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Summary

This second annual report provides an overview of the Dutch beach monitoring and assessment results for 2013 and serves as an annual update of the OSPAR beach litter monitoring activities in The Netherlands. In the analysis of beach litter data, several recommendations made in the first annual report (Dagevos, et al., 2013) were implemented using the new tool Litter Analyst (version 1.0) (Baggelaar & Meulen, 2014); (AMO-Icastat, 2014).

- The number of specific and total litter items on each beach is described using 6-year median and arithmetic averages.
- 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 year of monitoring.

The assessment of the beach litter monitoring data of 2008 - 2013 in The Netherlands shows increasing total counts of litter items at Bergen, Terschelling and Noordwijk show, whereas at Veere total litter counts show a decrease. At all beaches, 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. Counts for nets and ropes and polystyrene pieces are lowest at Bergen and highest at Veere. Nets and ropes show increasing counts for the period 2008-2013 at the beaches of Bergen, Terschelling, and Noordwijk. However, only at Bergen the trend is significant. The decreasing count of nets and ropes at Veere was found not significant.

At all four beaches, the origin of litter category “Other” is the largest contributor to total found litter. For the categories “Shipping”, “Fishing”, and “Tourism”. relative contribution differs per beach. At all four beaches, “Sanitation” is the smallest source of beach litter. Source trend analysis shows that at Bergen, Terschelling, and Noordwijk, that items from all source categories show increasing trends; at Veere, all source categories are decreasing.

More than 85% of the total litter items found on all four reference beaches is made of plastic. “Rubber” is the second-largest material category on all four beaches. Material trend analyses show that at Bergen and Terschelling, plastic, rubber, sanitary, and paper items have increasing trends. At Veere and Noordwijk, plastic, rubber, and sanitary items show decreasing trends. At all four beaches, the trend in plastic items has the largest slope of all material categories.

1. Introduction

Marine litter in the sea – in particular plastic litter – is a major environmental problem, and denominated by various scientists and conservation organizations as ‘the new environmental challenge’. All over the world, large quantities of marine litter have washed ashore. Marine litter is an environmental concern of global scale that may harm species in our seas, the ecological, social, and economic status of coastal areas.

Qualitative and quantitative information about marine litter entering our seas and oceans is required for policy development aiming to reduce marine litter and/or to assess effectiveness of existing policies. 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, storm water outlets or winds.



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 North East 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) in nine countries: the Netherlands, Belgium, Germany, the 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 the 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 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 2013. This report provides an overview of the field results from the 2013 beach surveys.

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 has been 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 assessment '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 2013;
- apply the new Litter Analyst Tool, developed for national and OSPAR assessments, for the first time;
- provide an overview of the Dutch beach assessment results for 2013.



Figure 1-1 Balloons found at monitoring site Veere

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. The other beaches are incidentally cleaned by volunteers or local authorities. 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 2013 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 meter border of the monitoring area, the surveyors make a turn and proceed with the next strip. 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.

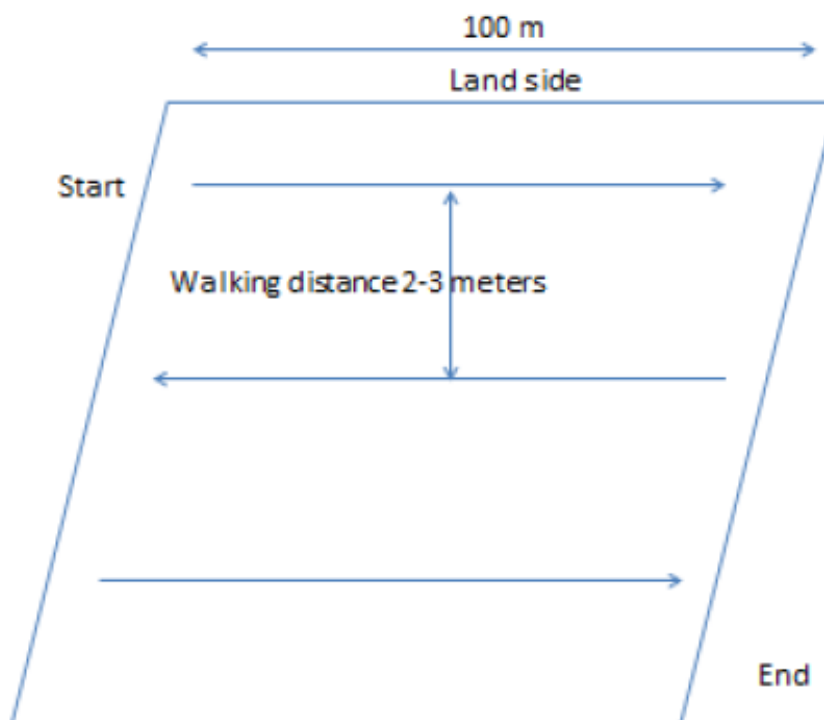


Figure 2-2 Walking pattern used for the beach litter monitoring. A monitoring strip is typically 2-3 m wide.

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 Figure 3.10.

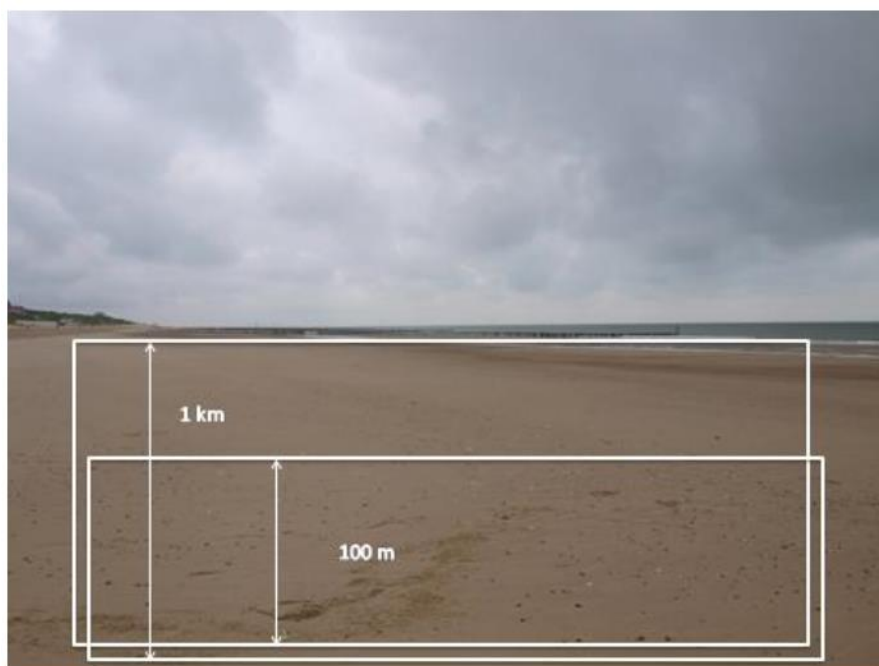


Figure 2-3 Photograph of the Dutch reference beach Terschelling.

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 mainly located 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 start point, endpoint of 100m section and endpoint of 1km section 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, slippery rocks 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' (OSPAR Commission, 2010) using OSPAR scoring lists (OSPAR, version 2010).

