



OSPAR Beach Litter Monitoring In the Netherlands 2009-2014 Annual Report



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Authors:

C. Blokhuis, M. Hougee, M. de Ruiter, (North Sea Foundation)

North Sea Foundation
Stichting De Noordzee

Client: Ministry of Infrastructure and the Environment
RWS Water, Traffic and the Environment, Postbus 17, 8200 AA Lelystad
Reference number: 31066363
Contact: Marcel van der Weijden (RWS CIV) and Willem van Loon (RWS WVL)
Email: marcel.vander.weijden@rws.nl; willem.van.loon@rws.nl
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North Sea Foundation project and author contact details:

Report number: Rijkswaterstaat BM 15.27
m.hougee@noordzee.nl
+31 30 2340016

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Summary

Marine litter – in particular plastic litter – is a major environmental problem. Qualitative and quantitative information about marine litter in our seas and oceans is required for policy development aiming to reduce marine litter and/or to assess effectiveness of existing programmes of measures.

This third annual report provides an overview of the Dutch beach monitoring and analysis results for 2009-2014. Since this research aims to provide insight in the Dutch situation, analyses were performed with aggregated results of all four Dutch beaches of Veere, Noordwijk, Bergen aan Zee and Terschelling. The number of specific and total litter is described using 6-year median and arithmetic averages, thus data over the period 2009-2014 was used. Significance of trends in number of specific and total litter items over time were assessed by non-parametric regression using untransformed data from item counts set out against the monitoring date. Analysis of beach litter monitoring data was performed using the tool Litter Analyst (version 2.0) (Baggelaar and Van der Meulen, 2014; AMO Icastat, 2014).

On average 389 items were found per 100 meter beach during the period 2009-2014. The data shows a decreasing trend in average numbers for all beaches aggregated (p-value = 0,573).

The top-80% resulted in a top 10 of most found litter items on the four monitored beaches, which is representative for the Dutch coast. For most litter items, there is a decreasing trend. However, the number 1 and 2 in the top 10, nets and ropes and plastic/polystyrene pieces smaller than 50 cm show an increasing trend. Together they account for more than half (54% / 215 counts) of the total number of litter items found.

The litter items on the OSPAR lists are connected to different sources. Litter is allocated to shipping, fisheries, tourism, sanitation and a category labelled as 'other' for litter items that cannot be related to a source, for example small unidentified pieces of plastic. In this report the top 80% found items and the probability of their source is provided.

Plastic/polystyrene is by far the material that contributes most to the total number of litter items with 88%. Decreasing trends were found for all material categories, except for 'ceramic/pottery' and 'medical' where no trends were found. The largest decreasing trends in material categories are from plastic/polystyrene and glass pieces.

1 Introduction

All over the world, large quantities of marine litter are washed ashore. Marine litter is an environmental concern of global scale that may harm species in our seas; it affects the ecological, social, and economic status of coastal areas.



Figure 1-1: Straw, ear pick, lolly stick, Veere

Qualitative and quantitative information about marine litter entering our seas and oceans is required for the development of policies and measures aiming to reduce marine litter and/or to assess effectiveness of existing measures. Marine litter (marine debris) is any persistent, manufactured or processed solid material discarded, disposed of, abandoned or lost in the marine and coastal environment. This also includes such items entering the marine environment via rivers, sewage outlets and storm water outlets.

In the year 2000, a standardized protocol for the 'OSPAR Pilot Project on Monitoring Marine Litter' was developed aiming to monitor the amounts and sources of marine litter in the NorthEast Atlantic region. In 2000 this protocol started with Sweden as coordinator. The protocols for 100-metres and 1-km surveys were developed, tested and used during fieldwork from 2000 onwards. The initial pilot project was executed for a period of six years (2000-2006) by nine countries: The Netherlands, Belgium, Germany, United Kingdom, Sweden, Denmark, France, Spain and Portugal. In 2007, after the pilot ended, it was decided to transfer the pilot in a regular OSPAR monitoring programme. The Netherlands and Belgium coordinated this regular programme.

