Dutch Seafloor Litter Monitoring in the North Sea

International Bottom Trawl Survey 2019

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Wageningen University &

Research report C068/19A

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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 state of marine waters on a regular basis and the effects of the measures taken, monitoring programs for MSFD descriptors and indicators have been established by the Member States.

GES is defined by 11 descriptors, of which Marine Litter (D10) is one. The Dutch monitoring program for this descriptor includes the collection of data on the presence, abundance and distribution of 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 GOV (Grand Ouverture Verticale) fishing net as a part of the International Bottom Trawl Survey (IBTS), which is carried out yearly in the North Sea.

This report presents the results of the seafloor litter monitoring during the IBTS of Quarter 1, 2019. Seafloor litter data have been collected annually since 2013, and the new data are presented with respect to the data collected in previous years. This is done for both the composition and the spatial distribution of the seafloor litter. The allocation of rectangles surveyed was redistributed amongst the countries participating in the IBTS in 2017, resulting in a different area covered by the Dutch survey compared to earlier years, hampering comparisons over the years.

In 2019, litter was caught in 83% of the hauls. The composition of this litter was similar compared to earlier years; more than 80% of the 249 items recorded was plastic and these were mainly monofilament lines and plastic sheets. The majority of these items was, as in previous years, small (<25 cm^2). The haul with the highest amount of litter items was close to the German coast, with 27 separate items recorded.

Due to the spatial change in the allocation of the survey area in 2017, and the semi-random sampling in a grid cell, it is difficult to compare the data between years. With this in mind, when comparing the mean and median values across the years, the values from this year were slightly higher than last year, but lower than the other years since recording began in 2013. It should be noted that the net used (GOV) is not designed to catch litter and as such it probably has a small chance of catching a litter item when it is present in the trawl path. Thus, the fact that these items are caught 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. Consequently, the degree of litter pollution on the seafloor is probably much larger than presented in this report.

Early January 2019, the container vessel MSC Zoe lost containers in the traffic lane north of the Dutch Island into the German area. This is part of the Dutch IBTS survey area and two additional hauls of one hour were done between the traffic lane and the Dutch Islands Ameland and Terschelling. One of these hauls contained no litter related to the cargo, while the second haul contained three items likely related to the lost cargo. These catches were lower than expected from all the media coverage on the amounts of litter on the beaches and seafloor in that area.

1 Introduction

The European Marine Strategy Framework Directive (MSFD 2008/56/EC) dictates that EU Member States are obligated to establish and implement measures to achieve or maintain good environmental status (GES) in their national marine waters. This GES is defined by 11 descriptors, of which one of these, Descriptor 10, is Marine Litter. In order to be able to achieve GES by 2020 for Marine Litter, it is necessary that "Properties and quantities of marine litter, including their degradation products such as small plastic particles down to micro-plastics do not cause harm to the coastal and marine environment and their volume decreases over time." (MSFD 2008/56/EC).

The oceans are of significant socio-economic importance, providing jobs, food and recreation to much of the world's population (Costanza 1999). Yet anthropogenic pollution abounds in our oceans, with marine litter threating wildlife, hindering human activities and reducing the recreational value of our coasts (Fleet et al. 2009).
Sources of marine litter can be sea- or land-based, although it is widely assumed that the latter represents an overwhelming majority of the litter (Jambeck et al. 2015). Land-based sources of marine litter include sewage and river outlets, landfills and recreational activities on the coast (Viega et al. 2016). Shipping, fisheries, offshore installations and illegal dumping all constitute some of the sources of sea-based marine litter (Viega et al. 2016). An example of shipping as source of marine litter is the accident that happened in the night of 1-2 January 2019, north of the Dutch Islands, when the container vessel MSC Zoe lost 342 containers, 18 of which were stranded the others are on the sea floor many of them broken and spilling all kinds of litter items.

Plastics represent the major portion of the marine litter (Galgani et al. 2015), and according to Jambeck et al. (2015) between 5 and 13 million metric tonnes of post-consumer plastic entered the oceans solely from land-based sources in 2010. This has impacts on marine fauna through effects such as entanglement and ingestion (Kühn et al. 2015). The former may impeded movement and inflict injury, thus reducing an animal's ability to avoid predators or acquire food, and increasing the potential for drowning. Consumption of marine debris (both intentional and accidental) may cause a suppressed appetite or blockage of the gastrointestinal tract leading to malnutrition and in some cases may even be lethal (Kühn et al. 2015). Litter in the ocean can also have detrimental effects on marine flora through smothering and crushing, resulting in reduced sunlight and the development of anoxic conditions on the seafloor (Kühn et al. 2015).

Various initiatives to reduce litter in the environment have been instigated or are currently under discussion. For example, in 2013 the law on dumping of garbage by marine vessels was changed from "all garbage may be dumped except" into "no garbage may be dumped except". Another instance is the ban or taxation on single-use plastic carrier bags in shops and supermarkets in many countries. In the Netherlands, this was introduced in January 2016. There has been a significant increase in awareness surrounding marine litter in recent years, with particular focus on plastics. In the Netherlands, initiatives include "Green Deal" on both Clean Beaches and Fishery for a Clean Sea. The Green deal on Fishery include the "Fishing for litter" program by KIMO to bring bycatch litter to land for recycling or processing, as well as studies to reduce loss from netting material. The most recent initiative is a ban on single-use plastics, the European parliament has voted for this in March 2019 paving the way for legislation.

Such measures can help towards achieving GES, next to this the MSFD requires the monitoring of the progress of these measures. This is interpreted as a requirement to monitor the amount of litter in the marine environment and where possible monitor potential effects of the measures taken to reduce the amount of litter as well. The requirements for monitoring are divided in a number of categories: monitoring litter in the water column, washed ashore, in biota and deposited on the seafloor. The monitoring of litter washed ashore results in the indicator on Beach litter (Ospar commission 2010, Schulz et al. 2017), and monitoring in biota in the indicator Plastic particles in fulmar stomachs (Van

Franeker et al. 2017). The beach litter monitoring indicates that a large part of the North Sea litter washes a shore on beaches near the Skagerrak. Additionally to these two indicators, there is the indicator Seabed litter to describe the litter deposited on the seafloor (Ospar commission 2017).

This report describes the methods used and data collected in 2019 for the Dutch (and French) part of the monitoring of litter deposited on the seafloor as commissioned by Rijkswaterstaat (RWS). The OSPAR commission proposed to collect this type of data by using the catches of the International Bottom Trawl Survey (IBTS). This is an internationally coordinated survey covering the Greater North Sea, providing a good platform for internationally collecting litter data, despite the fact that the sampling gear is not optimal for sampling litter.

A successful pilot study for collecting and recording seafloor litter on board was carried out during the Dutch International Bottom Trawl Survey (IBTS) in 2013 (van Hal & de Vries 2013) following the protocol for collecting data on marine litter as developed by working groups of the International Council for the Exploration of the Sea (ICES) (e.g. WGISUR, IBTSWG, WKMAL) (ICES 2015). This pilot only looked at the practical implications on board. The practical method was by no means optimised to nor represents a statistical representative approach. Following the pilot, it was decided that monitoring of seafloor litter would become a regular part of the Dutch IBTS. As a result of this, the international IBTS protocol on marine litter (ICES 2015) adjusted according to advice by the ICES Working Group on Marine Litter (WGML) (ICES 2018a) was included in the Dutch survey manual (van Damme et al. 2019), along with additional guidelines on how to classify specific litter items based on decisions made during the pilot (van Hal & de Vries 2013) updated by guidelines of WGML (ICES 2018a).

Since 2013, the IBTS data on seafloor litter have been stored and provided to RWS. Including the data collected in 2019, a total of seven years of data are available. As a result, RWS has requested to put the 2019 data into context with earlier years.

Aims and Objectives:

This report will present the seafloor litter data collected during the Dutch International Bottom Trawl Survey during Quarter 1 of 2019. The objectives of this report are to:

- Provide insight into the abundance and composition of seafloor litter in part of the North Sea.
- Assess the spatial distribution of seafloor litter in part of the North Sea.
- Compare these findings to those of previous years (2013-2018).

2 Materials and Methods

2.1 IBTS 2019

The International Bottom Trawl Survey Q1 (IBTS Q1) is carried out annually in January and February, and is performed by Scotland, Germany, Sweden, Norway, Denmark and The Netherlands (ICES 2015, 2018b).
The survey design is such that the North Sea is divided into grids (ICES rectangles) of 0.30° latitude and 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 means that the majority of the rectangles is sampled once by two different countries. For many years, the distribution of areas covered by each country remained unchanged. However, in 2017, France had to reduce its effort and was no longer able to cover all its allocated rectangles resulting in a redistribution of rectangles among the participating countries. This change affected the area covered by the Netherlands: it became more compact, no longer reaching as far north to Aberdeen nor as far south as the Channel and the southern English coast. The planned area remained mostly unchanged for the 2019 survey, with the exception of two additional rectangle taken from the German survey (**Figure 2-1**). However, owing to permit issues of the French, the Dutch took over hauls in four rectangles in UK-waters, while the French covered hauls in four of the planned Dutch rectangles in Dutch-waters.

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 codend. 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 may well go underneath it, and the proportion can be substantial. 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 flatfishes, other small bottom dwelling species and epibenthos are caught by the GOV in a random manner (<5% compared to a beam trawl, e.g. each item has less than 5% chance to be retained in the net), and are thus not representative of what is actually on the seafloor (ICES 2003). This may be the case for seafloor litter as well.
The horizontal opening of the net is determined by the pressure on the two doors (otterboards), one on each side of the net. The horizontal opening of the net varies with depth. The width between the doors (doorspread) 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 (wingspread) varies with depth as well. The wingspread is considered 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 4 knots (7.4 km/h) and trawling is only carried out during daylight hours.

The Netherlands uses the research vessel Tridens II 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 otterboards, as well as a new SIMRAD net-geometry system attached to the doors have been used.

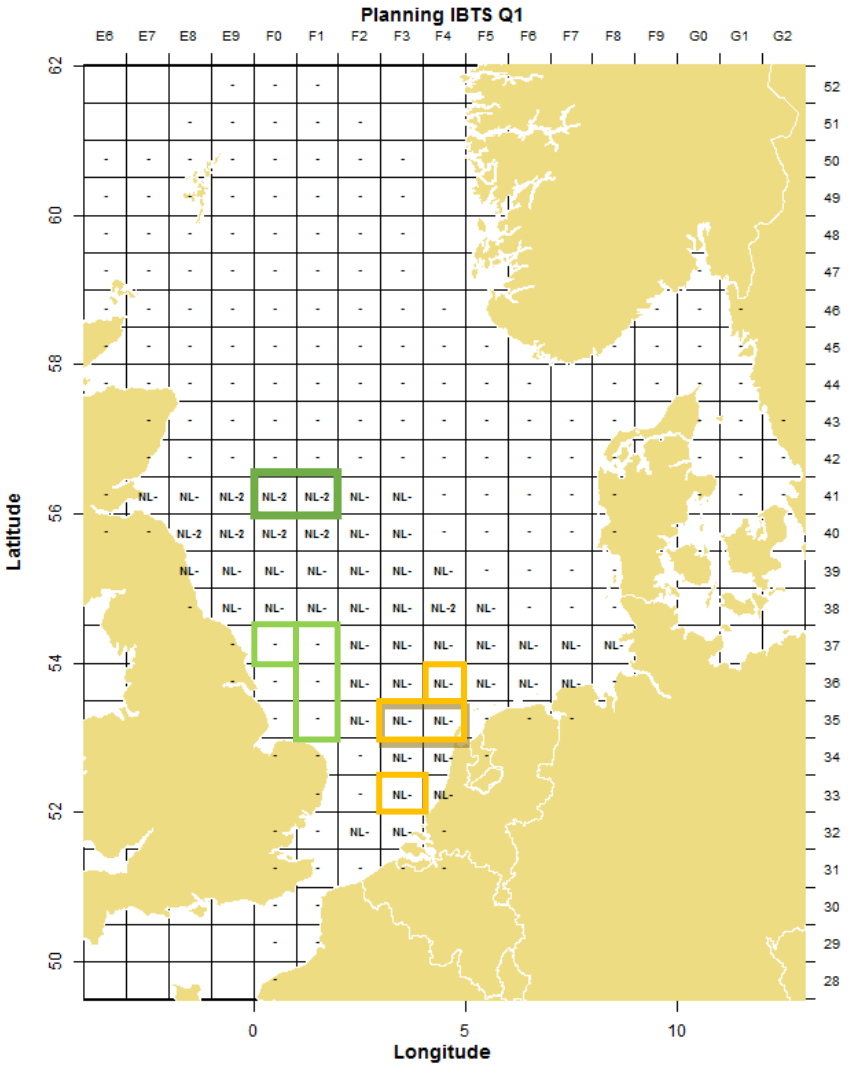

Figure 2-1. Planned ICES rectangles for Dutch GOV hauls during the 2019 IBTS. *Rectangles marked 'NL-' are those that should be covered once by the Netherlands and once by another participating country. Rectangles marked 'NL-2' are those that should be covered twice by the Netherlands. The dashes in the adjacent rectangles are those covered by other participating countries. The dark green square represents a deviation of the program of 2018, these two rectangle had to be covered twice in the 2019 Dutch IBTS program. The light green rectangles were taken over from the French and the orange rectangles were not covered as the French did these, which was a deviation of the plan. Rectangles left open are not covered by the International IBTS Q1.*

2.2 Sampling litter

The IBTS manual states that litter has to be collected each haul. Additional guidelines are available, the CEMP Guidelines on Litter on the Seafloor (EIHA 15/5/14-E; EIHA 15/5/14 Add.1-E) and most recent the WGML guidelines (ICES 2018a) including a classification (**Table 2-1**) marginally adjusted from the one in the IBTS manual. The WGML guidelines and the preliminary picture guide have largely improved on how to handle and classify items.

Photo 1*. Example of marine litter with organisms attached to it (in this case anemone, barnacles and dogfish eggs)*

On the Tridens the complete net is hoisted on board and only a part of the ground rope is left hanging over the side. The net is inspected and cleaned as far as possible after each trawl haul. Litter items in the net and in the catch are collected. Each litter item is

classified, weighed, the size is estimated, photographed (**Annex 2**), and in case of linear objects the length is measured. In case similar items are found in a single trawl haul, these are recorded as a single category, weighed together and the number of individual items is registered (**Annex 1, Table 2**). When organisms are attached (**Photo 1**) this is recorded as well. Moreover, a more detailed description of the litter item is given to facilitate analysis post-survey (**Annex 1, table 2**).

***Table 2-1. Classification of marine litter items (ICES 2018a)**. The table presents six categories of litter (A-F) and their respective subcategories, as well as size categories (A-F) used in the categorisation of seafloor litter items caught during the IBTS.*

Litter overview			
A: Plastic	**B: Metals**		**Related size category**
A1. Bottle	**B1.** Cans (food)		**A:** <5*5 cm= 25 cm^2
A2. Sheet	**B2.** Cans (beverage)		**B:** <10*10 cm= 100 cm^2
A3. Bag	**B3.** Fishing related		**C:** <20*20 cm= 400 cm^2
A4. Caps/ lids	**B4.** Drums		**D:** <50*50 cm= 2500 cm^2
A5. Monofilament	**B5.** Appliances		**E:** <100*100 cm= 10000 cm^2= 1 m^2
A6. Entangled filaments	**B6.** Car parts		**F:** >100*100 cm = 10000 cm2= 1 m2
A7. Synthetic rope	**B7.** Cables		
A8. Fishing net	**B8.** Other		
A9. Cable ties			
A10. Strapping band			
A11. Crates and containers			
A12. Diapers			
A13. Sanitary towel/tampon			
A14. Other			
C: Rubber	**D: Glass/ Ceramics**	**E: Natural products**	**F: Miscellaneous**
C1. Boots	**D1.** Jar	**E1.** Wood (processed)	**F1.** Clothing/ rags
C2. Balloons	**D2.** Bottle	**E2.** Rope	**F2.** Shoes
C3. Bobbins (fishing)	**D3.** Piece	**E3.** Paper/ cardboard	**F3.** Other
C4. Tyre	**D4.** Other	**E4.** Pallets	
C5. Glove		**E5.** Other	
C6. Other			

2.3 Area surveyed

Seafloor litter is presented as number of items per km^2. This requires the area surveyed, e.g. the swept area to be known. The swept area of the GOV is variable, and depends on the depth and the amount of fishing line used. For fish, two swept areas are calculated: one based on doorspread and the other on wingspread. The doorspread is the area between the doors (otterboards) of the gear, which is relevant for fish that are herded into the net. The wingspread is the area between the wings, which is considered 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 doorspread only, and as such wingspread needs to be calculated. In some cases doorspread is not recorded properly, and in these cases doorspread is calculated as well. The formulae are based upon (1) the data of multiple years for the doorspread recorded during the Dutch IBTS on the research vessel Tridens II and (2) the information gathered during the two years the Dutch IBTS was executed using the English vessel Endeavour using the English wingspread sensors.