2.5 Collection, identification and registration of litter

All items found on the sampling unit will be 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 so that they can be identified later and if necessary be added to 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

For each reference beach a questionnaire must be completed by the national coordinator (OSPAR, version 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 authorities responsible are used only. When circumstances change, for example, the development of a new residential area nearby, the questionnaire will be updated.

De 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 presented in Appendix I (export of OSPAR database) and Appendix II (link to scans of the field monitoring forms).

Photographs of unknown items are stored in a photo database at SDN and reported in Appendix III. 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 will enter the data from the (fresh) paper monitoring forms into the online database. This database is now hosted by the Marine Conservation Society¹. 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.

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)

¹ <http://www.mcsuk.org/ospar/home>

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: Litter Analyst

The data preparation (i.e. clustering, removal, and addition of items) is performed by the new tool Litter Analyst (version 1). 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 & 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,

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

a table of data series, and a data density matrix can be created and saved externally (Meulen & Baggelaar, december 2014).

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

2.7.3 Trend analyses

In the year 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. More specifically, the following trend analyses were performed:

- a. Total number of items monitored on 100 m; average of 4 beaches and individual beaches
- b. Total number of items monitored on 1 km; average of 4 beaches and individual beaches
- c. Top-80% items on 100 m; average of 4 beaches

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 (2008-2013) was used.

2.7.4 Calculation of assessment values of total item counts

The domination of annual fluctuations in the perception of beach litter surveys was avoided by using 6-year arithmetic averages, with standard errors to describe total abundance. This approach covers incidental annual variations. The averages are calculated from individual counts, and not from annual averages.

2.7.5 Source analysis

It is essential for the MSFD to connect monitoring results to probable sources and pathways, leading to possible water management measures. A relative contribution of each source is provided as an average for the period 2008-2013. Trend analyses is performed of total abundances of items (period 2008-2013) which have been assigned with sufficient confidence to (a) sea sources (shipping, fisheries, off shore); (b) land sources (tourism; sanitary; rivers and channels; or (c) unknown or uncertain sources. Litter sources marked down to five source categories: Shipping [404], Fishing [402], Tourism [403], Sanitation [401], and Other [405].

2.7.6 Material analysis

It is also essential for the MSFD to connect monitoring results to the litter materials. Especially the fraction of plastic/synthetic items appears to be of interest for MSFD policy makers. A relative contribution of each litter material is provided as an average for the period 2008-2013. Trend analysis is performed of the total abundances of items (period 2008-2013) 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].

2.8 Reporting

The North Sea Foundation produces an annual report, which contains an update of the state and trend analyses of Dutch beach litter using the new and existing data. This report will be finished within four months after the last monitoring activity. RWS Zee and Delta will report the new annual beach litter data in the OSPAR Access format, using the digital scans of the transcribed field forms.



Figure 2-4 Survey site Noordwijk



Figure 2-5 Litter at survey site Bergen

3. Results and Discussion

Exports from the OSPAR database containing litter data from 2013 have been added in Appendix I

OSPAR database exports of Dutch beach litter monitoring, year 2013. Digital versions of the original field monitoring forms of 2013 have been added in. In the following paragraphs, the top-80% analysis of total item abundance, source analysis, and material analysis will be elaborated on in more detail.

3.1 Top-80% Analysis

Top-80% analysis has resulted in a top-10 of most found items for Noordwijk, and top-11s of most found items for Bergen, Veere, and Terschelling. In Table 3—2, Table 3—4, Table 3—1, and Table 3—3, the top-80% of most found items on the four reference beaches for the period 2008-2013, average item count per 100 meter beach (6-year arithmetic averages), the relative abundance of each item (%) to total litter count per beach, the trend per item in counts per year, and the significance of the trend, are provided. Significant trends ($p < 0.05$) are in bold.

The tables with top-80% of each beach show the differences in top-80% and trends in litter counts on individual beaches. Bergen, Terschelling, and Noordwijk show increasing total counts of litter items, whereas at Veere total litter counts show a decrease. At all beaches, 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. Counts for nets and ropes and polystyrene pieces are lowest at Bergen and highest at Veere. Nets and ropes show increasing counts for the period 2008-2013 at the beaches of Bergen, Terschelling, and Noordwijk. However, only at Bergen the trend is significant, whereas at Terschelling the trend is almost significant ($p = 0.057$). The decreasing count of nets and ropes at Veere was found not significant ($p = 0.172$).

The tables on top-10s of most found litter items show mostly increasing counts of litter items for Bergen, Terschelling, and Noordwijk, whereas at Veere litter counts show a decrease in litter counts. A significant increase shows for counts of foam/sponge at Bergen with an increase of 0.80 counts on 100 meter. At Veere, significant decreases in counts of polystyrene pieces smaller than 50 cm, plastic caps, crisp bags, balloons, and plastic bags show, ranging from almost eleven pieces of plastic less on 100 meter beach to a decrease of more than two balloons on 100 meter beach. At Terschelling, significant increases show for counts of plastic caps, balloons, foam/sponge, and industrial plastic, ranging from more than three plastic caps to more than 2 pieces of industrial plastic on 100 meter beach. At Noordwijk, no significant trends in litter counts were found.

Table 3—1 Top 11 of most found items at Terschelling, including average count per 100 meter, percentage of total count, trend [counts/year], and significance of trend for the period 2008-2013.

Terschelling						
<i>Rank</i>	<i>Litter category [OSPAR-100-ID]</i>	<i>Med. Count / 100 m</i>	<i>Aver. count/ 100 m</i>	<i>% of total count</i>	<i>Trend [counts/year]</i>	<i>Significance of trend, p-value</i>
1	Nets and ropes [300]	132.0	148.3	36%	28.00	0.057
2	Plastic polystyrene pieces < 50 cm [301]	51.0	62.9	15%	7.00	0.119
3	Plastic: Caps [15]	17.0	24.0	6%	3.20	0.030
4	Plastic: Tangled [33]	12.0	18.2	4%	2.18	0.112
5	Rubber: Balloons [49]	14.0	16.8	4%	2.78	0.008
6	Plastic: Crisp [19]	9.0	15.7	4%	0.87	0.595
7	Plastic: Small_bags [3]	12.0	12.4	3%	-2.00	0.112
8	Plastic: Bags [2]	5.0	12.1	3%	0.21	0.710
9	Plastic: Foam_sponge [45]	6.0	11.6	3%	2.74	0.001
10	Plastic: Industrial [40]	9.0	11.5	3%	2.15	0.026
11	Glass: Other [93]	1.0	7.6	2%	-3,20	0.000

Table 3—2 Top 11 of most found items at Bergen, including average count per 100 meter, percentage of total count, trend [counts/year], and significance of trend for the period 2008-2013.