The Dutch Ministry of Environment and Infrastructure (IenM) decided to continue with the beach litter monitoring. With the installation of an Intersessional Correspondence Group Marine Litter (ICGML) the project was embedded in OSPAR on an official basis.

Within the European Marine Strategy Framework Directive (MSFD) marine litter is one of the descriptors (DG10) in order to assess the 'Good Environmental Status' of the marine environment. Monitoring beached litter is one of the obligations within this directive. Beach surveys performed according to the protocol can be used to monitor trends in amounts (quantitative), materials (qualitative), and possible sources (qualitative) of marine litter washed ashore. The Ministry of Transport and Environment (RWS Waterdienst) has assigned the North Sea Foundation the monitoring of the beaches according to the OSPAR protocol in the Netherlands in 2014. This report provides an overview of the field results from the 2009-2014 beach surveys.



Figure 1-2: Lithium stick, Bergen

A guideline for monitoring marine litter on beaches has been developed by OSPAR (OSPAR Commission, 2010) as a tool to collect data on litter in the marine environment. This tool has been designed to generate data on marine litter according to a standardized methodology. A uniform way of monitoring allows for regional interpretation of the litter situation in the OSPAR area and comparisons between regions. The guideline has been designed in such a way that all OSPAR countries can participate, bearing in mind adequate quality assurance of the data generated. The guideline is based on the method developed during the OSPAR pilot project 2000-2006 and is complimented with information derived from UNEP's own realisation of a worldwide guideline.

The first dataset has been analysed and provides an indication of the presence of different types of litter in the marine environment. The report 'Marine litter in the North-East Atlantic Region' (OSPAR, 2009) serves as a background document for the marine litter paragraphs in OSPAR's Quality Status Report (QSR) 2010.

The current report aims to:

- provide an annual update of Dutch beach litter monitoring data of 2014;
- continues the application of the Litter Analyst Tool;
- provide an overview of the Dutch beach litter monitoring results for 2009-2014.

2 Materials and methods

2.1 Selection of reference beaches

Within the OSPBAR Beach Monitoring Guideline (OSPAR Commission, 2010) the following criteria have been identified for selecting reference beaches. The beaches should be:

- a. composed of sand or gravel and exposed to the open sea;
- b. accessible to surveyors all year round;
- c. accessible for ease of marine litter removal;
- d. have a minimum length of 100 metres and if possible over 1 km in length;
- e. free of 'buildings' all year round;
- f. not subject to any other litter collection activities.

In each case, these criteria should be followed as closely as possible. However, the monitoring coordinators can use their expert judgement and experience of the coastal area and marine litter situation in their particular country when making the final selection of the reference beaches. For example, in some countries the local conditions do not allow for selection of beaches composed mainly of sand, and in some places survey sections of 1 km in length cannot be selected.

The Dutch reference beaches are:

- Bergen (NL1)
- Noordwijk (NL2)
- Veere (NL3)
- Terschelling (NL4)

All the Dutch reference beaches are composed of sand, are accessible all year round, are easy accessible for marine litter removal, have a length of 100 metres and 1 km, are free of buildings all year round and comply with the OSPAR criteria a, b, c, d, e. The compliance of criteria (f), 'no collection of any other litter activities', does not apply to the beaches. The reference beach Bergen is cleaned on a weekly basis all year round. Volunteers or local authorities incidentally clean the other beaches. Therefore contact with local beach authorities is essential. Before a monitoring on a reference beach is executed, the local beach coordinator is contacted to check for any local activities that can influence the monitoring session, e.g. a local clean-up, an accident with cargo, a recent storm, etc. In 2014 all local beach coordinators have been contacted on a regular basis. As a guideline, no local beach cleaning should have occurred within the two weeks before a planned beach monitoring date. If this has occurred, it is attempted to postpone the monitoring to about two weeks after the cleaning date. However, in cases of extreme weather events, unexpected changes in employee schedules, or for any reason poor communication with local beach coordinators, the monitoring may occur within two weeks after a cleaning activity.

Table 2-1 Contact information of local beach coordinators.

