CleanAtlantic

Tackling Marine Litter in the Atlantic Area

DELIVERABLE 7.2

WP 7: Tackling Marine Litter

Pilot action to investigate the presence of seafloor litter in the Ria of Vigo by using a modified trawling fishing gear coupled with of a video recording system

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1. Background

Accumulation of litter in the marine environment has become one of the most severe anthropogenic impacts that affects their organisms and ecosystems. This global concern is not only restricted to their deleterious effects on marine life via entanglement, ingestions vector for non-native species or smothering of flora and fauna, but it also represents a potential risk to human life and welfare. Marine litter impacts negatively producing economic losses in industries like tourism, shipping or fishing. Additionally, litter removal represents a major problem to coastal municipalities in charge of the beach cleaning operations and their associated costs.

Despite the fact that most marine litter data refer to marine debris in oceanic waters or on coastal areas, mainly beaches, benthic debris have been reported since the mid-seventies (Carpenter & Smith, 1972; Colton *et al*., 1974). Thenceforth, distribution, abundance and composition of litter on the seafloor was the subject of different studies, mostly on continental slopes and shelves, including coastal inlets and estuaries. Seafloor litter sampling is a challenging task, and despite the constraints and limitations associated to its use, different authors consider that trawling is the most adequate method to gather information about litter concentration on benthic soft substrates. However, seafloor litter sampling is usually coupled with that focused on demersal fisheries assessment and therefore it is subject to the objectives of evaluating fishing abundance in terms of area sampled and operational conditions.

According to many studies on benthic litter, the type and concentration of debris are quite variable and they are significantly influenced by different variables (Galgani et al., 2000; Keller et al., 2010; Lee et al., 2006; Pham et al., 2014) both marine (currents, fishing and aquaculture activities, shipping lanes, depth, etc.) and land-based (human population, river flow, ports, industrial activities, etc.). In coastal areas, where several of these anthropogenic activities take place, it is possible that litter origin and distribution could be attributable to a mixture of them. Fact that it is even more evident in the case of semi-enclosed and small-sized areas, such as estuaries and bays.

1.1. Objective

The CleanAtlantic project aims to protect biodiversity and ecosystem services in the Atlantic Area by improving capabilities to monitor, prevent and remove marine litter. Work package 7 is aimed directly at preventing and reducing marine litter and action 7.2 is addressed to implement fishing for litter and other marine litter retrieval pilot actions. The objective of this pilot action was to investigate the presence of seafloor litter in the Ria de Vigo by using a modified trawling fishing gear specifically developed to retrieve seafloor litter avoiding the capture of marine organisms. Moreover, the applicability of a low-cost filming system coupled to the gear was also tested in terms of recording the entrance of residues and the escape of fish species. Here we describe the equipment, the operational conditions and the collaborations established with sea professionals to carry out the sampling and removal of residues, the protocol employed to characterize the retrieved marine litter and the main results achieved. A video was also produced in order to illustrate the pilot action and for awareness raising purposes.