Bergen						
<i>Rank</i>	<i>Litter category [OSPAR-100-ID]</i>	<i>Med. Count / 100 m</i>	<i>Aver. count/ 100 m</i>	<i>% of total count</i>	<i>Trend [counts/year]</i>	<i>Significance of trend, p-value</i>
1	Nets and ropes [300]	42.0	90.5	35%	11.37	0.019
2	Plastic polystyrene pieces < 50 cm [301]	32.0	43.3	17%	1.75	0.561
3	Rubber: Balloons [49]	8.0	11.7	5%	1.00	0.118
4	Plastic: Small_bags [3]	7.0	9.7	4%	0.62	0.314
5	Plastic: Tangled [33]	7.0	9.4	4%	1.60	0.106
6	Plastic: Bags [2]	7.0	9.3	4%	0.00	0.811
7	Plastic: Caps [15]	6.0	9.0	4%	1.33	0.112
8	Plastic: Crisp [19]	7.0	8.3	3%	1.00	0.110
9	Plastic: Foam_sponge [45]	1.0	5.2	2%	0.80	0.023
10	Plastic: Drinks [4]	4.0	5.0	2%	-0.18	0.632
11	San: Buds [98]	2.0	4.9	2%	0.27	0.360

Table 3—3 Top 10 of most found items at Noordwijk, including average count per 100 meter, percentage of total count, trend [counts/year], and significance of trend for the period 2008-2013.

Noordwijk						
<i>Rank</i>	<i>Litter category [OSPAR-100-ID]</i>	<i>Med. Count / 100 m</i>	<i>Aver. count/ 100 m</i>	<i>% of total count</i>	<i>Trend [counts/year]</i>	<i>Significance of trend, p-value</i>
1	Nets and ropes [300]	76.0	118.3	33%	11.71	0.091
2	Plastic polystyrene pieces < 50 cm [301]	60.0	72.0	20%	8.00	0.119
3	Plastic: Caps [15]	14.0	18.9	5%	1.50	0.224
4	Rubber: Balloons [49]	11.0	16.0	4%	1.54	0.175
5	Plastic: Crisp [19]	10.0	13.5	4%	1.67	0.056
6	Plastic: Foam_sponge [45]	7.0	13.2	4%	1.82	0.118
7	Plastic: Small_bags [3]	10.0	12.5	4%	0.00	0.916
8	Plastic: Tangled [33]	5.0	10.0	3%	1.09	0.104
9	Plastic: Bags [2]	7.0	8.0	2%	-0.92	0.265
10	Plastic: Drinks [4]	6.0	6.3	2%	0.00	0.790

Table 3—4 Top 11 of most found items at Veere, including average count per 100 meter, percentage of total count, trend [counts/year], and significance of trend for the period 2008-2013.

Veere						
<i>Rank</i>	<i>Litter category [OSPAR-100-ID]</i>	<i>Med. Count / 100 m</i>	<i>Aver. count/ 100 m</i>	<i>% of total count</i>	<i>Trend [counts/year]</i>	<i>Significance of trend, p-value</i>
1	Nets and ropes [300]	154.5	201.6	36%	-13.25	0.172
2	Plastic polystyrene pieces < 50 cm [301]	79.0	91.7	16%	-10.96	0.070
3	Plastic: Caps [15]	29.5	42.7	8%	-7.26	0.000
4	Plastic: Tangled [33]	18.5	23.8	4%	-1.14	0.728
5	San: Buds [98]	16.0	18.6	3%	-1.19	0.411
6	Plastic: Crisp [19]	16.0	17.3	3%	-3.08	0.021
7	Rubber: Balloons [49]	15.0	15.9	3%	-2.27	0.017
8	Plastic: Other [48]	11.0	15.2	3%	0.00	0.960
9	Plastic: Foam_sponge [45]	5.5	12.9	2%	1.29	0.050
10	Plastic: Bags [2]	4.0	9.8	2%	-2.52	0.002
11	Plastic: Small_bags [3]	6.5	8.6	2%	-0.76	0.319

The trends of the count of top-80% items for each beach is provided in Figure 3-1 as boxplot. This boxplot shows, in correspondence with the previous paragraph, how the median trend at Veere is decreasing litter counts, whereas for the other three beaches, median trends show increasing litter counts. At Terschelling the largest range in trends of litter counts is present; Bergen shows the smallest range in litter count trends.

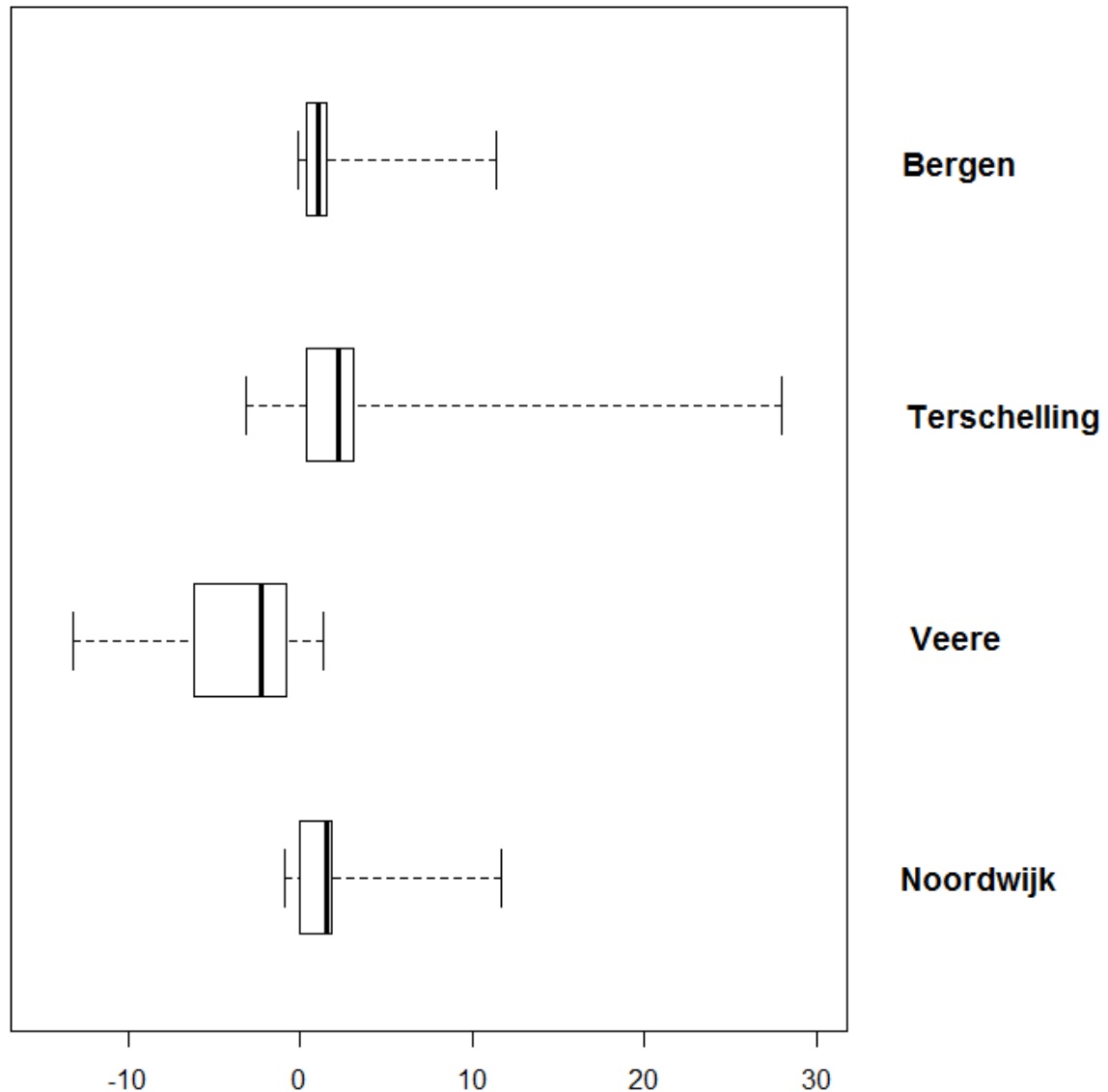


Figure 3-1 Boxplots of the minimum, 25%, 50%, and 75%-quartiles, and maximum trends of litter counts [counts/year] of top-80% items per beach for the period 2008-2013.



