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European Coastline Macro Litter Trends 2015–2021

Methodology development and trend results for the Marine Strategy Framework Directive

MSFD Technical Group on Marine Litter

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Contents

Abstract

The Marine Strategy Framework Directive (MSFD) requires that Good Environmental Status (GES) be achieved for the European marine environment, including in respect of marine litter, as per MSFD Descriptor 10. Based on a commonly agreed methodology, through *Guidance on the Monitoring of Marine Litter* since 2013, EU Member States have been providing data on macro litter abundances on selected EU beaches to the European Marine Observation and Data Network (EMODnet). Following the establishment of a baseline period, 2015–2016, and further ongoing data collection, data were analysed and normalised by the MSFD Technical Group on Marine Litter (TG ML). The methodology for step-trend assessment was then discussed, agreed upon and applied to the dataset from 2015 to 2021. The results show that a – 29 % trend in coastline macro litter total abundance has been achieved at the EU level, that is, in 2020–2021, there was about one-third less litter on EU coastlines than in 2015–2016, based on data from 253 selected monitored beaches after data preparation and treatment. Single-use plastic was found to have a decreased by 40 % between 2015–2016 and 2020–2021, fisheries-related items decreased by 20 % and plastic bags reduced by 20 %. Despite the encouraging trends showing the positive impacts of mitigation measures through EU legislation, regional and national efforts, and efforts by the public, the abundance of litter in many European areas remains high and demands the implementation of additional effective measures.

This report provides information on the methodology for analysing coastline litter trends. The results show progress towards GES, enabling the setting of intermediate quantitative targets and informing on progress towards the EU Zero Pollution Action Plan's Target 5 on coastline litter.

Foreword

The Marine Directors of the EU and all EU Member States have developed a common strategy to support the implementation of Directive (EU) 2008/56/EC, the Marine Strategy Framework Directive (MSFD). The main aim of this strategy is to ensure coherent and harmonious implementation of the Directive among EU Member States. The focus is on methodological questions related to a common understanding of the technical and scientific implications of the MSFD. In particular, one of the objectives of the strategy is the development of non-legally binding and practical documents on various technical issues pertaining to the Directive.

To support and advise on the policy development and implementation process, the MSFD Technical Group on Marine Litter (TG ML) was set up as part of the MSFD Implementation Strategy. The TG ML acts through the mandate of the Marine Directors of the EU. It is led by the Directorate-General for Environment and is chaired by the Spanish Centre for Public Works and Experimentation and the European Commission's Joint Research Centre. Members include EU Member State delegates, representatives of the parties to the Regional Sea Conventions (RSCs), other stakeholders and invited technical experts. The TG ML reviews scientific developments and prepares technical guidance and information documents to support EU Member States in implementing the MSFD. Further information can be found on the TG ML page of the Joint Research Centre's MSFD Competence Centre website (https://mcc.jrc.ec.europa.eu/dev.py?N=41&O=434&titre_chap=TG %20Marine %20Litter).

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Authors

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1 Introduction

Following the establishment of Marine Litter as one of the Descriptors for the environmental status of the European seas through the Marine Strategy Framework Directive (MSFD) [1], as Descriptor 10 (D10), methodologies for and approaches to the management of marine litter in the EU have been developed. The MSFD Technical Group on Marine Litter (TG ML) has been acting as the forum for information exchange, data collection and discussion about the development of approaches and preparation for their adoption through the Marine Strategy Coordination Group (MSCG).

This included the development of guidance documents for monitoring in 2013 and their update in 2023, providing the possibility of generating comparable data at the EU scale across the different litter types and environmental compartments (Galgani et al., 2013, 2023). Coastline macro litter, often referred to as beach litter, was selected as the first parameter for the development of baselines, as it appeared to be the most mature litter type to have been monitored.

The MSFD TG ML has been mandated to develop an approach for calculating trends in coastline litter from MSFD surveys, starting from established baselines (Hanke et al., 2019) in 2015-2016. The proposed approach should enable EU Member States to derive quantitative intermediate targets as milestones on the way towards achieving Good Environmental Status (GES). Trend evaluation is needed to check the effectiveness of measures and to quantify the distance between the current littering situation and the agreed threshold value (TV). Furthermore, trends in MSFD D10 coastline litter data is the most useful proxy to assess the Zero Pollution Action Plan Target 5, which states that 'By 2030 the EU should reduce by 50 % plastic litter at sea and by 30 % microplastics released into the environment' (European Commission, 2021).

To assess trends, data were collected from all EU Member States and ingested by the European Marine Observation and Data Network (EMODnet) into a database. Close collaboration with Regional Sea Conventions (RSCs) has been very important, as initial data collection had been begun, for example by the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), while the close alignment and cooperation enables basin-wide assessments, which are significant, as marine litter is a transboundary issue.

Analysis of that dataset led to the agreed baseline period 2015–2016 (Hanke et al., 2019), which was selected as the starting point for trend assessments. The resulting dataset has also been instrumental in developing an EU-level TV for coastline litter (Van Loon et al., 2020), against which the monitoring results can be compared.

Furthermore, a Joint List of Litter Categories was adopted by EU Member States, enabling the direct comparison of individual litter categories in order to address priority categories adequately (Fleet et al., 2021). EU Member States have mostly been efficient in continuing to acquire data and provide them, based on the guidance and Joint List of Litter Categories.

After a thorough review by EU Member States, a final dataset for 2015–2021, collected by EMODnet, has been established and provided to calculate trends in coastline litter abundance.

[1] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) (OJ L 164, 25.6.2008, p. 19).

This report provides the process, the methodologies adopted by EU Member States, and the baselines, assessment and trend values of EU Coastline Macro Litter from 2015 to 2021, as endorsed by the MSCG on 22 May 2024.

2 EU coastline litter baseline 2015–2016

In 2019, the available data on coastline litter were compiled and 2015–2016 selected as the baseline period (Hanke et al., 2019). A 2-year baseline period, rather than a single year, was proposed in order to enhance the data coverage and improve robustness. While data from previous years were available from some countries, they did not allow an EU-wide analysis. Following the data cleaning and normalisation process, and after confirmation by EU Member States of the dataset's completeness, baseline values at the country-region, region and EU levels were calculated, using medians as a way to reduce the strong impact of very high individual litter counts of individual beaches on the larger scale results.

After outlining a methodology for calculating trends, EU Member States provided a number of corrections, additions, deletions and changes to their data, and also communicating new 2015–2016 datasets to EMODnet. These changes were integrated into the EMODnet database, leading to an alteration of the previously determined baseline. In consequence, the baseline data for 2015–2016 now differ from the baseline data that were provided in 2019.

The differences are considerable in the EU's Mediterranean region (274 to 376 litter items / 100 m) and Black Sea region (106 to 973 items / 100 m). The additional datasets and correction of data, including removal, are welcomed, as they improve the quality and spatial coverage of the EU coastline litter monitoring.

3 Data collection for EU coastline litter trends

The availability and accessibility of data is crucial for comparable assessments of the environmental status of European seas. It is fundamental that such data is provided and endorsed by the individual EU Member State and then collected in a common database or data portal. EMODnet, as the EU hub for marine data, has developed, in collaboration with the Joint Research Centre (JRC) and the TG ML, a database of MSFD-relevant data. The collection and use of marine coastline macro litter data has demonstrated the benefits of joint large-scale agreed data acquisition and management of data for policy decision support.

A total of 7 426 beach litter surveys were provided by EU Member States and ingested into the EMODnet portal (Table 1) as part of the MSFD implementation strategy. EMODnet controlled, checked and adjusted the datasets, which contained data collected from 2015 to 2021, providing a consolidated dataset at the end of 2023. Data from 2022 and onwards are being collected, and trend calculations can be performed once the datasets are complete. Please note that this table includes surveys of different lengths; thus, the number of surveys does not precisely reflect the sampling effort.

Table 1. Total number of beach litter surveys per EU Member State and year provided by EU Member States and collected via the EMODnet portal. Number of beach litter surveys based on the consolidated EMODnet beach litter dataset.

Member State code	Member State	2015	2016	2017	2018	2019	2020	2021
BE	Belgium	9	8	3	0	0	0	0
BG	Bulgaria	24	8	60	80	80	72	80
CY	Cyprus	0	0	0	14	10	0	74
DE	Germany	129	123	120	117	120	101	108
DK	Denmark	15	16	16	18	19	21	19
EE	Estonia	30	10	30	30	30	30	36
EL	Greece	9	6	4	25	44	42	50
ES	Spain	96	101	103	99	108	81	102
FI	Finland	29	27	30	37	38	38	34
FR	France	31	63	89	95	157	147	196
HR	Croatia	18	0	3	3	30	6	14
IE	Ireland	16	16	16	16	16	19	14
IT	Italy	154	336	378	371	404	124	137
LT	Lithuania	0	0	16	16	32	23	12
LV	Latvia	38	38	41	12	0	43	43
MT	Malta	0	0	8	16	4	0	0
NL	Netherlands	18	14	16	16	15	15	16

Member State code	Member State	2015	2016	2017	2018	2019	2020	2021
PL	Poland	47	64	61	55	64	54	60
PT	Portugal	34	36	59	65	72	56	82
RO	Romania	6	17	16	30	18	22	28
SI	Slovenia	20	0	12	8	16	8	0
SE	Sweden	45	47	48	48	48	48	48
Total		**768**	**930**	**1 129**	**1 171**	**1 325**	**950**	**1 153**

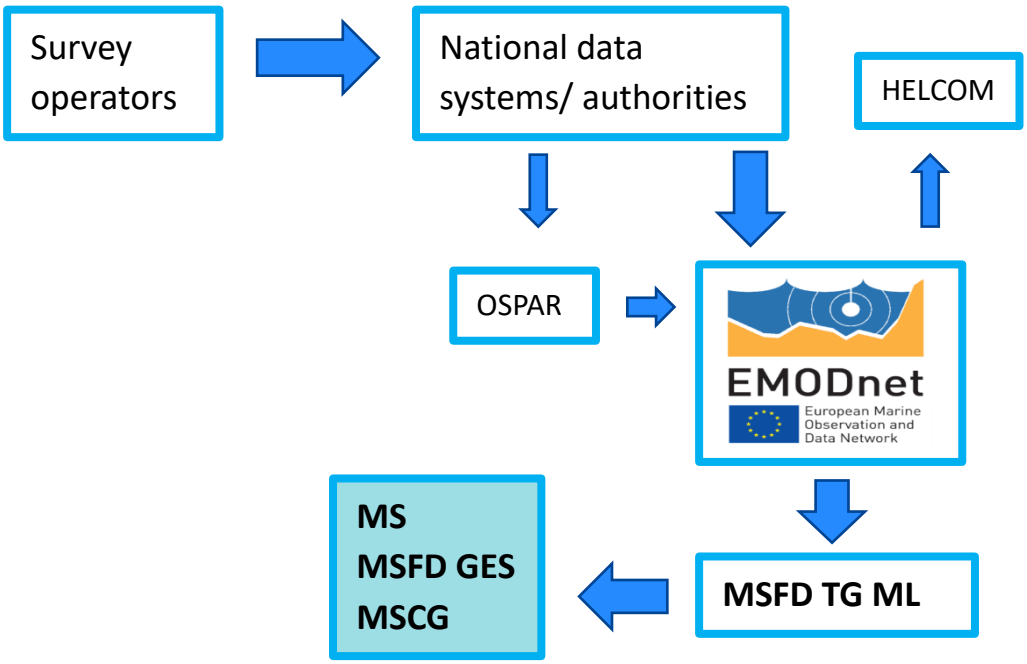
Source: Information extracted from the EMODnet beach litter dataset.

3.1 Data flows to the European Marine Observation and Data network (EMODnet)

Currently, data on marine coastline litter are still, after their collection by observers, reported mostly using dedicated data sheets and then aggregated into national datasets (Figure 1). While attempts have been made to use on-site apps for direct data transfer (e.g. the European Environment Agency's Marine Litter Watch), data are still being transferred manually using electronic data sheets.

Data have been provided by EU Member States partly through OSPAR, resulting in a routine update of such data through a dedicated data pathway. Other countries have collected data and provided them directly to EMODnet, including countries that are part of the Mediterranean Action Plan and EU Member States in the Black Sea region. The Baltic Marine Environment Protection Commission (Helsinki Convention, HELCOM) has also selected EMODnet as the platform to manage Baltic Sea data on beach litter. Currently, the process still involves numerous direct interactions for correcting and completing EU Member States' datasets in EMODnet. It has been agreed within TG ML and among EU Member States, that EU coastline litter data from the previous year will be provided by July of the following year at the latest.

Figure 1. Diagram of the beach litter survey data flow to EMODnet.



NB: HELCOM, Baltic Marine Environment Protection Commission – Helsinki Convention; MS, Member State; OSPAR, Convention for the Protection of the Marine Environment of the North-East Atlantic.
Source: Own elaboration.

3.2 European Marine Observation and Data network (EMODnet) data treatment

The dataset was checked and prepared by the EMODnet team at the Italian National Institute of Oceanography and Applied Geophysics (OGS). The dataset was then prepared and optimised for the application of the statistical analysis, considering data from 2015 to 2021. The finalised dataset was then provided to the JRC and Wageningen University & Research for analysis.

4 Data preparation and treatment

While the guidance for monitoring marine litter provided an approach to harmonised data collection, there were data that had not been acquired in full compliance with this guidance. Thus, the dataset needed to be pre-processed in order to enable the analysis of a homogeneous dataset. It can be assumed that the effort required for such data checks and adjustments will reduce once EU Member States fully implement the guidance, the use of the Joint List of Litter Categories and in-house data quality control.

Calculations were performed using an R script (R Core Team, 2024), developed and applied by Wageningen University & Research, in close collaboration with the JRC and the Netherlands Rijkswaterstaat (Ministry of Infrastructure and Water Management), as part of TG ML activities.

4.1 Data clean-up and validation

In line with the recommendations set out in Hanke et al. (2019), the following litter types were excluded from the analysis:

- paraffin and waxes
- mesolitter fragments < 2.5 cm.

Note that the following litter types, including identifiable mesolitter items, were retained in the analysis (Hanke et al., 2019):

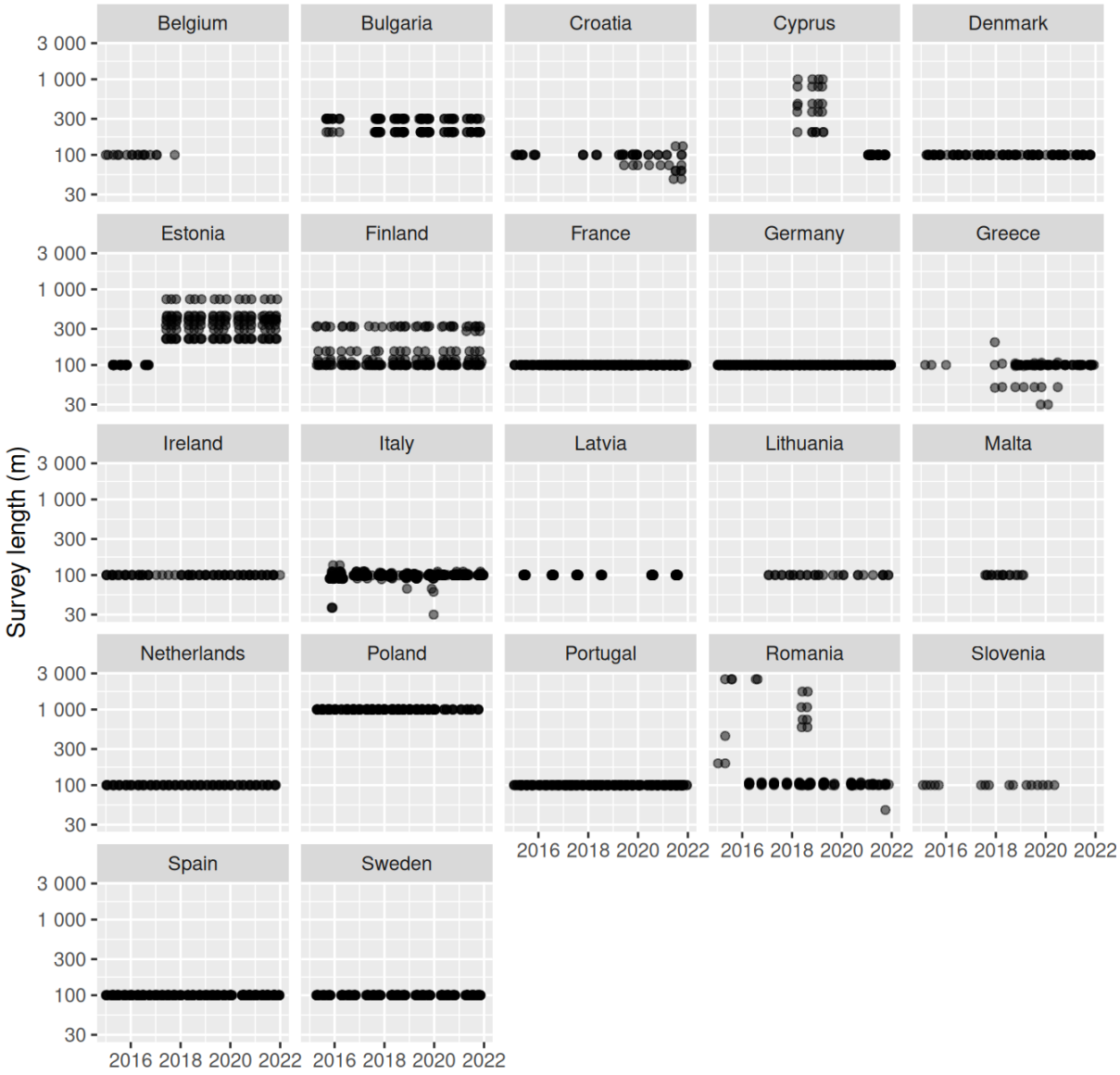
- cigarette butts
- bottle caps
- other litter types

Extreme values were identified but were not removed from the dataset because they were usually correct, showing peak occurrence of litter on certain beaches. Data collected up and including 2022 were kindly requested; however, the coverage for 2022 and 2023 was incomplete. Thus, these data were not used for trend calculations at this time.

4.2 Beach survey length normalisation

MSFD guidance on monitoring marine litter sets beach survey length at 100 m (Galgani et al., 2013, 2023). As the collected datasets were initially not acquired in accordance with the agreed guidance, partly due to non-alignment of EU Member States and RSC data collections, different survey lengths were used (Figure 2). Where appropriate, survey lengths were normalised to 100 m in order to increase comparability. This was done in cases where the beach was shorter than 100 m, for example. This also included combining surveys that had been split in three surveys of 33 m into 100 m surveys. The litter counts were corrected accordingly by multiplying the observed litter counts by a factor that was the ratio of the normalized survey length (i.e. 100 m) and the applied survey length. Survey lengths of 10 m and smaller were not considered, as these were associated with special surveys with a limited scope (e.g. collecting cigarette butts) and might have led to unreliable results when extrapolating to 100 m. It is crucial that monitoring is performed in accordance with the guidance from 2013 and updated in 2023, in order to improve data comparability.

Figure 2. Distribution of beach litter survey lengths by EU Member State.



Source: Own elaboration.

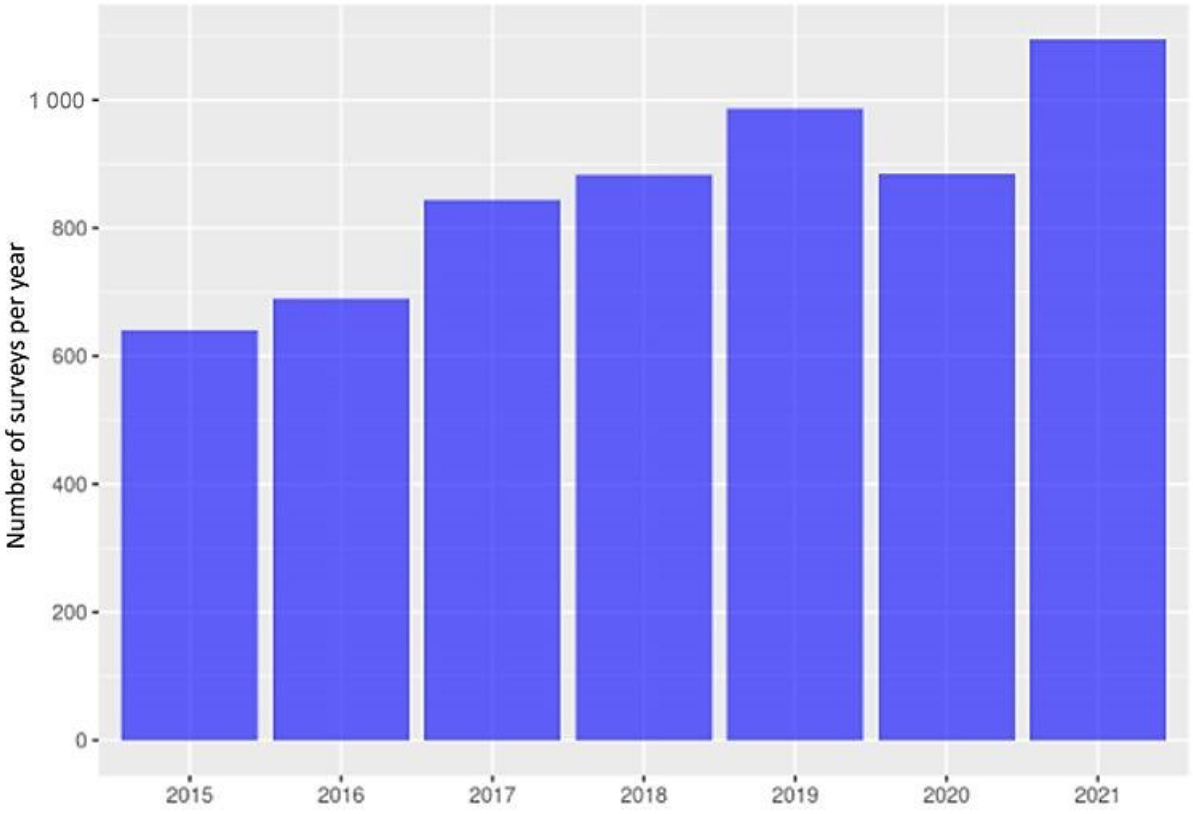
4.3 Data availability and adoption of final dataset by EU Member States

After the presentation of the collected survey numbers to the MSFD GES group on 19 April 2023, several EU Member States provided further corrections and additional data. This became a longer process due to stepwise interactions and dataset completion by EU Member States, which was concluded only in November 2023. The approach was presented to EU Member States in the 30th MSFD GES meeting on 15 April 2024.