Gemeente Veere Strand exploitatie Walcheren (SSW) Lucas Fransen Tel. 0118 586275 fransenssw@zeelandnet.nl	Gemeente Noordwijk Petri Biegstraaten Tel. 071 3660370
Gemeente Bergen Leo Doppenberg Tel. 072 8880320 L.Doppenberg@bergen-nh.nl	Gemeente Terschelling Evert Van Leunen e.v.leunen@terschelling.nl Leo Boumen milieu Tel: 0562 4462518



Figure 2-1 Dutch monitoring beaches for marine litter at Veere, Noordwijk, Bergen and Terschelling (With courtesy to RWS CIV for providing this figure).

2.2 Sampling areas

Once sampling areas have been identified a beach is chosen. A sampling unit is a fixed section of beach covering the whole area between the water line to the back of the beach i.e. start of the dunes. Two sampling units are used within the OSPAR area: 100-metres: for identifying all marine litter items; and 1-km: for identifying objects larger than 50 cm. The monitoring sessions start at the back of the beach on the landside. A small strip of about 2-3 meters is monitored; walking distance between the two surveyors is about 2-3 meters. Two surveyors walk parallel with the beach towards the end of the 100 metre monitoring area and draw a line in the sand during monitoring of the litter items. After reaching the 100-metre border of the monitoring area, the surveyors make a turn and proceed with the next strip. All litter is collected in garbage bags. The drawn line is now the border of the monitoring strip. This method is repeated until the sea line is reached. See also the picture below.

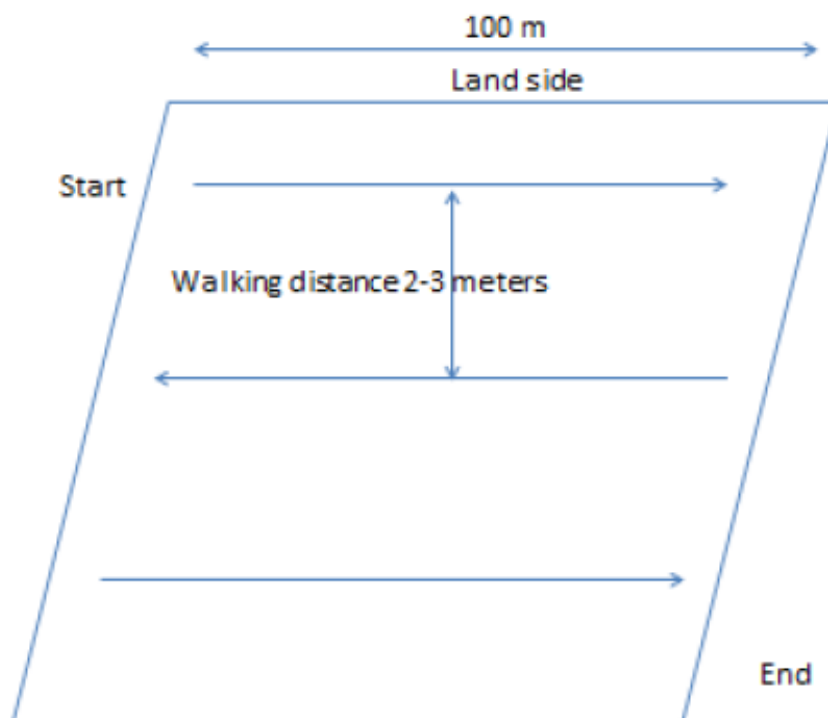


Figure 2-2 Walking pattern used for the beach litter monitoring. A monitoring strip is typically 2-3 m wide.

For both 100 m and 1 km units a separate survey form is available from the OSPAR method and filled in (OSPAR, version 2010). The 100 metres is the standard sampling unit. The 100-metre stretch must be part of the 1-km stretch; but the surveyors must use a fixed part of the 1-km. An example is given in 2-3.