Figure 3-2 Shipping waste at monitoring site Veere

3.2 Sources of litter items

Trend analysis of sources of litter items per beach for the period 2008-2013 are provided in Table 3—1. Significant trends ($p < 0.05$) are printed bold. The source trend analysis shows increasing counts per year for all five source categories at Bergen, Terschelling, and Noordwijk; at Veere, only shipping displays an increasing trend and the other four source categories show decreasing trends. The trends in litter items from shipping are significant at all four beaches. At Veere, also the trends for litter items from the sources other, fishing, and tourism are significant.

Table 3—1 Source trend analysis of litter items for each source category at Bergen, Veere, Terschelling, and Noordwijk including trend in counts/year and significance of trend for the period 2008-2013.

Terschelling		
<i>Source category</i>	<i>Trend [counts/year]</i>	<i>Significance of trend (p-value)</i>
Other [405]	4,2	0,673
Shipping [404]	20,4	0,027
Fishing [402]	0,9	0,843
Tourism [403]	2,4	0,710
Sanitation [401]	0,5	0,196
Bergen		
<i>Source category</i>	<i>Trend [counts/year]</i>	<i>Significance of trend (p-value)</i>
Shipping [404]	10,7	0,013
Other [405]	2,0	0,691
Tourism [403]	1,3	0,882
Fishing [402]	3,4	0,333
Sanitation [401]	0,4	0,366
Noordwijk		
<i>Source category</i>	<i>Trend [counts/year]</i>	<i>Significance of trend (p-value)</i>
Other [405]	10,7	0,137
Shipping [404]	10,8	0,013
Tourism [403]	2,5	0,234
Fishing [402]	0,7	1,000
Sanitation [401]	0,3	0,501
Veere		
<i>Source category</i>	<i>Trend [counts/year]</i>	<i>Significance of trend (p-value)</i>
Other [405]	-26,8	0,010
Fishing [402]	-39,3	0,000
Tourism [403]	-19,6	0,001
Shipping [404]	14,5	0,016
Sanitation [401]	-1,1	0,412

In Figure 3-2 an overview is provided of the relative contribution of beach litter sources to litter items found on the Dutch reference beaches for the period 2008-2013. At all four beaches, the origin of litter category “Other” is the largest contributor to total found litter. For the categories “Shipping”, “Fishing”, and “Tourism”, relative contribution differs per beach. At all four beaches, “Sanitation” is the smallest source of beach litter.

3.3 Materials of litter items

Trend analysis of litter materials per beach for the period 2008-2013 are provided in Table 3—2. Significant trends ($p < 0.05$) are in bold. At Bergen, item counts from wood and glass items show increasing trends, whereas the materials plastic, rubber, sanitary, and paper show increasing trends. For cloth, metal, ceramics, and medical items, trends were negligible. The trend for glass items is significant. At Veere, medical and ceramic items show negligible trends; the other materials show decreasing trends, of which all are significant but the trend for sanitary items. At Terschelling, plastic, rubber, sanitary, and paper items show increasing trends, but none are significant. The trends for glass, metal, and wood items show decreasing counts, of which the trend for glass is significant. The trends for cloth, ceramic, and medical items are negligible. At Noordwijk, plastic, rubber, and sanitary items show decreasing item counts; wood items are decreasing. None of these trends are found significant. The trends for metal, paper, glass, cloth, ceramic, and metal items are all negligible. At all four beaches, the trend in plastic items has the largest slope of all material categories.

Table 3—2 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 2008-2013.

Terschelling		
<i>Material category</i>	<i>Trend [counts/year]</i>	<i>Significance of trend (p-value)</i>
plastic/polystyrene [406]	38,8	0,143
rubber [407]	2,0	0,073
glass [412]	-3,6	0,000
metal [411]	-0,5	0,210
sanitary [414]	0,5	0,161
wood [410]	-0,4	0,330
paper/cardboard [409]	0,5	0,141
cloth/textile [408]	0,0	0,461
ceramic/pottery [413]	0,0	0,021
medical [415]	0,0	0,563
Bergen		
<i>Material category</i>	<i>Trend [counts/year]</i>	<i>Significance of trend (p-value)</i>
plastic/polystyrene [406]	17,9	0,189
rubber [407]	0,6	0,534
sanitary [414]	0,4	0,366
paper/cardboard [409]	0,0	0,496
wood [410]	-0,4	0,119
glass [412]	-0,4	0,044
cloth/textile [408]	0,0	0,629
metal [411]	0,0	0,649
ceramic/pottery [413]	0,0	0,773
medical [415]	0,0	1,000

Noordwijk		
<i>Material category</i>	<i>Trend [counts/year]</i>	<i>Significance of trend (p-value)</i>
plastic/polystyrene [406]	28,4	0,157
rubber [407]	1,3	0,243
sanitary [414]	0,4	0,231
wood [410]	-0,4	0,423
metal [411]	0,0	0,960
paper/cardboard [409]	0,0	0,387
glass [412]	0,0	0,960
cloth/textile [408]	0,0	0,876
ceramic/pottery [413]	0,0	0,389
medical [415]	0,0	0,258
Veere		
<i>Material category</i>	<i>Trend [counts/year]</i>	<i>Significance of trend (p-value)</i>
plastic/polystyrene [406]	-53,8	0,021
rubber [407]	-4,2	0,002
sanitary [414]	-1,0	0,470
wood [410]	-5,4	0,002
paper/cardboard [409]	-1,0	0,026
metal [411]	-2,0	0,000
cloth/textile [408]	-1,3	0,000
glass [412]	-0,6	0,006
medical [415]	0,0	0,524
ceramic/pottery [413]	0,0	1,000

In Figure 3-3 an overview is provided of the relative contribution of material categories to the total of litter items found on the Dutch reference beaches. More than 85% of the total litter items found on all four reference beaches is made of plastic. “Rubber” is the second-largest material category on all four beaches. At Bergen, Veere, and Noordwijk, “Sanitary” is the third-largest material category (at Bergen the third rank is shared with paper/cardboard); at Terschelling, glass appears to be the third-largest category. The material categories “Medical” and “Ceramic/pottery” are smaller than 0.00% and therefore not visible in the pie-charts.

