*, 630, 790-798.
- Mancini, E., Miccoli, A., Piazzolla, D., Saraceni, P. R., Lezzi, M., Tiralongo, F., ... & Marcelli, M. (2021). Macrozoobenthic fauna associated with benthic marine litter (Northern Tyrrhenian Sea, Italy) and first report of two bryozoan species in Italian waters. *Regional Studies in Marine Science*, 47, 101912.
- Meijer, L.J., van Emmerik, T., van der Ent, R., Schmidt, C., & Lebreton, L. (2021). More than 1000 rivers account for 80% of global riverine plastic emissions into the ocean. *Science Advances*, 7(18), eaaz5803.
- Meyerjürgens, J., Schöneich-Argent, R.I., & Badewien, T.H. (2022). An exploratory analysis of seabed litter dynamics in the SE German Bight. *Marine Pollution Bulletin*, 177, 113515.
- Meyerjürgens, J., Ricker, M., Aden, C., Albinus, M., Barrelet, J., Freund, H., ... & Badewien, T. H. (2023). Sources, pathways, and abatement strategies of macroplastic pollution: an interdisciplinary approach for the southern North Sea. *Frontiers in Marine Science*, 10, 1148714.
- Mghili, B., De-la-Torre, G. E., & Aksissou, M. (2023). Assessing the potential for the introduction and spread of alien species with marine litter. *Marine Pollution Bulletin*, 191, 114913.
- Nelms, S.E., Galloway, T.S., Godley, B.J., Jarvis, D.S., & Lindeque, P.K. (2018). Investigating microplastic trophic transfer in marine top predators. *Environmental Pollution*, 238, 999-1007.
- Nogueira, P., Kammann, U., & Aust, M. O. (2023). Visual quantification and identification of shallow seafloor marine litter in the southernmost North and Baltic seas using an epibenthic video sledge (EVS)—A comparison to bottom trawl data. *Science of The Total Environment*, 891, 164633.
- Norén, K., Svensson, F., & Lindmark, M. (2025). Evaluating the potential of underwater television to contribute to marine litter assessments alongside bottom trawling. *PloS one*, 20(6), e0324900.
- O'Donoghue, A.M. & van Hal, R. (2018). Seafloor Litter Monitoring. International Bottom Trawl Survey 2018. Report C052/18, Wageningen Marine Research, IJmuiden.
- OSPAR (n.d.). OSPAR Commission. <https://www.ospar.org/work-areas/cross-cutting-issues/cemp>
- OSPAR commission. (2010). OSPAR Commission. Guideline for Monitoring Marine Litter on the Beaches in the OSPAR Maritime Area. 90-3631-973.
- OSPAR commission. (2017). OSPAR Intermediate Assessment 2017: Composition and Spatial Distribution of Litter on the Seafloor. OSPAR Intermediate Assessment Portal (OAP).
<https://oap.ospar.org/> (Printable pdf Abstract: https://oap-cloudfront.ospar.org/media/filer_public/82/19/8219c6d3-7270-400a-9466-149903d7e2ba/seabed_litter.pdf).
- OSPAR commission. (2017). OSPAR Commission. Guidelines on Litter on the Seafloor. EIHA 17/9/1 Annex 12. <https://www.ospar.org/work-areas/cross-cutting-issues/cemp>.
- OSPAR commission (2025). Background Document on the use of chafing gear with a focus on dolly ropes as a source of marine litter in the OSPAR Maritime Area.
<https://www.ospar.org/documents?v=63725>
- Pham, C.K., Ramirez-Llodra, E., Alt, C.H., Amaro, T., Bergmann, M., Canals, M., . . . Galgani, F. (2014). Marine litter distribution and density in European seas, from the shelves to deep basins. *PloS one*, 9(4).