The number of EU coastline litter surveys available is presented in Figure 3. A total of 6 022 normalised surveys across EU coastlines/beaches were available for the baseline and assessment analysis. The number of surveys available increased over the years, with a reduction in 2020, which might be attributed to effect of the COVID-19 pandemic. Normalised beach litter surveys were

performed on 477 beaches, of which 253 beaches provided data in both the baseline period, 2015–2016, and the trend assessment period, 2020–2021.

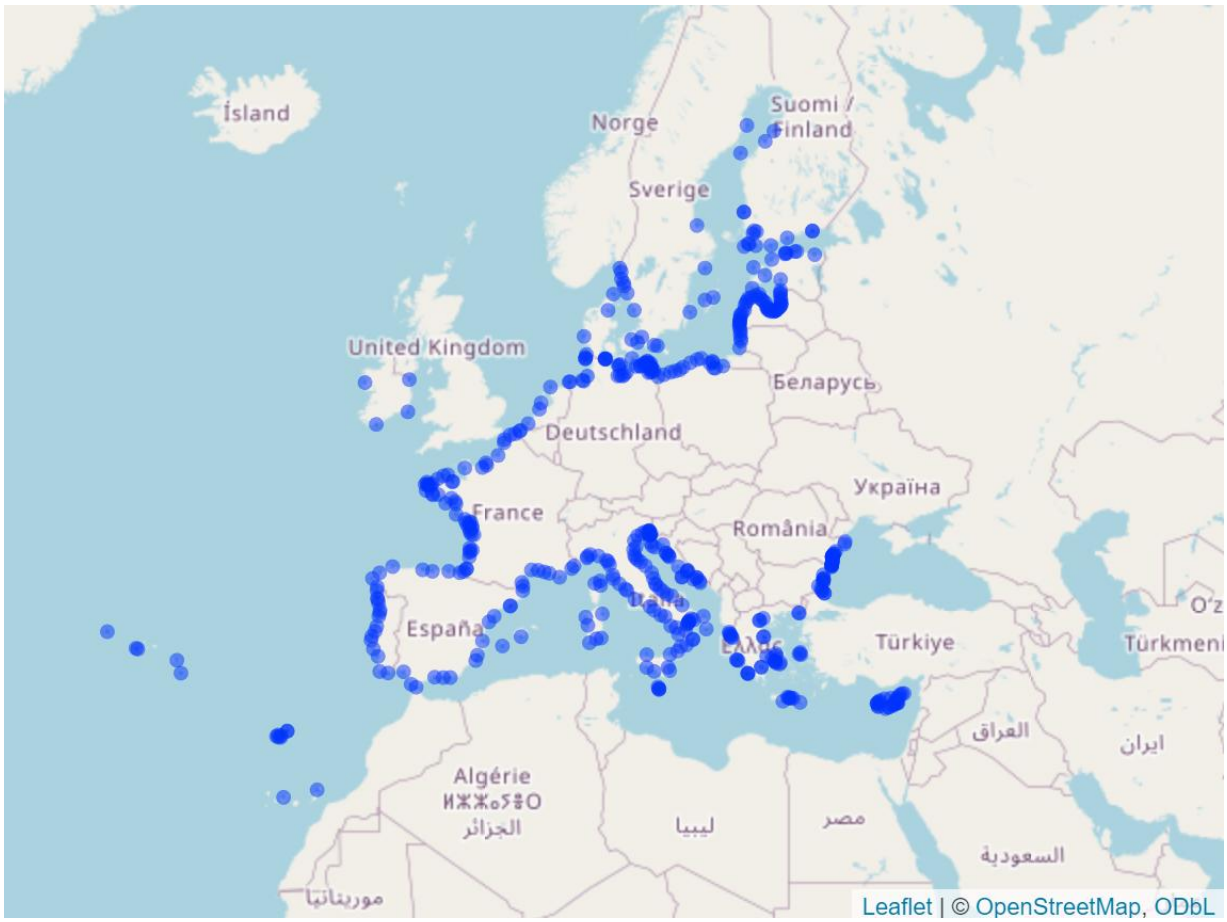
Figure 3. Availability of EU coastline litter surveys (normalised) per year.



NB: Total number of surveys is 6 022.
Source: Own elaboration.

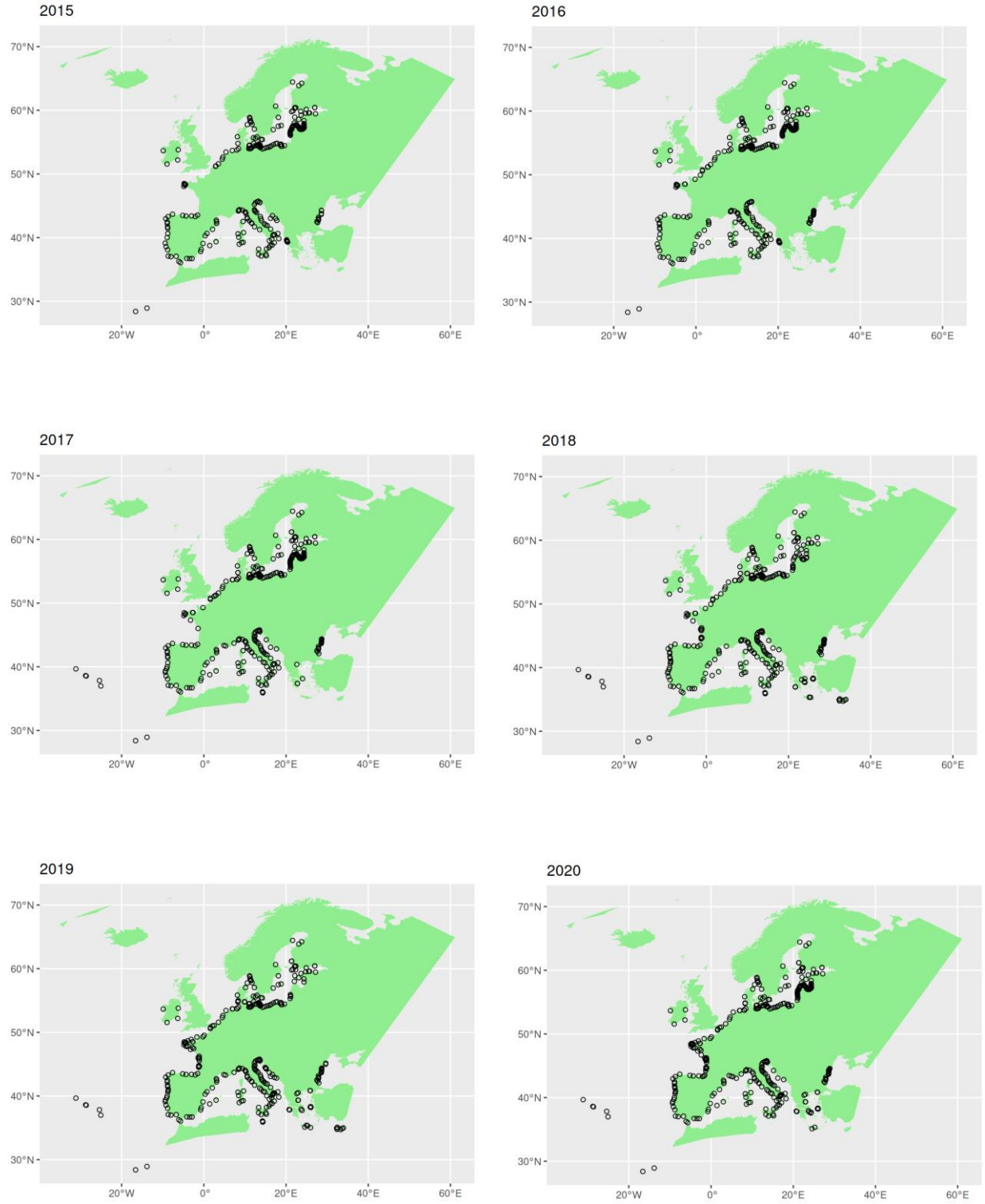
The spatial coverage of the beach litter monitoring is presented in Figure 4. Figure 5 shows the change in spatial coverage between 2015 and 2021.

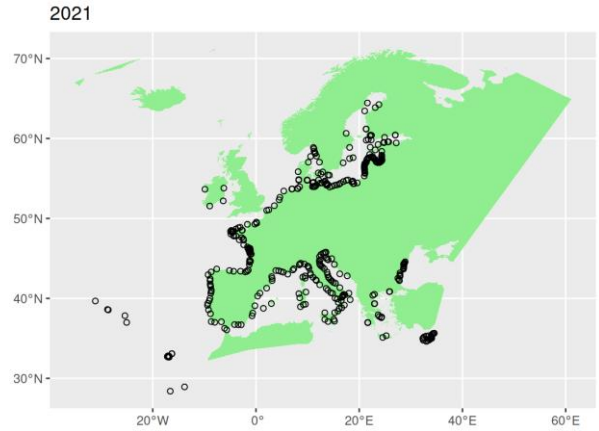
Figure 4. The spatial coverage of EU coastlines with monitored areas/beaches.



Source: Background map from OpenStreetMap.

Figure 5. Evolution of spatial coverage from 2015 to 2021. The dots on the map correspond to the locations where beach litter monitoring was conducted.





Source: Own elaboration.

5 Trend calculation method

5.1 Options for trend calculation

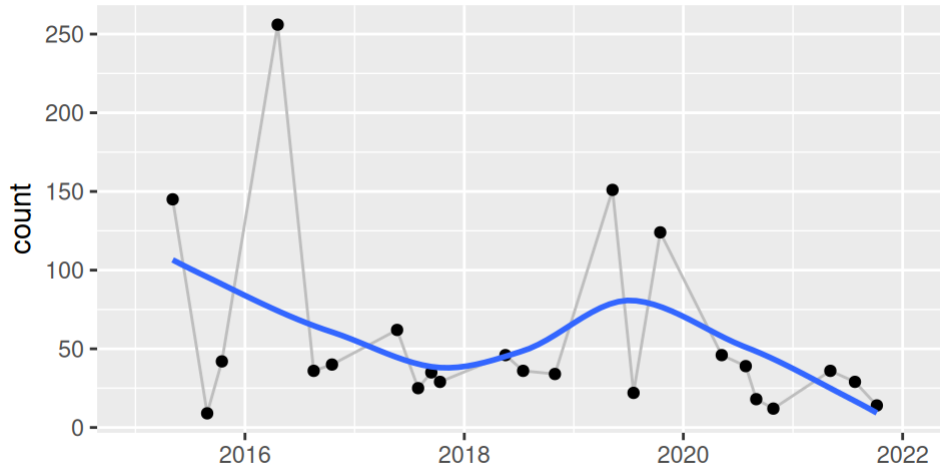
Three types of trend methods were discussed by the TG ML and tested for the calculation of macro litter trends on beaches:

- curved trends (locally estimated scatterplot smoothing (LOESS) method, Cleveland et al. (1992));
- slope trends (Theil–Sen method, Schulz et al. (2019));
- step trends.

5.2 Curved trends (locally estimated scatterplot smoothing method)

The curved trend analysis, using local regression LOESS, allowed flexibility to be built into the regression analysis, fitting the model to the data and describing specific parts of the trend evolution (Figure 6).

Figure 6. Example of curve trend assessment.

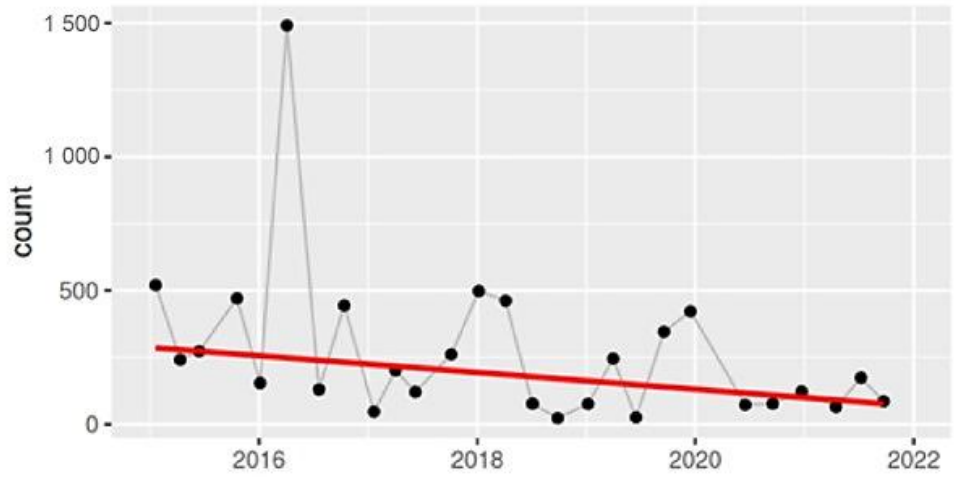


Source: Own elaboration.

5.3 Slope trends (Theil–Sen method)

The slope trend analysis was based on the non-parametric linear regression of the whole dataset for each specific beach (Figure 7). The analysis was carried out using the non-parametric Theil–Sen estimator based on the median of the slopes of all lines through pairs of points, which reduced the effect of potential outliers. Outliers are common in litter data.

Figure 7. Example of slope trend assessment.

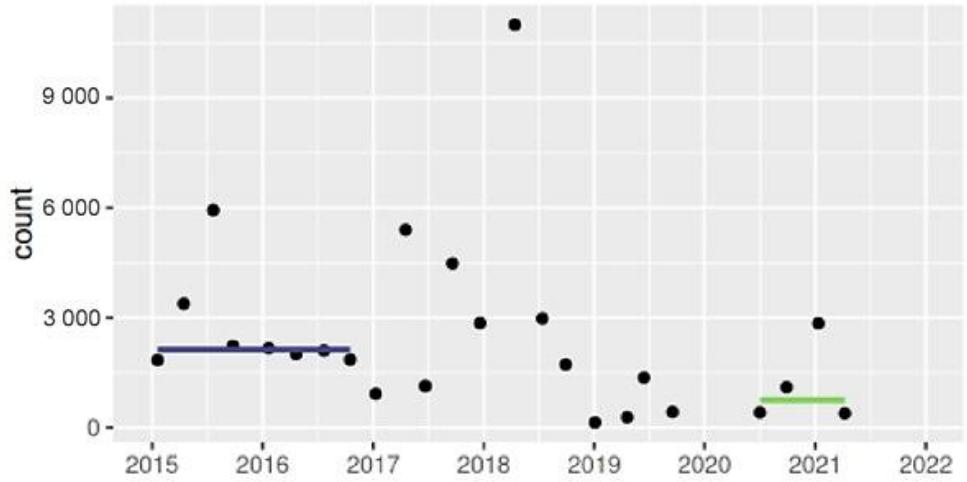


Source: Own elaboration.

5.4 Step-trend method

Step-trend analysis was selected as the methodology to calculate EU coastline litter trends based on the reasons mentioned in Section 5.5. The basic assessment unit used was the beach level combined with a 2-year data period (see the example in Figure 8).

Figure 8. Example of a 2-year step-trend assessment.



Source: Own elaboration.

5.5 Selection of trend calculation method

5.5.1 Reasons to select the step-trend method

Following the consideration of the different approaches and their specificities, step-trend analysis was selected as the methodology to calculate EU coastline litter trends. The main reasons for this selection were that:

- quantitative numerical analysis with a simple statistical method and output is crucial for monitoring progress and communication;
- it enabled a direct comparison between a previous state (baseline period) and the current state (assessment period).

The step-trend and aggregation methods were applied in this report to litter total abundance (TA) and the single-use plastic (SUP), fisheries-related (FISH) and plastic bag (BAG) litter groups. These methods can also be applied to individual litter categories and litter category groups as comparable data become available through application of the Joint List of Litter Categories.

The step-trend method was applied using the following approach.

- Two baseline years and two assessment years were used to increase the robustness of the results, compared with using a single year, because this reduced the influence of year-to-year variation.
- The data in the baseline period (2015–2016) and the assessment period (in this report, 2020–2021) were aggregated directly at the beach level.
- The median value of the assessment period per specific 2-year period was compared with the median value of the specific beach 2015/2016 period. This resulted in a reduction (or increase) in the value of the median. This value can also be expressed as a percentage reduction or increase.
- The significance of the reduction or increase at the beach level was calculated using the Mann-Whitney *U* test (Hollander and Wolfe, 1973).

5.5.2 Spatio-temporal aggregation

As described in Section 5.4 and 5.5.1, a 2-year period is the basic baseline or assessment unit. Equal weight was assigned to each aggregation step, as discussed and agreed by the TG ML (Hanke et al., 2019).

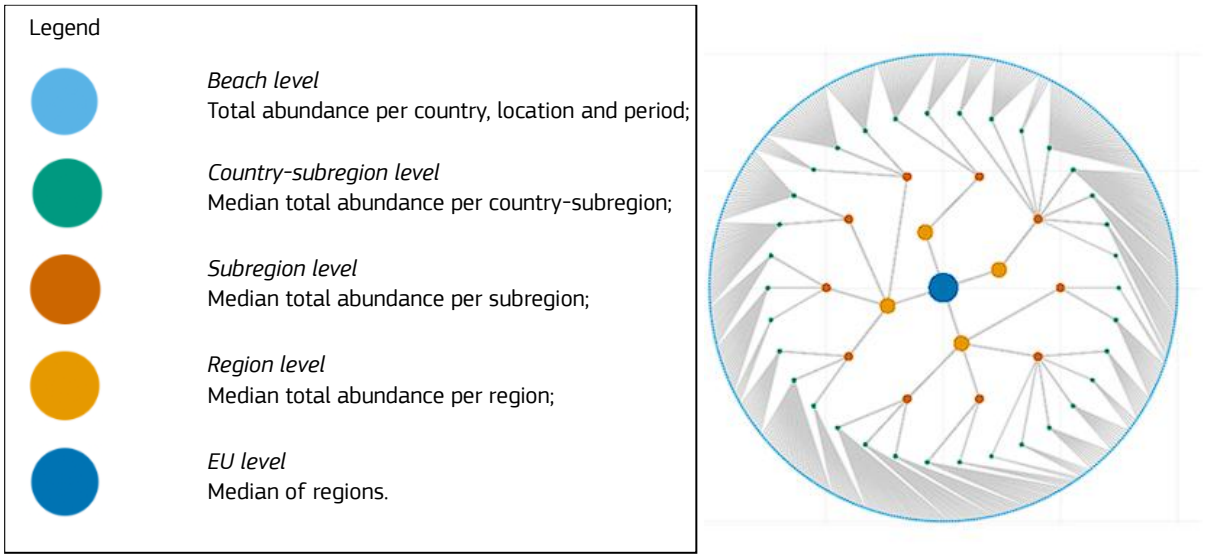
These basic baseline and assessment results were then aggregated to higher spatial levels, as follows.

- They were aggregated to the country-subregion level by calculating the median value of the survey locations of the 2-year beach-specific median values within that country-subregion.
- If a country lies in several marine subregions, the country level was calculated as the median value of the country-subregion median values.
- The subregional median was calculated as the median of the relevant country-subregion median values.
- The regional median (e.g. Mediterranean Sea) was calculated as the median of the relevant subregion median values.

- The EU median baseline and assessment values, and corresponding reduction or increase values, were calculated as the median of the respective regional medians.
- In the step-trend analysis, 253 beaches in 16 countries were included in the aggregated results for 2015–2016 and 2020–2021. The baseline period used results from a total of 1 330 surveys while the assessment period used results from 1 979 surveys. Therefore, a total of 3 309 surveys formed the basis of the step-trend calculation.

The complete spatial aggregation method is schematically presented in Figure 9.

Figure 9. Hierarchical spatio-temporal data aggregation of beach litter data.



Source: Own elaboration.

5.6 Estimation of trend uncertainty

Uncertainty usually refers to a lack of certainty or knowledge about the results of measurements due to multiple factors, for example natural fluctuation due to environmental conditions, limited sample representativity, sampling errors or limitations of the techniques applied.

Uncertainty can be minimised by using a harmonised monitoring method, which is, in principle, used for beach litter monitoring. MSFD coastline macro litter monitoring is conducted in accordance with an agreed harmonised protocol (Galgani et al., 2023), which is designed to produce comparable data, contributing to the reduction of sampling uncertainty. However, the results obtained may still include sources of uncertainty inherent to the sampling and measurement processes (e.g. environmental conditions, small differences between national methods, observer fatigue), and spatio-temporal variations. EU Member States have requested that the TG ML investigate and provide quantitative information on the uncertainty of EU coastline macro litter trends, in order to facilitate the interpretation of the results.

Uncertainty is frequently expressed as the 90 % confidence interval of the results. The bootstrapping method was selected to estimate the confidence intervals (Efron and Tibshirani, 1994; Wehrens et al., 2000). This method is based on repeated random sampling, with replacement from the available sample pool, to estimate the 90 % confidence interval of the real sample pool.

This random sampling process is repeated many times (bootstrapping), and each bootstrapped sample is aggregated to higher spatial levels using the same aggregation method as for the regular assessment. Therefore, the resulting confidence intervals detailed in this report indicate the range within which the litter abundance median can be expected to fall with a 90 % level of confidence.

The following steps were followed at different spatial scales to determine 90 % confidence intervals (see also Annex 1).

- A bootstrap sample was taken for each beach and period (baseline period and assessment period).
- The median of this bootstrap sample was taken. This provided a bootstrap median for this specific beach for this specific period.
- The median was aggregated in a hierarchical way following the same procedure as described in Section 5.5.
- The entire process was repeated 10 000 times to obtain an entire distribution of medians and to calculate the 5 % and 95 % percentiles. This generated the confidence limits of the 90 % confidence interval of the median.

To calculate the reduction percentages and the associated confidence intervals based on the bootstrapping method the following steps were used:

- for each bootstrap sample, the reduction percentage was computed, first at the beach level, and then aggregated to higher spatial levels;
- based on these 10 000 reduction percentages, the median reduction percentage and its associated 90 % confidence interval were computed.

This report addresses the estimation of the uncertainty at the regional and EU scales only, due to high variability at lower scales. This variability is potentially more exposed to factors such as differences in monitoring until there is full compliance with the guidance on monitoring marine litter.

The results from the uncertainty calculations are provided in addition to the trend results. The 90 % uncertainty intervals calculations confirm, except in a few cases, that the downward litter trends on EU coastlines are significant.