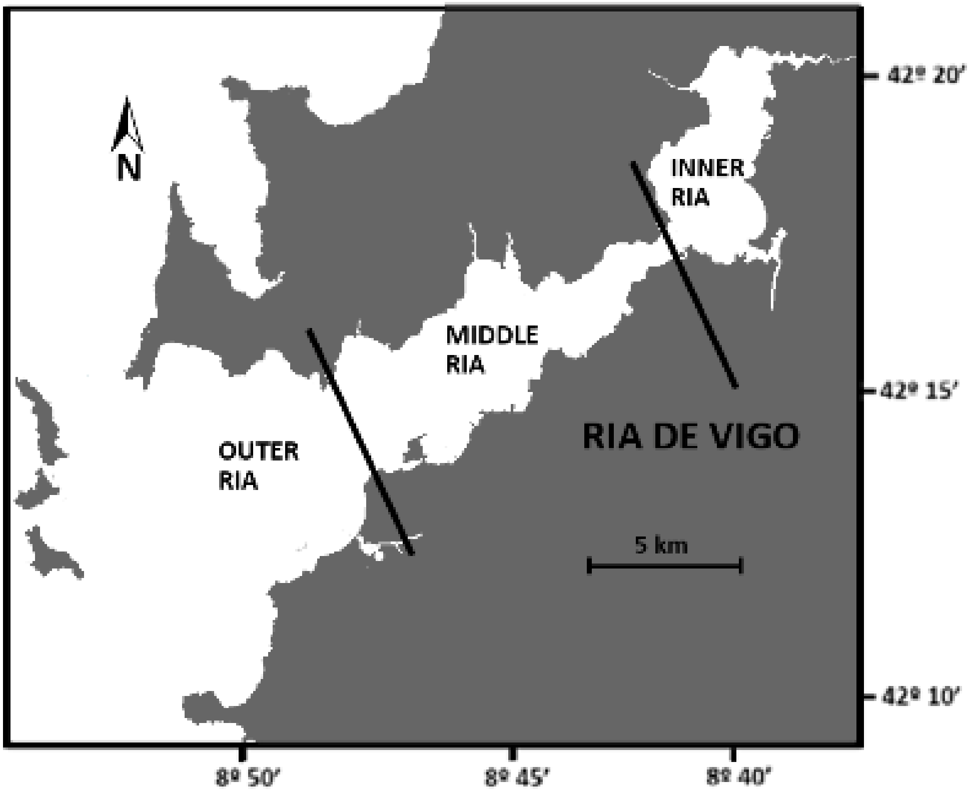
2. Methodology

2.1. Area of study

The area of study was located in the Ria of Vigo (Galicia - NW Spain), and oceanic bay that is the southernmost and the second largest Galician Rias, and that like the rest of Western rias (known as Rías Baixas) is characterised by frequent upwelling events and a high primary productivity which sustains an important fishing, shellfish gathering and aquaculture activities. Thus, seven fishermen's guilds are established in its coastal area, where approximately 500 small scale vessels and 400 walking shellfish gatherers carry out their professional activities. Additionally, around 530 floating mussel rafts are distributed in 14 different polygons.

This ria extends in northeast direction over a length of 35 km and a width ranging between 7 km and 700 m. Mean depth is 21 m, with a maximum of 50 m, and total surface and volume are 183 km^2 and 3.275 hm^3 respectively. It can be divided in three main zones (Evans et al., 2011): 1) the innermost part, which is an estuarine area that receives the main freshwater inputs; 2) the middle part, where the main channel, influenced by both continental and oceanic contributions is located; 3) the outermost part, which is under the dominant oceanic influence and sheltered from the open sea by the Cies Islands. Soft bottoms are predominant, mainly mud. This type of sediment is located in the innermost and shallowest part of the ria and extends toward the outermost zone along the main channel, in a lengthwise direction (NE-SW).

Figure1. Ria de Vigo with their three main zones.



In addition to the extensive aquaculture production and the high concentration of fishing activities, this area concentrates an important number of centres of population and industrial activity along its margins with a total population of about 480,000 inhabitants, which represent a significant environmental pressure on the costal and marine ecosystems and potential sources of marine litter.

2.2. Equipment

2.2.1. Experimental trawling fishing gear

A selective demersal trawl fishing gear (fig. 2) was specifically designed and developed by a Galician fishing net manufacturer company (Tecnopesca S.L.). The net was constructed adapting the mesh sizes, fishing line, groundrope, heading and belly measures in order to improve the removal of marine litter on soft bottoms and avoid the catch of fishes and other animal species. For that purpose, it includes a low vertical opening and innovative features, especially in the first section of the gear, which has large mesh size (20 cm) and a