The used formulae are as follow:

Doorspread= 14.2*LOG(Depth)+16.72*LOG(Warp_length)+18.49
Wingspread= Doorspread*0.18870+5.87280

The number of litter items per km^2 is then calculated as:

Number of litter items per km^2 = Items/(Wingspread (km)* Distance trawled (km)).

It should be noted that these formulae are the same as those used in the reports since 2016, but differ from those used in earlier years. As a result of this, values from reports prior to 2016 differ. For this report all data from these years were recalculated using the new formulae, thus allowing for comparison between years.

2.4 Litter data analysis

The litter data are presented as figures showing the composition of the litter by categories A-F (**Table 2-1**), and for plastics, the major category, by subcategories A1-A14. Furthermore, the composition of the litter is also presented by size categories A-F.
This is followed by figures on the spatial distribution in both absolute numbers and numbers per km^2. The numbers of items and number of items per km^2 are summarised by the minimum, maximum, mean and median values. The median is presented together with the median absolute deviation (MAD), representing the median of the absolute deviations from the data's median.

3 Results

The Dutch IBTS 2019 Q1 performed 64 valid trawl hauls (for the IBTS protocol one is declared invalid, however the reason does not affect the catches of litter). 58 of the hauls lasted the standard 30 minutes, with two comparison hauls lasting 15 minutes, one haul lasting 23 minutes, one haul lasting 54 minutes, one 57 and one 60 minutes. The last two were additional hauls along the coast of the Dutch Islands Ameland and Terschelling done between the beach and the location where the MSC Zoe lost her containers (**Figure 3-1**).
At sea, a number of rectangles were swapped with the French colleagues as shown in Figure 2-1.

At least one litter item was found in 53 of the hauls meaning that 11 hauls contained no marine litter. In total 249 litter items were registered.

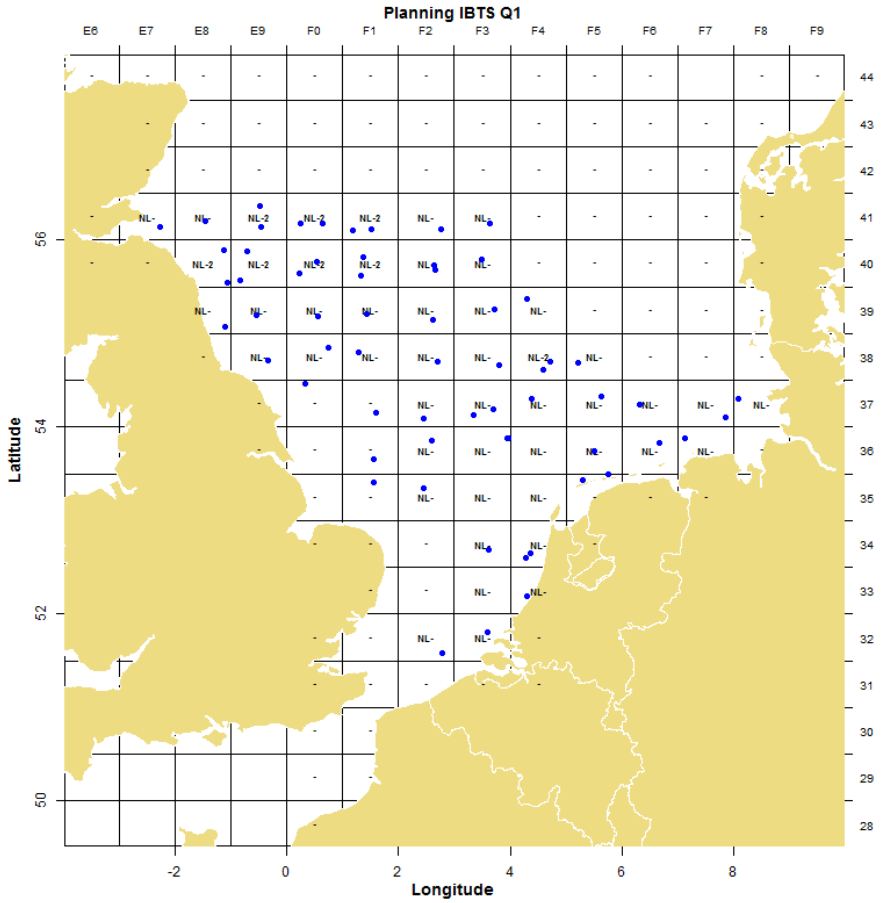

Figure 3-1. Executed Dutch GOV hauls during the 2019 IBTS. The blue points are the start locations of the valid GOV-hauls in 2019. The text ('NL-' or 'NL-2') indicates the official 2019 Dutch IBTS planning, deviation of this plan is shown by hauls in rectangle without 'NL', and the lack of hauls in rectangles with 'NL'. Also more hauls than planned per rectangle can be seen.

3.1 Composition of the litter caught in Q1 2019

3.1.1 General litter composition

Plastic is by far the most frequent category of seafloor litter with 221 (88.7%) of the 249 items caught (**Figure 3-2**). This is followed by Natural Products (15 items; 6.0%) and Rubbers (6 items; 2.4 %).

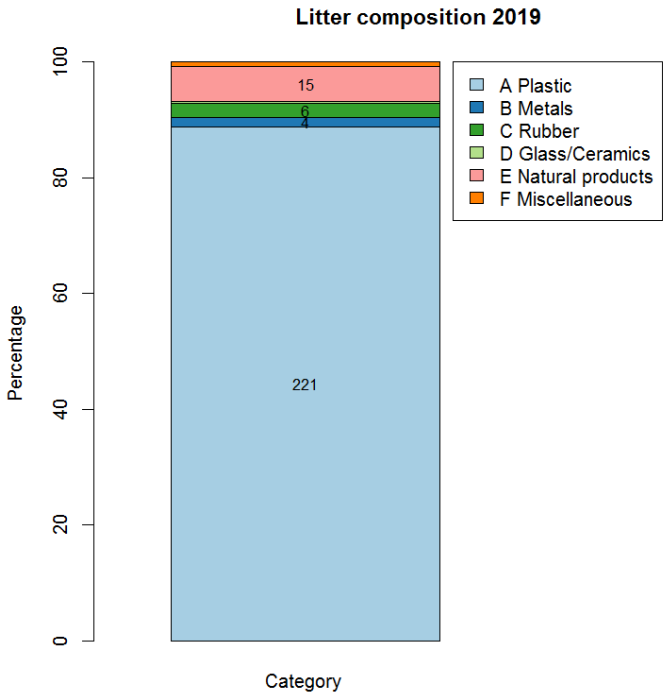

Figure 3-2. Composition of the seafloor litter in the catches of the Dutch IBTS Q1 2019. *Values within the graph are the absolute number of items for the categories containing more than 1% of the total items counted.*

3.1.2 Plastic composition

The largest category, Plastic, contains 14 subcategories (**Table 2-1**). The most dominant subcategory is A5 Monofilament representing 90 (40.7%) of the 221 plastic items caught, followed by subcategory A2 Sheet with 72 items (32.5%). The other items are markedly lower in contribution (**Figure 3-3**). The subcategories A1 Bottle, A10 Strapping band, A12 Diapers and A13 Sanitary towel/tampon were not caught.

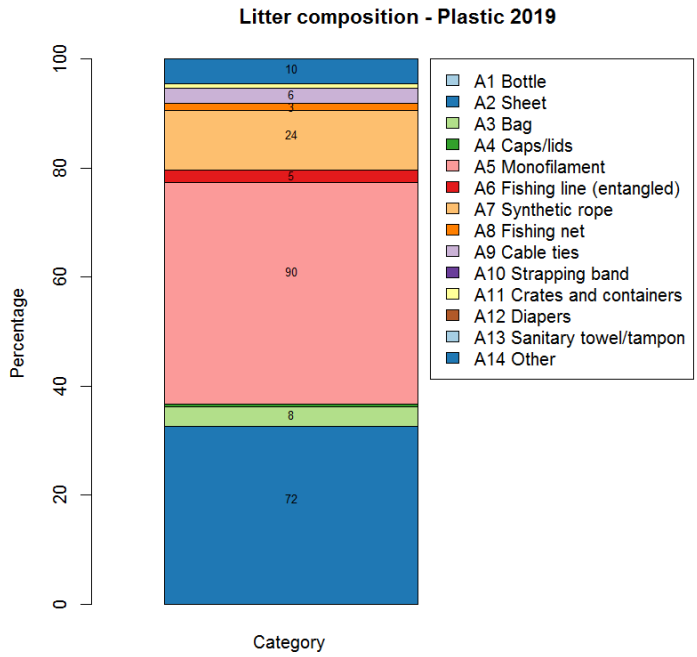

Figure 3-3. Composition of the seafloor litter category A Plastic in the catches of the Dutch IBTS Q1 2019. *Values within the graph are the absolute number of items for the subcategories containing more than 1% of the items counted.*

3.1.3 Size composition

All litter items are assigned a size category based on an estimation of the surface. Most of the items (148; 59.4%) are classified as size category A (<25 cm^2). The number of items decreases as the size category increases: 38 items (15.3%) in category B; 38 items (15.3%) in category C; and 22 items (8.9%) in category D. Both larger categories contained one item (**Figure 3-4**).

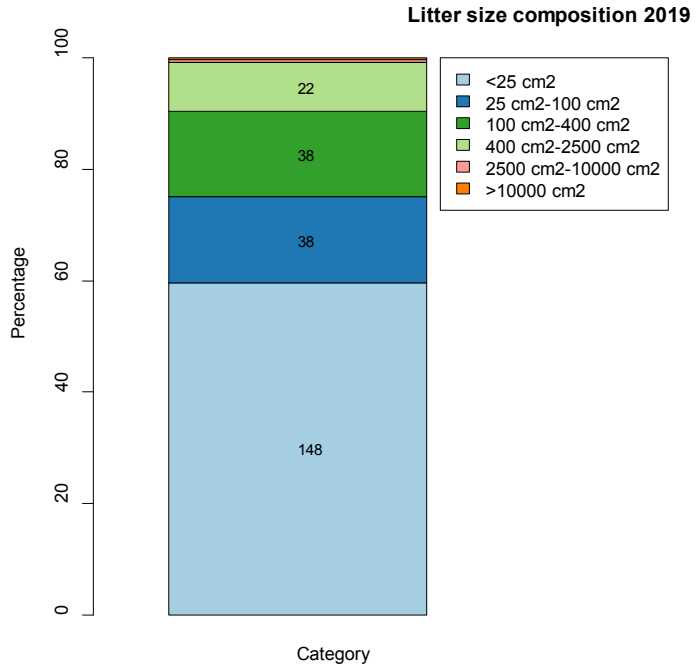

Figure 3-4. Size composition of the seafloor litter in the catches of the IBTS Q1 2019. *Values within the graph are the absolute number of items for the categories containing more than 1% of the items.*

Weighing was done consistently this year, however many items weighed less than 1 gram (e.g. single synthetic rope) for which no weight is recorded. The heaviest items were two fishing nets both weight more than 12 kg **(Photo 2**), followed by a rubber band of 1.5 kg, and two pieces of processed wood.

All other items were less than 1 kg. Thus, the distribution of the weight is skewed, as seen in the difference between average weight (828.8 g) and the median weight (80.0 g) (**Table** *3-1*), while the items <1 g were not even included.

***Photo 2**. Heaviest litter item caught during the Dutch IBTS 2019: fishing net (A8) caught during haul 3400028 (1st February)*

***Table 3-1**. **Summary data of the Dutch 2019 IBTS litter catches.** Each parameter is presented with its minimum, maximum, mean, median and median absolute deviation values.*

	min	max	mean	median	MAD
Items per trawl	0	27	3.89	2.00	2.97
Surface trawled (km^2)	0.00346	0. 14618	0.07337	0.07335	0.01
Items per km^2	0	616.5	63.0	31.3	45.9
Weight (g)*	1	12475	828.8	80.00	112.68

* All items <1 g were not weighed. The summary information presents data on the hauls with weighed items. Empty hauls and hauls with only items <1 g were left from the analysis resulting in 41 hauls with weight.

3.2 Abundance and distribution of the litter

The spatial distribution of litter caught during the IBTS 2019 is presented in **Figure 3-5**. The smallest circle represents hauls without litter items in the catch, zero hauls. It are 11 zero hauls, ten of these were located in the northern part of the area surveyed (close to the UK coast), while one was at the southern end, between the UK and the Netherlands.

The ranges presented by the bubbles in the plots are the same as those used in the earlier reports (van der Sluis & van Hal 2014, van Hal 2015, 2017a, b, O'Donoghue & van Hal 2018). The maximum in 2019 is 617 items per km^2 which is located close to the German coast and corresponds to 27 items reported from the catch. The median number of items is 33.3 items per km^2 corresponding to 2 items in the catch (Table 3-1). The two additional hauls of an hour above the Dutch Islands had 27 and 51 items per km^2. In the coastal area of Noord-Holland two hauls were done in the same rectangle one with 102 items per km^2, the other empty. Similar to the haul done in the rectangle further west.

The French survey took over four hauls in the Dutch coastal area which were supposed to be covered by the Dutch survey. The French delivered their litter data to be included in this report. The four hauls

are included in **Figure 3-5** and for these four hauls the counted items were in the range of the Dutch data.

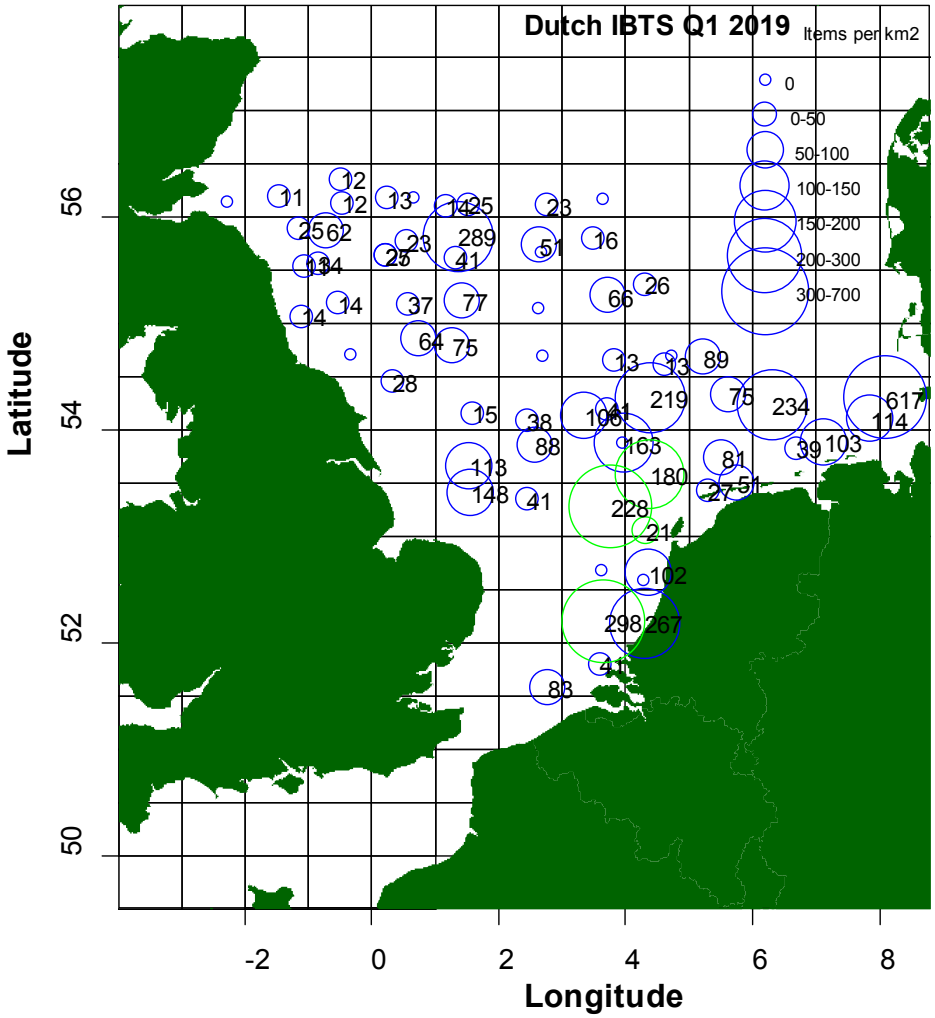

Figure 3-5. Density of litter items per haul per km² for the Dutch and a part of the French IBTS 2019. *The numbers in the circles represent the number of litter items per km² (empty hauls have no number), as well as the start position of the trawls and thus determine the rectangle sampled. The blue circles are Dutch data, while the green circles are French data.*

3.3 Comparison with earlier years

Information on the abundance and distribution of seafloor litter can be provided for the locations of the GOV trawls only. Owing to the redistribution of rectangles in 2017 and the swap of rectangle with France this year, the spatial coverage of the Dutch IBTS changed compared to earlier years. Besides that, the exact locations of the trawl hauls also vary between years, as the fishing positions are chosen semi-randomly within an ICES rectangle. This creates variation in the actual depth and seafloor structure of the trawl hauls between years. A one-to-one comparison of the trawl hauls between years is therefore complicated. Personal experience of the years in which litter data were collected gives the impression that the amount of litter varies between different habitats within the same rectangle. The impression is that areas with lots of structure, e.g. Sabellaria reefs or kelp areas, tend to have more litter items than sandy areas. As a result catches of litter can vary a lot even over small distances.