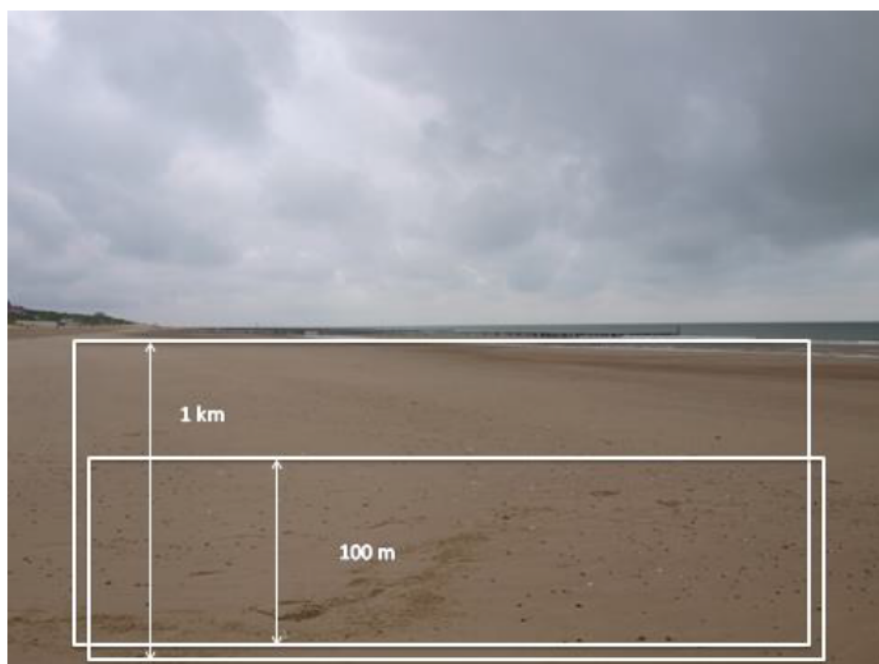


Figure 2-3 Photograph of the Dutch reference beach Terschelling.

Permanent reference points are used to ensure that exactly the same site will be monitored for all surveys. The start and end points of each sampling unit can be identified by different methods. In the Netherlands the reference beaches are identified by marked beach poles.

Action 1: In 2014, the choice of starting points (beach pole or special poles; and the measuring of length of the monitoring path (using measurement rope or GPS) will be checked and if necessary optimized.

Action 2: in 2014, it will be investigated if monitoring signs can be placed on the reference beaches.

Table 2-2 Details of the 4 Dutch OSPAR Beach Litter reference beaches.

nr	Beach name	Access point	Start Beach Pole (start of 100m and 1km survey)	Endpoint of 1km survey
NL1	Bergen	Boulevard Noord Egmond aan Zee	35.250	South to 36.250
NL2	Noordwijk	Langevelderslag	72.250	South to 73.250
NL3	Oostkapelle/Veere	Oranjezon	10.3	North in direction beach access Oranje zon
NL4	Terschelling	Oosterend Badweg	18.200	West to 19.200

In addition to beach pole descriptions, details GPS positions for startpoint, endpoint of 100m sections and endpoint of 1km sections will be assessed.

2.3 Monitoring frequency and period

The reference beaches are surveyed 4 times a year. However, circumstances may lead to inaccessible situations for surveyors: such as stormy wind, and hazards such as rain, snow or ice and may result in a postponed or even cancelled beach survey.

The survey periods are as follows:

- Winter: Mid-December–mid-January
- Spring: April
- Summer: Mid-June–mid-July
- Autumn: Mid-September–mid-October

2.4 Item classification

Items are classified according to the 'Guideline for monitoring Marine Litter on the Beaches in the OSPAR Maritime Area, Edition 1.0' using OSPAR scoring lists (OSPAR Commission, 2010).

2.5 Collection, identification and registration of litter

All items found on the sampling unit are entered on the survey forms provided (OSPAR, version 2010). On the survey forms, each item is given a unique OSPAR identification number. The survey forms also provide a box for a UNEP identification number. This is for UNEP use only. Unknown litter or items that are not on the survey form are noted in the appropriate "other item box". A short description of the "other" item will be included on the survey form. If possible, digital photos should be taken of unknown items in order for them to be identified later. The presence of recurring 'unknown' items may lead to the creation of a new category on the survey form. Following the advice from Van Franeker (2013), SDN will continue to monitor OSPAR Item nr 117 (plastic/polystyrene pieces < 25mm); since this is essential for data continuity and statistical tests of trends over time.