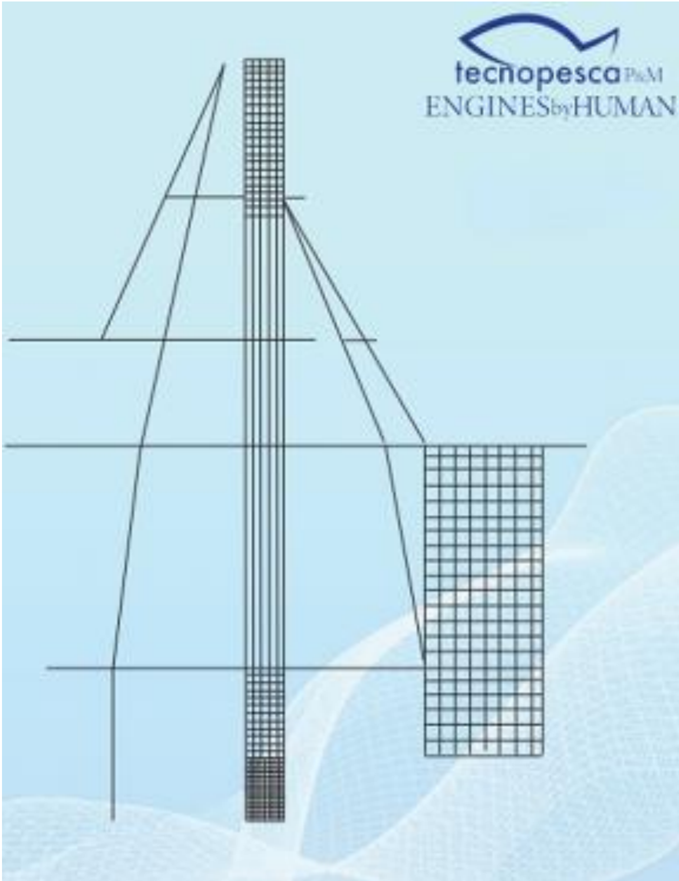


Figure 2. Design of the adapted fishing gear.

special disposition of the headline of the footrope. The aim of this design is to improve the escape of fishes by increasing the fish contact probability. The construction of the net extension and cod-end was classical to retain the catch. Benthic invertebrate species are retained due to reduced or lack of movement (scallops, cuttlefish, starfish, holothurians, sea pens, etc.) Skates, several species of flatfish and dogfish can be caught due to the large size and body shape of those species. However, a cod-end fast opening system facilitates a quick return of captured species to the sea, guaranteeing high survival rates.

The dimensions and weight of the fishing gear were determined taking into account the specific size and the engine power of the vessel used in this pilot action. Thus, the sweep surface and length were 36 m and 59 m respectively. For the same reason the optimum hauling speed recommended was between 2 and 3 knots.

2.2.2. Video recording system

A video recording system, designed and developed by the Spanish Institute of Oceanography (IEO) and CETMAR, was used in the framework of this pilot action (figure 3). This technology has proven to be very useful in onboard trials to monitor fishing gear performance and study the net selectivity and behaviour of the target species. Harsh conditions inside the net, possibility to hard impacts or risk of umbilical cable entanglement with different structures of the fishing gears made it difficult to operate with other technologies like Autonomous Underwater Vehicles (AUV) or Remote Operated Vehicle (ROVs). On the contrary, this cost-effective video system was built using a low-cost set of devices to record videos anchored to different part of the net, where it is severely shocked and impacted by the fishing gear structures, fish and litter.

A nylon square frame support an underwater camera inside a deep water housing that allows its use at depths up to 250 meters. An independent deep water-resistant spotlight is used to provide light for filming in areas with no natural lighting. This system can be anchored to the net with carabiners hooks and shackles, enabling its use attached to the different panels of the net and changing the position inside the gear as well as the shooting angle.

The underwater video system was used in 9 hauls, placing it in different parts of the net (headline and near the cod-end) making it possible to obtain images of gear behaviour during towing, presence of litter pieces in the water column, the retrieval of different items from the seabed as well as the escape of fish. System buoyancy was controlled through the use of a small buoy that ensured its correct operation during the hauls.