-
- Piet, G., Van Hal, R., & Greenstreet, S. (2009). Modelling the direct impact of bottom trawling on the North Sea fish community to derive estimates of fishing mortality for non-target fish species. *ICES Journal of Marine Science*, 66(9), 1985-1998.
- Rangel-Buitrago, N., Williams, A. T., Neal, W. J., Gracia, A., & Micallef, A. (2022). Litter in coastal and marine environments. *Marine Pollution Bulletin*, 177, 113546.
- Rijkswaterstaat (2025). Monitoring drankverpakkingen in het zwerfafval – Resultaten tot en met heel 2024. Memo 14 april 2025.
- Rochman, C. M. (2015). The complex mixture, fate and toxicity of chemicals associated with plastic debris in the marine environment. In *Marine anthropogenic litter* (pp. 117-140): Springer, Cham.
- Roos, M., van Loon, W.M.G.M., Cuperus, J. (2023). Seafloor litter in Dutch benthic dredge samples 2021-2022: a pilot study.
- Schulz, M., van Loon, W., Fleet, D.M., Baggelaar, P., & van der Meulen, E. (2017). OSPAR standard method and software for statistical analysis of beach litter data. *Marine pollution bulletin*, 122(1-2), 166-175.
- Schulz, M., Walvoort, D.J., Barry, J., Fleet, D.M., & van Loon, W.M. (2019). Baseline and power analyses for the assessment of beach litter reductions in the European OSPAR region. *Environmental Pollution*, 248, 555-564.
- Scotti, G., Esposito, V., D'Alessandro, M., Panti, C., Vivona, P., Consoli, P., ... & Romeo, T. (2021). Seafloor litter along the Italian coastal zone: An integrated approach to identify sources of marine litter. *Waste Management*, 124, 203-212.
- Skirtun, M., Sandra, M., Strietman, W. J., van den Burg, S. W., De Raedemaeker, F., & Devriese, L. I. (2022). Plastic pollution pathways from marine aquaculture practices and potential solutions for the North-East Atlantic region. *Marine Pollution Bulletin*, 174, 113178.
- Solomando, A., Pujol, F., Sureda, A., & Pinya, S. (2022). Evaluating the Presence of Marine Litter in Cetaceans Stranded in the Balearic Islands (Western Mediterranean Sea). *Biology*, 11(10), 1468.
- Spedicato, M.T., Zupa, W., Carbonara, P., Fiorentino, F., Follesa, M.C., Galgani, F., . . . Lazarakis, G. (2020). Spatial distribution of marine macro-litter on the seafloor in the northern Mediterranean Sea: the MEDITS initiative. *Scientia Marina*, 83(S1), 257-270.
- Thompson, R.C. (2015). Microplastics in the marine environment: sources, consequences and solutions. In *Marine anthropogenic litter* (pp. 185-200): Springer, Cham.
- Urban-Malinga, B., Wodzinowski, T., Witalis, B., Zalewski, M., Radtke, K., & Grygiel, W. (2018). Marine litter on the seafloor of the southern Baltic. *Marine pollution bulletin*, 127, 612-617.
- Valderrama-Herrera, M., Cardenas, S. A., Calvo-Mac, C., Celi-Vértiz, R. G., Chumpitaz-Levano, V. L., Flores-Miranda, W. E., ... & De-la-Torre, G. E. (2023). Rajids ovipositing on marine litter: A potential threat to their survival. *Marine Pollution Bulletin*, 191, 114941.
- Vanavermaete, D., Verle, K., Devriese, L. I., De Cauwer, K., De Schrijver, C., Torreele, E., ... & De Witte, B. (2023). Distribution and sources of macrolitter on the seafloor in Belgian fisheries areas. *Frontiers in Marine Science*, 10, 1124580.
- van der Sluis, M.T., van Hal, R. (2014). Collecting marine litter during regular fish surveys. Report number C065/14, IMARES, IJmuiden.
- Van Franeker, J.A., Kühn, S., Anker-Nilsson, T., Edwards, E. W., Gallien, F., Guse, N., ... & van Loon, W. M. (2021). New tools to evaluate plastic ingestion by northern fulmars applied to North Sea monitoring data 2002-2018. *Marine Pollution Bulletin*, 166, 112246.
- Van Hal R. (2019). Dutch Seafloor Litter Monitoring in the North Sea. Report C052/18, Wageningen Marine Research, IJmuiden.
- Van Loon, W., Hanke, G., Fleet, D., Werner, S., Barry, J., Strand, J., ... & Walvoort, D. (2020). A European Threshold Value and Assessment Method for Macro Litter on Coastlines.
- Van Rossum, B.J and Boer, E. (2023). Comparative statistical analysis of seafloor litter data for the North Sea. Report, WUR.
- Viega, J.M., Fleet, D., Kinsey, S., Nilsson, P., Vlachogianni, T., Wener, S., Galgani, F., Thompson, R.C., Dagevos, J., Gago, J., Sobral, P., & Cronin, R. (2016). Identifying Sources of Marine Litter, MSFD GES TG Marine Litter Thematic Report, JRC Technical Report, EUR 28309, doi: 10.2788/018068.
- Volwater, J. & van Hal, R. (2021). Monitoring of seafloor litter on the Dutch continental shelf: International Bottom Trawl Survey 2021, Dutch Beam Trawl Survey 2020 (No. C065/21). Wageningen Marine Research.