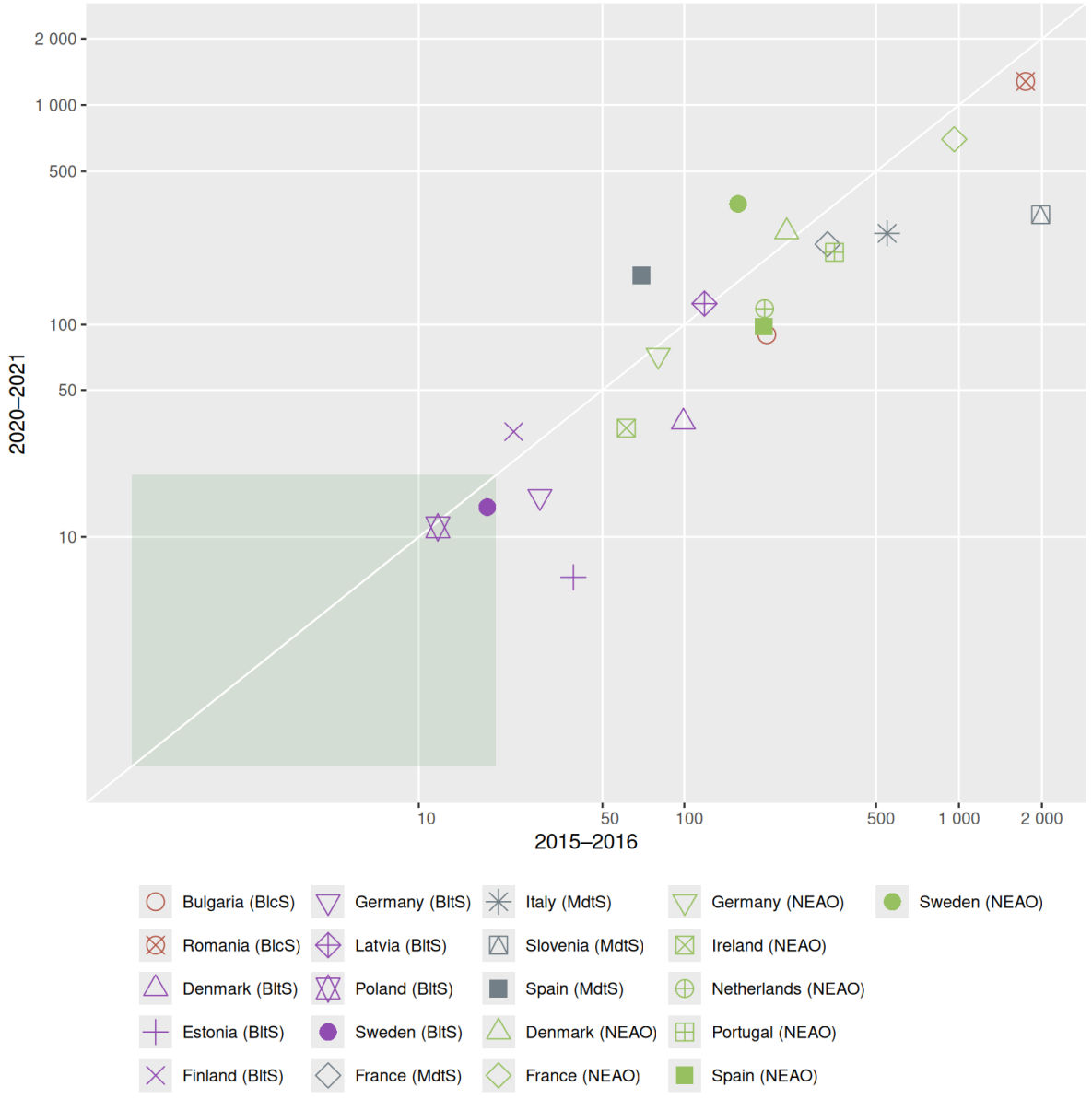
6 Total abundance litter trend results

The trends in macro litter TA, that is, the sums of all relevant categories of litter on EU coastlines, are presented in this chapter.

6.1 Country scale

The results at the country level are obtained by aggregating country-subregions for EU Member States with monitored coastlines in two or more subregions. A comparison of macro litter TA between 2015–2016 and 2020–2021 is represented in Figure 10, where dots below the diagonal line indicate an improvement compared with baseline values (2015–2016) and dots above the diagonal line indicate a deterioration.

Figure 10. Country-level plot comparing macro litter TA in 2015–2016 and 2020–2021. The box situated in the lower left quadrant of the figure represents the boundaries below the TV for coastline litter.



NB: BlcS, Black Sea; BltS, Baltic Sea; MdtS, Mediterranean Sea; NEAO, North East Atlantic Ocean + North Sea.
Source: Own elaboration.

The results for two EU Member States (FI, LV) and the country-regions of three EU Member States (DK - North East Atlantic Ocean + North Sea, ES - Mediterranean Sea, SE – North East Atlantic Ocean) indicate a deterioration between the baseline and assessment periods analysed. The results for the remaining country-regions suggest an improvement in the status of beach litter in comparison with the baseline period. Only PL and SE (Baltic Sea region) show values that are below the coastline litter TV.

The uncertainty of results is not considered at this scale in this report (see Section 5.5). Additional information on confidence intervals for TA at the country scale are provided in Annex 2, Table 22 and Figure 19.

6.2 Sub-regional scale

The Baltic Sea and Black Sea are regions without additional sub-regions defined in the coastal litter monitoring, while the North Atlantic Ocean + North Sea and the Mediterranean Sea are further divided into different sub-regions. This enables a more detailed analysis of litter coastline data; the aggregated results are presented in Table 2.

Table 2. Coastline macro litter TA (items / 100 m coastline) in 2015–2016 and 2020–2021 at the sub-regional scale.

Region	Sub-region	2015–2016 (TA)	2020–2021 (TA)
Baltic Sea	Baltic Sea	**29**	**16**
North East Atlantic Ocean + North Sea	Bay of Biscay and the Iberian Coast	**353**	**214**
	Celtic Seas	**202**	**132**
	Greater North Sea, including Kattegat + English Channel	**196**	**266**
	Macaronesia	**146**	**94**
Mediterranean Sea	Adriatic Sea	**1341**	**333**
	Ionian Sea + central Mediterranean Sea	**376**	**200**
	Western Mediterranean Sea	**333**	**233**
	Aegean-Levantine Sea	**—**	**—**
Black Sea	Black Sea	**973**	**684**

Source: Own elaboration.

The median values of the TA for all regions analysed show high levels for the periods under study. However, the results suggest a decreasing trend between the baseline and assessment periods for all sub-regions, except for the sub-region 'Greater North Sea, including Kattegat + English Channel'. The Baltic Sea region shows the lowest TA values, while the Black Sea and the Adriatic Sea sub-region exhibit the highest values.

6.3 Regional scale

The aggregation of resulting medians across country-regions within a region leads to values at the regional level (Table 3).

Table 3. Coastline macro litter TA (items / 100 m coastline) and trends (2015–2016 to 2020–2021) at the regional scale. Estimated confidence intervals of the TA at the regional scale are based on the bootstrapping method.

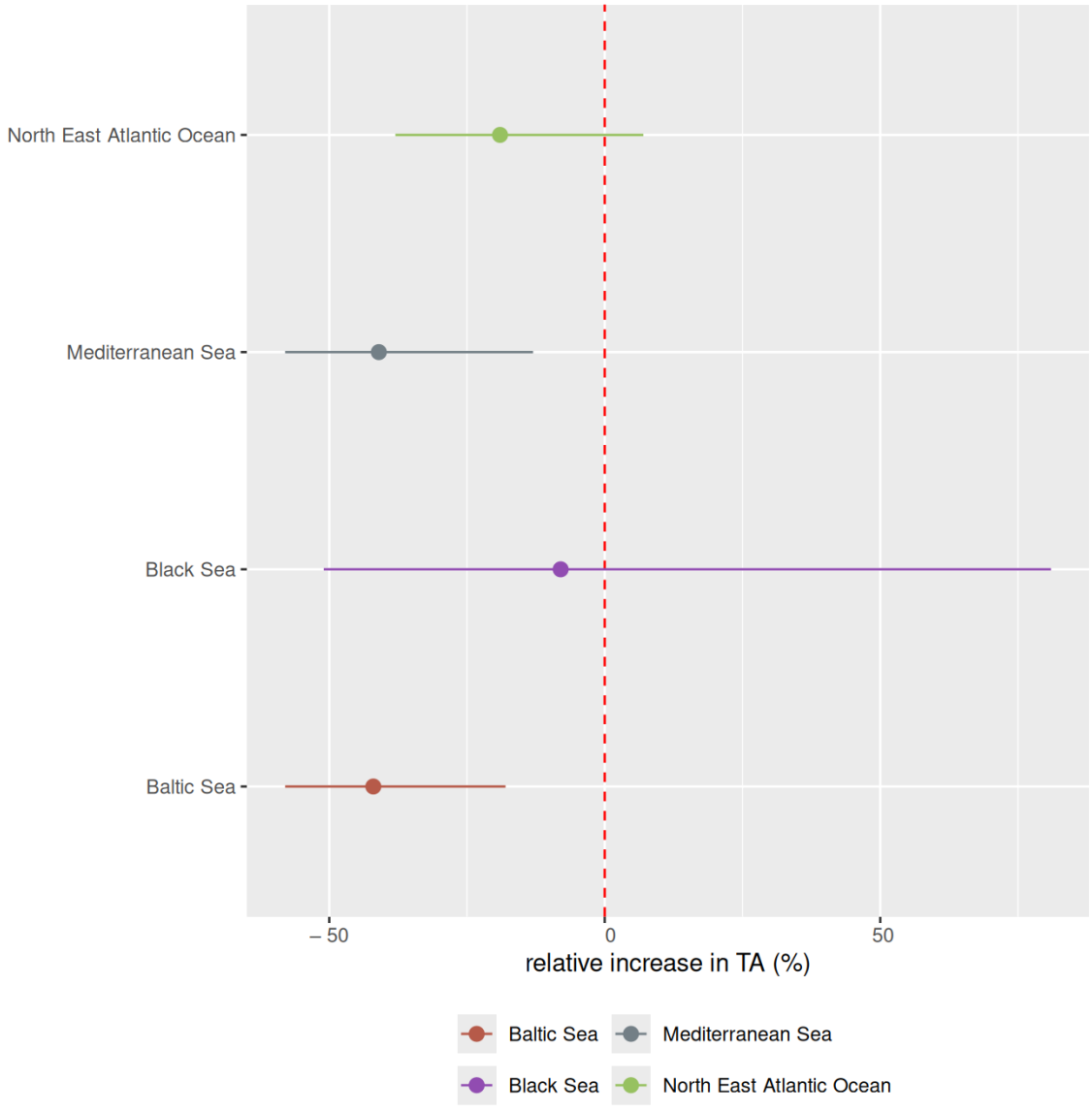
Region		2015–2016 (TA)		2020–2021 (TA)		Trend	
Baltic Sea (number of beaches = 104) ([1])		**29**		**16**		**– 45 %**	
	90 % confidence intervals ([2])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		25	41	15	24	– 58 %	– 18 %
North East Atlantic Ocean + North Sea (number of beaches = 55) ([1])		**199**		**173**		**– 13 %**	
	90 % confidence intervals ([2])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		175	238	134	210	– 38 %	7 %
Mediterranean Sea (number of beaches = 78) ([1])		**376**		**233**		**– 38 %**	
	90 % confidence intervals ([2])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		292	487	178	318	– 58 %	– 13 %
Black Sea (number of beaches = 16) ([1])		**973**		**684**		**– 30 %**	
	90 % confidence intervals ([2])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		397	1168	445	874	– 51 %	81 %

([1]) Number of beaches at the regional level considered for the step-trend spatio-temporal aggregation.
([2]) Estimated 90 % confidence intervals using bootstrapping.
Source: Own elaboration.

The aggregated results of the baseline (2015–2016) and assessment (2020–2021) periods indicate median values higher than the agreed coastline TV (20 items / 100 m) for all regions. The Baltic Sea region's results indicate the lowest median value for the assessment period, below the agreed TV (16 items / 100 m and confidence intervals (15-24)).

The estimated 90 % confidence intervals are presented in Figure 11. In the Mediterranean and Baltic Sea regions there is a decrease in the TA with 90 % confidence; however, the confidence intervals estimated for the North East Atlantic Ocean + North Sea and the Black Sea indicate positive values at the upper bound of their interval (see Table 3 and Figure 11). Consequently, the observed decreasing trend should be interpreted with caution due to the high variability of the data. Furthermore, the width of the confidence interval for the Black Sea region indicates a high degree of variability in the results for this region, suggesting that the uncertainty is potentially greater.

Figure 11. Estimated 90 % confidence intervals for litter TA at the regional scale based on bootstrapping. Estimated median values are represented by a dot.



Source: Own elaboration.

6.4 EU scale

The calculation of a trend at the EU scale provides an overall indication of trends in marine litter abundance on EU coastlines at a small spatial scale (Table 4). Based on the methodology agreed for developing the baseline, EU regions are weighted equally here. The 90 % confidence interval is estimated by means of bootstrapping to quantify our uncertainty about the median TA (see also Section 5.5).

Table 4. Coastline macro litter TA (items / 100 m coastline) and trend (2015–2016 to 2020–2021) at the EU scale. Estimated confidence intervals for the TA at the EU scale are based on the bootstrapping method.

EU scale	**2015–2016 (TA)**		**2020–2021 (TA)**		**Trend**	
	287		**203**		**– 29 %**	
90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
	245	348	169	244	– 47 %	– 12 %

([1]) Estimated 90 % confidence intervals using bootstrapping.
Source: Own elaboration.

The aggregation of resulting medians across regions to the EU level leads to a result that indicates the trend of litter abundance on EU coastlines from 2015 to 2021, based on 253 comparable beaches/coastline areas.

Comparing the baseline period 2015–2016 against the assessment period of 2020–2021 indicates a reduction in EU coastline litter of 29 %, with 90 % confidence that the value of the decreasing trend lies between - 47 % and - 12 %. These results confirm the downward trend of coastline litter at the EU level during the analysed period. While the confidence intervals are asymmetric, that is, 17 % upward and 18 % downwards from the median result, the uncertainty could be expressed as roughly - 29 % ± 18 % (at 90 % confidence), confirming with 90 % confidence that litter TA at the EU scale is decreasing.

This is a significant achievement, resulting from public concern, its translation into policy action through the MSFD and its D10 and then this leading to numerous mitigation measures, provided by EU legislation, national initiatives and local activities, down to actions by individual citizens.

6.5 Trend of trends

Using the step-trend method, trends can be calculated for different periods. Here, results for the comparison of the baseline period 2015–2016, against the assessment periods 2019–2020 and 2020–2021 are provided (Table 5). In both cases, 2-year periods have been used, and, through the agreed methodology, different trend values can be compared. The application of this calculation is limited by the availability of survey data from the targeted periods.

Table 5. Comparison of macro litter TA (items / 100 m coastline) and trends between the baseline period (2015–2016) and the 2019–2020 and 2020–2021 assessment periods.

	Baseline period (TA)	Assessment period (TA)	Trend
2015–2016 to 2019–2020	**287**	**228**	**– 21 %**
2015–2016 to 2020–2021	**287**	**203**	**– 29 %**

Source: Own elaboration.

The comparison shows that litter TA fell less between 2015–2016 and 2019–2020 than between 2015–2016 and 2020–2021', suggesting further significant litter reduction in the last year of the assessment period.

7 Abundance litter trend results by litter category group

The Joint List of Litter Categories has not yet been fully implemented in all EU Member States, although harmonisation efforts are ongoing. The use of different lists to categorise litter items hampers the direct comparability of items by specific categories. Consequently, the coastline macro litter median abundances and trends in the major aggregated categories SUP, FISH and BAG were calculated based on the aggregation of litter items by Fleet et al. (2021), where possible.

Annex 3 includes the conversion table that was used to transform the litter categories reported under the 'ITA', 'OSPAR', 'TSG-ML' and 'UNEP-MARLIN' lists into the Joint List of Litter Categories. Annex 4 indicates the specific categories included in the SUP, FISH and BAG category groups. However, this is a temporary approach due to the challenge of comparing litter categories reported under different lists, and the specific allocation of litter items is expected to take place when the implementation of the Joint List of Litter Categories is completed.

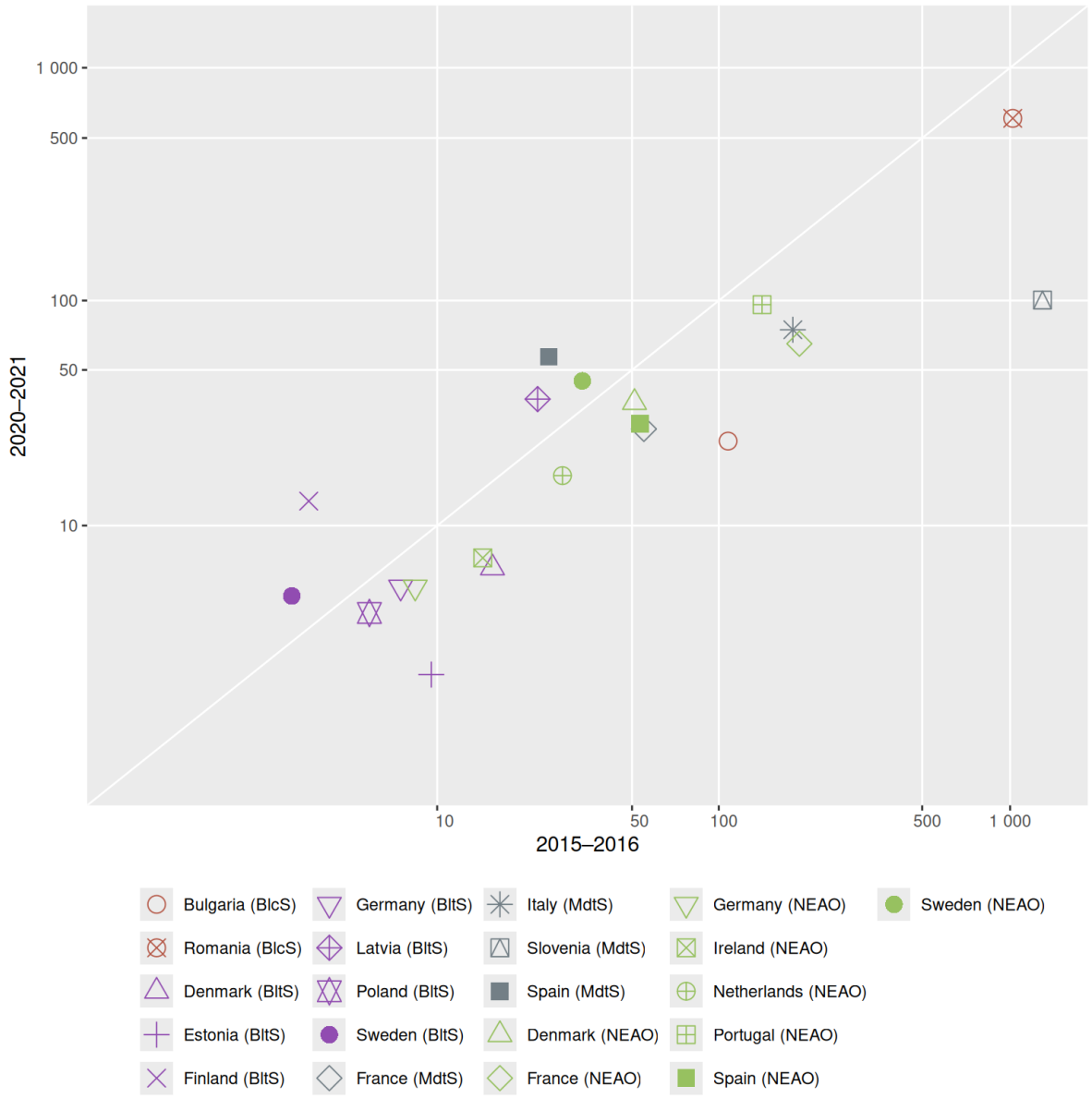
7.1 Single-use plastic category

The abundance of and trends in the aggregate litter category SUP are presented in this subsection for the different spatial scales and baseline and assessment periods. The SUP category is defined as all litter items that have been identified as single-use plastic (with the exception of cigarette butts) according to the aggregation list of litter items proposed by Fleet et al. (2021).

7.1.1 Country scale

This subsection provides the country-scale results of the abundance of litter in the aggregate category SUP. A comparison of the medians of the baseline and assessment period of SUP abundance is presented in Figure 12. The results of three EU Member States (SE, FI, LV) and the country-region of one EU Member State (ES - Mediterranean Sea) indicate an increase in SUP items in their coastal areas in comparison with the baseline period. Additional information on confidence intervals for SUP at the country scale is provided in Annex 2, Table 22 and Figure 20, but they are not considered at this spatial scale (see Section 5.5).

Figure 12. Comparison of 2015–2016 and 2020–2021 litter abundance in the aggregate category SUP at the country level scale. Dots below the diagonal line indicate an improvement compared with baseline values (2015–2016) and dots above the diagonal line indicate a deterioration.



NB: BlcS, Black Sea; BltS, Baltic Sea; MdtS, Mediterranean Sea; NEAO, North East Atlantic Ocean + North Sea.
Source: Own elaboration.

7.1.2 Sub-regional scale

The aggregated results for median SUP litter abundance at the sub-regional scale are presented in Table 6. During the baseline period, the higher median values were observed in the Adriatic Sea sub-region (median: 774 items / 100 m) and in the Black Sea (median: 564 items / 100 m), while the lower value was reported in the Baltic Sea (median: 7 items / 100 m).

The results of the analysis at the sub-regional scale generally indicate downward trends, with medians in the assessment period usually lower than those in the baseline period. The percentage decrease in the trend varies between – 87 % (Adriatic Sea sub-region) and – 25 % (Macaronesia

sub-region). In contrast, the 'Greater North Sea, including Kattegat + English Channel' and western Mediterranean Sea sub-regions show an upward trend in SUP concentration (6 % and 4 %, respectively).

Table 6. SUP abundance (items / 100 m coastline) in 2015–2016 and 2020–2021 at the sub-regional scale.

Region	Sub-region	2015–2016 (SUP)	2020–2021 (SUP)
Baltic Sea	Baltic Sea	**7**	**5**
North East Atlantic Ocean + North Sea	Bay of Biscay and the Iberian coast	**141**	**96**
	Celtic Seas	**30**	**13**
	Greater North Sea, including Kattegat + English Channel	**34**	**36**
	Macaronesia	**52**	**39**
Mediterranean Sea	Adriatic Sea	**774**	**104**
	Ionian Sea + central Mediterranean Sea	**134**	**68**
	Western Mediterranean Sea	**55**	**57**
	Aegean-Levantine Sea	**—**	**—**
Black Sea	Black Sea	**564**	**316**

Source: Own elaboration.

7.1.3 Regional scale

The aggregation of results for the SUP category at the regional scale indicates a general improvement in the environmental status of the coastline for this type of litter (Table 7), when median values are considered. Furthermore, the trend values for the Mediterranean Sea (– 49 %) and Black Sea (– 44 %) regions exhibit a similar percentage reduction, while a lower percentage reduction in trend values is observed in the North East Atlantic Ocean + North Sea region (– 12 %).