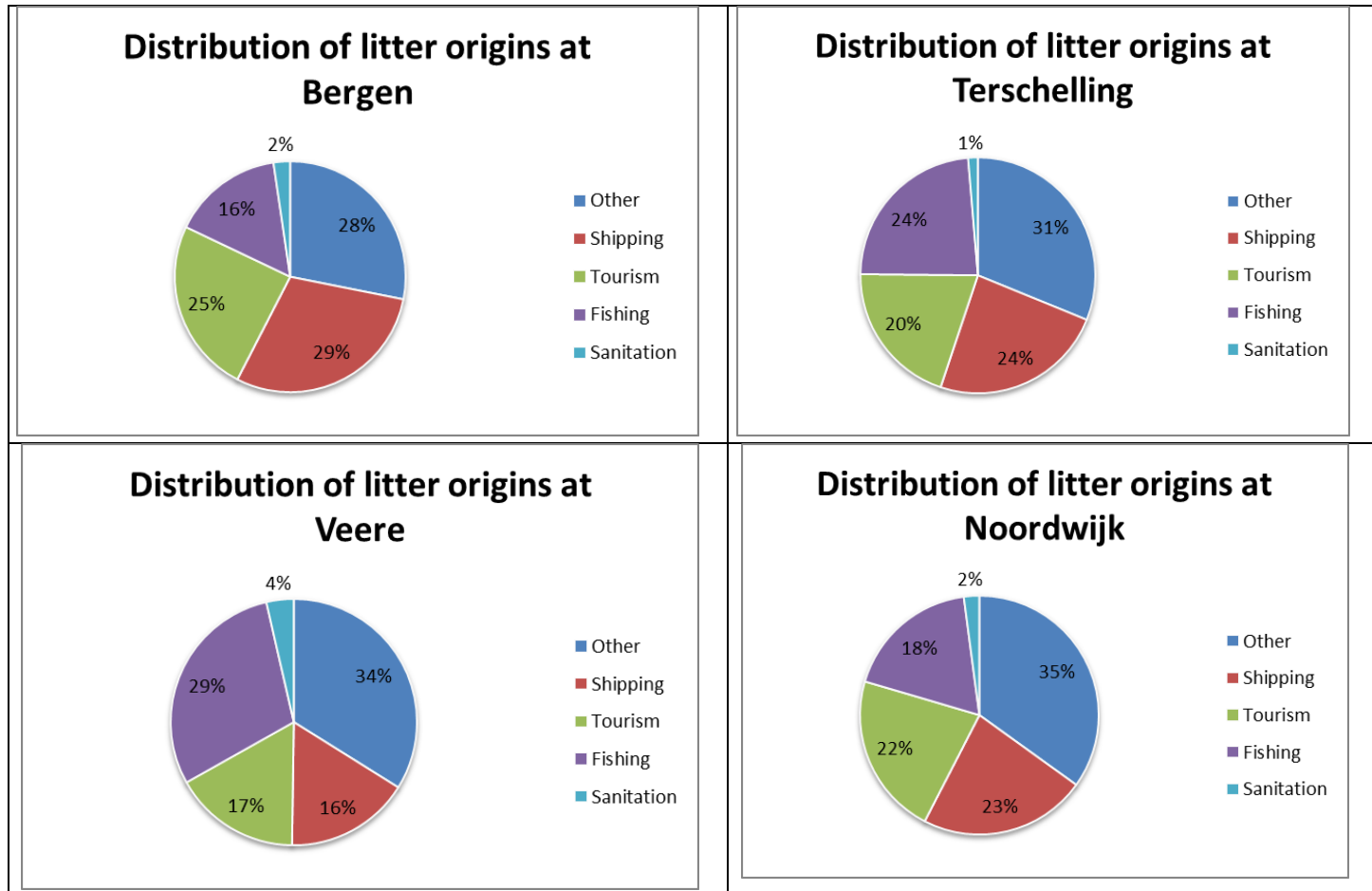


Figure 3-2 Distribution of litter origins at Bergen, Terschelling, Veere, and Noordwijk in the period 2008-2013.

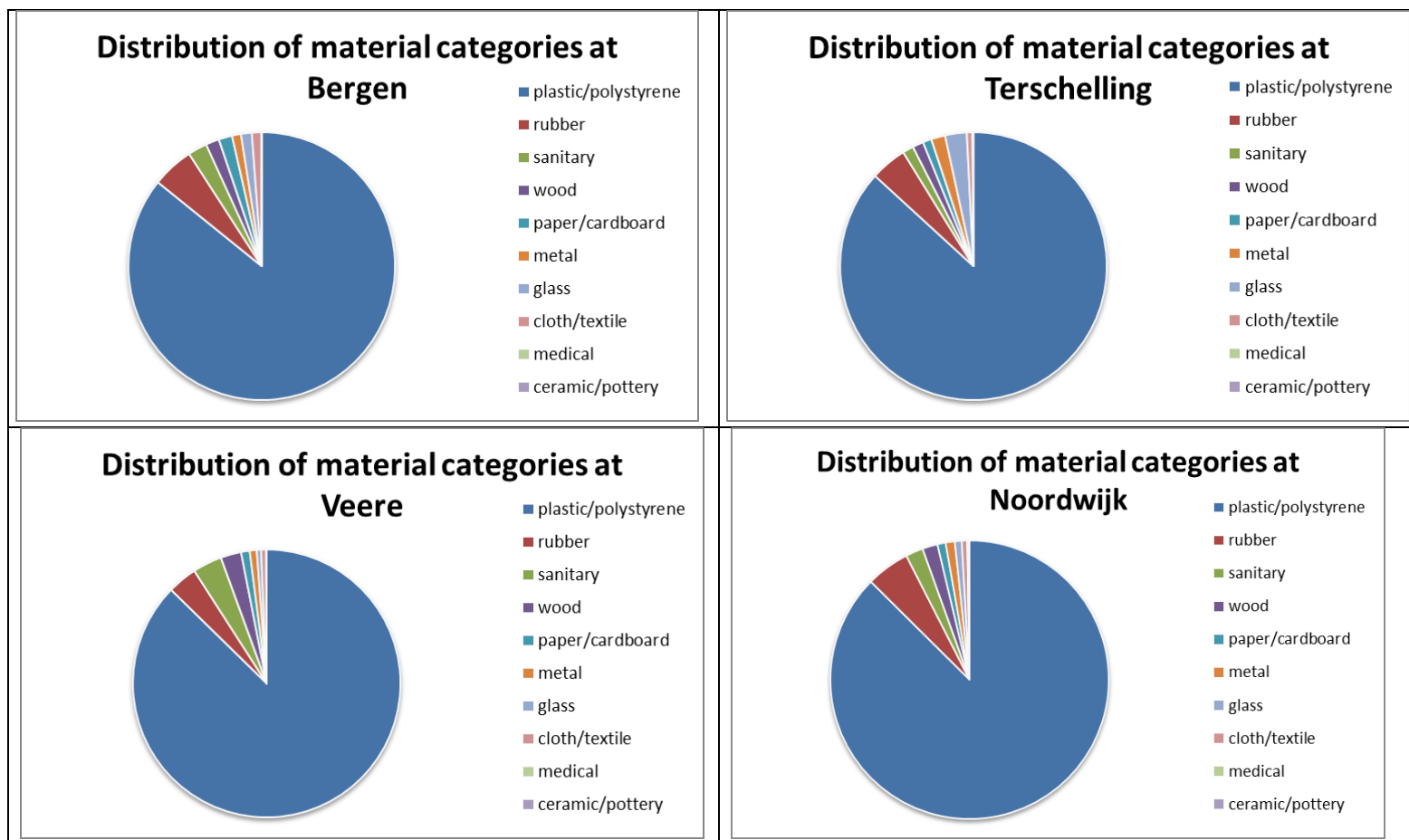


Figure 3-3 Distribution of material categories of litter items found at Bergen, Veere, Terschelling and Noordwijk in the period 2008-2013.