In all years the seafloor litter was dominated by plastics, with 83-88% of the total number of items caught. The largest plastic category this year was A5 (Monofilament) as in 2016. The guidelines of WGML 2018 made the distinction between A5 and A7 (Synthetic rope) clearer, which likely will make the categorisation more consistent. As a result A5 will most likely be the largest category followed by A2 (Sheet) as it would have been if categorisation would have followed the current guidelines. Despite

the guidelines, counting the number of individual pieces of rope/sheet correctly and in a consistent way is still difficult. The guideline states if items are entangled but recognisable as separate items they should be counted as separate items. Photo 3 shows such an entangled item, where a blue monofilament (one or more?), a green and yellow synthetic rope (potentially attached to each other and the netting material making it a single item) and orange monofilament (heavily entangled with the netting material, making

Overall, the mean values in 2019 are some of the lowest since recording began in 2013 (**Table 3-2, Table 3-3, Figure 3-6**). The spatial distribution is difficult to compare, especially using the maps presenting single hauls (**Figure 3-5**). Comparing the 2019 map with those of earlier years indicates that the distribution of litter seems as random as in previous years. Following the survey design in which a haul is representative for the whole ICES rectangle, or if multiple hauls are done the average is a representation of that rectangle, spatial maps were created (**Figure 3-7**, **Figure 3-8**). These maps are somewhat easier to compare, but do not provide a clear pattern of hotspots of litter over the years. Neither do they indicate clear differences between years.

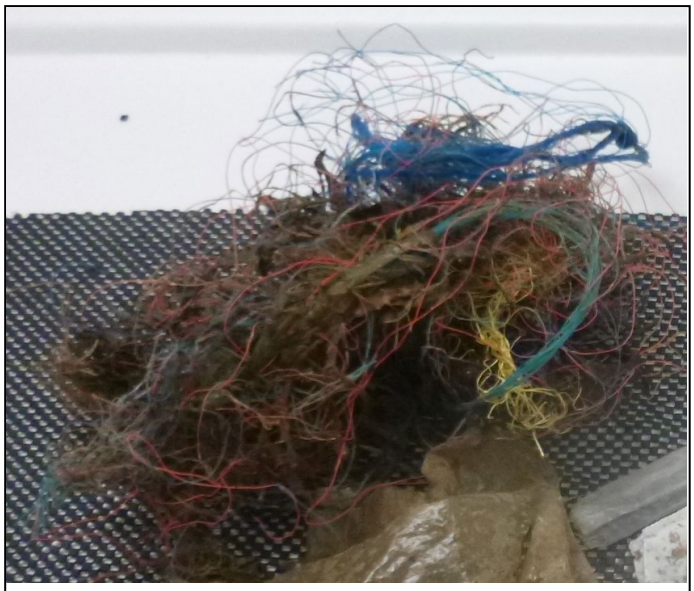

***Photo 3**. Entangled lines: recorded as two separate items, the blue monofilament and the rest. Potentially the yellow and green A7 could have been recorded as separate items as well, however these seem more entangled in the middle with the orange monofilament and other material (3400060, 19-feb-2019).*

***Table 3-2. Comparison between Dutch IBTS litter results for the period 2013-2019**. The minimum and maximum. mean, median, standard deviation and median absolute deviation (MAD) values for items per trawl are presented for comparison for years 2013-2019.*

	min	max	mean	median	Stdev	MAD
2019	0	27	3.89	2	4.75	2.97
2018	0	20	2.9	2	3.4	1.48
2017	0	33	6.4	4	6.46	4.45
2016	0	21	7	6	5	4.45
2015	0	23	8	7	5.73	5.93
2014	0	21	6.39	5	4.88	4.45
2013	0	11*	4.02	4	2.42	2.97

* Individual ropes were not counted. If multiple (dolly) ropes were present these were most of the time registered as a single item.

Table 3-3. Comparison between Dutch IBTS litter results for the period 2013-2019*. The minimum and maximum. mean, median, standard deviation and median absolute deviation (MAD) values for items per km² are presented for comparison for years 2013-2019.*

	min	max	mean	median	Stdev	MAD
2019	0	616.5	63	31.3	95.23	45.9
2018	0	253.2	40.3	30.9	44.8	32.2
2017	0	610.6	98.2	62.1	119.4	50.6
2016	0	298.1	106.9	99.4	76.1	74.4
2015	0	330.0	115.9	102.9	83.5	78
2014	0	529.1	91.7	65.6	88.0	57.8
2013	0	132.1*	51.2	49.3	32.0	30.6

* Individual ropes were not counted. If multiple (dolly) ropes were present these were most of the time registered as a single item.

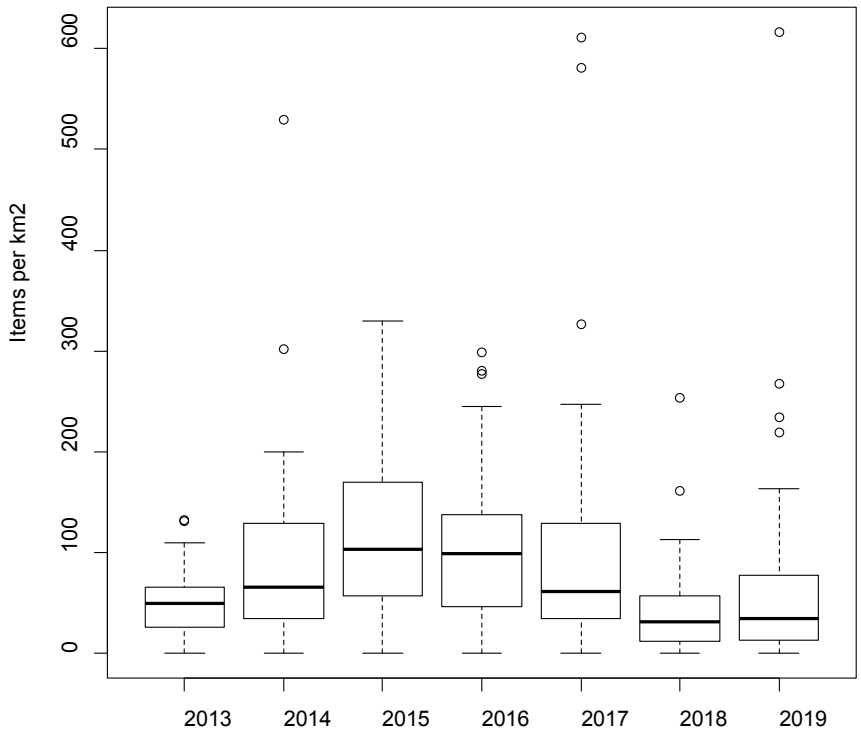

Figure 3-6*.* ***Boxplot of the items per km² for all the hauls in each year (2013-2019)****. The black horizontal line represents the median. NB: the geographical coverage differs between years.*

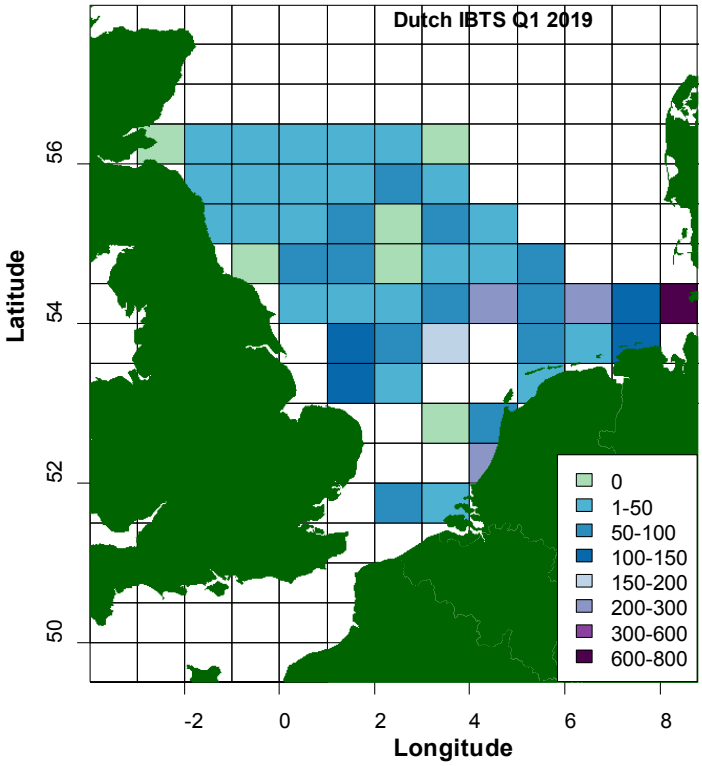

Figure 3-7. Density of litter items per km² for the IBTS Q1 2019*. For rectangles in which two hauls were carried out, the average of the density of litter items per haul per km² is used. The white rectangles are not sampled by the Dutch survey.*

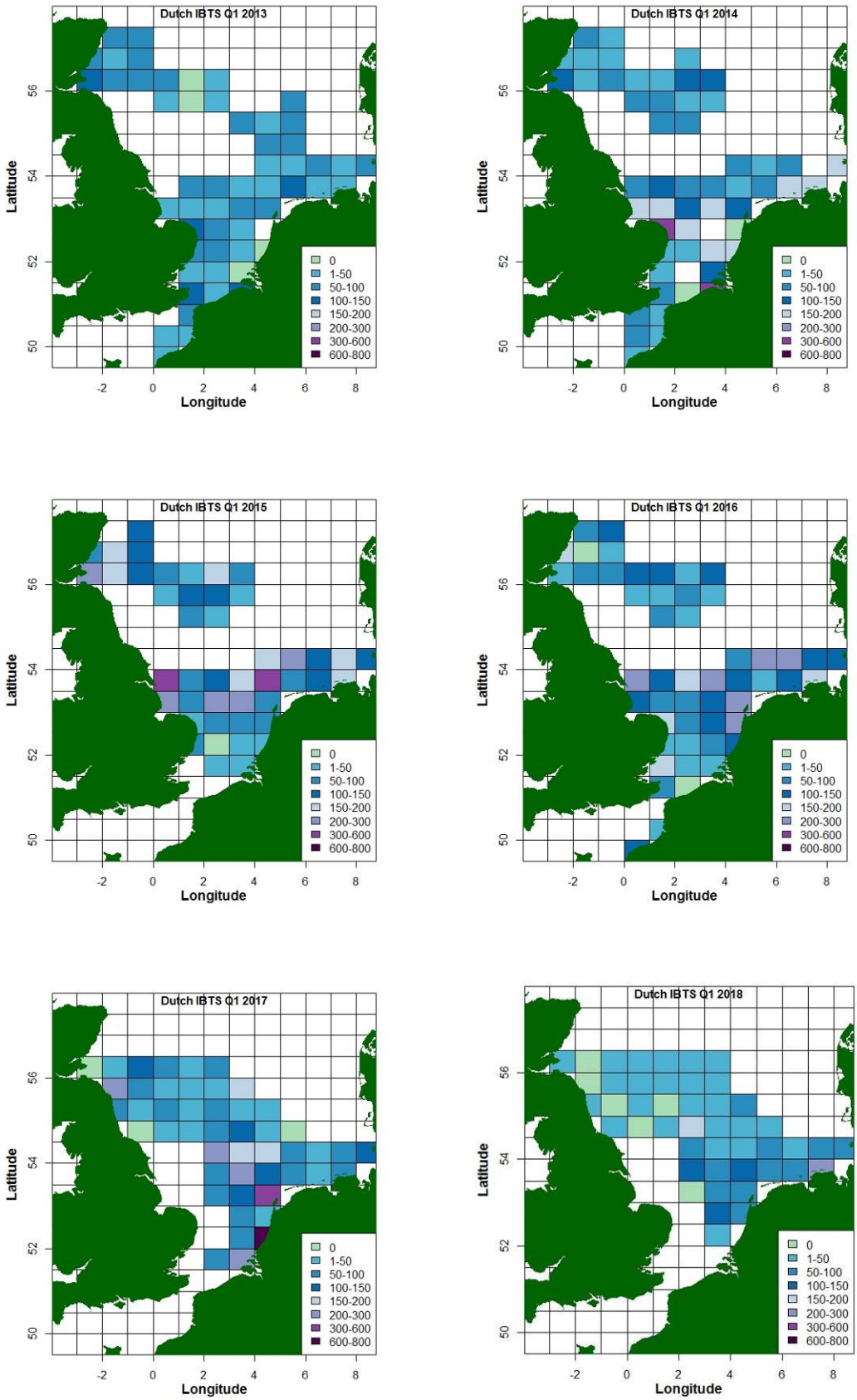

Figure 3-8. Density of litter items per km² for the IBTS 2013-2018*. The colour range is the same in all maps to allow for comparison across the years. For rectangles in which two hauls were carried out, the average of the density of litter items per haul per km² is used.*

3.4 MSC Zoe litter

Additionally to the regular IBTS, two hauls were done in the area between the Dutch Islands Ameland and Terschelling and the traffic lane where the MSC Zoe lost the containers. These two hauls were done in rectangle 35F5 and 36F5. Also the regular haul in 36F5 and the haul in 36F6 were planned considering the possibility to catch MSC Zoe litter.

The area where the MSC Zoe lost its litter was passed in the first week of the survey. A call by the governmental vessel coordinating the cleaning operation was received, which advised not to fish in the area. Just outside that area but still in the shipping lane just in German waters the regular haul in area 36F6 was done. In this haul (3400003), three litter items were caught, none related to the MSC Zoe. In the fifth week, the area was revisited and the regular haul in 36F5 was placed closely north of the shipping lane where the containers were lost. In this haul (3400062), five litter items were caught, none seemed related to the MSC Zoe.

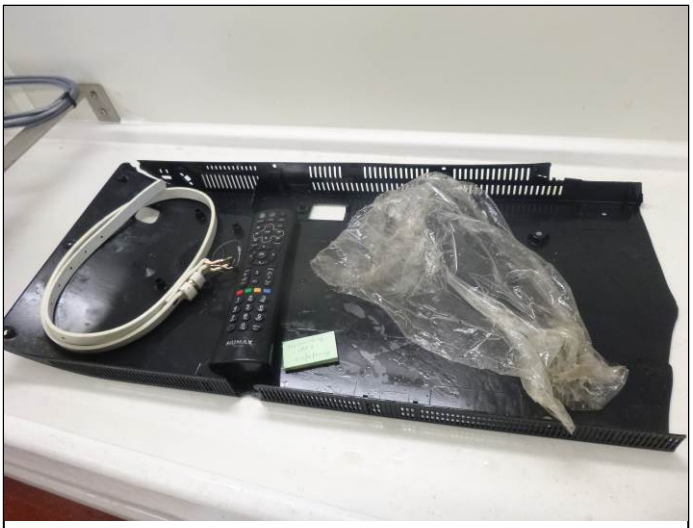

***Photo 4**. Litter recorded in the haul (one hour fishing time) along the beach of Terschelling. Items are likely related to the MSC Zoe.*

Two additional hauls were placed in the area, for which the advice as not to fish. These hauls were placed closely to the beaches of Ameland and Terschelling where a lot of the litter of the Zoe had stranded. The hauls were extended to an hour to increase the ground covered and so to increase the chance of catching items related to the MSC Zoe. One haul along Ameland (3400063), contained seven litter items. None of these seemed related to the Zoe. The haul along Terschelling (3400064) contained four litter items. Three, the back side of a TV; a remote control; and a brand new belt, are likely related to the MSC Zoe (**Photo 4**).

The French also did their regular hauls in the rectangle close to the shipping lane. They reported catching litter in those hauls, however none of the items seemed related to the MSC Zoe cargo.

4 Discussion and Conclusions

The abundance and composition of seafloor litter in 2019 are in line with those of previous years. The seafloor litter from the catches of the Dutch IBTS Q1 2019 contained mostly plastic items: 88.7% of the total number of litter items found was plastic. Moreover, the composition of the litter itself is comparable among the years, consisting mainly of plastic sheets and various types of ropes/lines. The differences in composition found between years are most likely related to inconsistencies in recordings rather than an actual change in the types of litter. Differences in values between years may be attributed to inconsistencies in the categorisation of items. The decision on how to categorise an item has been an issue in latest years. A clearer guideline is provided by the ICES WGML (ICES 2018a) solving a number of the classification issues and the draft photo guide was already helpful in clarifying remaining issues.
A remaining issue is still the way to count items in case of entanglement. The guideline states: "*If an item is made up of two or more objects that have become entangled, and all items are recognisable, all items should be accounted for separately.*" In Photo 3, an example of this issue is given. The item in the picture is counted as two now, which might be more if the yellow and green lines are separated as well. Fully disentangled it might result in a large number of separated monofilament lines, potentially making this haul one of the largest catches of litter this year. Fully disentangling would cost a lot of effort and is not possible in all cases. Furthermore, it is not certain that all the lines were separate items that became entangled at the seafloor or in the net, it might have been netting material already attached before becoming litter. This thus leaves some arbitrary choices in counting the number of litter items.