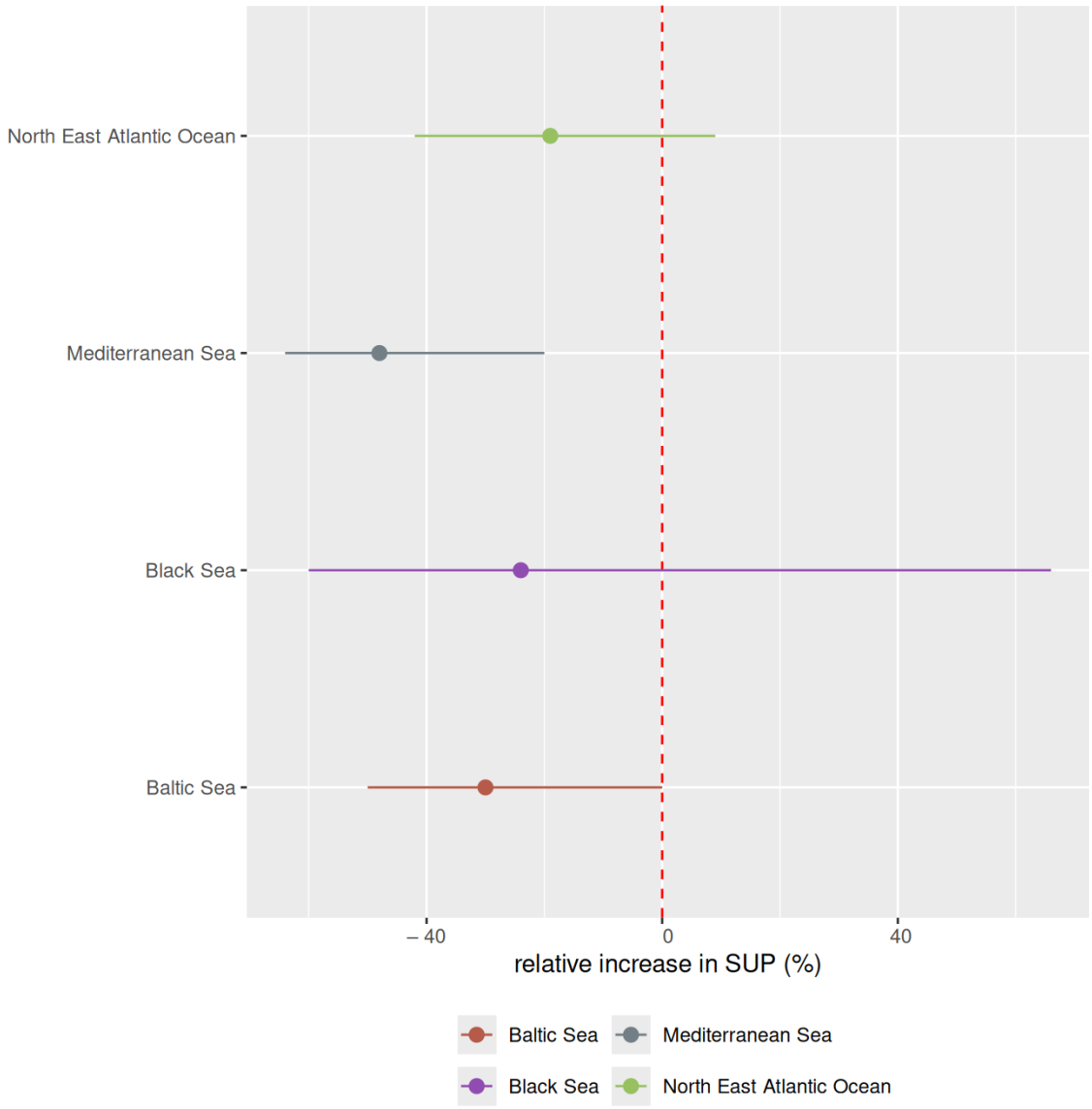
In the Mediterranean Sea and Baltic Sea regions there is a decrease in SUP abundance with 90 % confidence. Although median results suggest decreasing trends, confidence intervals indicate that prudent interpretation of the trend value for the Baltic Sea, Black Sea and North East Atlantic Ocean + North Sea regions is advised (see Table 7 and Figure 13). Therefore, there is currently no evidence in the data for decreasing trends with 90 % confidence for these last three regions. Similarly to the situation of TA at the regional scale (see Section 6.3), the confidence intervals for the Black Sea region are particularly wide, indicating high uncertainty in the trend result for this region.

Table 7. SUP abundance (items / 100 m coastline) and trends (2015–2016 to 2020–2021) at the regional scale. Estimated confidence intervals for the SUP category at the regional scale are based on the bootstrapping method.

Region		**2015–2016 (SUP)**		**2020–2021 (SUP)**		**Trend**	
Baltic Sea		**7**		**5**		**– 29 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		6	10	4	7	– 50 %	0 %
North East Atlantic Ocean + North Sea		**43**		**38**		**– 12 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		36	56	28	44	– 42 %	9 %
Mediterranean Sea		**134**		**68**		**– 49 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		94	166	56	82	– 64 %	– 20 %
Black Sea		**564**		**316**		**– 44 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		212	722	234	486	– 60 %	66 %

([1]) Estimated 90 % confidence intervals using bootstrapping.
Source: Own elaboration.

Figure 13. Estimated 90 % confidence intervals and estimated medians for the SUP category at the regional scale based on the bootstrapping method. Estimated median values are represented by a dot.



Source: Own elaboration.

7.1.4 EU scale

The percentage reduction in SUP abundance, comparing the baseline period 2015–2016 against the assessment period 2020–2021, is 40 % ± [– 55 %, – 19 %] (at 90 % confidence) at the EU scale (Table 8). These results confirm the downward trend in SUP abundance at the EU level during the analysed periods, making it possible to compare the reduction in SUP abundance between the two periods and estimate the potential contribution to the reduction in total litter abundance on the coastline.

Table 8. SUP abundance (items / 100 m coastline) and trend (2015–2016 to 2020–2021) at the EU scale. Estimated confidence intervals for the SUP category at the EU scale are based on the bootstrapping method.

EU scale	2015–2016 (SUP)		2020–2021 (SUP)		Trend	
	88		**53**		**– 40 %**	
90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
	66	107	44	60	– 55 %	– 19 %

([1]) Estimated 90 % confidence intervals using bootstrapping.
Source: Own elaboration.

7.1.5 Trend of trends

The trend results for the different assessment periods analysed are presented in Table 9. The median values and trends suggest a reduction in the abundance of SUP litter category over the two assessment periods compared with the baseline period.

Table 9. Comparison of TA (items / 100 m coastline) and trends between the baseline period (2015–2016) and the 2019–2020 and 2020–2021 assessment periods for the SUP category.

	Baseline period (SUP)	Assessment period (SUP)	Trend
2015–2016 to 2019–2020	**88**	**62**	**– 30 %**
2015–2016 to 2020–2021	**88**	**53**	**– 40 %**

Source: Own elaboration.

7.2 Fishery-related items category

The FISH category is defined as all litter items that originated from fisheries and aquaculture activities, based on the definition of the categories of litter items in Fleet et al. (2021). Annex 4 indicates the specific categories considered for the FISH group.

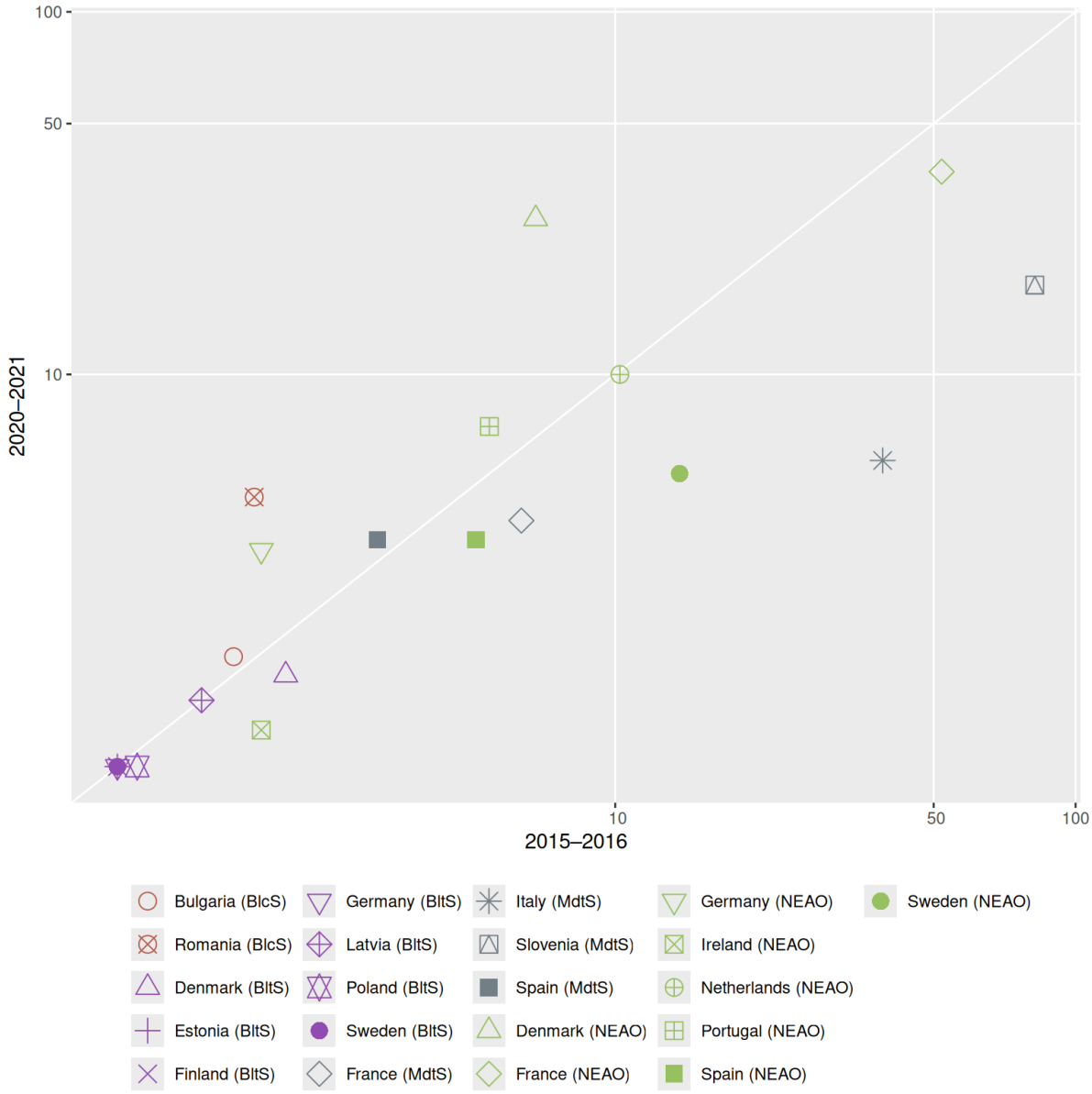
7.2.1 Country scale

The comparison of the median results for the baseline (2015–2016) and assessment (2020–2021) periods considering the FISH category at the country scale are presented in Figure 14. Most of the median values for the FISH category suggest a downward trend between the baseline and assessment periods at the country scale.

BG (Black Sea), DE, EE, FI, LV, PL and SE (Baltic Sea) and NL (North East Atlantic Ocean + North Sea) show the same median values for the baseline and assessment periods. Only two EU Member

States (PT, RO) and three country-regions (DE - North East Atlantic Ocean + North Sea, DK – North East Atlantic Ocean + North Sea, ES – Mediterranean Sea) present median values indicating a deterioration in these areas. Additional information on confidence intervals for the FISH category at the country scale is provided in Annex 2, Table 22 and Figure 21.

Figure 14. Comparison of 2015–2016 and 2020–2021 litter abundance in the aggregate category FISH at the country scale. Dots below the diagonal line indicate an improvement compared with baseline values (2015–2016) and dots above the diagonal line indicate a deterioration.



NB: BlcS, Black Sea; BltS, Baltic Sea; MdtS, Mediterranean Sea; NEAO, North East Atlantic Ocean + North Sea.
Source: Own elaboration.

7.2.2 Sub-regional scale

The aggregated results at the sub-regional scale for median FISH abundance are presented in Table 10. The highest value was observed in the Adriatic Sea sub-region during the baseline period (median: 66 items / 100 m) and the lowest value was observed in the Baltic Sea (median: 0 items / 100 m). In the assessment period, the highest values were observed in the Celtic Seas and Adriatic Sea sub-regions (median: 29 items / 100 m).

The percentage decrease in the trend varies between – 90 % (Ionian Sea + central Mediterranean Sea) and – 33 % (western Mediterranean Sea sub-region). The Black Sea and Celtic Seas sub-regions showed an increasing trend in FISH concentration of 200 % and 142 %, respectively.

Table 10. FISH abundance (items / 100 m coastline) in 2015–2016 and 2020–2021 at the sub-regional scale.

Region	Sub-region	2015–2016 (FISH)	2020–2021 (FISH)
Baltic Sea	Baltic Sea	**0**	**0**
North East Atlantic Ocean + North Sea	Bay of Biscay and the Iberian coast	**7**	**7**
	Celtic Seas	**12**	**29**
	Greater North Sea, including Kattegat + English Channel	**10**	**10**
	Macaronesia	**2**	**4**
Mediterranean Sea	Adriatic Sea	**66**	**29**
	Ionian Sea + central Mediterranean Sea	**39**	**4**
	Western Mediterranean Sea	**6**	**4**
	Aegean-Levantine Sea	**—**	**—**
Black Sea	Black Sea	**1**	**3**

Source: Own elaboration.

7.2.3 Regional scale

The aggregation of median results at the regional scale for the litter category FISH shows that the Mediterranean Sea recorded the largest reduction (Table 11). The recording of litter items within the FISH category was limited in the Baltic Sea region; therefore, confidence intervals could not be determined. The Black Sea region presents low median values for the baseline and assessment

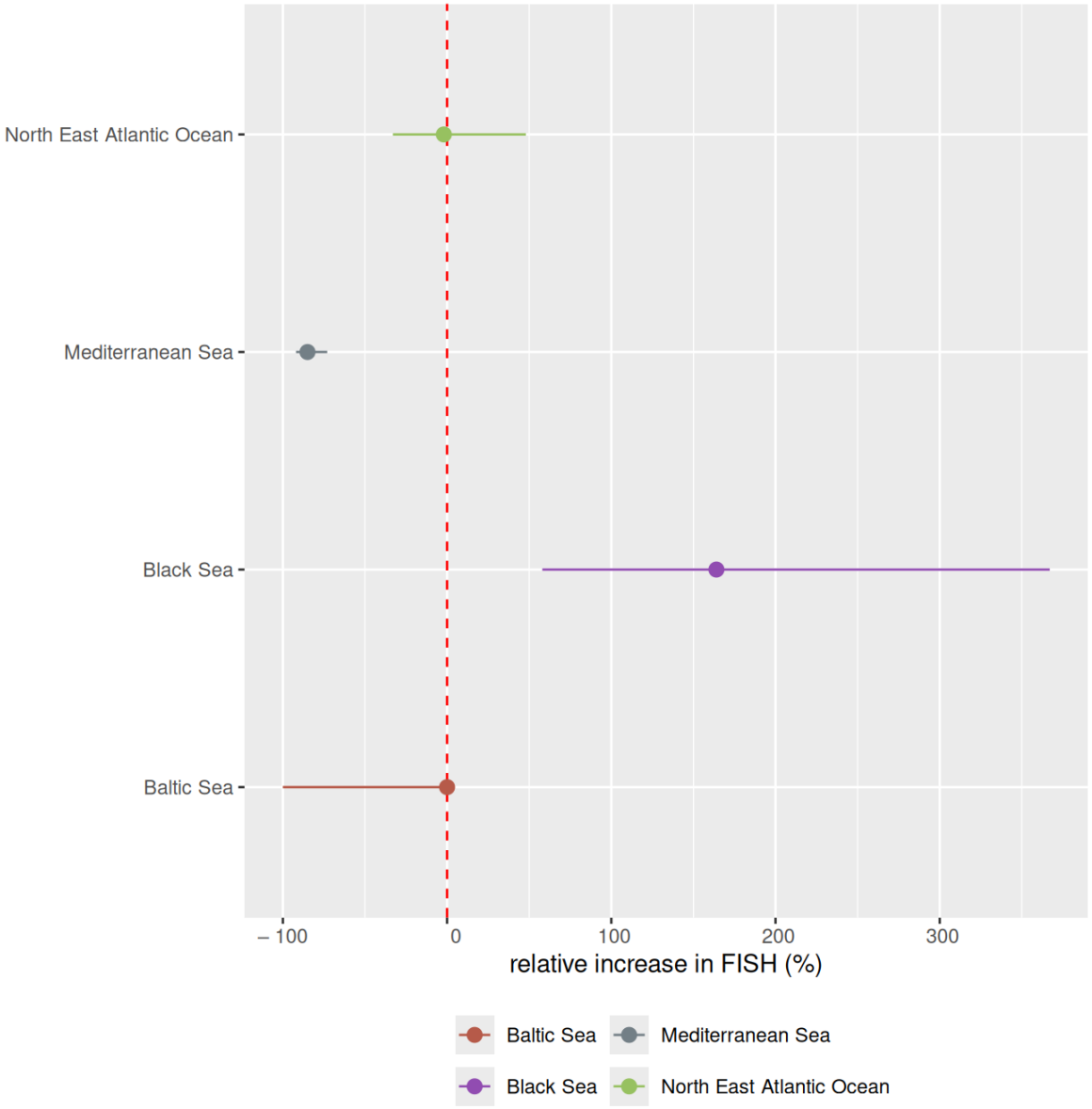
periods; therefore, slight changes in the median values represent major changes in the trend. There was a significant relative decrease for the Mediterranean Sea (90 % confidence) and a significant relative increase for the Black Sea (90 % confidence). For the North East Atlantic Ocean + North Sea, there is no evidence in the data of a significant relative increase or decrease (see Table 11 and Figure 15).

Table 11. FISH abundance (items / 100 m coastline) and trends (2015–2016 to 2020–2021) at the regional scale. Estimated confidence intervals for the FISH category are based using bootstrapping.

Region		**2015–2016 (FISH)**		**2020–2021 (FISH)**		**Trend**	
Baltic Sea		**0**		**0**		**0 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		0	0	0	0	–	–
North East Atlantic Ocean + North Sea		**9**		**8**		**– 11 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		6	10	6	11	– 33 %	48 %
Mediterranean Sea		**39**		**4**		**– 90 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		24	47	4	10	– 92 %	– 73 %
Black Sea		**1**		**3**		**+ 200 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		1	1	2	3	58 %	367 %

([1]) Estimated 90 % confidence intervals using bootstrapping.
Source: Own elaboration.

Figure 15. Estimated 90 % confidence intervals and estimated medians for the FISH category at the regional scale based on the bootstrapping method. Estimated median values are represented by a dot.



Source: Own elaboration.

7.2.4 EU scale

The percentage in the trend for the FISH category is – 20 % ± [– 42 %, 27 %] (at 90 % confidence) at the EU scale (Table 12). This value is subject to a pronounced influence during the process of spatial aggregation. This is evidenced by the clear downward trend observed at the regional level, with the exception of the Black Sea region (see Section 7.2.3), although the median absolute values for the Black Sea region are low. This should be noted when interpreting the spatial aggregation at the EU scale.

Table 12. FISH category abundance (items / 100 m coastline) and trend (2015-2016 to 2020-201) at the EU scale.

EU scale	2015–2016 (FISH)		2020–-2021 (FISH)		Trend	
	5		**4**		**– 20 %**	
90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
	3	6	3	5	– 42 %	27 %

([1]) Estimated 90 % confidence intervals using bootstrapping.
Source: Own elaboration.

7.2.5 Trend of trends

The median values and trends suggest an improvement in the FISH category over the two assessment periods considered in relation to the baseline period (Table 13). However, it is important to note that median values for the assessment periods suggest a potential deterioration (the value of the trend varies from – 40 % to – 20 %). Therefore, minor fluctuations in one period can lead to significant shifts in the relative trends analysed.

Table 13. Comparison of FISH abundance (items / 100 m coastline) and trends between the baseline period (2015–2016) and the 2019–2020 and 2020–2021 assessment periods.

	Baseline period (FISH)	Assessment period (FISH)	Trend
2015–2016 to 2019–2020	**5**	**3**	**– 40 %**
2015–2016 to 2020–2021	**5**	**4**	**– 20 %**

Source: Own elaboration.