4. Conclusions

The application of the use of 6-year arithmetic averages to describe the number of litter items on each beach and the use of non-parametric trend analysis using Mann Kendall and Theil-Sen slope estimation from individual item counts set out against the year of monitoring to show significance of trends in number of litter items, as performed using Litter Analyst, appear to work well in the assessment of beach litter data.

The assessment of the beach litter monitoring data of 2008 - 2013 shows that Bergen, Terschelling and Noordwijk show increasing total counts of litter items, whereas at Veere total litter counts show a decrease. At all beaches, 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. Counts for nets and ropes and polystyrene pieces are lowest at Bergen and highest at Veere. Nets and ropes show increasing counts for the period 2008-2013 at the beaches of Bergen, Terschelling, and Noordwijk. However, only at Bergen the trend is significant. The decreasing count of nets and ropes at Veere was found not significant.

At all four beaches, the origin of litter category "Other" is the largest contributor to total found litter. For the categories "Shipping", "Fishing", and "Tourism". relative contribution differs per beach. At all four beaches, "Sanitation" is the smallest source of beach litter. Source trend analysis shows that at Bergen, Terschelling, and Noordwijk, that items from all source categories show increasing trends; at Veere, all source categories are decreasing. Most likely the trends in sources are related to trends in top-80% items.

More than 85% of the total litter items found on all four reference beaches is made of plastic. "Rubber" is the second-largest material category on all four beaches. Material trend analyses show that at Bergen and Terschelling, plastic, rubber, sanitary, and paper items have increasing trends. At Veere and Noordwijk, plastic, rubber, and sanitary items show decreasing trends. At all four beaches, the trend in plastic items has the largest slope of all material categories.



Figure 4-1 Plastic sheeting at monitoring site Veere

5. Recommendations

The assessment of beach litter data is currently developing. For the next annual report the following recommendations are made, of which some were already mentioned in the first annual report. It is recommended:

- That RWS Zee and Delta organizes the installation of clear sign posts on the reference beaches, including texts explaining the research and the request not to remove or deposit litter. Furthermore, no litter bins should be available near these reference beaches.
- To always register the real survey date after a beach litter monitoring instead of the period in which the monitoring was supposed to be done (Baggelaar & Meulen, 2014).
- To keep the survey interval as close as possible to three months, to enable determination of process characteristics such as seasonality and autocorrelation (Baggelaar & Meulen, 2014).

6. References

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Appendices

Appendix I

OSPAR database exports of Dutch beach litter monitoring, year 2013

RefNo	NL1	NL1	NL1	NL1	NL2	NL2	NL2	NL2
Beach name	Bergen	Bergen	Bergen	Bergen	Noordw	Noordw	Noordw	Noordw
Country	NLs	NLs	NLs	NLs	NLs	NLs	NLs	NLs
Survey date	19-2-2013	1-4-2013	20-7-2013	16-10-2013	21-2-2013	24-4-2013	15-6-2013	17-10-2013
Period	1	2	3	4	1	2	3	4
Plastic: Yokes [1]	0	0	0	0	0	0	0	0
Plastic: Bags [2]	24	0	10	7	3	0	1	6
Plastic: Small_bags [3]	23	0	4	5	2	4	18	5
Plastic: Bag_ends [112]	13	0	0	1	0	1	0	0
Plastic: Drinks [4]	12	0	0	4	6	4	3	6
Plastic: Cleaner [5]	3	0	0	3	0	0	3	0
Plastic: Food [6]	3	0	1	6	2	1	3	5
Plastic: Toiletries [7]	0	0	0	3	0	0	0	3
Plastic: Oil_small [8]	0	0	0	0	1	0	0	0
Plastic: Oil_large [9]	0	0	0	0	0	0	0	0
Plastic: Jerry_cans [10]	0	0	0	1	0	1	1	0
Plastic: Injection_gun [11]	2	0	0	7	0	0	0	0
Plastic: Other_bottles [12]	0	0	0	0	0	0	0	0
Plastic: Crates [13]	1	0	0	0	0	0	0	0
Plastic: Car_parts [14]	0	0	0	0	0	0	0	0
Plastic: Caps [15]	39	0	5	18	17	4	19	51

Plastic: Cigarettelighters [16]	3	0	0	4	0	0	1	2
Plastic: Pens [17]	0	0	0	0	1	0	0	1
Plastic: Combs [18]	0	0	0	0	0	0	0	0
Plastic: Crisp [19]	31	0	7	7	16	9	17	8
Plastic: Toys [20]	0	0	0	1	1	0	0	2
Plastic: Cups [21]	4	0	0	1	4	0	3	2
Plastic: Cutlery [22]	15	0	4	2	3	0	4	3
Plastic: Fertiliser [23]	0	0	0	0	0	1	0	0
Plastic: Meshbags [24]	3	0	0	1	1	0	0	0
Plastic: Gloves [25]	0	0	0	1	0	0	0	4
Plastic: Gloves_pro [113]	1	0	0	0	0	0	2	0
Plastic: Lobsterpots [26]	0	0	0	0	0	0	0	0
Plastic: Fish_tags [114]	6	0	0	2	1	0	0	4
Plastic: Octopus_pots [27]	0	0	0	0	0	0	0	0
Plastic: Oyster_nets [28]	1	0	0	3	0	0	0	1
Plastic: Oyster_trays [29]	0	0	0	0	0	0	0	0
Plastic: Mussel_sheeting [30]	0	0	0	0	0	0	1	0
Plastic: Rope [31]	0	0	0	30	1	0	3	11
Plastic: String [32]	152	0	0	241	36	44	53	51
Plastic: Fishing_net_small [115]	7	0	42	12	3	2	6	35
Plastic: Fishing_net_large [116]	0	0	0	18	1	1	1	1
Plastic: Tangled [33]	24	0	7	0	2	15	6	10
Plastic: Fishboxes [34]	0	0	0	0	0	0	0	0
Plastic: Fishing_line [35]	0	0	0	0	0	0	0	2
Plastic: Light_sticks [36]	0	0	0	0	0	0	0	2
Plastic: Floats [37]	2	0	0	0	1	0	0	1
Plastic: Buckets [38]	0	0	0	1	0	0	1	2

Plastic: Strapping [39]	6	0	1	6	3	0	0	7
Plastic: Industrial [40]	18	0	2	9	0	5	4	8
Plastic: Fibre_glass [41]	0	0	0	0	0	0	0	0
Plastic: Hard_hats [42]	0	0	0	0	0	0	0	0
Plastic: Shotgun [43]	12	0	0	4	0	0	0	0
Plastic: Shoes [44]	0	0	0	0	1	1	2	2
Plastic: Foam_sponge [45]	38	0	3	16	17	2	12	19
Plastic: Plastic_small [117]	156	0	5	13	34	9	38	47
Plastic: Plastic_large [46]	74	0	16	24	34	14	47	73
Plastic: Plastic_vlarge [47]	1	0	0	4	2	1	0	1
Plastic: Other [48]	0	0	1	14	9	1	9	13
Rubber: Balloons [49]	23	0	6	38	4	4	13	35
Rubber: Boots [50]	1	0	0	0	0	0	0	0
Rubber: Tyres [52]	0	0	1	1	2	1	1	2
Rubber: Other [53]	0	0	0	0	0	0	0	1
Cloth: Clothing [54]	8	0	0	2	1	2	0	0
Cloth: Furnishings [55]	0	0	0	0	0	0	0	0
Cloth: Sacking [56]	0	0	2	0	0	0	0	0
Cloth: Shoes [57]	1	0	0	0	0	0	0	0
Cloth: Other [59]	0	0	1	1	0	0	0	0
Paper: Bags [60]	0	0	0	0	0	0	0	0
Paper: Cardboard [61]	4	0	0	0	0	1	0	0
Paper: Purepak [118]	0	0	0	0	2	0	0	0
Paper: Tetrapak [62]	2	0	0	2	2	0	0	0
Paper: Cig_packets [63]	0	0	1	0	0	0	0	0
Paper: Cig_stubs [64]	5	0	0	2	1	0	0	0
Paper: Cups [65]	0	0	0	0	0	0	0	0
Paper: Newspapers [66]	0	0	0	0	0	0	0	0
Paper: Other [67]	0	0	0	0	0	0	0	0