Spatially, the amount of litter differs between the years. This is most likely a chance effect and related to differences in actual fishing location, rather than to actual differences in the amount of litter present in the North Sea. All the scientists involved in the IBTS agree that the GOV, which is not designed to catch litter, has only a small probability of catching a litter item when it is present in the trawl path. The probability varies with litter type and the size of the item. The majority of the items is small (**Figure 3-4***)*, even smaller than most fish for which a catchability of less than 5% is assumed, e.g. being caught randomly rather that representative (ICES 2003, Fraser et al. 2007, Piet et al. 2009). Therefore, the probability of catching these small litter items is assumed to be minute and random. Thus, the fact that these items are caught 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. Consequently, the degree of litter pollution on the seafloor is probably much larger than presented in this report. Additional work on this is shown in **Annex 3**, which compares litter catches of the IBTS with those of a Beam Trawl. The Beam trawl clearly catches more litter than the GOV also the composition of the litter differs with a lower proportion of plastics in the beam trawl catches.
The lower than expected number of items related to the MSC Zoe in the two hauls near the area where the containers were lost also is an indication of the low catchability of GOV gear. Vessels active in the cleaning operation detected a large number of items on the seafloor and fishers in the area caught large amounts of items, indicating a much larger density than the 21-81 items per km^2 recorded by the IBTS.

The actual fishing locations are semi-randomly chosen within a rectangle, and differ between years. With that the depth and seafloor structure which are sampled differ. Based on personal observation of the catches, it is hypothesised that the amount of litter items is determined by type of seafloor structures in the trawl path. This is likely related to the amount retained by the seafloor structures, but also the effect of habitat on the catchability of the litter items. The difference on small local scale is exemplified by the zero catch next to one of the largest catches in the Dutch coastal zone in 2014. It is shown again this year, near the coast of Noord-Holland were a catch with 102 items per km^2 is close to a zero catch. Unfortunately, a description of habitat is not recorded (e.g. by side-scan sonar or multibeam) but it could be approximated on the basis of the fish catches or existing habitat or sediment maps. As it is not recorded it can't currently be incorporated in the analysis and the effect of

sampling different habitats between years cannot be disentangled from the differences in the amount of litter present.

Currently, the combination of low number of trawl hauls, low number of items found per sampling station, the low probability of catching an item when it is present in the trawl path and the spatial differences in the survey between years, make it difficult to draw conclusions on the absolute amounts of litter found and to use these data in trend analysis.
An improved analysis can be carried out when the data in this report are combined with the international IBTS data, although at this moment the international data are probably inconsistent due to the lack of standardisation in the collection process, as also stated by Moriarty et al. (2016) and WGML. WGML confirmed our analysis for the OSPAR assessment in 2017, where we reported that not all countries actually counted each litter item. Some of the countries only record the subcategory as present, rather than the number of items under that subcategory. WGML concluded that this hampers combining the North Sea data at this moment to create density maps, only present absences analyses seem feasible on the data up to 2018. Therefore, UK (OSPAR lead country for the seafloor litter indicator) has recently developed a presence-absence analysis of seafloor litter, and has applied this new method in the second OSPAR Intermediate assessment (EIHA 19/07/19-Add.1). This new assessment method is regarded as useful by The Netherlands and other OSPAR North Sea countries. The improved guidelines and communication with the Scientists in Charge hopefully improve the international data quality.

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 currently the approach is a reduction of the amount of litter in the environment. It is clear (Maes et al. 2018, Urban-Malinga et al. 2018) and also presented here, that despite the management measure to decrease in the input of litter and to remove the litter from the environment, there is still litter on the seafloor and that a situation with no litter in the environment is not reached and is unlikely to be reached within a short timeframe. The indicators proposed for the MSFD should be able to detect a reduction in litter related to management measures.
Using only the Dutch IBTS data will not be sufficient to detect such a change over a six year period. The number of sampling stations is too low and the spatial distribution not consistent enough. This is acknowledged as the proposed OSPAR indicator combines all the international IBTS data on marine litter. The development of the database to store all the international data centrally is completed. This database is developed by the ICES data centre and is linked to the existing DATRAS database (http://datras.ices.dk, **Annex 4**). The international data is thus available and could be combined, however as stated the current data in that database for the North Sea is not consistent in the way it is collected.

In recent year the international data are collected more consistent, owing amongst others to the improved guidelines by WGML. However, even when the international data of the IBTS are combined, as the UK has done for the second OSPAR Intermediate assessment, the issue of the very low catchability of the GOV used in the IBTS is of concern. Due to the low catchability there is a large chance that the zero's (no litter in a GOV-haul) are actually false zero's (no litter caught, while there were multiple items of litter on the seafloor). Earlier power-analyses, without taking this issue in consideration, showed that a large number of sampling stations is required to detect a 10 to 30% change in the amount of litter over time (Maes et al. 2014). The issue of a large chance of having false zeros increases the number of sampling stations or reduces the change in litter that can be detected. This catchability problem is therefore an issue requiring further investigation when continuing work on this indicator.
As this catchability issue is hard to solve and difficult to incorporate in the analyses, it might be worthwhile to find or develop other methods for detecting a change in the amount of litter on the seafloor. A dedicated survey, possibly on hotspots where litter is likely to be gathered by the dominant currents could assist in providing trend information of fixed locations. However, it remains to be proven that these hotspots actually exist, or that these shift, which seems to be suggested by the draft second OSPAR intermediate assessment (EIHA 19/07/19-Add.1). Another option is as

Rijkswaterstaat proposes to perform a pilot using the benthic dredge samples, which are currently used for MSFD benthic assessments. The dredge samples the top sediment layer using an effective net size opening of 0.5 cm, and is expected to give a much better quantitative view of the seafloor litter situation. However, owing to the small net opening only for relatively small litter items and on a much smaller scale than the GOV. A third option might be to use the beam trawl surveys in the Dutch coastal areas. Next to the beam trawl survey presented in Annex 3, the Netherlands performs three regular beam trawl surveys covering the coastal areas and the Wadden Sea (Beam Trawl Survey (BTS), Sole Net Survey (SNS), Demersal Fish Survey (DFS)), covering a larger area than the dredge samples. The RWS-project related to the MSC Zoe has requested to collect the litter from the catches of these surveys following the WGML-protocol. This might be a good start for the longer term collection of litter from these surveys. Developing a time series using a gear, likely better equipped for sampling seafloor litter than the GOV.

5 Recommendations

- Perform a pilot study using benthic dredge samples. In this pilot study, additional analysis could be done about the relation between the habitat structure, known current patters and the litter content.
- Follow the progress of the data collection of seafloor litter in the Dutch beam trawl surveys, done in the RWS project related to the MSC Zoe. Explore the possibilities to extend this data collection to create a time series.
- Participate in the UK lead development of analyses on the international dataset.
- Further investigate the differences in seafloor litter catch efficiency of the GOV and beam trawl gears, and to further establish/corroborate a correction factor for this. So that the data of both surveys could be combined increasing the amount of information available.

6 Quality Assurance

Wageningen Marine Research utilises an ISO 9001:2015 certified quality management system. This certificate is valid until 15 December 2021. The organisation has been certified since 27 February 2001. The certification was issued by DNV GL.

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Justification

Report C068/19A
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: Dr. E.M. Foekema
Senior scientist

Signature: 

Date: July 15th 2019

Approved: Drs. J. Asjes
Manager Integration

Signature: 

Date: July 15th 2019

Annex 1 Data tables with sea floor litter monitoring data of Dutch IBTS Q1 2019

Annex 1 table 1. Complete trawl list of the Dutch IBTS Q1 2019, in which the total number of items (Number of items) and the density (Items km²) per haul are reported. *Sample represents the haul number; latitude_s and longitude_s represent the coordinates at the start of each haul; latitude_h and longitude_h represent the coordinates at the end of each haul; Items km² is sum of all litter items divided by the fished surface (Bottom track * Wingspread).*

Ship	Country	ICES rectangle	sample	latitude_s	latitude_h	longitude_s	longitude_h	Water depth	BOTTOM TRACK	WING SPREAD	Number of items	Items km²
Tri2	NED	33F4	3400001	52.18633	52.21267	4.302	4.327	16.4	3415	16.44	15	267.177
Tri2	NED	34F4	3400002	52.6515	52.62383	4.36217	4.34	22.8	3460	19.87	7	101.837
Tri2	NED	36F6	3400003	53.82967	53.81883	6.6865	6.6235	22.7	4342	17.76	3	38.902
Tri2	NED	36F7	3400004	53.88183	53.8675	7.131	7.07017	26.5	4284	18.14	8	102.954
Tri2	NED	37F7	3400005	54.09917	54.08483	7.86267	7.813	46.4	3621	19.46	8	113.537
Tri2	NED	37F8	3400006	54.30033	54.32467	8.0955	8.0815	17.3	2826	15.50	27	616.535
Tri2	NED	37F6	3400007	54.242	54.25267	6.3145	6.36117	37.4	3261	18.33	14	234.253
Tri2	NED	37F5	3400008	54.32983	54.31883	5.63333	5.68117	42.2	3351	19.84	5	75.219
Tri2	NED	38F5	3400009	54.68483	54.657	5.22033	5.19533	45.6	3532	19.08	6	89.025
Tri2	NED	38F4	3400010	54.70283	54.67117	4.72117	4.72817	46.8	3581	20.03	0	0.000
Tri2	NED	37F2	3400011	54.0865	54.0985	2.45433	2.40117	73.2	3698	21.53	3	37.671
Tri2	NED	37F1	3400012	54.159	54.145	1.58417	1.63083	51.7	3393	19.84	1	14.858
Tri2	NED	36F1	3400013	53.65967	53.6835	1.54567	1.5235	90	3017	20.59	7	112.677
Tri2	NED	35F1	3400014	53.40867	53.4315	1.55317	1.53933	34.2	2724	17.38	7	147.827
Tri2	NED	38F1	3400015	54.7955	54.76717	1.28417	1.31267	38.8	3655	18.14	5	75.420
Tri2	NED	38F0	3400016	54.8525	54.82183	0.738	0.754	79.7	3547	22.10	5	63.782
Tri2	NED	39F0	3400017	55.18917	55.1645	0.56217	0.6005	76.8	3700	22.10	3	36.687
Tri2	NED	39F1	3400018	55.21433	55.24333	1.42733	1.44483	52.7	3389	19.08	5	77.318
Tri2	NED	40F1	3400019	55.61967	55.599	1.3205	1.27883	82	3484	20.97	3	41.065
Tri2	NED	40F1	3400020	55.82217	55.82083	1.35767	1.35683	81.2		21.91	1	288.811
Tri2	NED	41F1	3400021	56.12217	56.15367	1.51817	1.54333	83.2	3791	21.16	2	24.935
Tri2	NED	41F1	3400022	56.10767	56.13167	1.1715	1.20817	71.8	3480	21.16	1	13.582
Tri2	NED	41F0	3400023	56.18283	56.18767	0.64517	0.70883	95.6	4015	22.48	0	0.000
Tri2	NED	41F0	3400024	56.1835	56.15083	0.23733	0.23883	79.6	3628	21.35	1	12.913
Tri2	NED	40F0	3400025	55.77383	55.807	0.537	0.55433	94.9	3811	22.48	2	23.347
Tri2	NED	40F0	3400026	55.64333	55.6125	0.21333	0.23083	67	3652	20.03	2	27.348
Tri2	NED	40F0	3400027	55.641	55.62467	0.21667	0.22483	68.2	1911	20.59	1	25.413
Tri2	NED	41E9	3400028	56.36183	56.3965	-0.48767	-0.489	74.8	3833	21.91	1	11.906
Tri2	NED	41E9	3400029	56.136	56.17033	-0.47333	-0.45117	78.7	4051	21.35	1	11.564
Tri2	NED	40E9	3400030	55.876	55.845	-0.71867	-0.69583	78.9	3749	21.53	5	61.932
Tri2	NED	40E9	3400031	55.566	55.53283	-0.84517	-0.851	95.8	3759	23.23	3	34.351
Tri2	NED	41E7	3400032	56.1415	56.17033	-2.28617	-2.312	61.4	3586	21.35	0	0.000
Tri2	NED	41E8	3400033	56.20417	56.23967	-1.4635	-1.48783	63.3	4205	20.97	1	11.341
Tri2	NED	40E8	3400034	55.892	55.9265	-1.1455	-1.135	78.2	3879	20.59	2	25.039
Tri2	NED	40E8	3400035	55.54417	55.575	-1.06417	-1.10167	106.5	4112	22.67	1	10.729

Ship	Country	ICES rectangle	sample	latitude_s	latitude_h	longitude_s	longitude_h	Water depth	BOTTOM TRACK	WING SPREAD	Number of items	Items km²
Tri2	NED	39E8	3400036	55.06717	55.094	-1.11117	-1.13367	81.9	3307	21.72	1	13.920
Tri2	NED	39E9	3400037	55.19683	55.133	-0.54217	-0.53317	71.9	3395	20.97	1	14.047
Tri2	NED	38E9	3400038	54.71583	54.74317	-0.34783	-0.38017	71.3	2880	19.27	0	0.000
Tri2	NED	37F0	3400039	54.45933	54.42983	0.31667	0.305	71.1	3406	20.78	2	28.258
Tri2	NED	40F2	3400040	55.6785	55.7075	2.666	2.57317	72.5		21.53	0	0.000
Tri2	NED	34F4	3400041	52.5975	52.56983	4.28233	4.27767	24	3174	17.38	0	0.000
Tri2	NED	34F3	3400042	52.68367	52.66483	3.62067	3.66567	30	3718	17.95	0	0.000
Tri2	NED	38F2	3400043	54.70267	54.668	2.69433	2.69283	20.5	3855	16.44	0	0.000
Tri2	NED	39F2	3400044	55.14367	55.11333	2.625	2.64983	31.8	3720	18.33	0	0.000
Tri2	NED	39F3	3400045	55.2585	55.2635	3.722	3.77533	34.9	3410	17.76	4	66.045
Tri2	NED	39F4	3400046	55.37617	55.3545	4.301	4.25167	43.3	3945	19.65	2	25.803
Tri2	NED	40F2	3400047	55.7325	55.71317	2.63917	2.59183	80.2	3653	21.53	4	50.847
Tri2	NED	41F2	3400048	56.1165	56.085	2.75383	2.72433	79.2	3951	21.72	2	23.302
Tri2	NED	41F3	3400049	56.1755	56.2055	3.64067	3.6065	70.3	3960	21.16	0	0.000
Tri2	NED	40F3	3400050	55.798	55.80467	3.48183	3.54133	55.3	3783	16.44	1	16.079
Tri2	NED	38F3	3400051	54.658	54.66117	3.8095	3.75217	44.4	3704	20.40	1	13.232
Tri2	NED	38F4	3400052	54.61417	54.61417	4.59967	4.54167	50.7	3752	20.97	1	12.711
Tri2	NED	37F4	3400053	54.30617	54.33933	4.383	4.39067	51.4	3668	21.16	17	219.056
Tri2	NED	37F3	3400054	54.19267	54.195	3.70117	3.75817	43.4	3712	19.84	3	40.742
Tri2	NED	37F3	3400055	54.13283	54.16633	3.35383	3.372	32.3	3877	19.46	8	106.040
Tri2	NED	32F3	3400056	51.80417	51.824	3.59667	3.61917	24.8	2674	18.14	2	41.236
Tri2	NED	32F2	3400057	51.5835	51.6145	2.77667	2.80183	32.5	3836	18.89	6	82.788
Tri2	NED	35F2	3400058	53.3495	53.33133	2.44333	2.46917	33.1	2640	18.70	2	40.503
Tri2	NED	36F2	3400059	53.8565	53.83833	2.5855	2.64233	58.2	4250	21.35	8	88.182
Tri2	NED	36F3	3400060	53.8785	53.879	3.9625	3.9065	41.6	3674	20.03	12	163.103
Tri2	NED	36F3	3400061	53.88133	53.87933	3.94233	3.97117	41.7		20.96	0	0.000
Tri2	NED	36F5	3400062	53.74317	53.7585	5.51633	5.55883	30.6	3305	18.70	5	80.883
Tri2	NED	36F5	3400063	53.50017	53.508	5.76033	5.87517	14.2	7641	18.14	7	50.507
Tri2	NED	35F5	3400064	53.43367	53.45383	5.29567	5.42667	10.8	8995	16.25	4	27.363