-
- Volwater, J., & van Hal, R. (2022). Monitoring of seafloor litter on the Dutch continental shelf: International Bottom Trawl Survey 2022, Dutch Beam Trawl Survey 2021. (Wageningen Marine Research report; No. C061.22), (Rijkswaterstaat report; No. BM 22.23). Wageningen Marine Research. <https://doi.org/10.18174/578841>.
- Volwater, J. J. J., & van Hal, R. (2023). Monitoring of seafloor litter on the Dutch Continental Shelf: International Bottom Trawl Survey 2023, Dutch Beam Trawl Survey 2022. (Wageningen Marine Research report; No. C054/24), (Rijkswaterstaat report; No. BM 24.21). Wageningen Marine Research.
- Volwater, J. J. J., & van Hal, R. (2024). Monitoring of seafloor litter on the Dutch Continental Shelf: International Bottom Trawl Survey 2024, Dutch Beam Trawl Survey 2023. (Wageningen Marine Research report; No. C060/23), (Rijkswaterstaat report; No. BM 23.20). Wageningen Marine Research.
- Walvoort, D., & van Loon, W. (2018) litteR User's Manual 2018-09-26
Wageningen Marine Research (2020, 15 October). Pluisvrij maken netten boomkorsurvey. Interne memo met kenmerk: 2028232.IdB-ih.
- Zablotski, Y., & Kraak, S.B. (2019). Marine litter on the Baltic seafloor collected by the international fish-trawl survey. *Marine pollution bulletin*, 141, 448-461.

Justification

Report: C066/25

Project Number: 4316100081

The scientific quality of this report has been peer reviewed by a colleague scientist and a member of the Management Team of Wageningen Marine Research

Approved: Karen Kwakman-Schilder
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Date: 8 October 2025

Approved: C.J. Wiebinga, PhD
Business Manager Projects

Signature:

Signed by:

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Date: 8 October 2025

Annex 1 Litter data in DATRAS

The ICES Database of Trawl Surveys (DATRAS) is the international database in which the results of the North Sea IBTS, but also a large number of other surveys in the North Sea and other ICES regions are stored and made publicly available. The data of the fish surveys is made publicly available as raw data (Exchange format) and in a large variety of data-products depending on the survey (e.g. indices, Age-Length-keys, CPUE (Catch Per Unit Effort) by length or by age, etc.)

Since a couple of years DATRAS also contains the international litter data of the trawl surveys and makes these publicly available. The Dutch data is provided to DATRAS every year after the survey, with a deadline of providing the data prior to the WGML.

DATRAS makes the litter data available as raw data and as a data-product, being the latest OSPAR litter assessment output.

DATRAS can be accessed via: datras.ices.dk

On the right side of the page the download page and the DATRAS documents page can be selected. The latter contains all the relevant documents with, amongst others, the survey manuals and the Litter format. Via the download page all the data and data products can be downloaded.