Wood: Corks [68]	0	0	0	0	1	0	0	0
Wood: Pallets [69]	0	0	0	0	0	0	0	0
Wood: Crates [70]	0	0	0	0	0	0	0	0
Wood: Lobsterpots [71]	0	0	0	0	0	0	0	0
Wood: Fish_boxes [119]	0	0	0	0	0	0	0	0
Wood: Lolly [72]	0	0	0	0	0	0	0	0
Wood: Brushes [73]	0	0	0	0	0	0	0	0
Wood: Other_small [74]	0	0	3	1	0	3	0	7
Wood: Other_large [75]	3	0	0	0	2	0	0	10
Metal: Aerosol [76]	0	0	0	0	1	0	0	0
Metal: Caps [77]	0	0	0	0	0	0	0	0
Metal: Drink [78]	6	0	2	2	1	2	0	6
Metal: Bbqs [120]	0	0	0	0	0	0	0	0
Metal: Electrical [79]	0	0	0	0	0	0	0	0
Metal: Fishing [80]	0	0	0	0	0	0	0	0
Metal: Foil [81]	0	0	0	0	2	0	0	0
Metal: Food [82]	0	0	0	0	0	0	0	0
Metal: Scrap [83]	0	0	0	0	0	0	0	0
Metal: Oil [84]	0	0	0	0	0	0	0	0
Metal: Paint_tins [86]	0	0	0	0	0	0	0	0
Metal: Lobsterpots [87]	0	0	0	0	0	0	0	0
Metal: Wire [88]	0	0	0	0	0	0	0	0
Metal: Other_small [89]	0	0	0	0	0	0	0	0
Metal: Other_large [90]	0	0	0	0	0	0	0	0
Glass: Bottles [91]	0	0	2	2	0	1	0	0
Glass: Bulbs [92]	0	0	0	0	0	0	0	0
Glass: Other [93]	3	0	0	1	1	0	0	0
Pottery: Construction [94]	0	0	0	0	0	0	0	0
Pottery: Octopus_pots [95]	0	0	0	0	0	0	0	0

Pottery: Other [96]	0	0	0	0	0	0	0	0
San: Condoms [97]	0	0	0	0	0	0	0	0
San: Buds [98]	34	0	5	3	5	2	0	12
San: Towels [99]	1	0	0	0	0	1	0	0
San: Tampons [100]	0	0	0	1	0	0	0	0
San: Toilet [101]	0	0	0	1	0	0	0	0
San: Other [102]	0	0	2	0	0	0	0	0
Med: Containers [103]	0	0	0	0	0	0	0	0
Med: Syringes [104]	0	0	0	0	0	0	0	0
Med: Other [105]	0	0	0	0	0	0	0	0
Faeces: In_bags [121]	0	0	0	0	0	0	0	0
Pollutants: Wax_small [108]	0	0	0	0	0	0	0	100
Pollutants: Wax_medium [109]	0,03	0	0	0,03	0	0	0	1
Pollutants: Wax_large [110]	0	0	0	0,02	0	0	0	0
Pollutants: Other [111]	0	0	0	0	0	0	0	0
Survey: Old_rope_small [200]	0	0	0	0	0	0	0	0
Survey: Old_rope_large [201]	0	0	0	0	0	0	0	0
Survey: Old_plastic_pieces [202]	0	0	0	0	0	0	0	0
Survey: Old_gloves [203]	0	0	0	0	0	0	0	0
Survey: Old_cartons [204]	0	0	0	0	0	0	0	0
Survey: Old_oildrums_new [205]	0	0	0	0	0	0	0	0
Survey: Old_oildrums_old [206]	0	0	0	0	0	0	0	0
Survey: Old_human_faeces [207]	0	0	0	0	0	0	0	0
Survey: Old_animal_faeces	0	0	0	0	0	0	0	0

[208]								
Survey: Old_cloth_rope [210]	0	0	0	0	0	0	0	0
RefNo	NL3	NL3	NL3	NL3	NL4	NL4	NL4	NL4
Beach name	Veere	Veere	Veere	Veere	Tersch	Tersch	Tersch	Tersch
Country	NLs	NLs	NLs	NLs	NLs	NLs	NLs	NLs
Survey date	6-3-2013	17-4-2013	15-7-2013	22-10-2013	22-2-2013	1-4-2013	22-7-2013	9-10-2013
Period	1	2	3	4	1	2	3	4
Plastic: Yokes [1]	0	0	0	0	0	0	0	0
Plastic: Bags [2]	1	3	4	0	4	0	4	6
Plastic: Small_bags [3]	1	6	11	2	9	0	6	4
Plastic: Bag_ends [112]	0	0	0	0	0	0	0	0
Plastic: Drinks [4]	2	3	5	0	14	0	9	5
Plastic: Cleaner [5]	0	0	0	0	2	0	4	1
Plastic: Food [6]	4	2	0	1	12	0	8	3
Plastic: Toiletries [7]	0	1	0	0	2	0	0	0
Plastic: Oil_small [8]	0	0	0	0	0	0	0	0
Plastic: Oil_large [9]	0	0	0	0	0	0	0	0
Plastic: Jerry_cans [10]	0	0	0	0	1	0	3	2
Plastic: Injection_gun [11]	0	2	0	0	0	0	0	1
Plastic: Other_bottles [12]	0	0	0	0	0	0	1	0
Plastic: Crates [13]	0	0	0	0	1	0	0	0
Plastic: Car_parts [14]	0	0	0	0	0	0	0	0
Plastic: Caps [15]	32	22	13	4	53	0	17	18
Plastic: Cigarettelighters [16]	0	1	3	0	1	0	0	0
Plastic: Pens [17]	1	0	3	1	3	0	1	0
Plastic: Combs [18]	0	0	0	0	0	0	0	0
Plastic: Crisp [19]	8	11	7	2	9	0	22	14
Plastic: Toys [20]	5	0	0	2	1	0	0	0
Plastic: Cups [21]	3	2	2	0	6	0	1	2