2.6 Data Management

The national coordinator must complete a questionnaire for each reference beach. (OSPAR Commission, 2010). The questionnaire includes information on the location and the physical and geographical characteristics of each beach, including the proximity of possible sources of marine litter. Also included are questions regarding factors that could help explain the amounts, types, and composition of marine litter found on that beach, for example, cleaning activities. It is advisable to contact local, regional or national authorities for information on cleaning schemes etc. For questions on the proximity of shipping lanes, river mouths, waste water outlets, etc. official data from responsible authorities are used only. When circumstances change, the questionnaire will be updated.

The beach litter monitoring data are entered in the OSPAR database within three working days after the monitoring took place, in order to have a good visual memory of the results and circumstances. The transcribed monitoring forms are scanned and digitally stored by SDN and added to the annual report. The monitoring data are (digitally) presented in an export of the OSPAR database in **Appendix I**. The scanned field forms are added in **Appendix II**. Photographs of unknown items are stored in a photo database at SDN, sent to ICGML Basecamp for judgment of other marine litter experts and are displayed in the annual report. Until 2013 the data was entered by SDN into an Excel file, and RWS transferred the data from the Excel file into the online database. From 2014 onwards the North Sea Foundation enters the data from the (fresh) paper monitoring forms into the online database. The Marine Conservation Society now hosts this database¹. In the near future, RWS CIV will also store the beach litter data in the RWS DONAR database.

2.7 Data analysis procedures

2.7.1 Data preparation: item clustering

The item list for 100-meter surveys is part of the data in **Appendix I**. The current 100m-survey form contains 116 categories (marked by item-codes). However, the database holds eleven additional categories that were used before 2010. Changes made to the categories in 2010 represent a serious complication in data analyses. For analyses that include data from before and after the changes in 2010, it is essential that clusters of items are used that contain both the old and the new categories. Usage of separate categories in these cases would lead to incorrect trend analysis results. Five item-codes got a different definition and – to avoid confusion – their time series from before 2010 got new item-codes, as listed in **table 2-3**.

¹<http://www.mcsuk.org/ospar/home>

Table 2-3 Items clustering that is performed on the initial items 31, 32, 46, 62, and 84 in the period 2002-2009 and in the period 2010 and later (Baggelaar & Meulen, 2014). Grey cells represent that an item was not on the survey form in that period (columns) and also not registered as such.

Initial code	Period 2002-2009 New code: old definition	Period 2010 and later Old code: new definition
31	200: plastic rope/cord/nets < 50 cm	
		31: plastic rope (diameter >1 cm)
32	201: plastic rope/cord/nets > 50 cm	
		32: plastic string/cord (diameter <1 cm)
46	202: plastic/polystyrene pieces <50 cm	
		46: plastic/polystyrene pieces 2.5-50 cm
62	204: cartons/tetra packs	
		62: non-milk cartons/tetra packs
84	205: metal oil drums (new, not rusty)	
		84 metal oil drums (new and old)

Five other item-codes were removed (51, 58, 85, 106, and 107) and their time series from before 2010 got new item-codes, as illustrated in table 2-4.

Table 2-4 Items that were removed from the survey list and their new assigned code (Baggelaar & Meulen, 2014). The grey cells represent that an item was not on the survey form in that period (column) and also not registered anymore.

Initial code	Period 2002-2009 New code: old definition	Period 2010 and later Item not on survey form
51	203: rubber gloves	
58	210: textile rope/strings	
85	206: metal oil drums (old, rusty)	
106	207: human faeces	
107	208: animal faeces	

In 2010, ten new items were introduced (112-121), as shown in table 2-5.

Table 2-5 Items that were added to the survey list in 2010 (Baggelaar & Meulen, 2014). Grey cells represent that an item was not on the survey form in that period (column) and also not registered yet.