- First, select the preferred data product. In case of litter the options are:
 - o Litter Exchange data (raw data)
 - o Litter Assessment output (the OSPAR product).
- Then select the preferred survey, relevant for the North Sea:
 - o NS-IBTS
 - o BTS (beam trawl survey)
- Select the preferred quarter and year (or all)
- Submit
- Accept the download policies
- A zip-file is downloaded, including a disclaimer, a pdf met metadata and references to the headers and a csv-file with the data.
- The first column of this file is the RecordType: HH (haul information) and LT (litter data). Based upon year, country and StNo the HH and LT can be combined to get all the haul information added to the litter information.

Issues with these downloads should be communicated directly to the ICES data centre. Advice on improvements to the data products should be communicated to the IBTSWG-chair(s) and the ICES data centre.

Annex 2 Photos entangled filaments






Photo 1 Example of an "A6 – Entangled filament" whereby single items are not recognisable. The Dutch surveyors counted this item as one single "A6 – Entangles filaments".



Photo 2 Example of "A7 – Synthetic rope" which is degrading into multiple "A5 – Monofilament" items, colour and length of the blue monofilaments clearly indicate they are originating from the blue piece of "A7 – Synthetic rope". Such a piece of synthetic rope can easily fall apart once in the cod-end together with the rest of the (fish and benthos) catch. The Dutch surveyors counted this catch of marine litter as one orange "A5 – Monofilament" and one blue "A7 – Synthetic rope".

Annex 3 Examples of top-10 litter types

A5 - Monofilament	
A2 - Sheet	
A7 - Synthetic rope	

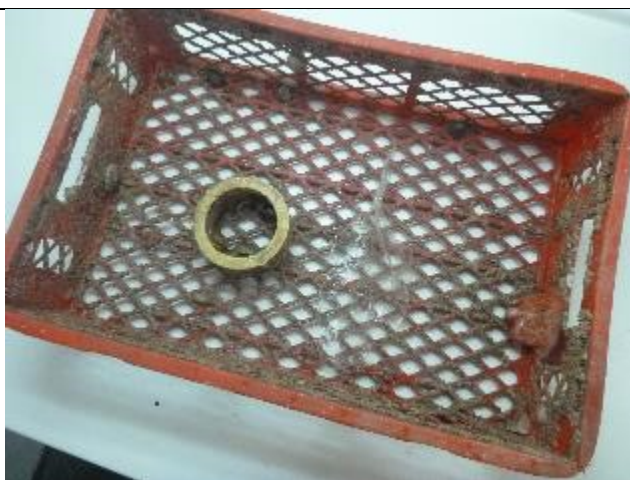
A3 - Bag



A6 – Entangled filaments



A11 - Crates



A14 - Other



E1 - Wood



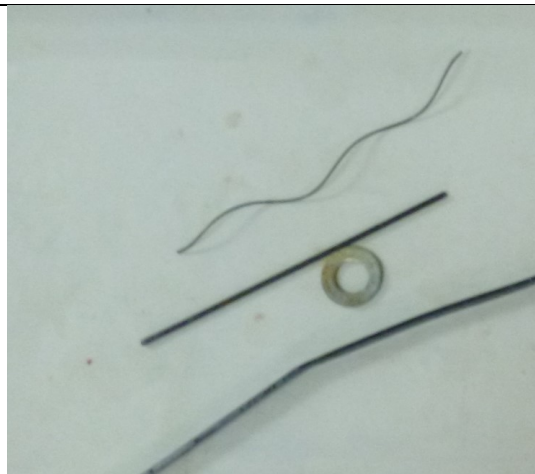
A1 - Bottle



B2 - Cans



B8 - Other



E5 - Other



Annex 4 Photo examples wood and coal

Wood



Coal



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With knowledge, independent scientific research and advice, **Wageningen Marine Research** substantially contributes to more sustainable and more careful management, use and protection of natural riches in marine, coastal and freshwater areas.

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