7.3 Plastic bags category

Artificial polymers classified as bags are considered in this category (BAG). The following nine specific sub-categories were considered based on the definition in the Joint List of Litter Categories (Fleet et al. 2021):

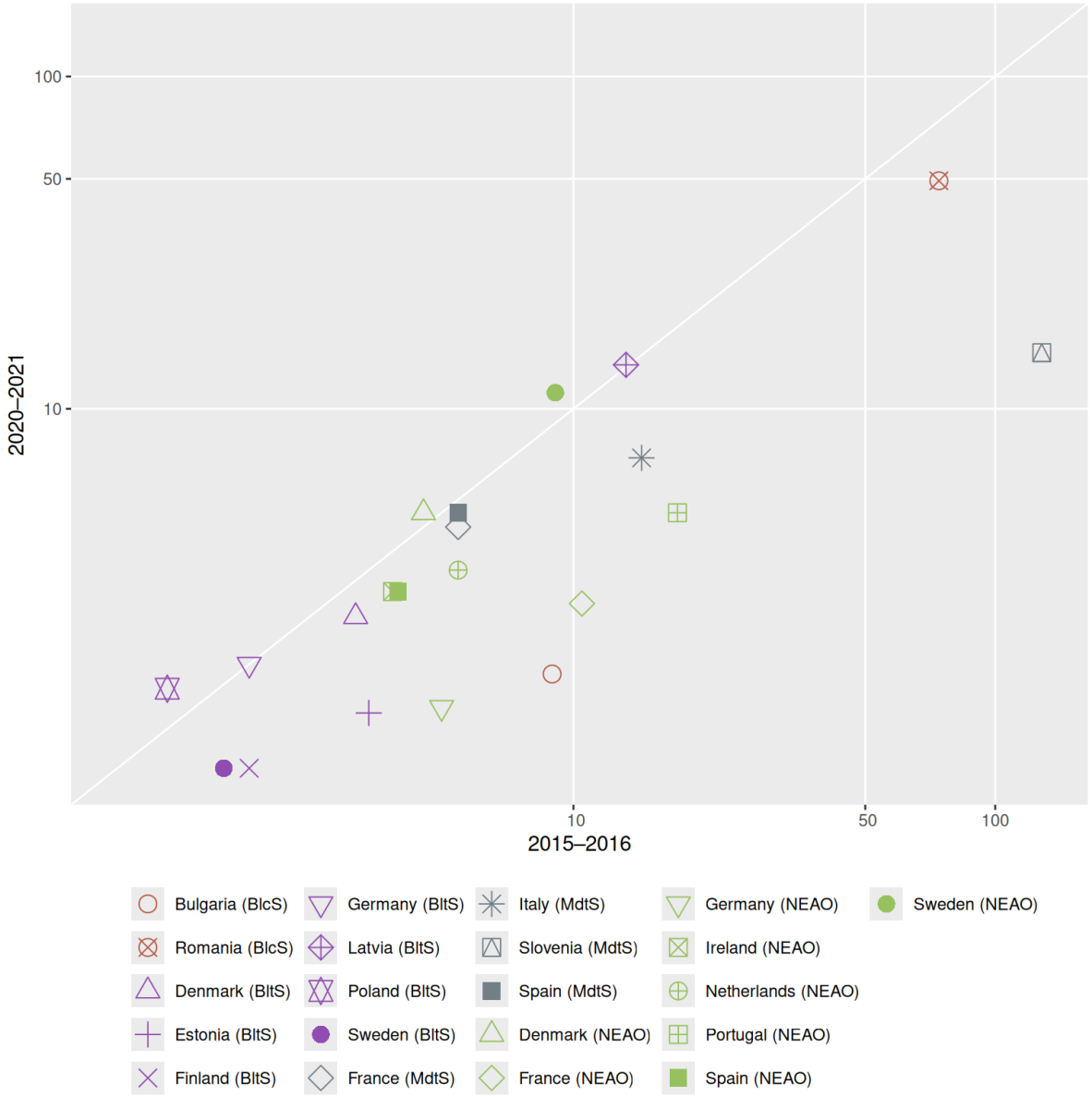
- plastic bags,
- plastic shopping/carrier/grocery bags,
- plastic dog/pet faeces bag,
- the part that remains from tear-off plastic bags,

- plastic heavy-duty sacks,
- other plastic heavy-duty sacks,
- plastic mesh bags,
- plastic mesh bags for vegetables, fruit and other products,
- small plastic bags.

7.3.1 Country scale

A comparison of the median values of the baseline and assessment periods in the BAG category is presented in Figure 16. Confidence intervals for the BAG category at the country scale are presented in Annex 2, Table 22 and Figure 22.

Figure 16. Comparison of 2015–2016 and 2020–2021 litter abundance in the aggregate category BAG at the country scale. Dots below the diagonal line indicate an improvement compared with baseline values (2015–2016) and dots above the diagonal line indicate a deterioration.



NB: BlcS, Black Sea; BltS, Baltic Sea; MdtS, Mediterranean Sea; NEAO, North East Atlantic Ocean + North Sea.
Source: Own elaboration.

7.3.2 Sub-regional scale

The aggregated results at the sub-regional scale for median BAG abundance are presented in Table 14. In general, the median values are lower than those obtained in the SUP and FISH categories (see Sections 7.1.2 and 7.2.2). The highest value was observed in the Adriatic Sea sub-region during the baseline period (median: 73 items / 100 m) and the lowest value was observed in the Baltic Sea (median: 1 item / 100 m).

Regarding the BAG category, no discernible increase in trend was identified across any of the sub-regions. The percentage decrease in the trend varies between – 85 % (Adriatic Sea sub-region) and – 20 % (western Mediterranean Sea sub-region). The Baltic Sea and the Celtic Seas maintained the same coastline litter status between the periods analysed.

Table 14. BAG abundance (items / 100 m coastline) in 2015–2016 and 2020–2021 at the sub-regional scale.

Region	Sub-region	2015–2016 (BAG)	2020–2021 (BAG)
Baltic Sea	Baltic Sea	**1**	**1**
North East Atlantic Ocean + North Sea	Bay of Biscay and the Iberian coast	**12**	**3**
	Celtic Seas	**2**	**2**
	Greater North Sea, including Kattegat + English Channel	**5**	**3**
	Macaronesia	**4**	**2**
Mediterranean Sea	Adriatic Sea	**73**	**11**
	Ionian Sea + central Mediterranean Sea	**15**	**10**
	Western Mediterranean Sea	**5**	**4**
	Aegean-Levantine Sea	**—**	**—**
Black Sea	Black Sea	**41**	**25**

Source: Own elaboration.

7.3.3 Regional scale

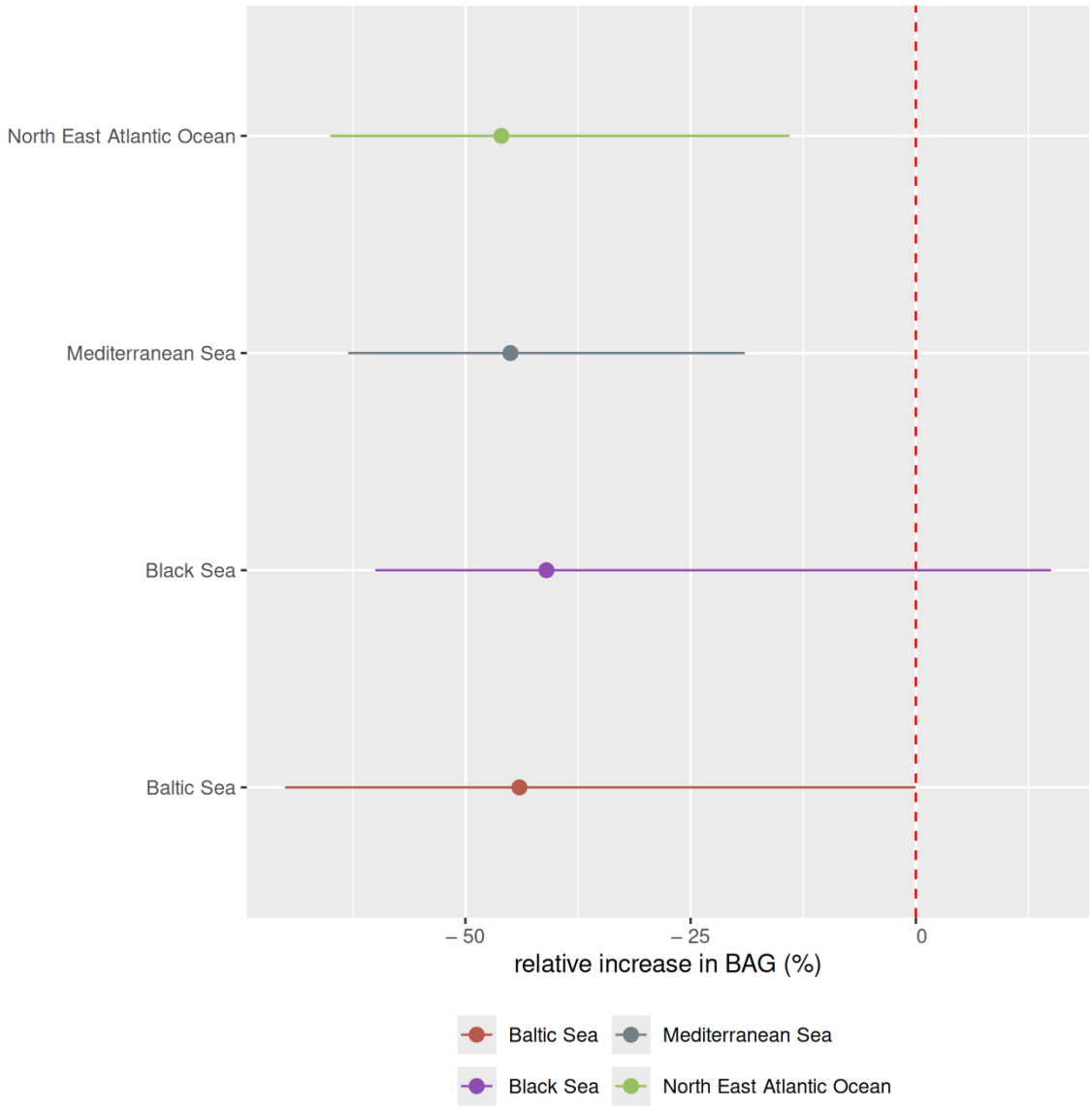
At the regional scale, trend results indicate decreases of litter within the BAG category of up to 50 % (Table 15), generally showing a downward trend across all the regions, with the exception of the Baltic Sea, where the trend is stable. The confidence intervals for the Black Sea (– 60 % to 15 %) and Baltic Sea (– 70 % to 0 %) regions are particularly wide (Table 15 and Figure 17), indicating that the trends for these regions should therefore be considered with caution.

Table 15. BAG abundance (items / 100 m coastline) and trends (2015–2016 to 2020–2021) at the regional scale. Estimated confidence intervals for the BAG category at the regional scale are based on the bootstrapping method.

Region		**2015–2016 (BAG)**		**2020–2021 (BAG)**		**Trend**	
Baltic Sea		**1**		**1**		**0 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		1	2	0	1	– 70 %	0 %
North East Atlantic Ocean + North Sea		**4**		**2**		– **50 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		4	6	2	4	– 65 %	– 14 %
Mediterranean Sea		**15**		**10**		– **33 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		10	18	6	10	– 63 %	– 19 %
Black Sea		**41**		**25**		– **40 %**	
	90 % confidence intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		22	57	19	30	– 60 %	15 %

([1]) Estimated 90 % confidence intervals using bootstrapping.
Source: Own elaboration.

Figure 17. Estimated 90 % confidence intervals and estimated medians for the BAG category at the regional scale based on the bootstrapping method. Estimated median values are represented by a dot.



Source: Own elaboration.

7.3.4 EU scale

The trend for the BAG category is – 40 % at EU scale (Table 16), with a lower bound of – 60 % and an upper bound of – 25 %. These results also confirm the downward trend in the BAG category at the EU level during the analysed periods. The uncertainty could be expressed as roughly – 40 % ± 20 % (at 90 % confidence).

Table 16. BAG abundance (items / 100 m coastline) and trend (2015–2016 to 2020–2021) at the EU scale.

EU scale	2015–2016 [BAG]		2020–2021 [BAG]		Trend	
	10		**6**		**– 40 %**	
90 % confidence Intervals ([1])	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
	8	12	4	7	– 60 %	– 25 %

([1]) Estimated 90 % confidence intervals using bootstrapping.
Source: Own elaboration.

7.3.5 Trend of trends

The comparison of the baseline period against the assessment periods 2019–2020 and 2020–2021 for the BAG category are provided in Table 17. The median values and trends suggest a potential improvement in BAG abundance over the two assessment periods considered in relation to the baseline period; however, it is important to note that the number of litter item differed by only 1 between the two assessment periods. Therefore, minor fluctuations in one period can lead to significant shifts in the relative trends analysed.

Table 17. Comparison of BAG abundance (items / 100 m coastline) and trends between the baseline period (2015–2016) and the 2019–2020 and 2020–2021 assessment periods.

	Baseline period (BAG)	Assessment period (BAG)	Trend
2015–2016 to 2019–2020	**10**	**7**	**– 30 %**
2015–2016 to 2020–2021	**10**	**6**	**– 40 %**

Source: Own elaboration.

8 General overview of EU coastline litter trends

In this chapter, coastline litter trends results are summarised at the regional (Tables 18 and 19) and EU (Tables 20 and 21) scales for TA, SUP, FISH and BAG, based on the step-trend method comparing the baseline period (2015–2016) and the assessment period (2020–2021), to provide an overview of the main results. This report did not consider trends at the country or sub-regional scales, although the aggregation of results at different spatial scales, based on the agreed methodology (see Section 5.5), enabled the calculation of trends at the regional and EU levels.

The aggregation of median values at different spatial levels (from the beach to the EU scale) suggests a downward trend in coastal litter TA at the regional scale between the periods analysed (see Table 19). Overall, the median values are still above the agreed TV for coastal litter (20 litter items / 100 m coastline), although the trends obtained ranged from – 45 % (Baltic Sea) to – 13 % (North East Atlantic Ocean + North Sea).

Table 18. General overview of median values of total litter abundance (items / 100 m coastline) and trends in coastline litter TA at the regional scale.

Region	**TA (median values – items / 100 m coastline)**		**Trend (%)**
	2015–2016	**2020–2021**	
Baltic Sea	29	16	– 45 %
North East Atlantic Ocean + North Sea	199	173	– 13 %
Mediterranean Sea	376	233	– 38 %
Black Sea	973	684	– 30 %

Source: Own elaboration.

In accordance with the TA results, the results of the assessment period (2020–2021) for the specific categories analysed, SUP, FISH and BAG, suggest an improvement in comparison with the baseline period. However, this is not the case for the FISH and BAG groups in the Baltic Sea and FISH in the Black Sea (see Table 19). In these instances where the presence of litter items is minimal, minor fluctuations from the baseline value can lead to significant shifts in the relative trends. Annex 5 introduces a fingerprint plot to summarise the trend characteristics.

Table 19. General overview of median values (items / 100 m coastline) and trends in the SUP, FISH and BAG categories at the regional scale.

Region		SUP		FISH		BAG	
		2015–2016	2020–2021	2015–2016	2020–2021	2015–2016	2020–2021
Baltic Sea	*Median litter abundance*	7	5	0	0	1	1
	Trend	– 29 %		0 %		0 %	
North East Atlantic Ocean + North Sea	*Median litter abundance*	43	38	9	8	4	2
	Trend	– 12 %		– 11 %		– 50 %	
Mediterranean Sea	*Median litter abundance*	134	68	39	4	15	10
	Trend	– 49 %		– 90 %		– 33 %	
Black Sea	*Median litter abundance*	564	316	1	3	41	25
	Trend	– 44 %		200 % [1]		– 40 %	

([1]) Minor fluctuations from the baseline value can lead to significant shifts in the relative trends. See Annex 5.
Source: Own elaboration.

At the EU scale, the general overview illustrates a significant achievement, marked by downward trends in TA and the SUP, FISH and BAG categories (Tables 20 and 21). Policy actions implemented through EU legislation (e.g. the MSFD) have led to several mitigation initiatives and actions at different scales. Although the agreed EU coastline litter TV has not yet been reached (20 macro litter items per 100 m coastline), a percentage trend reduction in TA of 29 % has been achieved.

Table 20. General overview of median TA values (items / 100 m coastline) and trend at the EU scale.

	TA (median values – items / 100 m coastline)		Trend (%)
	2015–2016	2020–2021	
EU scale	287	203	– 29 %

Source: Own elaboration.

For the selected litter groups at the EU scale, the SUP and BAG categories have achieved a 40 % and the FISH category a 20 % trend reduction (Table 21). It is important to note that, due to the intrinsic uncertainty of these data, the trend numbers should not be seen as precise trends but an indication of litter amounts.

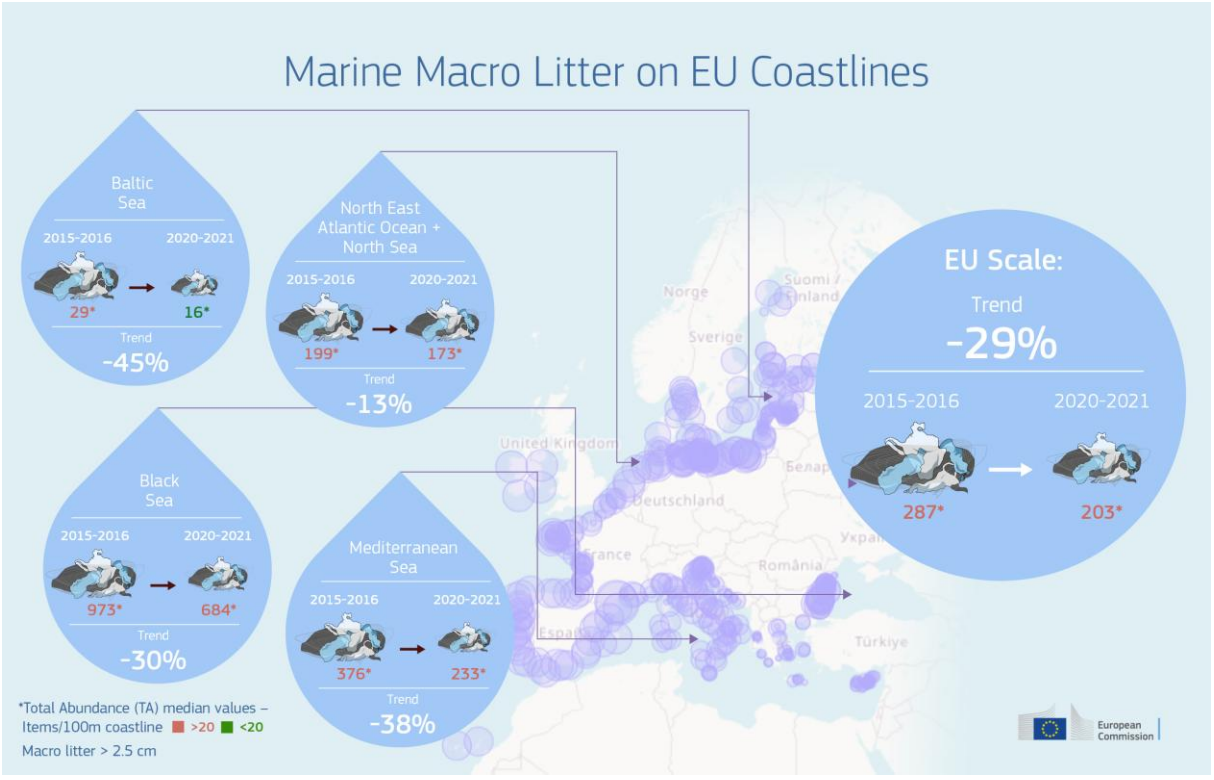
Table 21. General overview of median values (items / 100 m coastline) and trends for SUP, FISH and BAG at the EU scale.

		SUP		FISH		BAG	
		2015–2016	**2020–2021**	**2015–2016**	**2020–2021**	**2015–2016**	**2020–2021**
EU scale	*Median litter abundance*	88	53	5	4	10	6
	Trend	– 40 %		– 20 %		– 40 %	

Source: Own elaboration.

Figure 18 summarises the median values of the coastline marine macro litter TA at the regional and the EU scales through an infographic.

Figure 18. Overview of the EU coastline macro litter TA at the regional and the EU scales.



Source: Own elaboration.

9 Zero Pollution Action Plan

The Zero Pollution Action Plan is a major pillar of the EU Green Deal, providing for strategic reduction of pollution across different types of anthropogenic pollution in different environmental compartments.

Coastline litter monitoring is one of the proxies, together with floating macro litter, seafloor macro litter and microlitter in various compartments, which enable an understanding of marine litter abundance in the environment. MSFD coastline macro litter trends have been selected as a proxy for marine litter and will be used to verify progress towards the goal of the Zero Pollution Action Plan, in particular Target 5: 'By 2030 the EU should reduce by 50 % plastic litter at sea and by 30 % microplastics released into the environment'.

Basis: Directive (EU) 2019/904 on the reduction of the impact of certain plastic products on the environment ('SUP Directive'), Directive 2008/56/EC (MSFD) and Chemicals legislation (REACH).

Description: Plastic litter at sea: Reaching the target of 50 % reduction by 2030 would include consumption changes triggered by the sound implementation of existing (mainly the Waste Framework Directive) and new (mainly the Single-Use Plastic Directive) EU law. Monitoring beach litter quantities, as required by the Marine Strategy Framework Directive, will be used as a proxy to track progress.

The results of the coastline litter trend calculations show that most EU regions are on their way to reaching the target by 2023. It should be recognised, however, that not all (sub)-regions have a clear downward trend, and that the trend could not be calculated some countries and sub-regions due to a lack of survey data.

The results show that significant targeted efforts are needed and that a 50 % reduction will still leave an unacceptably high abundance of macro litter on some coastlines.

Results of the adopted report on EU coastline litter trends will be provided for the upcoming *2024 Zero Pollution Monitoring and Outlook report*, which is an update to the first report, published in 2022 (European Commission Joint Research Centre, 2022).

10 Implementing MSFD monitoring provisions

While the trend calculations have been made possible through the gradual harmonisation of monitoring, there are still some EU Member States have not yet fully implemented the monitoring guidance and the Joint List of Litter Categories.

10.1 Need for monitoring operators to fully implement guidance

Since 2013, guidance has provided the basics of harmonised beach/coastline litter monitoring: four surveys should be performed annually, every 3 months (except for areas with snow-covered beaches in winter), on beaches of different types, on a 100 m stretch (Galgani et al., 2013, 2023). There is a need for further alignment, as on some beaches fewer surveys are being performed per year; thus, minimum requirements for the number of surveys for trend assessments are not being met. While snow coverage may hinder data acquisition during winter in some Nordic countries, in most cases four surveys are possible. These are needed, as the monitoring is based on removal of the litter; thus, the litter added every 3 months is quantified, and a lower number of surveys alters the counts significantly, leading to non-comparability of the results.

Feedback and information exchange among monitoring operators has been suggested to enable them to further implement monitoring guidance, for example through a dedicated information exchange platform.

10.2 Need for full implementation of the agreed Joint List of Litter Categories

The comparability of marine macro litter data depending on unambiguous identification and reporting of litter categories. This enables the prioritisation of mitigation measures by targeting the most abundant categories, increasing their efficiency. Whereas initially there were several lists of litter categories, EU Member States and RSCs have agreed on a jointly developed list to overcome difficulties in data analysis and also enable transboundary data analysis in the shared marine basins. Not all countries and RSCs have fully implemented the Joint List of Litter Categories yet. Once sufficient progress has been made, it will be possible to follow the trend developments of individual categories in areas across Europe, making category-specific mitigation actions possible.

11 Reporting of quantified national beach litter reduction targets

EU Member States committed to reporting targets under MSFD Article 10 to underline their ambition to reach GES and provide quantifiable waypoints towards GES. When agreeing on the TV for EU coastline macro litter, several countries informed about the need for intermediate targets in order to plan for steps bridging the high litter abundances and the agreed TV.

The availability of trend calculations and their results now enables EU Member States to select, plan and report such national targets, based on an assessment of the trends in litter abundance and litter category groups.

12 Conclusions

12.1 General conclusions

This report presents the process, assessment method used to establish trends in EU coastline macro litter to enable the interpretation of trends in marine litter abundance. Coastline litter trend analysis provides a general direction of the increase or decrease of litter abundance in a defined period to assess changes in abundance of coastline marine macro litter.

Establishing a methodology for trend calculation, based on the data provided by EU Member States, enables the selection of the most appropriate approach to further develop intermediate measurable targets toward reaching the coastline marine macro litter TV. We note the following points.