Annex 1 table 2. Complete litter list of the Dutch IBTS Q1 2019. For every haul, each litter item is categorised per type and size category. *Sample represents the haul number; Litter type and Size category are the subcategory and size class, respectively, assigned to each litter item as per Table 2-1. Additional information such as description, weight (g) and length (m) if applicable, and the presence/absence of attached organisms are also recorded.*

Date	Sample	Litter Type (A1; B2; C…)	Description (Label/ Brand)	Size category (A; B; C..)	Weight (g)	Length (m)	Number of items
21/01/19	3400001	E1	processed wood	C	1137.00		9.00
21/01/19	3400001	A5	blue	A		0.22	1.00
21/01/19	3400001	A5	turquoise	A		0.38	1.00
21/01/19	3400001	A9	black	A	3.00	0.12	1.00
21/01/19	3400001	A2	transparent	A			1.00
21/01/19	3400001	A7	white	A		0.06	1.00
21/01/19	3400001	A7	white	A		0.06	1.00
21/01/19	3400002	B8	Welding rod	A	21.00		1.00

Date	Sample	Litter Type (A1; B2; C…)	Description (Label/ Brand)	Size category (A; B; C..)	Weight (g)	Length (m)	Number of items
21/01/19	3400002	A7		A		0.10	1.00
21/01/19	3400002	A9	black	A	4.00	0.12	1.00
21/01/19	3400002	A4		A			1.00
21/01/19	3400002	A2	white	A			1.00
21/01/19	3400002	A2	transparent	A			1.00
21/01/19	3400002	A9	black	A	3.00		1.00
22/01/19	3400003	A7	white	A	34.00	0.75	1.00
22/01/19	3400003	A7	white	A	2.00	0.09	1.00
22/01/19	3400003	A2	crème	B	4.00		1.00
22/01/19	3400004	A2	transparent	B	1.00		1.00
22/01/19	3400004	A5	Black	A		0.24	1.00
22/01/19	3400004	A5	blue	A		0.48	1.00
22/01/19	3400004	A2	transparent	B	1.00		1.00
22/01/19	3400004	A9	black	A	4.00	0.14	1.00
22/01/19	3400004	A5	orange	A		0.45	1.00
22/01/19	3400004	A2	white	B	1.00		1.00
22/01/19	3400004	A6	blue/orange	B	36.00		1.00
22/01/19	3400005	D2	green	C	134.00		1.00
22/01/19	3400005	A5	blue	A		0.53	1.00
22/01/19	3400005	A2	transparent, Amstel radler Dutch text	C	12.00		1.00
22/01/19	3400005	A2	transparent	A			1.00
22/01/19	3400005	A2	biscuit misshapes	A			1.00
22/01/19	3400005	A2	white	A			1.00
22/01/19	3400005	A2	blue	D	116.00		1.00
22/01/19	3400005	A2	white	C	8.00		1.00
22/01/19	3400006	A11	biscuit packaging	C	8.00		1.00
22/01/19	3400006	A5	blue	A		0.60	1.00
22/01/19	3400006	A5	blue	A		0.30	1.00
22/01/19	3400006	A5	blue	A		0.21	1.00
22/01/19	3400006	A5	blue	A		0.19	1.00
22/01/19	3400006	A5	orange	A		0.36	1.00
22/01/19	3400006	A5	orange	A		0.48	1.00
22/01/19	3400006	A5	orange	A		0.39	1.00
22/01/19	3400006	A5	orange	A		0.39	1.00
22/01/19	3400006	A5	orange	A		0.38	1.00
22/01/19	3400006	A5	orange	A		0.42	1.00
22/01/19	3400006	A5	orange	A		0.40	1.00
22/01/19	3400006	A5	orange	A		0.43	1.00
22/01/19	3400006	A5	orange	A		0.43	1.00
22/01/19	3400006	A5	orange	A		0.40	1.00
22/01/19	3400006	A5	orange	A		0.26	1.00
22/01/19	3400006	A5	orange	A		0.23	1.00
22/01/19	3400006	A2	grey	B	1.00		1.00
22/01/19	3400006	A2	black	A			1.00
22/01/19	3400006	A2	white	C	1.00		1.00
22/01/19	3400006	A2	transparent	D	8.00		1.00
22/01/19	3400006	A2	transparent	C	1.00		1.00

Date	Sample	Litter Type (A1; B2; C…)	Description (Label/ Brand)	Size category (A; B; C..)	Weight (g)	Length (m)	Number of items
22/01/19	3400006	A2	mini cheddars (best before 2015)	C	1.00		1.00
22/01/19	3400006	A2	transparent	D	13.00		1.00
22/01/19	3400006	A3	blue	C	12.00		1.00
22/01/19	3400006	A3	transparent	C	3.00		1.00
22/01/19	3400006	A3	white transparent	D	14.00		1.00
23/01/19	3400007	A9	black	A	3.00	0.48	1.00
23/01/19	3400007	A2	white	C	4.00		1.00
23/01/19	3400007	F1	cloth, arm of a shirt	D	101.00		1.00
23/01/19	3400007	A14	red	A	7.00		1.00
23/01/19	3400007	A2	transparent	B	2.00		1.00
23/01/19	3400007	A5	blue	A		0.90	1.00
23/01/19	3400007	A5	orange	A		0.40	1.00
23/01/19	3400007	A5	orange	A		0.75	1.00
23/01/19	3400007	A5	orange	A		0.39	1.00
23/01/19	3400007	A5	orange	A		0.30	1.00
23/01/19	3400007	A5	orange	A		0.30	1.00
23/01/19	3400007	A5	black	A		0.37	1.00
23/01/19	3400007	A5	greenish	A		0.50	1.00
23/01/19	3400007	A5	green	A		0.31	1.00
23/01/19	3400008	A5	orange	A		0.13	1.00
23/01/19	3400008	A2	black garbage bag	A			1.00
23/01/19	3400008	A7	green	A		0.06	1.00
23/01/19	3400008	A7	white	A	3.00	0.12	1.00
23/01/19	3400008	A2	transparent	B	2.00		1.00
23/01/19	3400009	A2	blueish	C	3.00		1.00
23/01/19	3400009	A7		B	23.00	0.23	1.00
23/01/19	3400009	A5	blue	A		0.48	1.00
23/01/19	3400009	A5	blue	A		0.23	1.00
23/01/19	3400009	A5	white	A		0.17	1.00
23/01/19	3400009	A3	black garbage bag	D	80.00		1.00
23/01/19	3400010	EMPTY					
24/01/19	3400011	A3	transparent	D	72.00		1.00
24/01/19	3400011	A5	blue	A		0.60	1.00
24/01/19	3400011	A6	blue, orange, white, black, green	B	16.00		1.00
24/01/19	3400012	A7	green	A		0.35	1.00
24/01/19	3400013	C6	rubber tire	D	1550.00	4.00	1.00
24/01/19	3400013	A2	blue transparent	C	2.00		1.00
24/01/19	3400013	A5	orange	A		0.64	1.00
24/01/19	3400013	A2	blue/yellow	C	38.00		1.00
24/01/19	3400013	A2	transparent	B	1.00		1.00
24/01/19	3400013	A5	transparent	A			1.00
24/01/19	3400013	A7	green	A			1.00
24/01/19	3400014	C6	rubber tire	C	105.00		1.00
24/01/19	3400014	A7	orange	B	52.00		1.00
24/01/19	3400014	E1			373.00		1.00
24/01/19	3400014	A5	black	A		0.25	1.00

Date	Sample	Litter Type (A1; B2; C…)	Description (Label/ Brand)	Size category (A; B; C..)	Weight (g)	Length (m)	Number of items
24/01/19	3400014	A5	blue	A		0.38	1.00
24/01/19	3400014	B8	spacer	A	8.00		1.00
24/01/19	3400014	E2		A	4.00	0.13	1.00
29/01/19	3400015	A7	orange	A	2.00	0.08	1.00
29/01/19	3400015	A5	blue	A		0.62	1.00
29/01/19	3400015	E3	white	B	30.00		1.00
29/01/19	3400015	A7	blue	B	24.00	0.79	1.00
29/01/19	3400015	A14	knife, plastic handle metallic blade	B	24.00		1.00
29/01/19	3400016	A2	transparent	D	325.00		1.00
29/01/19	3400016	A14	blue tube, crab cage	B	85.00		1.00
29/01/19	3400016	A14	yellow tube, crab cage	C			1.00
29/01/19	3400016	A8	net, crab cage	C	550.00		1.00
29/01/19	3400016	A7	blue	A			1.00
29/01/19	3400017	A5	orange	A		0.62	1.00
29/01/19	3400017	A5	turquoise	A		0.10	1.00
29/01/19	3400017	A5	turquoise	A		0.39	1.00
29/01/19	3400018	A5	orange	A		0.21	1.00
29/01/19	3400018	A5	black	A		0.78	1.00
29/01/19	3400018	A5	back	A		0.53	1.00
29/01/19	3400018	A2	white	B	1.00		1.00
29/01/19	3400018	C1	boot sole	C	372.00		1.00
30/1/19	3400019	A5	orange	A		0.14	1.00
30/1/19	3400019	A5	orange	A		0.79	1.00
30/1/19	3400019	A8	Fishing net+ floats	E	12310.00		1.00
30/1/19	3400020	A5	blue	A		0.63	1.00
30/1/19	3400021	A5	orange	A		0.51	1.00
30/1/19	3400021	A5	orange	A		0.73	1.00
30/1/19	3400022	A5	orange	A		0.42	1.00
31/1/19	3400023	EMPTY					
31/1/19	3400024	A5	blue	A		0.15	1.00
31/1/19	3400025	A2	transparent	C	5.00		1.00
31/1/19	3400025	A14	glove	C	89.00		1.00
31/1/19	3400026	A5	orange	A		0.10	1.00
31/1/19	3400026	B8	nail	A	3.00		1.00
31/1/19	3400027	A5	white	A		0.38	1.00
1/2/19	3400028	A8	fishing net	F	12475.00		1.00
1/2/19	3400029	A5	orange, entangled	B	3.00		1.00
1/2/19	3400030	A5	black	A		0.62	1.00
1/2/19	3400030	A5	turquoise	A		0.20	1.00
1/2/19	3400030	A5	orange	A		0.22	1.00
1/2/19	3400030	A2	transparent	A			1.00
1/2/19	3400030	A2	transparent	A			1.00
1/2/19	3400031	A2	transparent	B	1.00		1.00
1/2/19	3400031	A9	green	A			1.00
1/2/19	3400031	A2	black transparent	A			1.00
4/2/19	3400032	EMPTY					
4/2/19	3400033	A5	blue	A		0.13	1.00

Date	Sample	Litter Type (A1; B2; C…)	Description (Label/ Brand)	Size category (A; B; C..)	Weight (g)	Length (m)	Number of items
4/2/19	3400034	A5	blue	A		1.90	1.00
4/2/19	3400034	A3	transparent	A	17.00		1.00
4/2/19	3400035	A5	orange	A			1.00
5/2/19	3400036	A2	transparent	B	1.00		1.00
5/2/19	3400037	A2	transparent	C	2.00		1.00
5/2/19	3400038	EMPTY					
5/2/19	3400039	A2	white	D	41.00		1.00
5/2/19	3400039	E1		B	137.00		1.00
6/2/19	3400040	EMPTY					
11/2/19	3400041	EMPTY					
11/2/19	3400042	EMPTY					
12/2/19	3400043	EMPTY					
12/2/19	3400044	EMPTY					
12/2/19	3400045	A2	transparent	D	88.00		1.00
12/2/19	3400045	A2	white	C	8.00		1.00
12/2/19	3400045	A2	transparent	C	8.00		1.00
12/2/19	3400045	E1		C	1462.00		1.00
12/2/19	3400046	A2	transparent, yellow lines	C	13.00		1.00
12/2/19	3400046	A2	white	B	1.00		1.00
13/2/19	3400047	A11	transparent, paint in the container	C	130.00		1.00
13/2/19	3400047	A2	black, garbage bag	D	22.00		1.00
13/2/19	3400047	A7	orange	A	36.00	1.17	1.00
13/2/19	3400047	A5	angling line	A	6.00	0.45	1.00
13/2/19	3400048	A7	turquoise	A	4.00	0.43	1.00
13/2/19	3400048	A2	white	B	6.00		1.00
13/2/19	3400049	EMPTY					
13/2/19	3400050	A2	mentos candy wrapper (France)	B	4.00		1.00
14/2/19	3400051	A2	white, marmite	B	1.00		1.00
14/2/19	3400052	A2	transparent	D	80.00		1.00
14/2/19	3400053	A2	transparent	D	93.00		1.00
14/2/19	3400053	A7	orange	A	23.00	0.83	1.00
14/2/19	3400053	A5	blue	A		0.95	1.00
14/2/19	3400053	A5	blue	A		0.65	1.00
14/2/19	3400053	A5	blue	A		0.95	1.00
14/2/19	3400053	A5	blue	A		0.78	1.00
14/2/19	3400053	A5	blue	A		0.38	1.00
14/2/19	3400053	A5	blue	A		0.56	1.00
14/2/19	3400053	A5	blue	A		0.26	1.00
14/2/19	3400053	A5	blue	A		0.50	1.00
14/2/19	3400053	A5	orange	A		0.25	1.00
14/2/19	3400053	A5	orange	A		0.76	1.00
14/2/19	3400053	A5	orange	A		0.95	1.00
14/2/19	3400053	A5	black	A		0.43	1.00
14/2/19	3400053	A6		A	17.00		1.00
14/2/19	3400053	A7	orange	A	6.00	0.60	1.00
14/2/19	3400053	A2	transparent	A			1.00

Date	Sample	Litter Type (A1; B2; C…)	Description (Label/ Brand)	Size category (A; B; C..)	Weight (g)	Length (m)	Number of items
14/2/19	3400054	A2	baby blue	D	12.00		1.00
14/2/19	3400054	A2	white	B	2.00		1.00
14/2/19	3400054	A5	fishing line	A		0.68	1.00
14/2/19	3400055	A7		A	4.00	0.11	1.00
14/2/19	3400055	A5	blue	A		0.66	1.00
14/2/19	3400055	A5	blue	A		0.16	1.00
14/2/19	3400055	A5	orange	A		0.50	1.00
14/2/19	3400055	A5	orange	A		0.26	1.00
14/2/19	3400055	A5	orange	A		0.35	1.00
14/2/19	3400055	A5	orange	A		0.33	1.00
14/2/19	3400055	A5	natural colour	A		0.49	1.00
18/2/19	3400056	A2	transparent	A			1.00
18/2/19	3400056	A5	orange	A		0.38	1.00
18/2/19	3400057	A2	white	B	1.00		1.00
18/2/19	3400057	A2	tissue cover	B	4.00		1.00
18/2/19	3400057	A2	brownish	B	1.00		1.00
18/2/19	3400057	A14	black	B	1.00		1.00
18/2/19	3400057	A7	black	A		0.38	1.00
18/2/19	3400057	E1		A	4.00		1.00
19/2/19	3400058	A2	blue, food wrapper	A			1.00
19/2/19	3400058	A2	transparent	A			1.00
19/2/19	3400059	A5	orange	A		0.65	1.00
19/2/19	3400059	A5	orange	A		0.93	1.00
19/2/19	3400059	A5	blue	A		0.31	1.00
19/2/19	3400059	A2	blueish transparent	D	57.00		1.00
19/2/19	3400059	A2	blue	A			1.00
19/2/19	3400059	A2	white	B	6.00		1.00
19/2/19	3400059	A2	transparent	C	2.00		1.00
19/2/19	3400059	A2	pink	B	1.00		1.00
19/2/19	3400060	A2	white, protect molled 14st.	D	29.00		1.00
19/2/19	3400060	A2	transparent	D	36.00		1.00
19/2/19	3400060	A2	transparent	C	7.00		1.00
19/2/19	3400060	A2	white	A			1.00
19/2/19	3400060	A2	needle package	B	1.00		1.00
19/2/19	3400060	A7	green	A		0.17	3.00
19/2/19	3400060	A14	purple, white, balloon stings	A	13.00		1.00
19/2/19	3400060	C2	balloon	A	3.00		1.00
19/2/19	3400060	A6	orange, brownish, yellow.	C	182.00		1.00
19/2/19	3400060	A7	blue, separated from the A6	B	3.00		1.00
19/2/19	3400061	EMPTY					
20/2/19	3400062	A2	chips bag Mister Chips	C	13.00		1.00
20/2/19	3400062	A5	orange	A		1.80	1.00
20/2/19	3400062	A2	transparent	D	95.00		1.00
20/2/19	3400062	C6	grey, fridge door rubber	A	43.00	0.80	1.00
20/2/19	3400062	A2	transparent	A			1.00
20/2/19	3400063	B8		A	1.00	0.09	1.00