Initial code	Period 2002-2009 Item not on survey form	Period 2010 and later Code: definition
112		112: plastic bag ends
113		113: rubber gloves (industry./profess.)
114		114: plastic lobster and fish tags
115		115: plastic nets and pieces of net < 50 cm
116		116: plastic nets and pieces of net > 50 cm
117		117: plastic/polystyrene pieces < 2.5 cm
118		118: cartons/tetra packs (milk)
119		119: wooden fish boxes
120		120: disposable metal BBQs
121		121: bagged dog faeces

2.7.2 Data preparation and analysis using Litter Analyst

The data preparation (i.e. clustering, removal, and addition of items) is performed by the new tool Litter Analyst (version 2.0). Litter Analyst is able to read the data-exports from the OSPAR database (in the .CSV format), preparing the data for analysis, to export data as a .CSV file or a Microsoft Excel™ file, and perform trend analysis on individual litter items and total items with the Mann-Kendall test and Theil-Sen slope estimator. For more details on the chosen analysis and Litter Analyst, the reader is kindly referred to Baggelaar en Van der Meulen (2014) and the User Manual of Litter Analyst². Outputs of Litter Analyst are evaluation tables of items, sources, and materials, but also a data series plot, boxplots of item counts per year, a table of data series, and a data density matrix can be created and saved externally (Meulen & Baggelaar, december 2014). For the analyses in this report, the following settings in Litter Analyst were used: Aggregation condition 75%, minimal percentage of counts of items in top-X list 80%.

For analysis of the 1 km dataset it is recommended to simply look at total counts of all items recorded for any data use combinations that include data from before and after 2010.

2.7.3 Trend analyses

In the annual report trend analyses are performed on the total item counts and the top-80% items. The top-80% is defined as the list of most abundant items that during a six-year period constitutes on average at least 80% of the total counts. Trends are analysed by non-parametric Mann Kendall trend analysis of specific item counts against the year of the survey. In the current beach analysis, the dataset of 6 years (2009-2014) was used.

2.7.4 Calculation of total item counts

The occurrence of considerable fluctuations in the total counts of beach litter surveys was avoided by using 6-year arithmetic averages and median values to describe total abundance. The averages are calculated from individual beach survey counts, and not from annual averages.

2.7.5 Source analysis

The assignment of sources categories to litter items by Litter Analyst, based on an older OSPAR list, is still under debate because it is complex and not always clearcut. Therefore these results have not been added to this annual report. Instead, for the Dutch top-80% items the probable sources are reported in Table 3.5: Top 80% of most found items and their most probable sources.

2.7.6 Material analysis

It is also essential for the MSFD to connect monitoring results to the litter material composition. Especially the fraction of plastic/synthetic items is of interest for MSFD policy makers, in light of the increased awareness and attention on plastic in the seas and oceans. A relative contribution of each litter material is provided as an average for the period 2009-2014. Trend analysis is performed of the total abundances of items (period 2009-2014) which have been assigned with sufficient confidence to either of the following material categories: Plastic/polystyrene [406], Rubber [407], Sanitary [414], Paper/cardboard [409], Wood [410], Glass [412], Cloth/textile [408], Metal [411], Ceramic/pottery [413], and Medical [415].

2.7.7 Unknown items

Items that could not be allocated to a category are photographed in order to reveal their origin at a later stage and to improve the OSPAR survey field forms over time. The photos of these 'unknown' items are published in the annual report.

2.7.8 Special circumstances

Special circumstances, such as extreme weather conditions, nearby sand suppletions or any other activities that may influence the monitoring, are listed on the field forms and published in the annual report.

2.8 Reporting

The North Sea Foundation produces an annual report with an update of the state and trend analyses of Dutch beach litter using data from the current and preceding years. This report will be finished within four months after the last monitoring activity.

²<http://www.amo-nl.com/pdf/User%20manual%20Litter%20Analyst.pdf>

3 Results and Discussion

Exports from the OSPAR database containing litter data from 2001- 2014 have been added in Appendix I. In the following paragraphs, the total counts for each beach and for all beaches aggregated are shown. The top-80% analysis of total item abundance, source analysis, and material analysis will be elaborated on in more detail.