- Data availability from 2015 to 2021 allows the consideration of all EU regions. All the subregions, except the Aegean-Levantine Sea sub-region in the Mediterranean Sea, can be evaluated.
- Data availability for the baseline and assessment periods allows the analysis of step trends, except for the aggregations where data for the baseline and/or assessment period are not available.
- Coastline litter TA has reduced significantly in all areas with high litter concentrations. At the EU level, a reduction of approximately 29 % has been achieved.
- Results from the EU coastline macro litter trend calculations show that the absolute amounts of beach litter are still above the agreed EU coastline macro litter TV in most of the analysed areas. However, the provisions for mitigating marine litter appear to be effective if they are applied consistently, and most EU regions are on their way to reaching the Zero Pollution Action Plan target by 2030.
- The availability of the EU coastline macro litter trend calculations enables EU Member States to define and set up national targets, based on an assessment of trends in the litter TA and litter category groups.
- Significant progress has been made in implementing the guidance on monitoring marine litter. However, there are still some areas where the coastline litter monitoring method has not been fully implemented. The implementation of the guidance on monitoring marine litter should be ensured to allow the gradual harmonisation of coastline litter monitoring in Europe, enabling the direct comparability of data.
- The use of different litter lists to categorise macro litter hinders the direct comparability of litter objects. Unambiguous identification and reporting of litter categories is needed to enable the prioritisation and efficiency of mitigation measures; therefore, it is recommended that EU Member States and RSCs implement the jointly developed List of Litter Categories. This will also enable the calculation of trends for further litter category groups.

12.2 Implications for the implementation of measures against marine litter

The calculated trends in total litter abundance on EU coastlines are the result of the large-scale attention of the society, in particular through the Marine Strategy Framework Directive and its

provisions since 2008. Dedicated EU legislation was then developed in order to tackle specific litter types and areas. These include the SUP directive (Directive (EU) 2019/904) and the revision of the Port Reception Facility Directive (Directive (EU) 2019/883). Furthermore RSCs, often inspired by EU legislation, have prepared regional action plans to reduce marine litter.

A multitude of local provisions has been implemented in municipalities, regions and countries, increasing public awareness and targeting consumer behaviour. Industry has, partly due to (upcoming) legislation, but also voluntarily, reduced the production and use of plastics likely to litter the environment.

The EU coastline litter trends show that provisions for mitigating marine litter have been successful, but that efforts need to continue in order to further reduce litter in European seas and in the shared marine basins. Concentrations in many areas remain high and require targeted action, while EU legislation is still in the process of being implemented in the Member States.

Current efforts to develop the United Nations Global Treaty to end Plastic Pollution can profit both technically, from the method developments and experience in this process, and conceptually, in the sense that the observed downward trends in beach litter quantities demonstrate that the fight against plastic pollution of the seas can be won, if adequate measures are implemented consistently.

12.3 Future trend calculations and outlook

As the trend calculation methodology has been agreed upon within the TG ML, presented to the GES group and adopted by the MSCG, and data are regularly being acquired, future calculations of EU coastline macro litter will be straightforward. It is recommended that EU Member States complete their implementation of the guidance on monitoring marine litter (Galgani et al., 2023).

Comparing the baseline data from 2015–2016 against the next upcoming dataset, for example 2021–2022 and 2022–2023, will entail rerunning the data analysis script and providing the trends in litter TA and selected category groups.

The EU coastline macro litter trends analysis provides quantitative information on the development of coastline litter abundance and enables the prioritisation of efforts and the implementation of targeted mitigation measures. Although the results show that significant efforts are still needed to reduce plastic litter at sea by 50 % by 2030, the coastline litter trends indicate that EU Member States are on track to reach the Zero Pollution Action Plan target by 2030.

References

Cleveland, W. S., Grosse, E. and Shyu, W. M. (1992), *Local regression models.* Chamber, J. M. and Hastie, T. J. (eds), Statistical Models in S, Wadsworth & Brooks/Cole, Pacific Grove, California, Chapter 8.

Efron, B. and Tibshirani, R. J. (1994), *An Introduction to the Bootstrap*. Chapman and Hall/CRC. doi:10.1201/9780429246593

European Commission (2021), Commission communication – Pathway to a healthy planet for all - EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil ', COM(2021) 400 final).

Fleet, D., Vlachogianni, T. and Hanke, G. (2021), *A joint list of litter categories for marine macrolitter monitoring – Manual for the application of the classification system*, JRC Technical Report, Publications Office of the European Union, Luxembourg, doi:10.2760/127473.

Galgani, F., Hanke, G., Werner, S., Oosterbaan, L., Nilsson, P., Fleet, D., Kinsey, S., Thompson, R. C, van Franeker, J., Vlachogianni, T., Scoullos, M., Veiga, J. M, Palatinus, A., Matiddi, M., Maes, T., Korpinen, S., Budziak, A., Leslie, H., Gago, J. and Liebezeit, G. (2013), *Guidance on monitoring of marine litter in European seas – A guidance document within the common implementation strategy for the marine strategy framework directive*, JRC Scientific and Policy Report, Publications Office of the European Union, Luxembourg, doi:10.2788/99475.

Galgani, F., Ruiz-Orejón, L. F., Ronchi, F., Tallec, K., Fischer, E. K., Matiddi, M., Anastasopoulou, A., Andresmaa, E., Angiolillo, M., Bakker Paiva, M., Booth, A. M., Buhhalko, N., Cadiou, B., Clarò, F., Consoli, P., Darmon, G., Deudero, S., Fleet, D., Fortibuoni, T., Fossi, M.C., Gago, J., Gérigny, O., Giorgetti, A., González-Fernández, D., Guse, N., Haseler, M., Ioakeimidis, C., Kammann, U., Kühn, S., Lacroix, C., Lips, I., Loza, A. L., Molina Jack, M. E., Norén, K., Papadoyannakis, M., Pragnel-Raasch, H., Rindorf, A., Ruiz, M., Setälä, O., Schulz, M., Schultze, M, Silvestri, C., Soederberg, L., Stoica, E., Storr-Paulsen, M., Strand, J., Valente, T., van Franeker, J., van Loon, W. M. G. M., Vighi, M., Vinci, M., Vlachogianni, T., Volckaert, A., Weiel, S., Wenneker, B., Werner, S., Zeri, C., Zorzo, P., and Hanke, G. (2023), *Guidance on the Monitoring of Marine Litter in European Seas An update to improve the harmonised monitoring of marine litter under the Marine Strategy Framework Directive*, JRC133594, EUR 31539 EN, Publications Office of the European Union, Luxembourg, doi:10.2760/59137

Hanke, G., Walvoort, D., van Loon, W., Addamo, A.M., Brosich, A., del Mar Chaves Montero, M., Molina Jack, M.E., Vinci, M., and Giorgetti, A. (2019). *EU Marine Beach Litter Baselines*, EUR 30022 EN, Publications Office of the European Union, Luxemburg, JRC114129, doi:10.2760/16903.

Hollander, M. and Wolfe, D.A. (1973), *Nonparametric Statistical Methods*, John Wiley & Sons, New York.

European Commission Joint Research Centre (2022), *Zero pollution outlook 2022*, JRC129655, Publications Office of the European Union, Luxembourg, doi:10.2760/39491,

R Core Team (2024), *R: A Language and Environment for Statistical Computing*_. R Foundation for Statistical Computing, Vienna. https://www.R-project.org/.

Schulz, M., Walvoort, D., Barry, J., Fleet, D., and van Loon, W. (2019), *Baseline and power analyses for the assessment of beach litter reductions in the European OSPAR region*. Environmental Pollution, Vol. 248, pp. 555-564. doi: 10.1016/j.envpol.2019.02.030.

Van Loon, W., Hanke, G., Fleet, D., Werner, S., Barry, J., Strand, J., Eriksson, J., Galgani, F., Gräwe, D., Schulz, M., Vlachogianni, T., Press, M., Blidberg, E. and Walvoort, D. (2020), *A European Threshold Value and Assessment Method for Macro Litter on Coastlines*. JRC121707, EUR 30347 EN, Publications Office of the European Union, Luxembourg, 2020, doi:10.2760/54369.

Wehrens, R., Putter, H. and Buydens, L.M.C. (2000), *The bootstrap: a tutorial.* Chemometrics and Intelligent Laboratory Systems, Vol. 54, pp. 35-52, doi:10.1016/S0169-7439(00)00102-7

List of abbreviations and definitions

Abbreviation	Definition
D10	Marine Strategy Framework Directive Descriptor 10
EEA	European Environment Agency
EMODnet	European Marine Observation and Data Network
GES	Good Environmental Status
HELCOM	Baltic Marine Environment Protection Commission – Helsinki Convention
JRC	Joint Research Centre
MAD	Median Absolute Deviation
MSCG	Marine Strategy Coordination Group
MSFD	Marine Strategy Framework Directive (Directive (EU) 2008/56/EC)
MSFD CIS	Marine Strategy Framework Directive Common Implementation Strategy
OGS	Italian National Institute of Oceanography and Applied Geophysics
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
RSC	Regional Sea Convention
SUP	single-use plastic
TA	total abundance
TG ML	Technical Group on Marine Litter under the Marine Strategy Framework Directive
TV	threshold value
UN	United Nations

Abbreviation	Definition
UNEP	United Nations Environment Programme

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Annexes

Annex 1. Confidence intervals of trend results

The reduction or increase results of beach litter, from the baseline period 2015-2016 to the assessment period 2020-2021, have an uncertainty. This uncertainty is frequently expressed as the 90% confidence interval of the results.

From the several available methods to estimate these confidence intervals, bootstrapping is a simple and effective method that is used frequently (Efron and Tibshirani, 1994; Wehrens et al., 2000).

In short, bootstrapping is performed as follows.

1. Take a bootstrap sample for each beach and period (baseline period and assessment period). For example, for the assessment period, in the Netherlands, for each beach 2-years times 4 surveys are 8 total counts. These 8 values will be sampled with replacement (a so-called bootstrap sample). Therefore, when you have 8 total counts: x1, x2, x3, x4, x5, x6, x7, x8, a bootstrap sample may look like: x5, x3, x7, x8, x2, x4, x4, x3. Note that there are duplicates (or triplicates, etc.) due to sampling with replacement. Also note that the size of the bootstrap sample is also eight.
2. Take the median of this bootstrap sample. This will give you a bootstrap median for this specific beach for this specific period.
3. This median will be aggregated in a hierarchical way (exactly the same procedure as we used before):

   beach → country sub-region → subregion → region → EU.

4. This entire process is repeated a large number of times, currently 10 000 times. So instead of obtaining a single median, you end up with 10 000 medians, that is, an entire distribution of medians. We use this distribution to calculate the 5 % and 95 % percentiles. These are the confidence limits of the 90 % confidence interval of the median.

Annex 2. Country-region results and estimated confidence intervals for TA, SUP, FISH and BAG categories

Table 22 provides the specific median values at the country-region scale for TA, SUP, FISH and BAG.

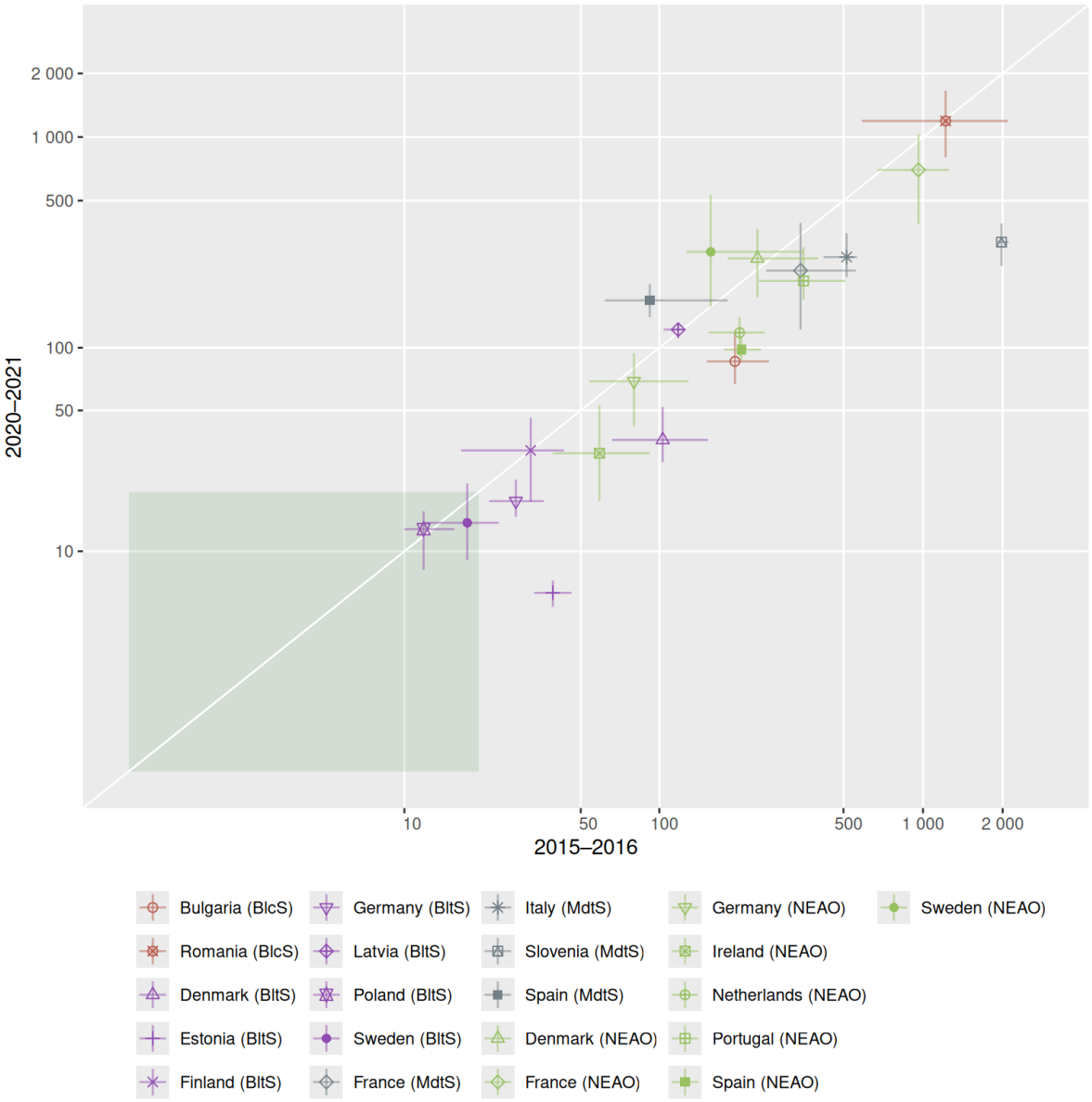
Table 22. Country-region results (median values) for the baseline and assessment periods for the TA, SUP, FISH and BAG categories.

Region	Member State	2015–2016 (TA)	2020–2021 (TA)	2015–2016 (SUP)	2020–2021 (SUP)	2015–2016 (FISH)	2020–2021 (FISH)	2015–2016 (BAG)	2020–2021 (BAG)
Baltic Sea	DE	29	16	7	5	0	0	1	1
	DK	99	36	16	6	1	1	2	2
	EE	39	6	10	2	0	0	3	0
	FI	23	32	3	13	0	0	1	0
	LV	118	125	23	37	0	0	14	14
	PL	12	11	5	4	0	0	0	1
	SE	18	14	2	4	0	0	1	0
North East Atlantic Ocean + North Sea	DE	80	72	8	5	1	3	4	0
	DK	236	266	51	36	6	28	4	4

Region	Member State	2015–2016 (TA)	2020–2021 (TA)	2015–2016 (SUP)	2020–2021 (SUP)	2015–2016 (FISH)	2020–2021 (FISH)	2015–2016 (BAG)	2020–2021 (BAG)
	ES	195	98	53	29	5	3	3	2
	FR	961	699	190	65	52	37	10	2
	IE	61	33	15	7	1	0	3	2
	NL	196	118	28	17	10	10	5	3
	PT	353	214	141	96	5	7	18	4
	SE	157	356	34	45	14	5	9	11
Mediterranean Sea	ES	70	168	26	57	2	3	5	4
	FR	333	233	55	28	6	4	5	4
	IT	548	261	180	75	39	6	15	7
	SI	1980	318	1291	100	82	18	128	15
Black Sea	BG	200	90	108	24	1	1	9	1
	RO	1745	1279	1021	607	1	4	74	49

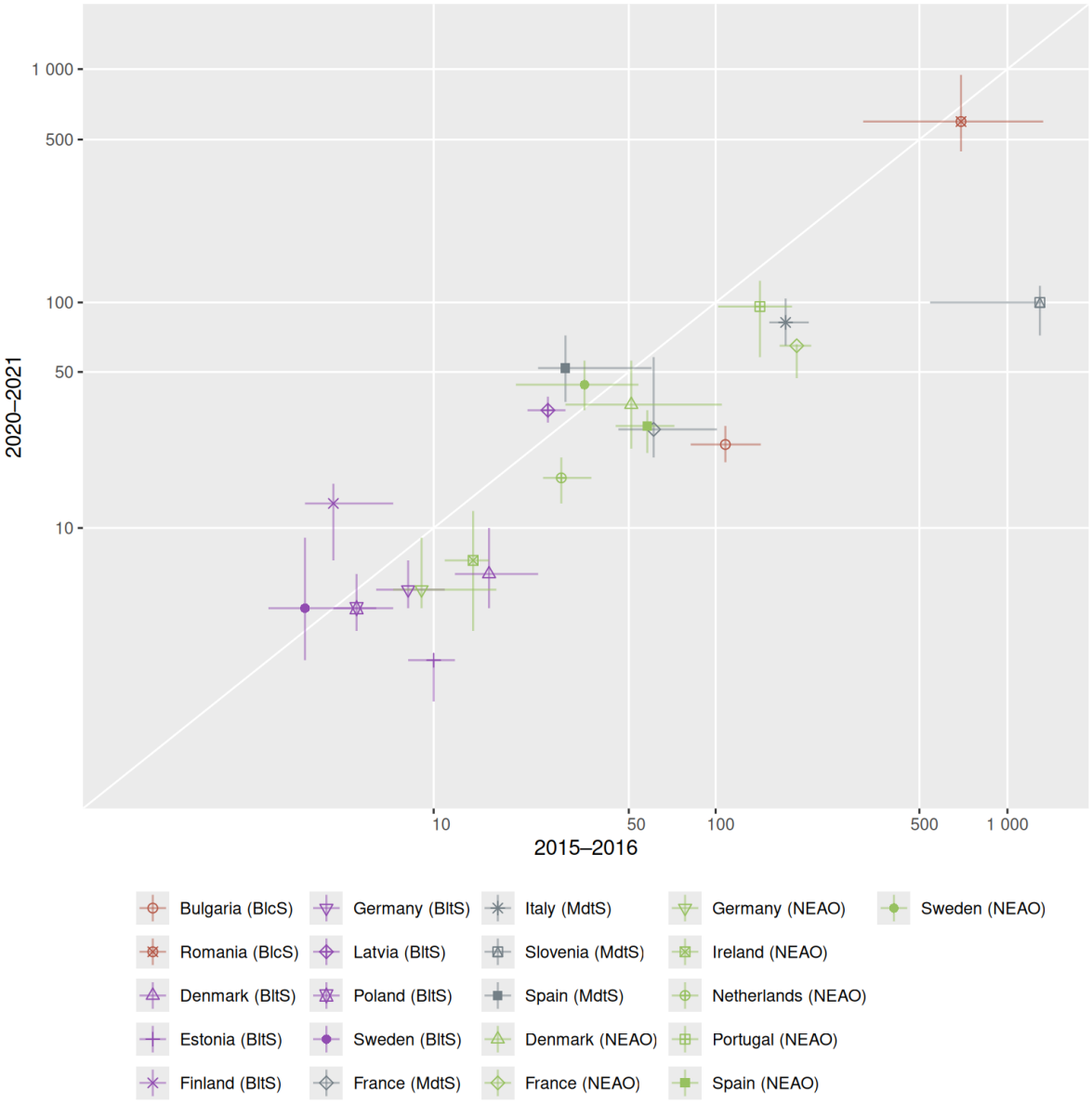
Source: Own elaboration.

Figure 19. Comparison of 2015–2016 and 2020–2021 total litter abundance at the country scale, including the estimated confidence interval for both periods. Dots below the diagonal line indicate an improvement compared with baseline values (2015–2016) and dots above the diagonal line indicate a deterioration.



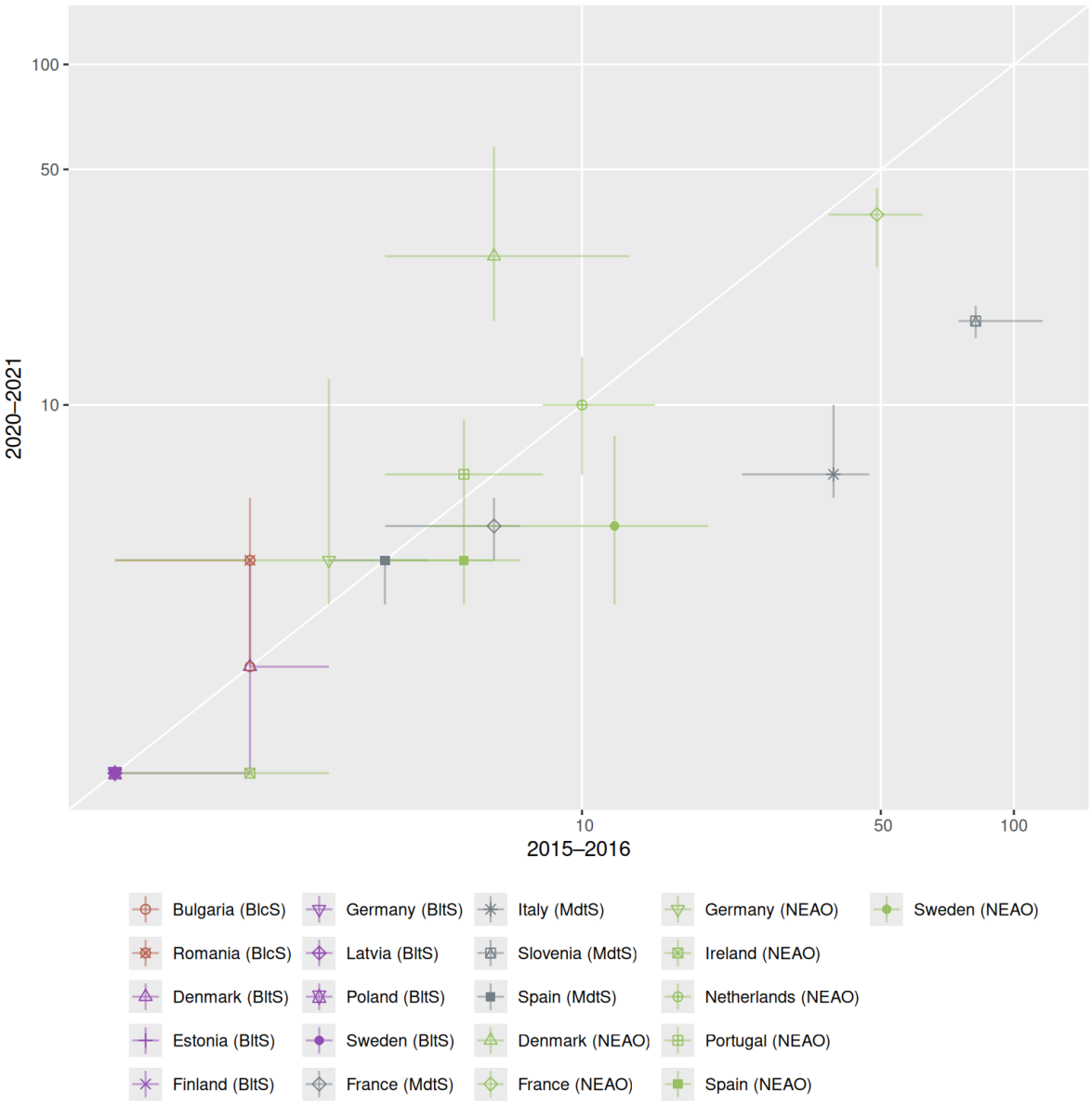
NB: BlcS, Black Sea; BltS, Baltic Sea; MdtS, Mediterranean Sea; NEAO, North East Atlantic Ocean + North Sea.
Source: Own elaboration.