Date	Sample	Litter Type (A1; B2; C…)	Description (Label/ Brand)	Size category (A; B; C..)	Weight (g)	Length (m)	Number of items
20/2/19	3400063	A5	orange	A	1.00		1.00
20/2/19	3400063	A6	blue	B	10.00		1.00
20/2/19	3400063	A3	transparent	D	43.00		1.00
20/2/19	3400063	A14	black	A	2.00		1.00
20/2/19	3400063	A2	blueish transparent	B	6.00		1.00
20/2/19	3400063	F1		A	1.00		1.00
20/2/19	3400064	A3	bag of bread, "De echte bakker, Urkerhard"	D	19.00		1.00
20/2/19	3400064	A14	TV remote control, humax	B	147.00		1.00
20/2/19	3400064	C6	Female belt, zolla,	B	84.00	103.00	1.00
20/2/19	3400064	A14	Backside of tv	D	611.00		1.00

Annex 2 Photos of seafloor litter in the Dutch IBTS Q1 2019

Photos are captioned as follows:
Haul number: General description (subcategory) [from left to right and top to bottom]

Haul 3400001: monofilament x 2 (A5), synthetic rope x2 (A7), transparent sheet (A2), processed wood x9 (E1) and black cable tie (A9)

Haul 3400002: cable tie x2 (A9), transparent sheet (A2), white sheet (A2), synthetic rope (A7), welding rod (B8) and lid (A4)

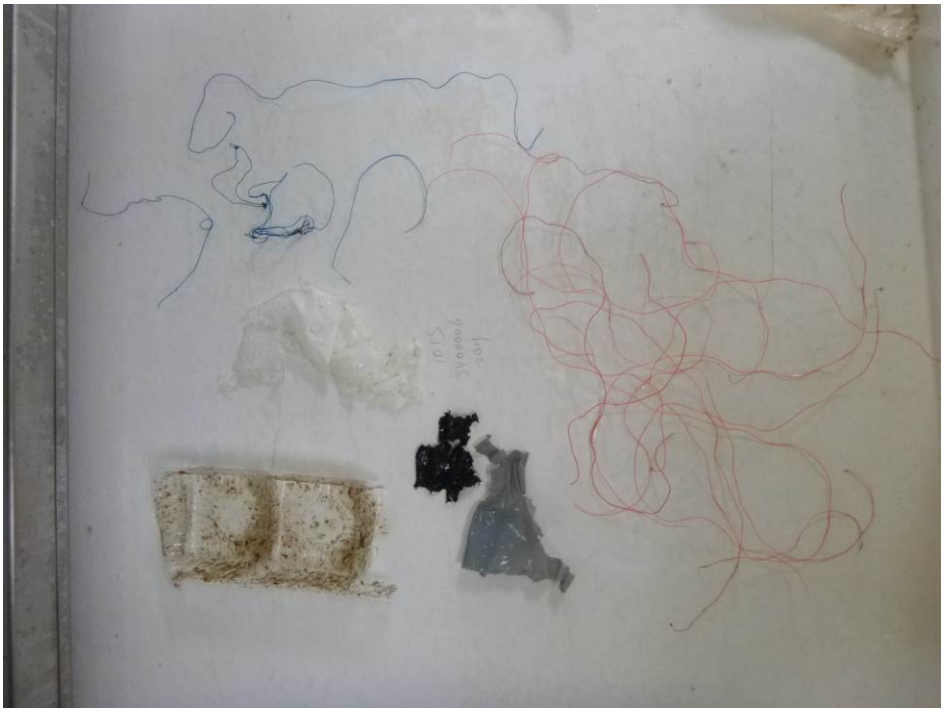
Haul 3400003: Sheet (A2), synthetic rope (A7)

Haul 3400004: Transparent Sheet (A2), monofilament x2 (A5), entangled (A6), cable tie (A9), transparent sheet (A2), Monofilament x2 (A5)

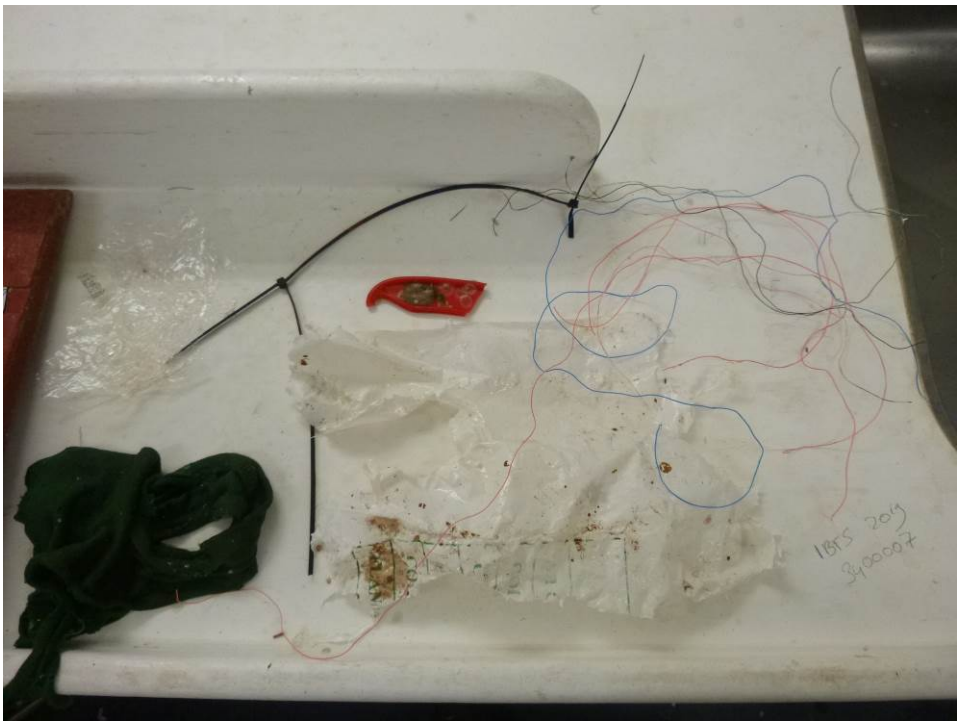
Haul 3400005: Glass bottle with anemone (D2), sheet x4 (A2) and blue monofilament (A5)

Haul 3400005: blue plastic sheet (A2) and transparent plastic sheet (A2)

Haul 3400006: transparent sheet x 3 (A2), transparent bag x2 (A3, blue bag (A3)



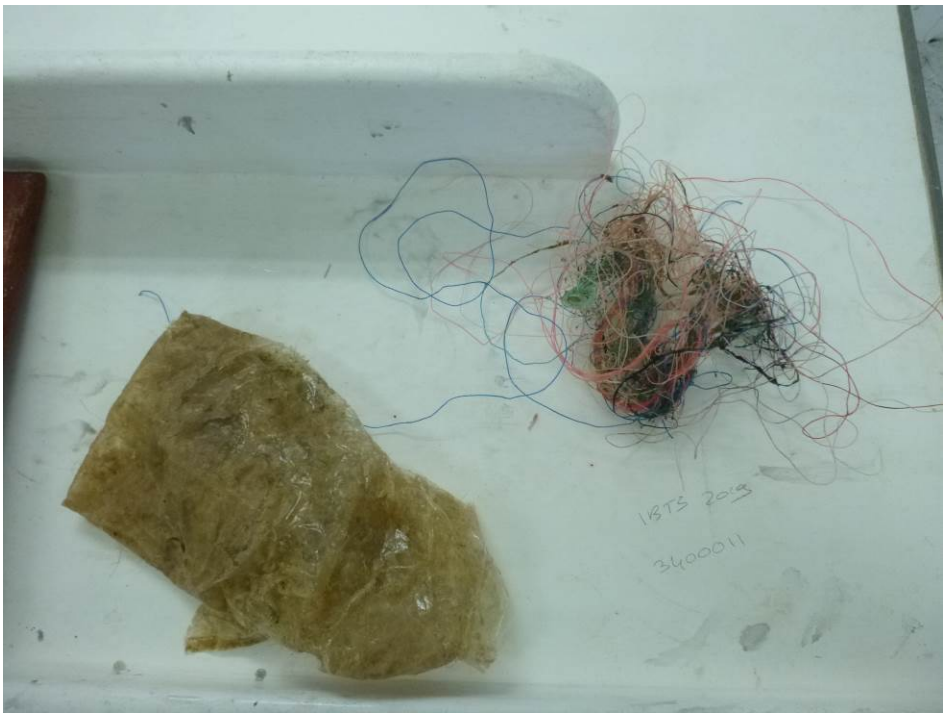
Haul 3400006: sheet transparent x2 (A2) sheet black (A2), sheet grey(A2), monofilament x16 (A5)



Haul 3400007: transparent sheet (A2), arm of a shirt (F1), cable tie (A9), red Plastic (A14), white sheet (A2), monofilament (A5)

Haul 3400008:transparent sheet (A2), monofilament orange (A5), synthetic rope (A7), synthetic rope (A7), plastic sheet (A2)

Haul 3400009: monofilament blue x2 (A5), synthetic rope (A7), monofilament white (A5), sheet (A2), black bag (A3)



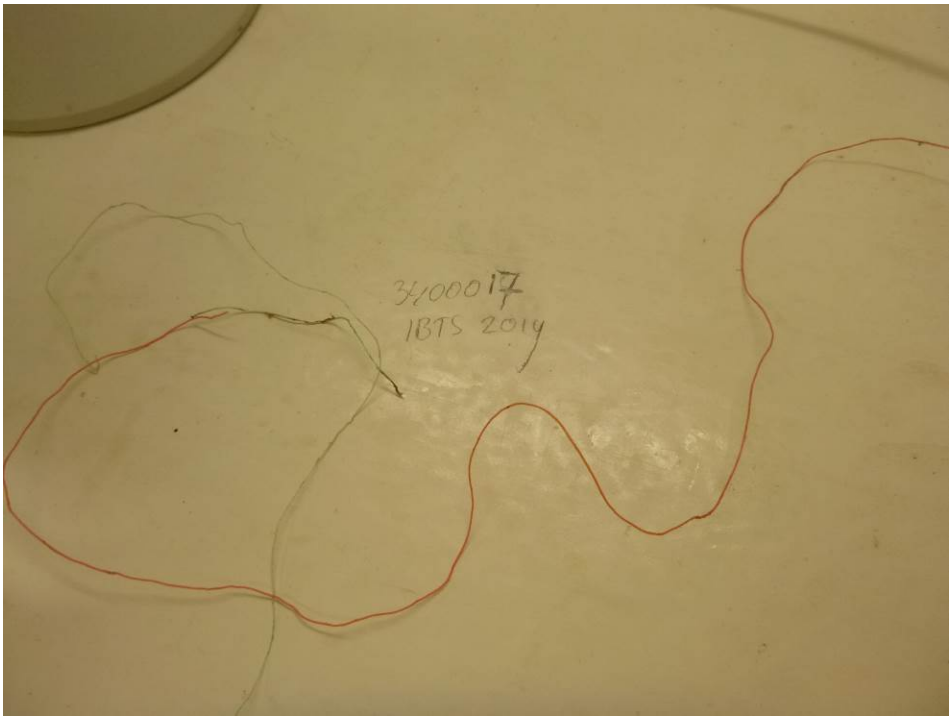
Haul 3400011: bag (A3), monofilament blue (A5), entangled filaments (A6)

Haul 3400013: rubber tire (C6), monofilament (A5), synthetic rope (A7), plastic sheet x2 (A2)

Haul 3400014: synthetic rope (A7), rubber tire (C6), natural rope (E2), monofilament x2 (A5), spacer (B8), processed wood (E1).

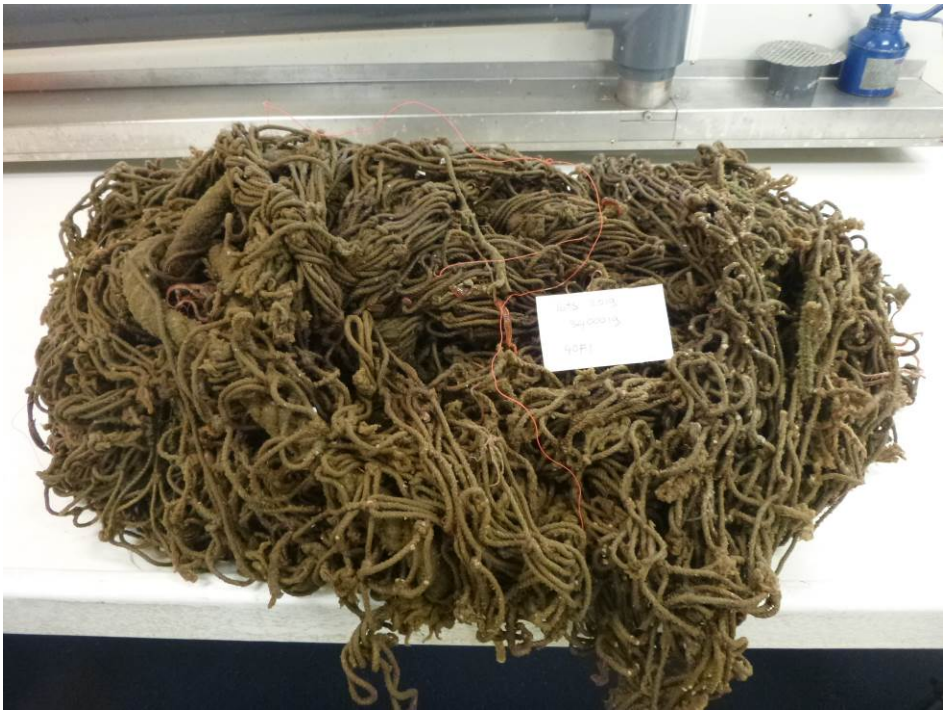
Haul 3400015: synthetic rope (A7), monofilament (A5), syntehtic rope (A7), knife (A14) and Paper (E3)

Haul 3400016: Yellow tube of a crab cage (A14), blue tube of a crab cage (A14), netting of crab cage (A8), sheet (A2)



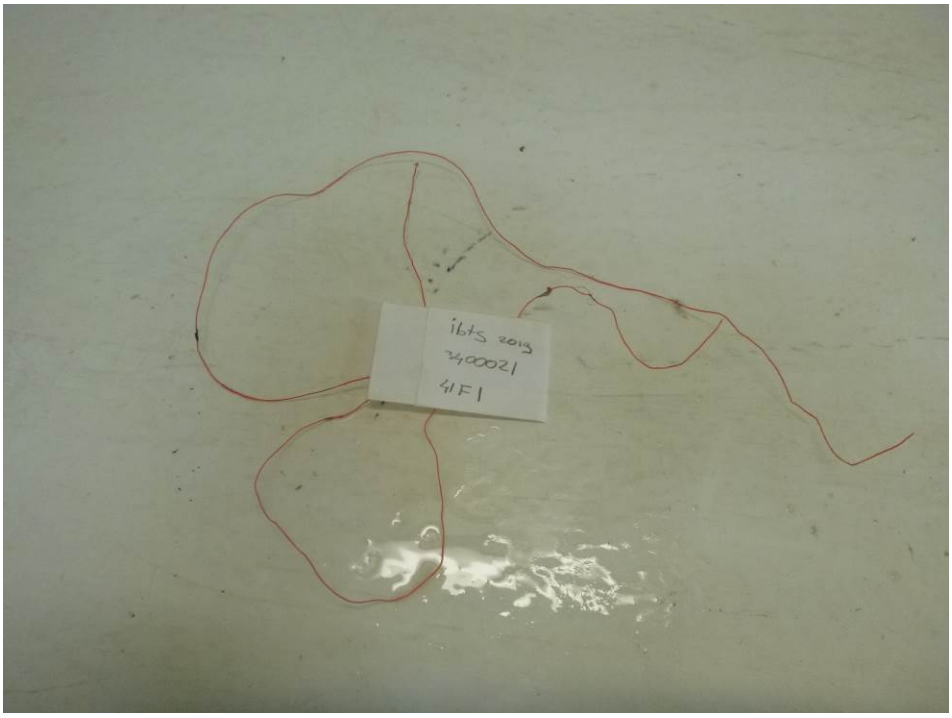
Haul 3400017: monofilament x3 (A5)

Haul 3400018: sheet (A2), monofilament x3 (A5), sole of a boot (C1)