3.1 Total counts

The average total item counts per 100-meter beach (6-year arithmetic averages), the trend and the significance of the trend are displayed in table 3.1. An increasing trend is found for Bergen and Noordwijk and a decreasing trend for Terschelling and Veere. The total average number of items counts for all beaches aggregated amounts to 389 items per 100 m beach with a low significant trend ($p = 0,573$). A very high significant trend is found for Veere ($p = 0,004$), with a decreasing number of average items during the period 2009-2014.

Table 3-1 Average total item counts, trend and significance of the trend for Bergen, Noordwijk, Terschelling and Veere and for all four beached aggregated for the period 2009-2014.

Location	Period	Average total counts per survey	Trend (counts/year)	Significance of trend (p-value)
Bergen	01/01/2009-31/12/2014	315	30,3	0,398
Noordwijk	01/01/2009-31/12/2014	433	55,5	0,108
Terschelling	01/01/2009-31/12/2014	405	-30,2	0,304
Veere	01/01/2009-31/12/2014	388	-73,3	0,004
Ber Noo Ter Vee	01/01/2009-31/12/2014	389	-10,5	0,573

3.2 Top-80% Analysis

Top-80% analysis has resulted in a top-10 for all four beaches for the period 2009-2014. Since this research aims to provide insight in the Dutch situation, results are displayed as aggregated results for all four beaches.

The aggregated results for the four Dutch beaches are given in table 3-2. Most found items, median and average item count per 100 meter beach (6-year arithmetic averages), the relative abundance of each item (%) related to total litter count, the trend per item in counts per year, and the significance of the trend, are provided.

Nets and ropes rank as the number one most found item and plastic polystyrene pieces smaller than 50 cm were the second most found item. Together, they account for more than half of the total number of litter items found and there is an increasing trend for these items.

Table 3-2 Top 80% of most found items along the Dutch coast, including median and average count per 100 meter, percentage of total count, trend [counts/year], and significance of trend for the period 2009-2014.

Aggregated results for Terschelling / Bergen / Noordwijk / Veere						
Rank	Litter category [OSPAR-100-ID]	Med. Count / 100 m	Aver. count/ 100 m	% of total count	Trend [counts/year]	Significance of trend p-value
1	Nets and ropes [300]	134,2	144,2	37,1%	2,2	0,778
2	Plastic polystyrene pieces < 50 cm [301]	64,2	67,3	17,3%	2,0	0,612
3	Plastic: Caps [15]	20,8	22,0	5,6%	-0,8	0,413
4	Rubber: Balloons [49]	12,9	15,7	4,0%	-0,4	0,756

5	Plastic: Crisp [19]	12,2	14,4	3,7%	-0,5	0,632
6	Plastic: Tangled [33]	12,9	13,6	3,5%	-1,6	0,204
7	Plastic: Foam_sponge [45]	12,0	12,1	3,1%	0,8	0,463
8	Plastic: Small_bags [3]	8,5	10,2	2,6%	-0,9	0,142
9	Plastic: Bags [2]	6,9	7,8	2,0%	-1,4	0,007
10	Plastic: Industrial [40]	6,9	7,6	2,0%	0,4	0,247

3.3 Sources of litter items

OSPAR identified the following sources: fishing, shipping, tourism, sanitation and a category 'other' for unknown sources. The assignment of source categories to litter items is complex. In many cases, litter items can originate from different sources. Nets and ropes for example, often originate from fishing vessels, but can also come from cargo vessels. Therefore, the top 10 of most found items is provided in table 3.4 below with a probability classification of the source. The probability classification is based on expert judgment from the surveyors. It aims to serve as input for the current discussions within OSPAR about the allocation of litter items to different sources. The probability classification is provided in table 3.3.