Figure 20. Comparison of 2015–2016 and 2020–2021 litter abundance in the SUP category at the country scale, including the estimated confidence interval for both periods. Dots below the diagonal line indicate an improvement compared with baseline values (2015–2016) and dots above the diagonal line indicate a deterioration.



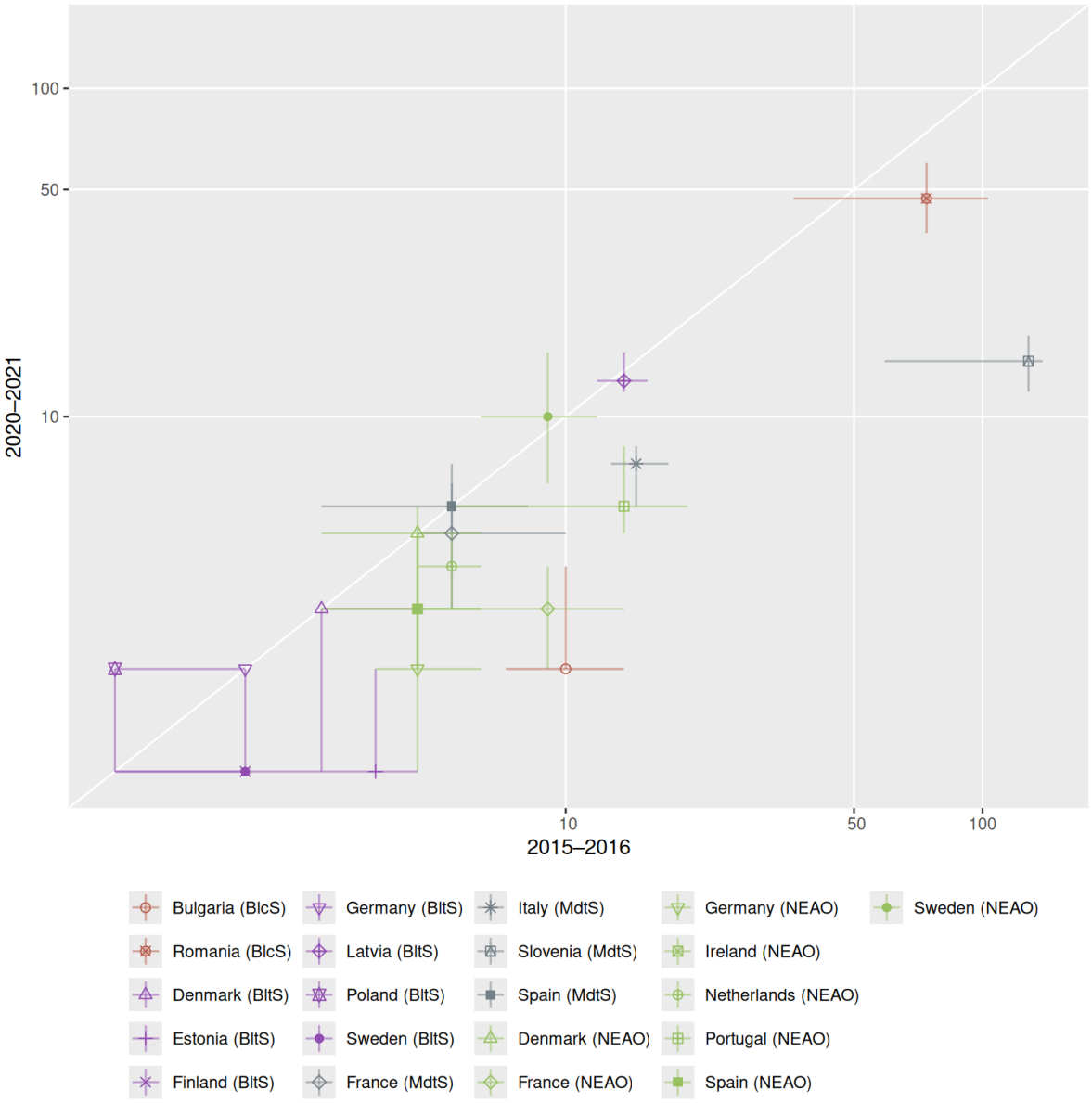
NB: BlcS, Black Sea; BltS, Baltic Sea; MdtS, Mediterranean Sea; NEAO, North East Atlantic Ocean + North Sea.
Source: Own elaboration.

Figure 21. Comparison of 2015–2016 and 2020–2021 litter abundance in the FISH category at the country scale, including the estimated confidence interval for both periods. Dots below the diagonal line indicate an improvement compared with baseline values (2015–2016) and dots above the diagonal line indicate a deterioration.



NB: BlcS, Black Sea; BltS, Baltic Sea; MdtS, Mediterranean Sea; NEAO, North East Atlantic Ocean + North Sea.
Source: Own elaboration.

Figure 22. Comparison of 2015–2016 and 2020–2021 litter abundance in the BAG category at the country scale, including the estimated confidence interval for both periods. Dots below the diagonal line indicate an improvement compared with baseline values (2015–2016) and dots above the diagonal line indicate a deterioration.



NB: BlcS, Black Sea; BltS, Baltic Sea; MdtS, Mediterranean Sea; NEAO, North East Atlantic Ocean + North Sea.
Source: Own elaboration.

Annex 3. Conversion table of macro litter categories

The following table provides an approximation for converting marine litter reported with different lists (i.e. OSPAR, ITA, UNEP-MARLIN, TSG-ML) to the Joint List of Litter Categories (Table 23). Due to the differences between lists, which hinder direct comparability and categorisation into specific categories, some macro litter categories have been incorporated into higher hierarchies.

Table 23. Conversion table used to convert the reported codes to the MSFD TG ML Joint List of Litter Categories.

Reported list	Reported code	Joint List of Litter Categories code
ITA	IT1	pl_nn_bag_
ITA	IT10	pl_nn_cbt_
ITA	IT11	pl_hy_com_
ITA	IT12	pl_nn_cpa_shet_
ITA	IT13	pl_re_toy_
ITA	IT14	pl_nn_box_
ITA	IT15	pl_fi_box_
ITA	IT16	pl_fi_
ITA	IT17	pl_fi_trp_
ITA	IT18	pl_nn_idp_
ITA	IT19	pl_nn_
ITA	IT2	pl_nn_b&c_
ITA	IT20	ru_re_bln_
ITA	IT21	ru_cl_ftw_
ITA	IT22	ru_vk_
ITA	IT23	ru_nn_bnd_
ITA	IT24	ru_nn_oru_
ITA	IT25	ct_nn_cpt_
ITA	IT26	ct_cl_
ITA	IT27	ct_nn_tex_
ITA	IT28	pp_nn_bag_
ITA	IT29	pp_nn_
ITA	IT3	pl_nn_b&c_eoil_
ITA	IT30	pp_fc_tab_
ITA	IT31	pp_sm_cig_
ITA	IT32	pl_sm_but_
ITA	IT33	pp_nn_opp_
ITA	IT34	wo_fc_b&c_cork_
ITA	IT35	wo_nn_box_
ITA	IT36	wo_fc_ice_
ITA	IT37	wo_nn_
ITA	IT38	me_nn_b&c_cans_aesp_
ITA	IT39	me_nn_b&c_lids_
ITA	IT4	pl_vk_prt_
ITA	IT40	me_nn_
ITA	IT41	me_fi_wsl_
ITA	IT42	me_nn_srp_
ITA	IT43	me_nn_b&c_barl_
ITA	IT44	me_nn_b&c_barl_
ITA	IT45	me_nn_wir_
ITA	IT46	me_nn_bat_
ITA	IT47	me_nn_ome_
ITA	IT48	gc_fc_
ITA	IT49	gc_nn_lit_
ITA	IT5	pl_sm_lht_
ITA	IT50	gc_co_btc_
ITA	IT51	gc_nn_occ_
ITA	IT52	ru_hy_con_
ITA	IT53	pl_hy_cbs_
ITA	IT54	pl_hy_

Reported list	Reported code	Joint List of Litter Categories code
ITA	IT55	pl_hy_
ITA	IT56	pl_md_
ITA	IT57	pl_md_syg_
ITA	IT58	pl_md_omd_
ITA	IT59	pl_nn_bag_dogb_
ITA	IT6	pl_nn_pen_
ITA	IT7	pl_fc_tab_
ITA	IT8	pl_cl_glv_
ITA	IT9	pl_nn_flb_
OSPAR	1	pl_fc_sxp_
OSPAR	10	pl_nn_b&c_jery_
OSPAR	100	pl_hy_stt_tamp_
OSPAR	101	pl_hy_tfr_
OSPAR	102	pl_hy_
OSPAR	103	pl_md_pha_
OSPAR	104	pl_md_syg_
OSPAR	105	pl_md_omd_
OSPAR	108	ch_nn_lig_pfwa_
OSPAR	109	ch_nn_lig_pfwa_
OSPAR	11	pl_nn_b&c_injn_
OSPAR	110	ch_nn_lig_pfwa_
OSPAR	112	pl_nn_bag_ends_
OSPAR	113	pl_cl_glv_ingl_
OSPAR	114	pl_nn_tag_
OSPAR	115	pl_fi_net_smal_
OSPAR	116	pl_fi_net_larg_
OSPAR	117	pl_nn_frg_
OSPAR	118	pp_fc_b&c_tpak_milk_
OSPAR	119	wo_fi_box_
OSPAR	12	pl_nn_b&c_ob&c_
OSPAR	120	me_re_bbq_
OSPAR	121	pl_nn_bag_dogb_
OSPAR	13	pl_nn_box_
OSPAR	14	pl_vk_prt_
OSPAR	15	pl_nn_b&c_lids_
OSPAR	16	pl_sm_lht_
OSPAR	17	pl_nn_pen_
OSPAR	18	pl_hy_com_
OSPAR	19	pl_fc_wrp_cwls_
OSPAR	2	pl_nn_bag_cabg_
OSPAR	20	pl_re_toy_
OSPAR	200	pl_nn_rps_
OSPAR	201	pl_nn_rps_
OSPAR	202	pl_nn_frg_
OSPAR	203	pl_cl_glv_
OSPAR	204	pp_fc_b&c_tpak_
OSPAR	205	me_nn_b&c_barl_
OSPAR	206	me_nn_b&c_barl_
OSPAR	21	pl_fc_tab_cups_
OSPAR	210	ct_nn_tex_
OSPAR	22	pl_fc_tab_
OSPAR	23	pl_nn_bag_hdsa_
OSPAR	24	pl_nn_bag_mesh_vege_
OSPAR	25	pl_cl_glv_hogl_
OSPAR	26	pl_fi_trp_crab
OSPAR	27	pl_fi_trp_octo_
OSPAR	28	pl_aq_shf_sack_
OSPAR	29	pl_aq_shf_oyst_
OSPAR	3	pl_nn_bag_smbg_
OSPAR	30	pl_aq_shf_tahi_
OSPAR	31	pl_nn_rps_rope_

Reported list	Reported code	Joint List of Litter Categories code
OSPAR	32	pl_nn_rps_strg_
OSPAR	33	pl_fi_net_tang_
OSPAR	34	pl_fi_box_
OSPAR	35	pl_fi_lin_
OSPAR	36	pl_fi_fil_
OSPAR	37	pl_nn_flb_
OSPAR	38	pl_nn_buc_
OSPAR	39	pl_nn_stb_
OSPAR	4	pl_fc_b&c_dbot_
OSPAR	40	pl_nn_cpa_shet_
OSPAR	41	pl_nn_fib_
OSPAR	42	pl_cl_hdw_helm_
OSPAR	43	pl_hu_car_
OSPAR	44	pl_cl_ftw_shoe_
OSPAR	45	pl_nn_idp_idfd_
OSPAR	46	pl_nn_frg_smal_
OSPAR	47	pl_nn_frg_larg_
OSPAR	48	pl_nn_idp_
OSPAR	49	ru_re_bln_
OSPAR	5	pl_nn_b&c_clng_
OSPAR	50	ru_cl_ftw_rubo_
OSPAR	52	ru_vk_tyr_
OSPAR	53	ru_nn_oru_
OSPAR	54	ct_cl_clg_
OSPAR	55	ct_nn_cpt_
OSPAR	56	ct_nn_sac_
OSPAR	57	ct_cl_ftw_
OSPAR	58	ct_nn_tex_
OSPAR	59	ct_nn_tex_
OSPAR	6	pl_fc_b&c_ffmd_
OSPAR	60	pp_nn_bag_
OSPAR	61	pp_nn_
OSPAR	62	pp_fc_b&c_tpak_
OSPAR	63	pp_sm_cig_
OSPAR	64	pl_sm_but_
OSPAR	65	pp_fc_tab_cups_
OSPAR	66	pp_nn_new_
OSPAR	67	pp_nn_opp_
OSPAR	68	wo_fc_b&c_cork_
OSPAR	69	wo_nn_pal_
OSPAR	7	pl_hy_b&c_
OSPAR	70	wo_nn_box_
OSPAR	71	wo_fi_trp_
OSPAR	72	wo_fc_ice_
OSPAR	73	Wo_nn_owo_
OSPAR	74	wo_nn_owo_smal_
OSPAR	75	wo_nn_owo_larg_
OSPAR	76	me_nn_b&c_cans_aesp_
OSPAR	77	me_nn_b&c_lids_
OSPAR	78	me_fc_b&c_cans_bevg_
OSPAR	79	me_nn_app_
OSPAR	8	pl_nn_b&c_eoil_smal_
OSPAR	80	me_fi_wsl_
OSPAR	81	me_nn_foi_
OSPAR	82	me_fc_b&c_cans_fcan_
OSPAR	83	me_nn_srp_
OSPAR	84	me_nn_b&c_barl_
OSPAR	86	me_nn_b&c_cans_ptin_
OSPAR	87	me_fi_trp_
OSPAR	88	me_nn_wir_
OSPAR	89	me_nn_ome_smal_

Reported list	Reported code	Joint List of Litter Categories code
OSPAR	9	pl_nn_b&c_eoil_larg_
OSPAR	90	me_nn_ome_larg_
OSPAR	91	gc_nn_b&c_bott_
OSPAR	92	gc_nn_lit_
OSPAR	93	gc_nn_occ_ogli_
OSPAR	94	gc_co_btc_
OSPAR	95	gc_fi_trp_octo_
OSPAR	96	gc_nn_occ_ocet_
OSPAR	97	ru_hy_con_
OSPAR	98	pl_hy_cbs_
OSPAR	99	pl_hy_stt_sant_
TSG-ML	G1	pl_fc_sxp_
TSG-ML	G10	pl_fc_b&c_
TSG-ML	G100	pl_md_pha_
TSG-ML	G101	pl_nn_bag_dogb_
TSG-ML	G102	pl_cl_ftw_flip_
TSG-ML	G11	pl_hy_b&c_bech_
TSG-ML	G12	pl_hy_b&c_obch_
TSG-ML	G124	pl_nn_idp_
TSG-ML	G125	ru_re_bln_
TSG-ML	G126	ru_re_bls_
TSG-ML	G127	ru_cl_ftw_rubo_
TSG-ML	G128	ru_vk_tyr_
TSG-ML	G129	ru_nn_its_
TSG-ML	G13	pl_nn_b&c_ob&c_
TSG-ML	G130	me_vk_whl_
TSG-ML	G131	ru_nn_bnd_
TSG-ML	G133	ru_hy_con_
TSG-ML	G134	ru_nn_oru_
TSG-ML	G135	ct_cl_
TSG-ML	G135	pl_cl_
TSG-ML	G136	pl_cl_ftw_shoe_
TSG-ML	G137	ct_cl_clg_
TSG-ML	G138	ct_cl_ftw_
TSG-ML	G139	ct_re_bps_
TSG-ML	G14	pl_nn_b&c_eoil_smal_
TSG-ML	G140	ct_nn_sac_
TSG-ML	G141	ct_nn_cpt_
TSG-ML	G143	ct_nn_sal_
TSG-ML	G144	pl_hy_stt_tamp_
TSG-ML	G145	ct_nn_tex_
TSG-ML	G147	pp_nn_bag_
TSG-ML	G148	pp_nn_box_
TSG-ML	G15	pl_nn_b&c_eoil_larg_
TSG-ML	G150	pp_fc_b&c_tpak_milk_
TSG-ML	G151	pp_fc_b&c_tpak_otpk_
TSG-ML	G152	pp_sm_cig_
TSG-ML	G153	pp_fc_tab_
TSG-ML	G154	pp_nn_new_
TSG-ML	G155	pp_re_fwo_
TSG-ML	G156	pp_nn_frg_
TSG-ML	G158	pp_nn_opp_
TSG-ML	G159	wo_fc_b&c_cork_
TSG-ML	G16	pl_nn_b&c_jery_
TSG-ML	G160	wo_nn_pal_
TSG-ML	G162	wo_nn_box_
TSG-ML	G163	wo_fi_trp_
TSG-ML	G164	wo_fi_box_
TSG-ML	G165	wo_fc_ice_
TSG-ML	G166	pl_nn_pai_
TSG-ML	G167	wo_re_fwo_

Reported list	Reported code	Joint List of Litter Categories code
TSG-ML	G17	pl_nn_b&c_injn_
TSG-ML	G171	wo_nn_owo_smal_
TSG-ML	G172	wo_nn_owo_larg_
TSG-ML	G173	wo_nn_owo_
TSG-ML	G174	me_nn_b&c_cans_aesp_
TSG-ML	G175	me_fc_b&c_cans_bevg_
TSG-ML	G176	me_fc_b&c_cans_fcan_
TSG-ML	G177	me_nn_foi_
TSG-ML	G178	me_nn_b&c_lids_
TSG-ML	G179	me_re_bbq_
TSG-ML	G18	pl_nn_box_
TSG-ML	G180	me_nn_app_
TSG-ML	G181	me_fc_tab_
TSG-ML	G182	me_fi_wsl_
TSG-ML	G184	me_fi_trp_
TSG-ML	G186	me_nn_srp_
TSG-ML	G187	me_nn_b&c_barl_
TSG-ML	G188	me_nn_b&c_cans_ocan_
TSG-ML	G19	pl_vk_prt_
TSG-ML	G190	me_nn_b&c_cans_ptin_
TSG-ML	G191	me_nn_wir_
TSG-ML	G193	me_vk_prt_
TSG-ML	G194	me_co_cab_
TSG-ML	G195	me_nn_bat_
TSG-ML	G197	me_nn_ome_
TSG-ML	G198	me_nn_ome_smal_
TSG-ML	G199	me_nn_ome_larg_
TSG-ML	G2	pl_nn_bag_
TSG-ML	G20	pl_nn_b&c_lids_
TSG-ML	G200	gc_nn_b&c_bott_
TSG-ML	G201	gc_nn_b&c_jars_
TSG-ML	G202	gc_nn_lit_libu_
TSG-ML	G203	gc_fc_tab_
TSG-ML	G204	gc_co_btc_
TSG-ML	G205	gc_nn_lit_flbu_
TSG-ML	G207	gc_fi_trp_octo_
TSG-ML	G208	gc_nn_gfr_
TSG-ML	G21	pl_fc_b&c_lids_drnk_
TSG-ML	G210	gc_nn_occ_ogli_
TSG-ML	G211	pl_md_omd_
TSG-ML	G213	ch_nn_lig_pfwa_
TSG-ML	G214	ch_nn_drk_oita_
TSG-ML	G215	fw_
TSG-ML	G22	pl_nn_b&c_lids_dtgt_
TSG-ML	G23	pl_nn_b&c_lids_olid_
TSG-ML	G24	pl_nn_b&c_lids_ring_
TSG-ML	G25	pl_sm_tob_
TSG-ML	G26	pl_sm_lht_
TSG-ML	G27	pl_sm_but_
TSG-ML	G28	pl_nn_pen_
TSG-ML	G29	pl_hy_com_
TSG-ML	G3	pl_nn_bag_cabg_
TSG-ML	G30	pl_fc_wrp_cwls_crsp_
TSG-ML	G31	pl_fc_wrp_cwls_loly_
TSG-ML	G32	pl_re_toy_
TSG-ML	G33	pl_fc_tab_cups_
TSG-ML	G34	pl_fc_tab_cupt_
TSG-ML	G35	pl_fc_tab_stst_
TSG-ML	G36	pl_nn_bag_hdsa_ohds_
TSG-ML	G37	pl_nn_bag_mesh_
TSG-ML	G38	pl_nn_cpa_