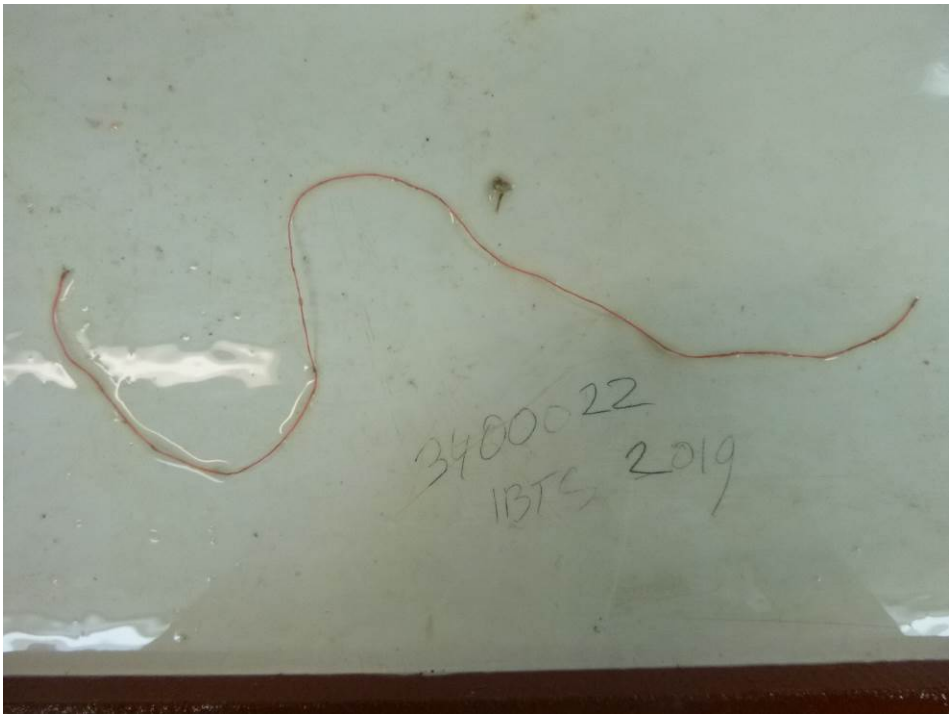


Haul 3400019: fishing net + floats (A8) and monofilament (A5)

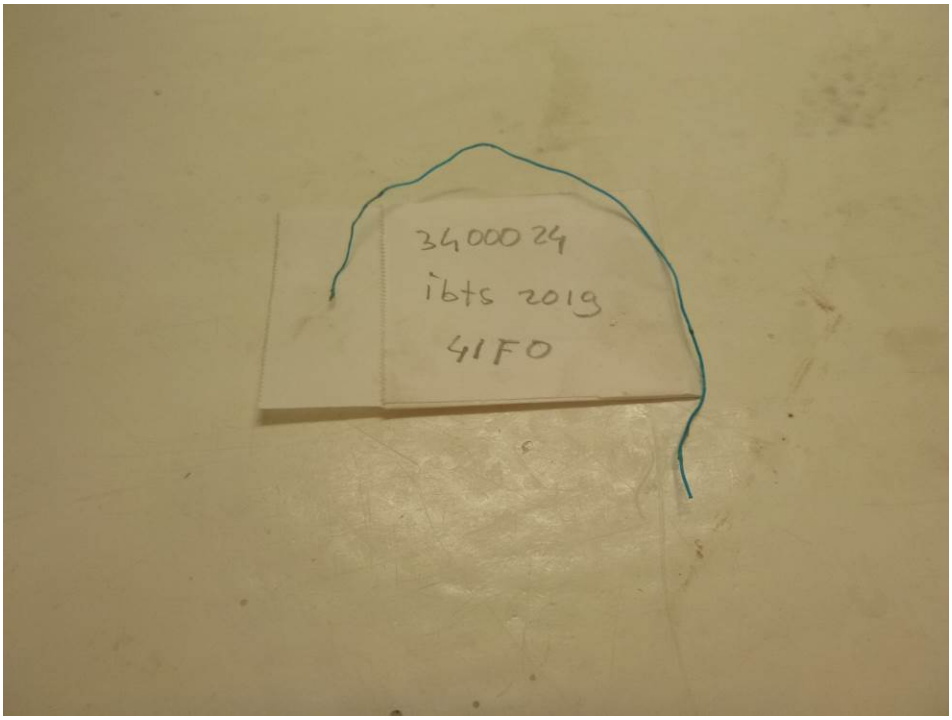
Haul 3400020: monofilament (A5)



Haul 3400021: monofilament x 2 (A5)



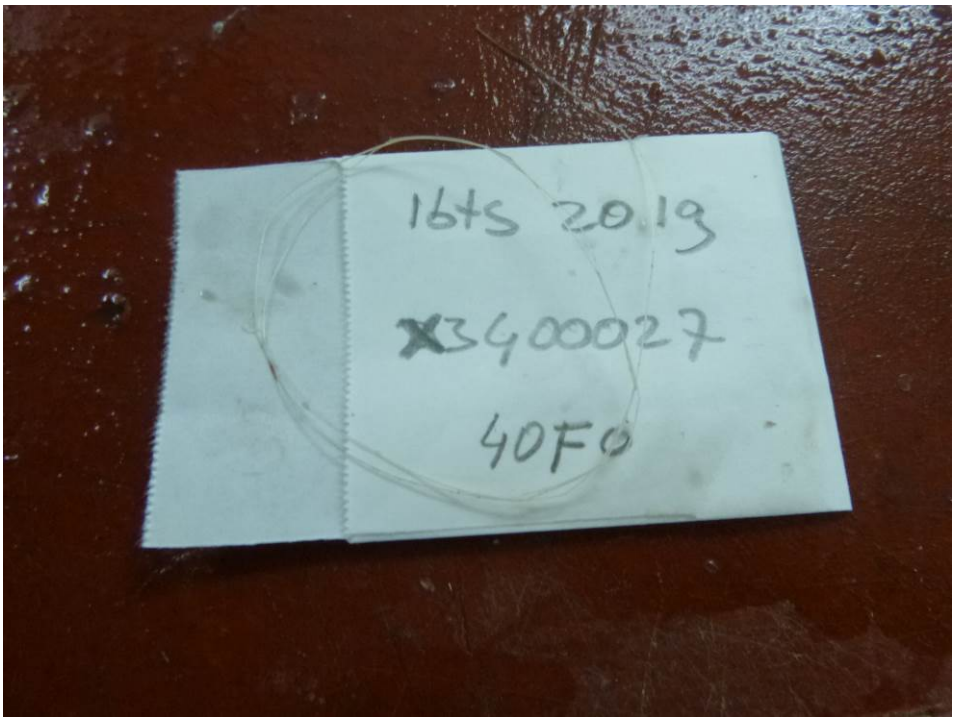
Haul 3400022: monofilament x1 (A5)



Haul 3400024: monofilament (A5)

Haul 3400025: plastic sheet (A2), glove (A14)

Haul 3400026: monofilament (A5), nail (B8)



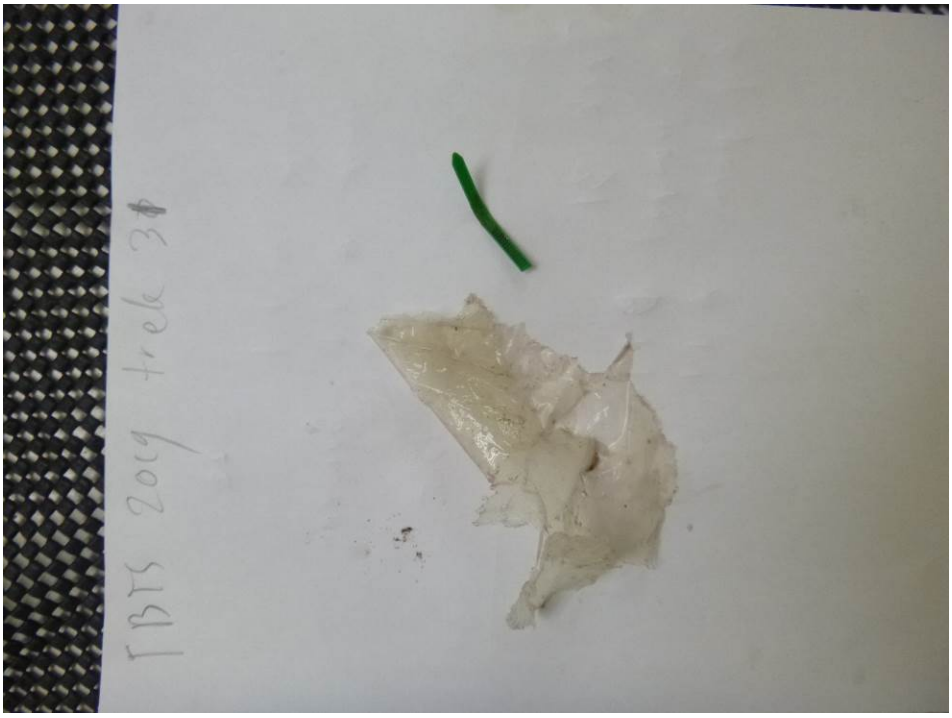
Haul 3400027: monofilament (A5)

Haul 3400028: fishing net (A8)

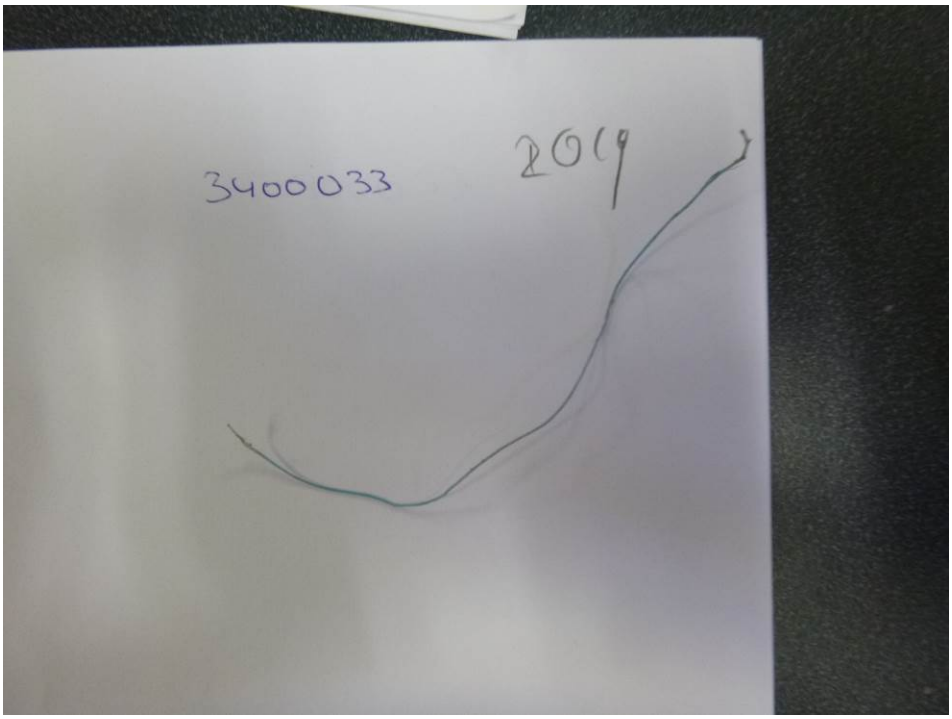
Haul 3400029: monofilament (A5)

Haul 3400030: monofilament (A5)

Haul 3400030: sheet x2 (A2), monofilament (A5)



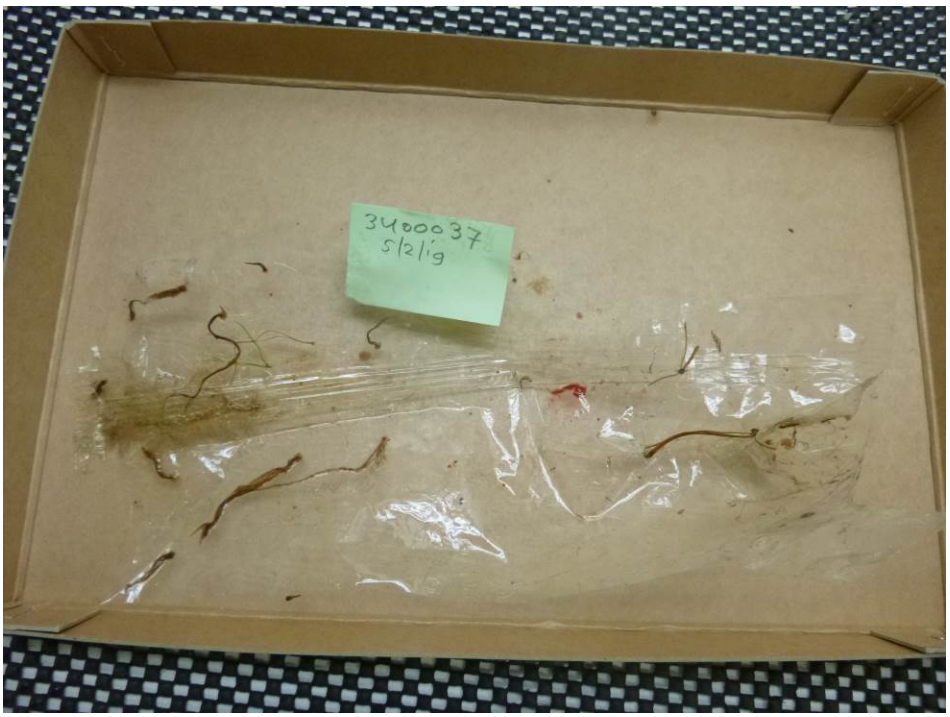
Haul 3400031: sheet x2 (A2), cable tie (A9)



Haul 3400033: monofilament (A5)

Haul 3400034: sheet (A2), monofilament (A5)

Haul 3400036: sheet (A2)



Haul 3400037: sheet (A2)

Haul 3400039: white sheet (A2), processed wood (E1)

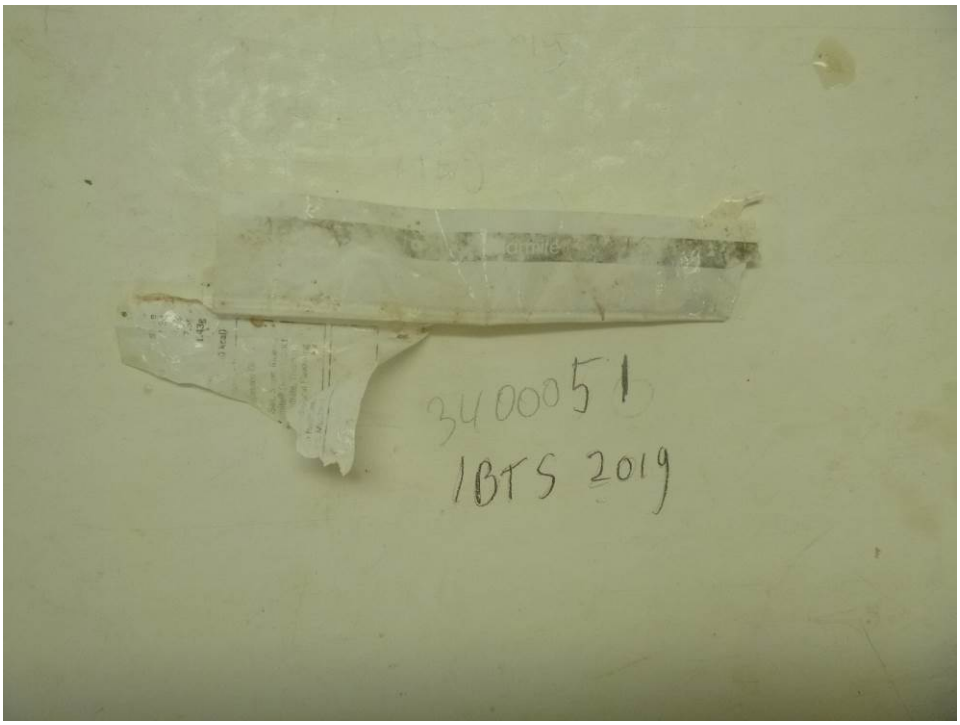
Haul 3400045: sheet (A2), processed wood (E1)

Haul 3400046: plastic sheet (A2)

Haul 3400047: bottle with paint (A11), synthetic rope (A7), sheet (A2), angling line (A5)

Haul 3400048: synthetic ropes (A7), sheet (A2)

Haul 3400050: candy wrapper (A2)