Table 3-3 Probability classification of the allocation of litter items to sources

Sign	Probability	Comment
-	Unlikely	Items not likely to originate from source
x	Low probability	0-25% of items originate from source (estimation)
xx	Medium probability	25-75% of items originate from source (estimation)
xxx	High probability	> 75% of the items originate from source (estimation)

Table 3-4 Top 80% of most found items and their most probable sources

Aggregated results for Terschelling / Bergen / Noordwijk / Veere					
Rank	Litter category [OSPAR-100-ID]	Fishing	Shipping	Tourism	Other
1	Nets and ropes [300]	xxx	x	-	-
2	Plastic polystyrene pieces < 50 cm [301]	xx	xx	x	x
3	Plastic: Caps [15]	x	x	x	x
4	Rubber: Balloons [49]	-	-	xx	xx
5	Plastic: Crisp [19]	-	-	xxx	x
6	Plastic: Tangled [33]	xxx	-	-	-
7	Plastic: Foam_sponge [45]	x	x	-	xxx
8	Plastic: Small_bags [3]	x	x	x	xx
9	Plastic: Bags [2]	x	x	xx	x
10	Plastic: Industrial [40]	-	xxx	-	x

3.4 Materials of litter items

Trend analyses of litter materials for the period 2009-2014 are provided in table 3-5.

Decreasing trends are found for all material categories, except for 'ceramic/pottery' and 'medical' where no trends were found. The largest decreasing trend is from plastic/polystyrene material (-6,3 counts/year). The decreasing trends for 'glass', 'paper/cardboard', 'wood' and 'cloth/textile' have a high significance.

Table 3-5 Material trend analysis of litter items for each material category at Bergen, Veere, Terschelling, and Noordwijk including trend in counts/year and significance of trend for the period 2009-2014.

Aggregated results for Terschelling / Bergen / Noordwijk / Veere		
<i>Material category</i>	<i>Trend [counts/year]</i>	<i>Significance of trend (p-value)</i>
plastic/polystyrene [406]	-6,3	0,693
rubber [407]	-0,9	0,499
metal [411]	-0,4	0,381
glass [412]	-1,8	0,000
sanitary [414]	-0,4	0,283
paper/cardboard [409]	-0,8	0,001
wood [410]	-0,6	0,007
cloth/textile [408]	-0,4	0,034
ceramic/pottery [413]	0,0	0,828
medical [415]	0,0	0,302

3.5 Unknown items

Figure 2-4 and 2-5 show the two unknown items that were found during the surveys in 2014. The glass item shown on figure 2-5 was later identified as a glass vial filled with injection fluid. A possible source could be shipping as items from first aid kits that have passed their expiration date are found on the beaches regularly. The other unknown item (figure 2-4) is a large piece of unidentifiable plastic, possible a car part.



Figure 3-4: Unknown large plastic item, Bergen



Figure 3-5 Injection fluid in glass vial, Veere

3.6 Special circumstances

No special circumstances were encountered during the surveys in 2014.

4 Conclusions

On average 389 items were found per 100 meter beach, using 6-year arithmetic averages during the period 2009-2014. There is a decreasing trend (-10,5) but the significance of the trend is low ($p=0,573$). The only very high significant trend is found for Veere ($p=0,004$), with a decreasing number of average items (-73,3) per 100 meter beach during the period 2009-2014.

The top-80% resulted in a top 10 of most found litter items on the four Dutch beaches monitored. The most found items are nets and ropes (nr. 1) and plastic/polystyrene pieces smaller than 50 cm (nr. 2). Together these two items account for more than half of the total number of litter counts and there is an increasing trend. For six out of the top 10 items, there is a decreasing trend. The only trend with a high significance ($p=0,007$) found was the decreasing trend for the number of plastic bags counted.

No trend analysis for litter items connected to different sources was performed as the allocation of items to different sources is currently under debate within OSPAR. Many items can originate from different sources. This is made visible by a probability classification. Nets and ropes account for 37% of all litter items found. Nets and ropes mostly originate from the fishing sector.

Decreasing trends were found for all material categories, except for 'ceramic/pottery' and 'medical' where no trends were found. The largest trends in material categories are from plastic/polystyrene and glass pieces.



Figure 4-1: Pencil, Veere

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