Reported list	Reported code	Joint List of Litter Categories code
TSG-ML	G39	pl_cl_glv_
TSG-ML	G4	pl_nn_bag_smbg_
TSG-ML	G40	pl_cl_glv_hogl_
TSG-ML	G41	pl_cl_glv_ingl_
TSG-ML	G42	pl_fi_trp_crab_
TSG-ML	G43	pl_nn_tag_
TSG-ML	G44	pl_fi_trp_octo_
TSG-ML	G45	pl_aq_shf_sack_
TSG-ML	G46	pl_aq_shf_oyst_
TSG-ML	G47	pl_aq_shf_tahi_
TSG-ML	G49	pl_nn_rps_rope_
TSG-ML	G5	pl_nn_bag_ends_
TSG-ML	G50	pl_nn_rps_strg_
TSG-ML	G52	pl_fi_net_
TSG-ML	G53	pl_fi_net_smal_
TSG-ML	G54	pl_fi_net_larg_
TSG-ML	G56	pl_fi_net_tang_
TSG-ML	G57	pl_fi_box_plbx_
TSG-ML	G58	pl_fi_box_fbox_
TSG-ML	G59	pl_fi_lin_
TSG-ML	G6	pl_nn_b&c_
TSG-ML	G60	pl_fi_fil_
TSG-ML	G61	pl_fi_ofi_
TSG-ML	G62	pl_fi_flb_
TSG-ML	G63	pl_nn_flb_
TSG-ML	G64	pl_nn_fen_
TSG-ML	G65	pl_nn_buc_
TSG-ML	G66	pl_nn_stb_
TSG-ML	G67	pl_nn_cpa_shet_
TSG-ML	G68	pl_nn_fib_
TSG-ML	G69	pl_cl_hdw_helm_
TSG-ML	G7	pl_fc_b&c_dbot_smll_
TSG-ML	G70	pl_hu_car_
TSG-ML	G71	pl_cl_ftw_
TSG-ML	G72	pl_nn_tfk_
TSG-ML	G73	pl_nn_fom_
TSG-ML	G74	pl_nn_fom_pain_
TSG-ML	G76	pl_nn_frg_smal_
TSG-ML	G77	pl_nn_frg_larg_
TSG-ML	G79	pl_nn_frg_nofp_smal_
TSG-ML	G8	pl_fc_b&c_dbot_lage_
TSG-ML	G80	pl_nn_frg_nofp_larg_
TSG-ML	G82	pl_nn_frg_fopy_smal_
TSG-ML	G83	pl_nn_frg_fopy_larg_
TSG-ML	G84	pl_nn_cds_
TSG-ML	G85	pl_fi_bag_hdsa_salt_
TSG-ML	G86	pl_re_div_
TSG-ML	G87	pl_nn_tap_
TSG-ML	G88	pl_nn_tel_
TSG-ML	G89	pl_co_oco_
TSG-ML	G9	pl_nn_b&c_clng_
TSG-ML	G90	pl_ag_pot_
TSG-ML	G91	pl_nn_bio_
TSG-ML	G92	pl_fi_bte_
TSG-ML	G93	pl_nn_cbt_
TSG-ML	G95	pl_hy_cbs_
TSG-ML	G96	pl_hy_stt_sant_
TSG-ML	G97	pl_hy_tfr_
TSG-ML	G98	pl_hy_dap_
TSG-ML	G99	pl_md_syg_
UNEP_MARLIN	CL01	ct_cl_

Reported list	Reported code	Joint List of Litter Categories code
UNEP_MARLIN	CL02	ct_re_bps_
UNEP_MARLIN	CL03	ct_nn_tex_
UNEP_MARLIN	CL04	ct_nn_tex_
UNEP_MARLIN	CL05	ct_nn_cpt_
UNEP_MARLIN	CL06	ct_nn_
UNEP_MARLIN	FP01	pl_nn_fom_
UNEP_MARLIN	FP02	pl_fc_
UNEP_MARLIN	FP03	pl_nn_flb_
UNEP_MARLIN	FP04	pl_nn_fom_pain_
UNEP_MARLIN	FP05	pl_nn_idp_idfd_
UNEP_MARLIN	GC01	gc_co_btc_
UNEP_MARLIN	GC02	gc_nn_b&c_
UNEP_MARLIN	GC03	gc_fc_tab_
UNEP_MARLIN	GC04	gc_nn_lit_libu_
UNEP_MARLIN	GC05	gc_nn_lit_
UNEP_MARLIN	GC06	gc_nn_
UNEP_MARLIN	GC07	gc_nn_gfr_
UNEP_MARLIN	GC08	gc_nn_occ_
UNEP_MARLIN	ME01	me_fc_tab_
UNEP_MARLIN	ME02	me_nn_b&c_lids_
UNEP_MARLIN	ME03	me_fc_b&c_cans_bevg_
UNEP_MARLIN	ME04	me_nn_b&c_cans_ocan_
UNEP_MARLIN	ME05	me_nn_b&c_barl_
UNEP_MARLIN	ME06	me_nn_foi_
UNEP_MARLIN	ME07	me_fi_wsl_
UNEP_MARLIN	ME08	me_nn_
UNEP_MARLIN	ME09	me_nn_wir_
UNEP_MARLIN	ME10	me_nn_app_
UNEP_MARLIN	ME11	me_re_bbq_
UNEP_MARLIN	OR01	fw_
UNEP_MARLIN	OR03	fw_
UNEP_MARLIN	OT01	ch_nn_lig_pfwa_
UNEP_MARLIN	OT02	pl_hy_stt_
UNEP_MARLIN	OT03	me_nn_app_
UNEP_MARLIN	OT04	me_nn_bat_
UNEP_MARLIN	PC01	pp_nn_new_
UNEP_MARLIN	PC02	pp_nn_box_
UNEP_MARLIN	PC03	pp_fc_tab_
UNEP_MARLIN	PC04	pp_re_fwo_
UNEP_MARLIN	PC05	pp_nn_
UNEP_MARLIN	PL01	pl_nn_b&c_lids_
UNEP_MARLIN	PL02	pl_nn_b&c_ob&c_
UNEP_MARLIN	PL03	pl_nn_b&c_ob&c_
UNEP_MARLIN	PL04	pl_fc_tab_
UNEP_MARLIN	PL05	pl_fc_sxp_
UNEP_MARLIN	PL06	pl_fc_b&c_
UNEP_MARLIN	PL07	pl_nn_bag_
UNEP_MARLIN	PL08	pl_re_toy_
UNEP_MARLIN	PL09	pl_cl_glv_
UNEP_MARLIN	PL10	pl_sm_lht_
UNEP_MARLIN	PL11	pl_sm_but_
UNEP_MARLIN	PL12	pl_md_syg_
UNEP_MARLIN	PL13	pl_nn_box_
UNEP_MARLIN	PL14	pl_nn_flb_
UNEP_MARLIN	PL15	pl_nn_bag_mesh_
UNEP_MARLIN	PL16	pl_nn_cpa_shet_
UNEP_MARLIN	PL17	pl_fi_trp_
UNEP_MARLIN	PL18	pl_fi_lin_
UNEP_MARLIN	PL19	pl_nn_rps_
UNEP_MARLIN	PL20	pl_fi_net_
UNEP_MARLIN	PL21	pl_nn_stb_

Reported list	Reported code	Joint List of Litter Categories code
UNEP_MARLIN	PL22	pl_nn_fib_
UNEP_MARLIN	PL23	pl_nn_idp_idnf_
UNEP_MARLIN	PL24	pl_nn_idp_
UNEP_MARLIN	RB01	ru_re_
UNEP_MARLIN	RB02	ru_cl_ftw_
UNEP_MARLIN	RB03	ru_cl_
UNEP_MARLIN	RB04	ru_vk_tyr_tyre_
UNEP_MARLIN	RB05	ru_nn_its_
UNEP_MARLIN	RB06	ru_nn_bnd_
UNEP_MARLIN	RB07	ru_hy_con_
UNEP_MARLIN	RB08	ru_nn_oru_
UNEP_MARLIN	WD01	wo_fc_b&c_cork_
UNEP_MARLIN	WD02	wo_fi_trp_
UNEP_MARLIN	WD03	wo_fc_ice_
UNEP_MARLIN	WD04	wo_nn_box_
UNEP_MARLIN	WD05	wo_re_fwo_
UNEP_MARLIN	WD06	wo_nn_owo_

Source: Own elaboration.

Annex 4. Litter categories assigned to single-use plastic, fisheries-related and plastic bag litter groups

Table 24 indicates which categories have been included in the groups SUP, FISH and BAG.

Table 24. List of litter categories assigned to the SUP, FISH and BAG groups.

Joint List of Litter Categories code	Name (Joint List of Litter Categories)	SUP	FISH	BAG
pl_fc_	plastic food consumption related items	✓		
pl_fc_b&c_	plastic food bottles & containers	✓		
pl_fc_b&c_dbot_	plastic drink bottles	✓		
pl_fc_b&c_dbot_lage_	plastic drink bottles >0.5 l	✓		
pl_fc_b&c_dbot_smll_	plastic drink bottles ≤ 0.5 l	✓		
pl_fc_b&c_ffmd_	plastic food containers made of foamed polystyrene	✓		
pl_fc_b&c_lids_drnk_	plastic caps/lids drinks	✓		
pl_fc_b&c_pfoc_	plastic food containers made of hard non-foamed plastic	✓		
pl_fc_sxp_	plastic 4/6-pack yokes & six-pack rings	✓		
pl_fc_tab_	plastic tableware/cups/cutlery/plates/trays/straws/stirrers	✓		
pl_fc_tab_cups_	plastic cups and cup lids	✓		
pl_fc_tab_cups_fcup_	cups and cup lids of foamed polystyrene	✓		
pl_fc_tab_cups_hpcp_	cups and lids of hard plastic	✓		
pl_fc_tab_cupt_	plastic cutlery, plates and trays	✓		
pl_fc_tab_cupt_cutl_	plastic cutlery	✓		
pl_fc_tab_cupt_plat_	plastic plates and trays	✓		
pl_fc_tab_stst_	plastic straws and stirrers	✓		
pl_fc_tab_stst_stir_	plastic stirrers	✓		
pl_fc_tab_stst_strw_	plastic straws	✓		
pl_fc_wrp_cwls_	plastic crisps packets/sweets wrappers/lolly & lollypop sticks	✓		
pl_fc_wrp_cwls_crsp_	plastic crisps packets/sweets wrappers	✓		
pl_fc_wrp_cwls_loly_	plastic lolly & ice-cream sticks	✓		
pl_hy_cbs_	plastic cotton bud sticks	✓		
pl_hy_stt_	plastic sanitary towels/panty liners/backing strips, tampons and tampon applicators	✓		
pl_hy_stt_sant_	plastic sanitary towels/panty liners/backing strips	✓		
pl_hy_stt_tamp_	plastic tampons and tampon applicators	✓		
pl_hy_wws_	plastic wet wipes	✓		
pl_nn_bag_	plastic bags	✓		✓
pl_nn_bag_cabg_	plastic shopping/carrier/grocery bags	✓		✓
pl_nn_bag_ends_	the part that remains from tear-off plastic bags	✓		✓
pl_nn_bag_smbg_	small plastic bags	✓		✓
pl_sm_but_	tobacco products with filters (cigarette butts with filters)	✓		
ru_re_bln_	rubber balloons	✓		
pl_nn_bag_dogb_	plastic dog/pet faeces bag			✓
pl_nn_bag_hdsa_	plastic heavy-duty sacks			✓
pl_nn_bag_hdsa_ohds_	other plastic heavy-duty sacks			✓

Joint List of Litter Categories code	Name (Joint List of Litter Categories)	SUP	FISH	BAG
pl_nn_bag_mesh_	plastic mesh bags			✓
pl_nn_bag_mesh_vege_	plastic mesh bags for vegetable, fruit and other products			✓
pl_aq_shf_oyst_	plastic oyster trays		✓	
pl_aq_shf_sack_	plastic mussels/oyster mesh bags, net sack, socks		✓	
pl_aq_shf_tahi_	plastic sheeting from mussel culture (Tahitians)		✓	
pl_fi_	plastic fisheries related items		✓	
pl_fi_bag_hdsa_salt_	plastic commercial salt packaging		✓	
pl_fi_box_	plastic fish boxes		✓	
pl_fi_box_fbox_	fish boxes - foamed polystyrene		✓	
pl_fi_box_plbx_	fish boxes - hard plastic		✓	
pl_fi_bte_	plastic bait containers/packaging		✓	
pl_fi_fil_	plastic fishing light sticks / fishing glow sticks incl. packaging		✓	
pl_fi_flb_	plastic floats for fishing nets		✓	
pl_fi_lin_	plastic fishing line		✓	
pl_fi_net_	plastic nets and pieces of net including dolly ropes		✓	
pl_fi_net_larg_	plastic nets and pieces of net > 50cm		✓	
pl_fi_net_smal_	plastic nets and pieces of net 2.5 cm ≥ ≤ 50 cm		✓	
pl_fi_net_strg_drop_	plastic string and filaments exclusively from dolly ropes		✓	
pl_fi_net_strg_fish_	other plastic string and filaments exclusively from fishery		✓	
pl_fi_net_tang_	plastic tangled nets/cord		✓	
pl_fi_net_tang_mixd_	plastic tangled nets and rope without dolly rope or mixed with dolly rope		✓	
pl_fi_net_tang_tadr_	plastic tangled dolly rope		✓	
pl_fi_ofi_	other plastic fisheries related items not covered by other categories		✓	
pl_fi_trp_	plastic crab/lobster/octopus traps & pots and their tops		✓	
pl_fi_trp_crab_	plastic crab/lobster traps (pots) and tops		✓	
pl_fi_trp_octo_	plastic octopus pots		✓	

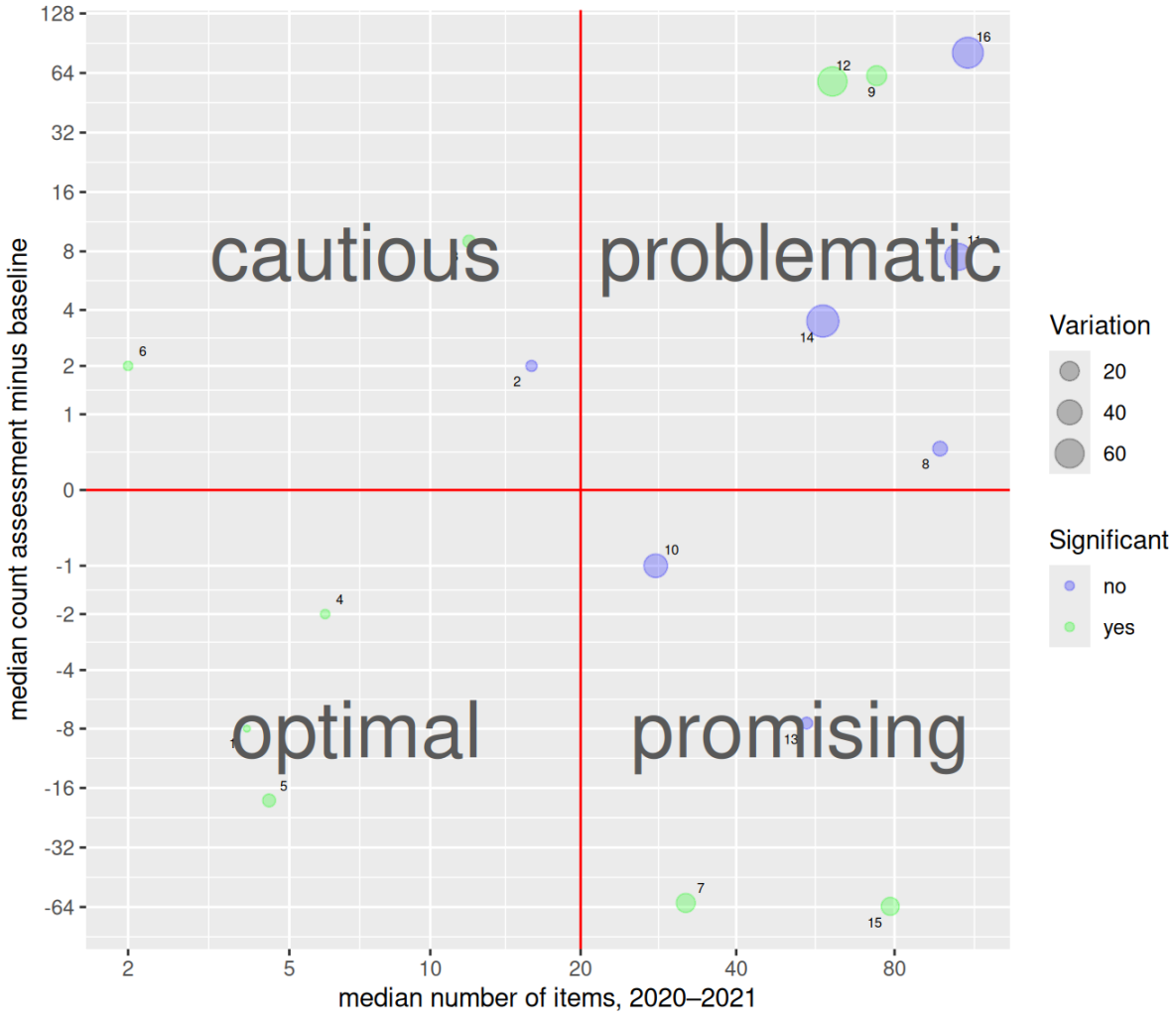
Source: Own elaboration.

Annex 5. Fingerprint plots

A trend can be described by several characteristics: its magnitude, that is, the step size for a step trend or the slope for a linear trend, its direction (increasing, decreasing), its statistical significance, the variation of observations around the trend, and the order of magnitude of the counts (small numbers, big numbers).

To summarise these trend characteristics in a single plot, we introduce the fingerprint plot. A notional example is given in Figure 23.

Figure 23. Notional example of a fingerprint plot.



Source: Own elaboration.

A fingerprint plot should facilitate the interpretation and intercomparison of trends. A fingerprint plot gives the median litter count of a time series in the assessment period on the horizontal axis, and the slope or step size on the vertical axis. The plot is split into quadrants by two lines, as follows.

- A horizontal line with intercept zero. Time series above this line potentially have an increasing trend, and time series below this line a decreasing trend.
- A vertical line indicating the TV for marine macro litter where Total Abundance (TA) equals 20 (Van Loon et al., 2020).

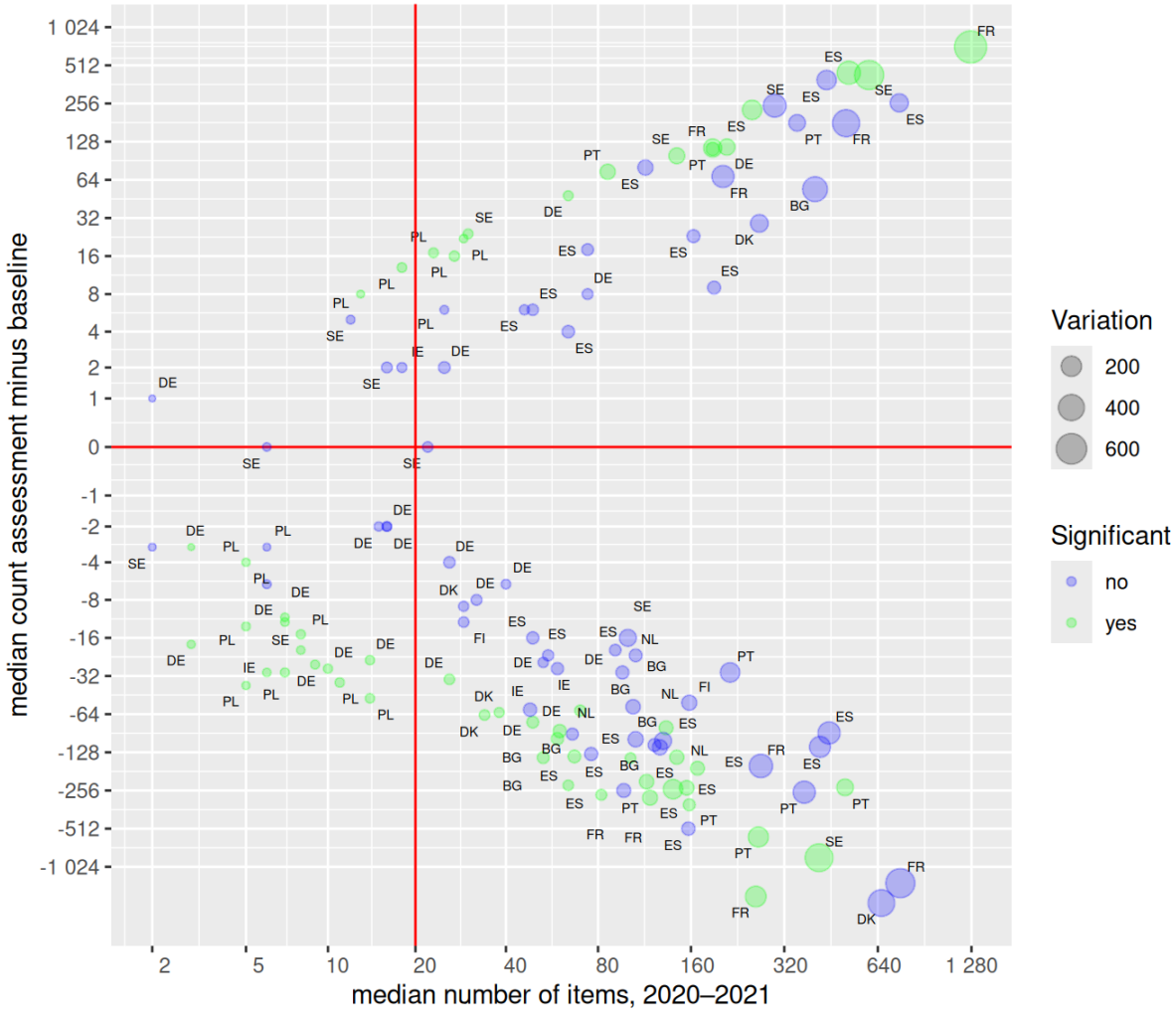
These lines divide the fingerprint plot into four quadrants, as follows.

- The lower left quadrant is the optimal quadrant. It contains time series with potentially decreasing trends where the TA in the assessment period is below the TV.
- The lower right quadrant is the promising quadrant. It contains time series with a potentially decreasing trend, but with a TA still greater than 20 in the assessment period. These time series may eventually move to the lower left quadrant.
- The upper left quadrant is the cautious quadrant. Although the time series in this quadrant are below the TV, they have a potentially increasing trend. These time series may eventually move to the upper right quadrant.
- The upper right quadrant is the problematic quadrant. It contains time series with a potentially increasing trend and litter amounts exceeding the TV.

Time series are represented as dots. The colour of each dot indicates the statistical significance of the trend. The size of each dot is proportional to the variation of the time series in the assessment period. This variation is quantified by the median absolute deviation (MAD), that is, the median of the absolute deviations from the median.

Figure 24 shows a fingerprint plot for time series of TA. Country codes are given near each circle.

Figure 24. Fingerprint plot time series of TA. Country codes are given near each circle.



Source: Own elaboration.

We see several time series in the optimal quadrant. The promising quadrant is well populated, and many trends are significantly decreasing. The problematic quadrant is also well populated. Most trends here are not significantly increasing. The cautious quadrant is almost empty. There are time series with significantly increasing trends near the TV that may need some attention.

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