Plastic: Cutlery [22]	4	10	8	0	5	0	4	3
Plastic: Fertiliser [23]	2	0	0	0	0	0	0	0
Plastic: Meshbags [24]	1	0	0	0	3	0	0	0
Plastic: Gloves [25]	0	1	2	0	2	0	0	1
Plastic: Gloves_pro [113]	1	0	0	0	2	0	1	0
Plastic: Lobsterpots [26]	0	0	0	0	0	0	0	0
Plastic: Fish_tags [114]	3	6	0	0	6	0	0	0
Plastic: Octopus_pots [27]	0	0	0	0	0	0	0	0
Plastic: Oyster_nets [28]	0	0	1	1	6	0	0	0
Plastic: Oyster_trays [29]	0	0	0	0	3	0	0	0
Plastic: Mussel_sheeting [30]	0	0	2	0	1	0	0	0
Plastic: Rope [31]	8	2	8	2	18	0	0	5
Plastic: String [32]	102	148	144	67	307	0	18	128
Plastic: Fishing_net_small [115]	27	16	16	1	57	0	192	34
Plastic: Fishing_net_large [116]	0	1	1	0	3	0	0	2
Plastic: Tangled [33]	25	38	21	1	25	0	14	11
Plastic: Fishboxes [34]	0	0	0	0	0	0	0	0
Plastic: Fishing_line [35]	4	2	3	0	0	0	0	0
Plastic: Light_sticks [36]	0	0	1	0	0	0	0	0
Plastic: Floats [37]	0	0	0	0	0	0	0	0
Plastic: Buckets [38]	0	0	1	0	0	0	0	2
Plastic: Strapping [39]	0	0	2	0	9	0	11	4
Plastic: Industrial [40]	2	4	7	2	35	0	37	12
Plastic: Fibre_glass [41]	0	0	0	0	0	0	0	0
Plastic: Hard_hats [42]	0	0	0	0	0	0	0	0
Plastic: Shotgun [43]	15	11	8	0	6	0	2	0
Plastic: Shoes [44]	2	2	1	0	0	0	0	0

Plastic: Foam_sponge [45]	5	8	11	4	13	0	10	8
Plastic: Plastic_small [117]	72	83	33	2	87	0	0	28
Plastic: Plastic_large [46]	49	34	58	9	61	0	51	41
Plastic: Plastic_vlarge [47]	1	3	3	0	1	0	2	2
Plastic: Other [48]	16	11	11	2	1	0	0	8
Rubber: Balloons [49]	7	9	14	2	33	0	6	18
Rubber: Boots [50]	0	0	0	0	0	0	0	0
Rubber: Tyres [52]	1	3	0	1	3	0	1	1
Rubber: Other [53]	0	0	0	0	0	0	0	0
Cloth: Clothing [54]	1	0	0	2	2	0	3	0
Cloth: Furnishings [55]	0	0	0	0	0	0	0	0
Cloth: Sacking [56]	0	0	0	0	0	0	1	0
Cloth: Shoes [57]	0	0	0	0	0	0	0	0
Cloth: Other [59]	0	0	0	0	0	0	0	0
Paper: Bags [60]	0	0	0	0	0	0	0	0
Paper: Cardboard [61]	1	0	0	0	0	0	0	0
Paper: Purepak [118]	1	0	0	0	1	0	0	0
Paper: Tetrapak [62]	2	2	0	0	2	0	7	2
Paper: Cig_packets [63]	0	0	0	0	1	0	0	0
Paper: Cig_stubs [64]	0	0	1	1	0	0	0	0
Paper: Cups [65]	0	0	0	0	0	0	0	0
Paper: Newspapers [66]	0	0	0	0	0	0	0	0
Paper: Other [67]	0	0	0	0	0	0	0	0
Wood: Corks [68]	1	0	2	1	0	0	0	0
Wood: Pallets [69]	0	0	0	0	2	0	1	0
Wood: Crates [70]	0	0	0	0	0	0	0	0
Wood: Lobsterpots [71]	0	0	0	0	0	0	0	0
Wood: Fish_boxes [119]	0	0	0	0	0	0	0	0
Wood: Lolly [72]	0	0	0	0	0	0	0	0

Wood: Brushes [73]	0	0	0	0	0	0	0	0
Wood: Other_small [74]	3	5	8	0	4	0	0	0
Wood: Other_large [75]	2	2	1	0	0	0	0	0
Metal: Aerosol [76]	0	1	0	0	1	0	0	0
Metal: Caps [77]	0	0	0	0	0	0	0	0
Metal: Drink [78]	0	0	0	0	4	0	0	0
Metal: Bbqs [120]	0	0	0	0	0	0	1	0
Metal: Electrical [79]	0	0	0	0	0	0	0	0
Metal: Fishing [80]	0	0	0	0	0	0	0	0
Metal: Foil [81]	1	0	0	0	0	0	0	0
Metal: Food [82]	0	0	0	0	0	0	0	0
Metal: Scrap [83]	0	0	0	0	0	0	0	0
Metal: Oil [84]	0	0	0	0	0	0	0	0
Metal: Paint_tins [86]	0	0	0	0	0	0	0	0
Metal: Lobsterpots [87]	0	0	0	0	0	0	0	0
Metal: Wire [88]	0	0	0	0	0	0	0	0
Metal: Other_small [89]	0	0	0	0	0	0	0	0
Metal: Other_large [90]	0	0	0	0	0	0	0	0
Glass: Bottles [91]	0	0	3	0	4	0	8	0
Glass: Bulbs [92]	0	0	0	0	2	0	0	0
Glass: Other [93]	0	0	0	0	0	0	1	0
Pottery: Construction [94]	0	0	0	0	0	0	0	0
Pottery: Octopus_pots [95]	0	0	0	0	0	0	0	0
Pottery: Other [96]	0	0	0	0	0	0	0	0
San: Condoms [97]	0	0	0	0	0	0	0	0
San: Buds [98]	20	17	12	5	5	0	2	3
San: Towels [99]	1	0	2	0	0	0	1	0
San: Tampons [100]	1	0	0	1	2	0	1	1
San: Toilet [101]	0	1	0	0	2	0	0	0

San: Other [102]	0	0	0	0	0	0	0	0
Med: Containers [103]	0	0	0	0	0	0	0	0
Med: Syringes [104]	0	0	0	0	0	0	0	0
Med: Other [105]	0	0	0	0	0	0	0	0
Faeces: In_bags [121]	0	0	0	0	0	0	0	0
Pollutants: Wax_small [108]	0,01	0,07	0,07	0	0	0	0	0,01
Pollutants: Wax_medium [109]	0	0	0	0,01	0	0	0	0,04
Pollutants: Wax_large [110]	0	0	0	0	0,02	0	0	0
Pollutants: Other [111]	0	0	0	0	0	0	0	0
Survey: Old_rope_small [200]	0	0	0	0	0	0	0	0
Survey: Old_rope_large [201]	0	0	0	0	0	0	0	0
Survey: Old_plastic_pieces [202]	0	0	0	0	0	0	0	0
Survey: Old_gloves [203]	0	0	0	0	0	0	0	0
Survey: Old_cartons [204]	0	0	0	0	0	0	0	0
Survey: Old_oildrums_new [205]	0	0	0	0	0	0	0	0
Survey: Old_oildrums_old [206]	0	0	0	0	0	0	0	0
Survey: Old_human_faeces [207]	0	0	0	0	0	0	0	0
Survey: Old_animal_faeces [208]	0	0	0	0	0	0	0	0
Survey: Old_cloth_rope [210]	0	0	0	0	0	0	0	0

Appendix II

Digital scans of original forms of Dutch beach litter monitoring, year 2013.