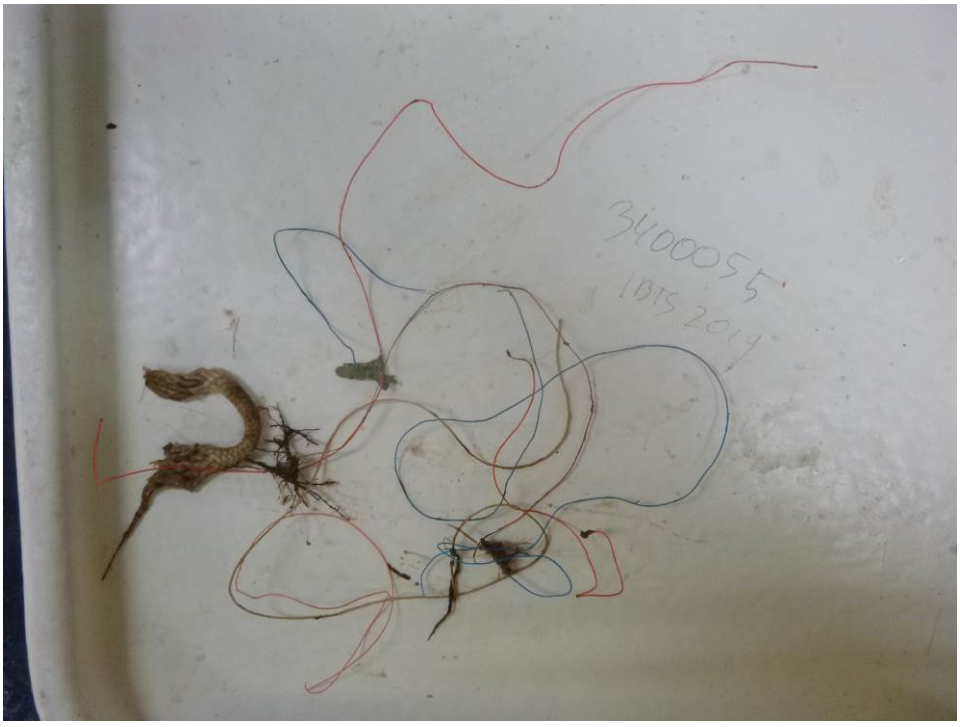


Haul 3400051: sheet (A2)

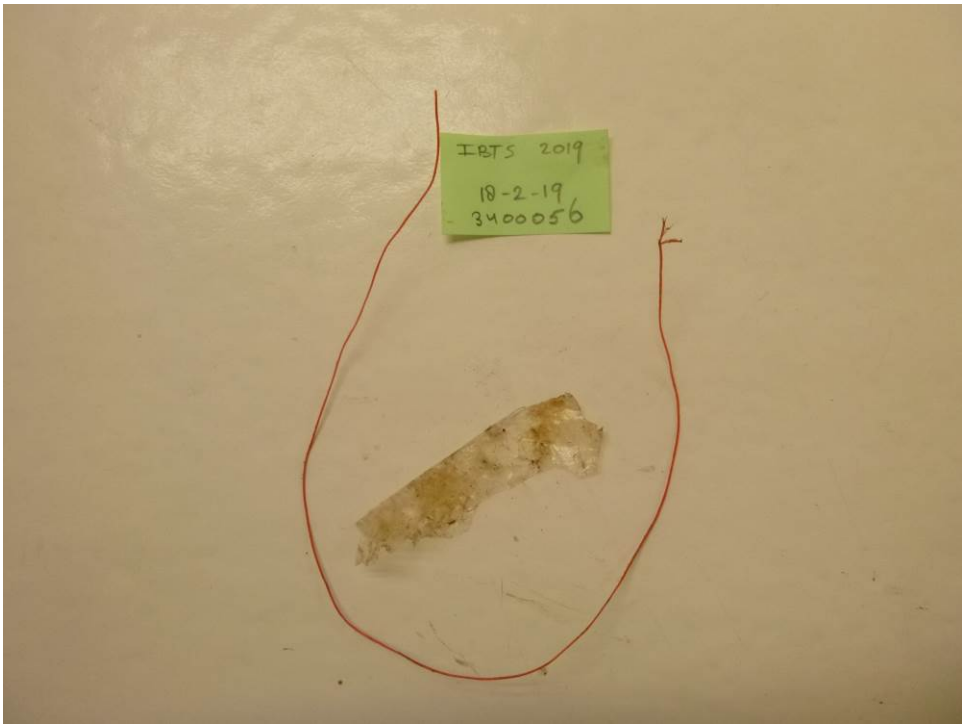
Haul 3400052: plastic sheet (A2)

Haul 3400053: monofilament x12 (A5), synthetic rope (A7), sheet (A2)

Haul 3400054: monofilament (A5) plastic sheet x2 (A2)



Haul 3400055: synthetic rope (A7), monofilament (A5)



Haul 3400056: plastic sheet (A2) and monofilament (A5)

Haul 3400057: plastic (A14), plastic sheet x3 (A2), processed wood (E1) and synthetic rope (A7)

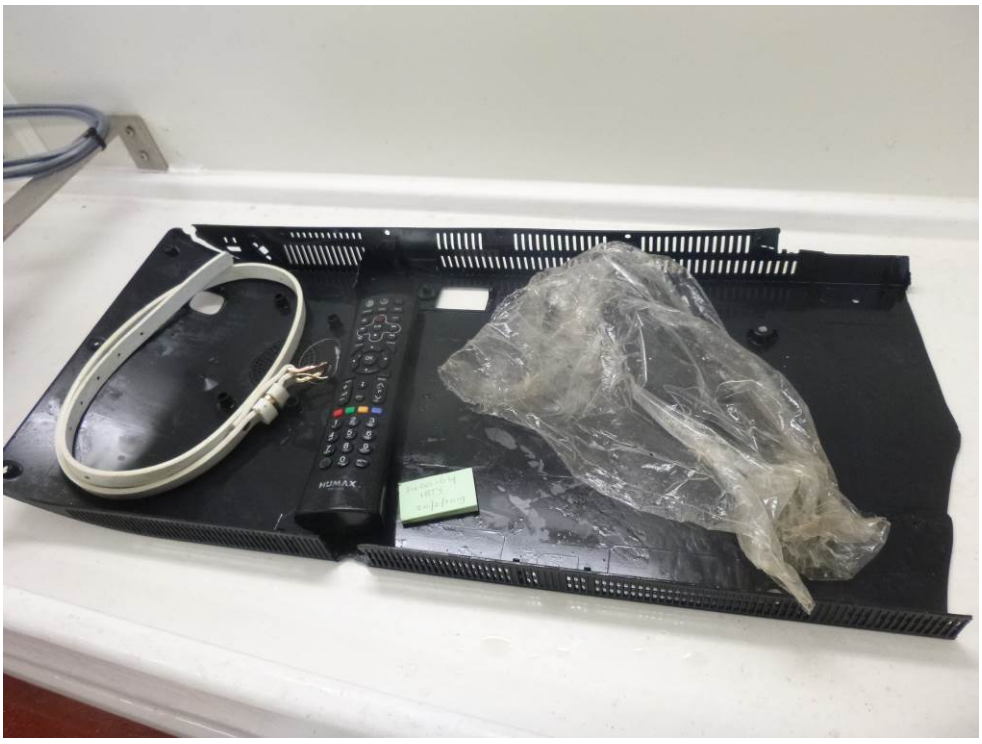
Haul 3400058: plastic sheet x2 (A2)

Haul 3400059: plastic sheet x5 (A2), monofilament x3 (A5)

Haul 3400060: Entangled filament (A6), monofilament blue (A7), sheet (A2), needle package (A2), sheet x3 (A2), Balloon strings (A14), balloon (C2)

Haul 3400062: plastic sheet x3 (A2), fridge door rubber (C6), monofilament (A5)

Haul 3400063: Entangled filament (A6), bag (A3), monofilament (A5), metal (B8), cloth (F1), plastic (A14), sheet (A2)



Haul 3400064: backside TV (A14), Female belt, Zolla, (C6), remote control (A14), bag (A3)

Annex 3 Comparison with Beam Trawl catches

In the main body of the report, issues are raised concerning the catchability of litter by the GOV used during the IBTS. The chance of catching litter items present on the seafloor is expected to be low, even to be random (the assumption is that <5% of the items is caught). This is a notable issue to consider when interpreting the amounts of litter caught by, and reported for the IBTS, as these are clearly a large underestimation of the actual amounts present on the seafloor. If the assumption that litter is caught randomly is indeed true, the IBTS can only be used as an indication of the presence of litter items, not as an indicator for presence-absence, nor as an indicator for the amounts of litter present.

A gear with both better bottom contact and higher catches of seafloor litter than the GOV is the beam trawl (Van der Sluis & van Hal, 2014). However, the beam trawl also has catchability issues and as such there is an issue with the underestimation of the actual amounts as well. A beam trawl of 8 m with a 40 mm codend mesh size is used during the Dutch Beam Trawl Survey [DBTS], a statutory survey in the North Sea that takes place in the third quarter of every year. During the DBTS, litter items are recorded following a similar methodology to that of the IBTS in the first quarter. Thus methodologically, the amounts could be compared. However, seasonal influences, spatial extent and habitat differences (the beam trawl can be used in other habitats than the GOV) hamper the straightforward comparison of the seafloor litter quantities in both surveys. **Table 1** presents the main differences between the IBTS and DBTS. Despite the aforementioned issues, the beam trawl catches of the 2016 survey are presented as an initial comparison to the catches from the GOV.

Annex 3 table 1. *Main differences between IBTS and DBTS*

	IBTS	**DBTS**
Location	North Sea	North Sea
Time of year	Q1	Q3
Duration of survey	5 weeks	4 weeks
Gear	Grande Ouverture Verticale	Beam Trawl
Gear info	"Semi pelagic" bottom trawl	Beam Trawl
Net width	Variable 15-20m	8m
Codend mesh size	10mm	40mm

The most noticeable difference is the composition of the litter caught by the two gears. Plastic accounts for 83-88% of the seafloor litter caught by the GOV, compared to just 54% of the litter caught during the 2016 DBTS (**Figure 1**). A much larger proportion of the litter in the DBTS is classified as Miscellaneous compared to the IBTS. This indicates that litter types are distributed differently on or in the seafloor. The beam trawl scrapes the top layer of the seafloor and catches items actually buried in this top layer, while the GOV touches the bottom and solely catches the items on top off or slightly floating above the seafloor.

The difference in the amount of litter caught is the other noticeable difference, due mostly related to the type of gear, although the above-mentioned effects should not be neglected. Comparing the absolute values per haul is not particularly relevant as the amount of seafloor covered is higher in the IBTS than in the DBTS. Therefore only the number of items per km^2 is of interest. Here, the larger catches of the DBTS become clear, with average catches of 296.3 items per km^2 (**Table 3**) compared to 40.3 to 115.9 items per km^2 in the IBTS (**table 3-1**). Indeed, the average catch of the DBTS is higher than the maximum catch of the IBTS in 2018.

The presence-absence of litter items indicates that DBTS has a higher chance of catching a litter item (or fishes in areas with more often litter presence). In 2016, only one of the 73 DBTS hauls contained no litter item, compared to 11 out of 54 hauls of the IBTS in 2018. As a haul of the IBTS covers a more seafloor this difference is larger.

The background of the comparison between these two gears is to calculate a conversion factor to raise the amount of litter in the IBTS to "real" amounts of litter in the North Sea. A conversion factor could also enable the amalgamation of datasets of these two gears in a single analysis, thus increasing the

number of data points and strengthening the analysis. **Table 2** presents the advantages for and disadvantages of a conversion factor.

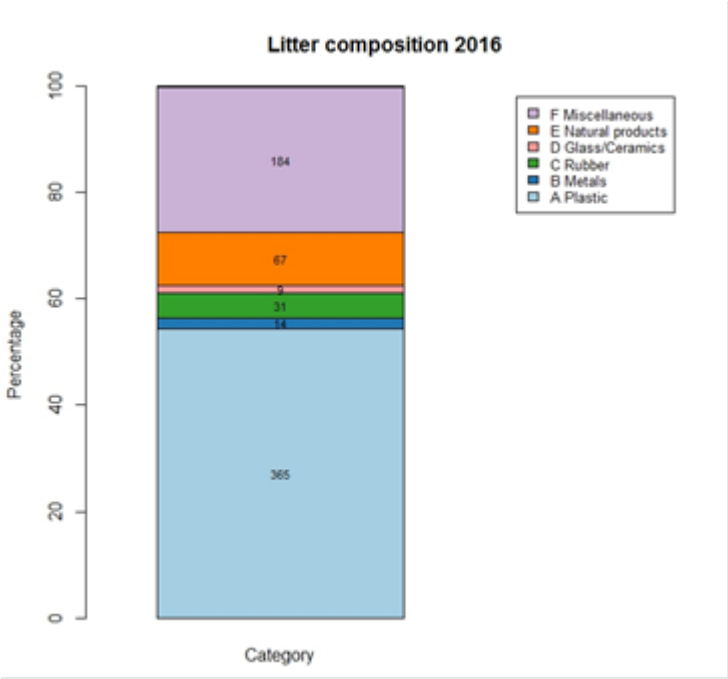
Annex 3 table 2. *A summary of the advantages for and disadvantages of a conversion factor*

Advantages	Challenges
- Raising the amounts of litter in the IBTS brings the values closer to actual amounts present on the sea floor - More realistic amounts are better for raising awareness - Allows for the expansion of the dataset by combining information of the two surveys, with the intention of improving statistical power	- The calculation of a conversion factor is hampered because the gears are not used at the same time, in the same spatial area and in the same habitats - A single conversion factor can't be calculated because the catchability for the various litter types varies for the two gears (larger proportion of plastic in the IBTS) and probably even for items within the same subcategory - Raising the amounts of litter in the IBTS will not give the "real" amounts of litter in the North Sea as the DBTS has its own catchability issues - Raising the amounts of litter in the IBTS will not raise the zero catches of the IBTS, while the presence-absence data of the DBTS indicate that the zeros in the IBTS are unlikely to be all areas without litter - Raising the IBTS data will not affect the trend analyses based on these data only (except that the zeros will have a different influence as these are not raised)

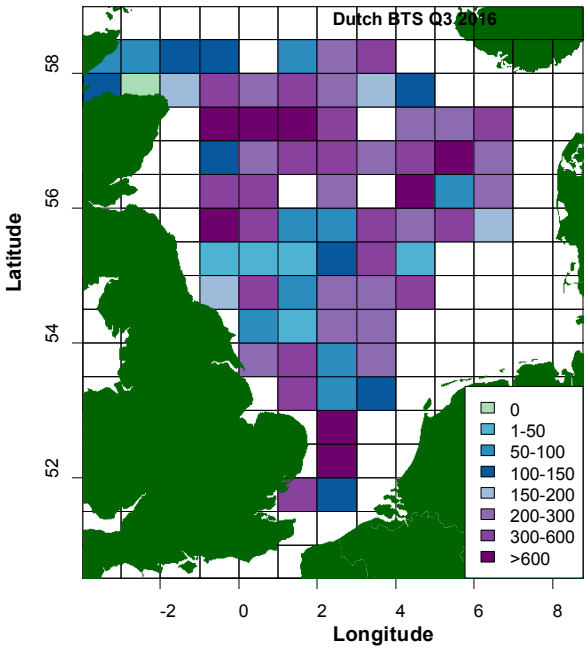
The challenges indicate that we are not advocating for using the conversion factor. However, there are statistical techniques that could be used to combine these different datasets in a single analysis. WGML (ICES 2018) has been considering these techniques, but these require that there are no collinear factors. Collinearity is a problem for the two Dutch datasets, as different areas, habitats covered and time are all collinear with the difference in gears. Therefore, WGML has reviewed the international data and there is overlap between the International IBTS Q3 and the DBTS at least with respect to area and time, although habitats might still differ. WGML hasn't carried out combined analyses as of yet, as there were still a large number of data issues to be solved. This type of combined analysis is one of the terms of reference for WGML in the years to come.

Annex 3 table 3. Summary data of the Dutch 2016 BTS litter catches. *Each parameter is presented with its minimum, maximum, mean, median and median absolute deviation values*

DBTS 2016	min	max	mean	median
Items per trawl	0	36	9.1	7
Items per km²	0	1286.8	296.3	247.2



Annex 3 figure 1. Composition of the seafloor litter in the catches of the Dutch BTS Q3 2016. *Values within the graph are the absolute number of items for the categories containing more than 1% of the total items counted. Plastic represents the largest category with 365 items (54.4 %) of the 670 litter items caught.*



Annex 3 figure 2. Density of litter items per km² for the DBTS Q3 2016*. The highest density in 2016 (1286 items per km²) was observed east of the Scottish coast (Aberdeen), situated in the middle of the three purple rectangles. The only rectangle in which no litter was caught was located in the Moray Firth. For rectangles in which two hauls were carried out, the average of the density of litter items per haul per km² was used. The white rectangles were not sampled by the Dutch survey.*

Annex 4 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 publically available. The data of the fish surveys is made publically available as raw data (Exchange format) and in a large variety of data-products depending on the survey (for example indices, Age-Length-keys, CpUE 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 publically available. The Dutch data is provided to DATRAS every year after the survey, with a deadline of providing the data prior to 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 you can select the download page and the DATRAS documents page. The last contains all the relevant documents 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:
    - Litter Exchange data (raw data)
    - Litter Assessment output (the OSPAR product).
- Then select the preferred survey, relevant for the North Sea:
    - NS-IBTS
    - 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.

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Wageningen Marine Research is the Netherlands research institute established to provide the scientific support that is essential for developing policies and innovation in respect of the marine environment, fishery activities, aquaculture and the maritime sector.

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The Wageningen Marine Research vision
'To explore the potential of marine nature to improve the quality of life'

The Wageningen Marine Research mission
- To conduct research with the aim of acquiring knowledge and offering advice on the sustainable management and use of marine and coastal areas.
- Wageningen Marine Research is an independent, leading scientific research institute

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