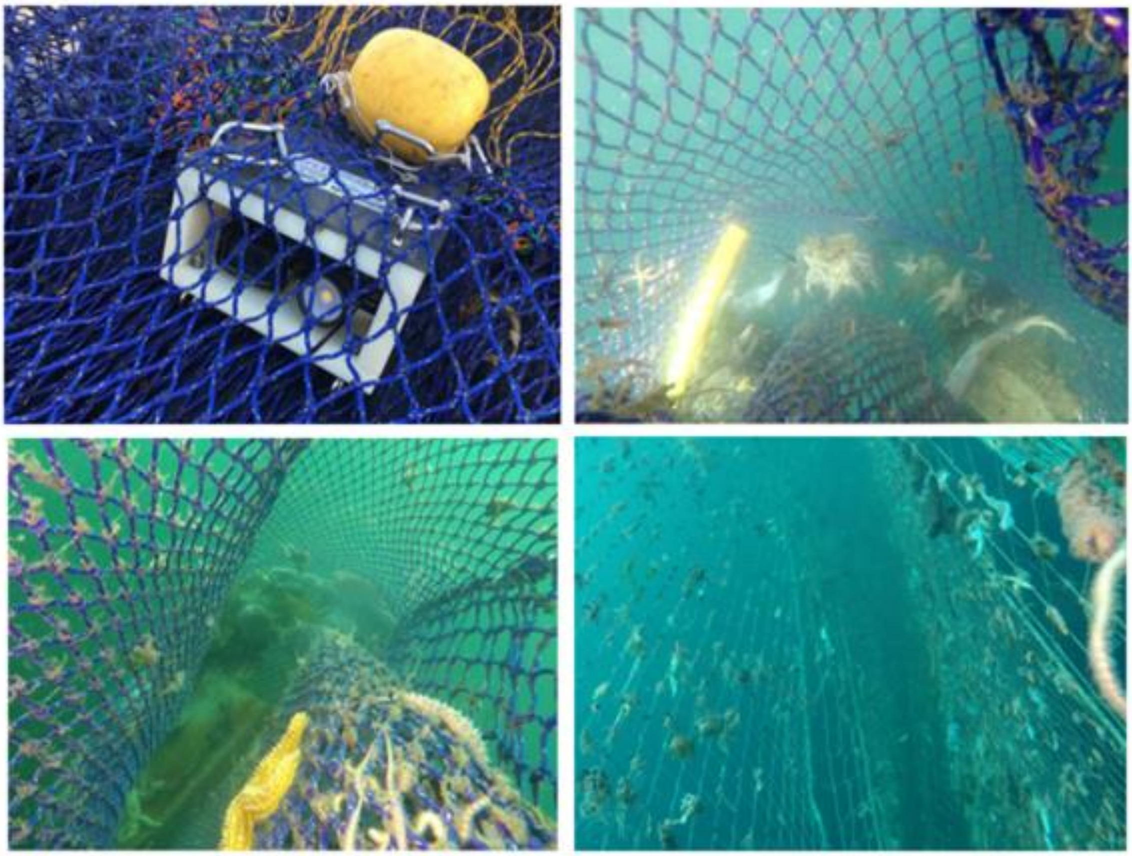


Figure 3. Installation of the filming systems and snapshot taken from the underwater videos.

2.2.3. Collaboration with Galician Coastguard

The Galicia's Coast Guard Service, dependent of the Galician Ministry of the Sea, is the organisation in charge of maritime surveillance, search, rescue and protection operations in Galician waters. Its fleet, with about 20 vessels, includes the training ship "Valentin Paz Andrade" home based in Vigo harbour. It measures 22.9 m in length, the beam is 6.85 m wide and the mean draft 2.40 m. The ship has a propulsion power of 493 hp, a speed test of 11 knots and is equipped for fishing trawler stern midwater rig, semi and substantial drag booms, troll, purse seine and longline.

A collaboration to carry out this pilot action was established between CETMAR and the Coast Guard Service in the frame of CleanAtlantic project. Thus, the adapted trawling fishing gear was installed in the vessel in September 2019 by the Valentin Paz Andrade crew with the technical support of staff members of the net manufacturer company.

Figure 4. Valentin Paz Andrade training ship and installation of the adapted fishing gear.

3. Retrieval activities

An active marine litter retrieval scheme was implemented in the Ria of Vigo between September 2019 and October 2020. The study area inside the ria was limited to their middle and outer zones, with a depth enough to allow the navigational operations of the ship. In addition, trawling was only carried out in the subtidal soft-bottoms to avoid interactions with rock outcrops that could damage the net integrity (figure 5).

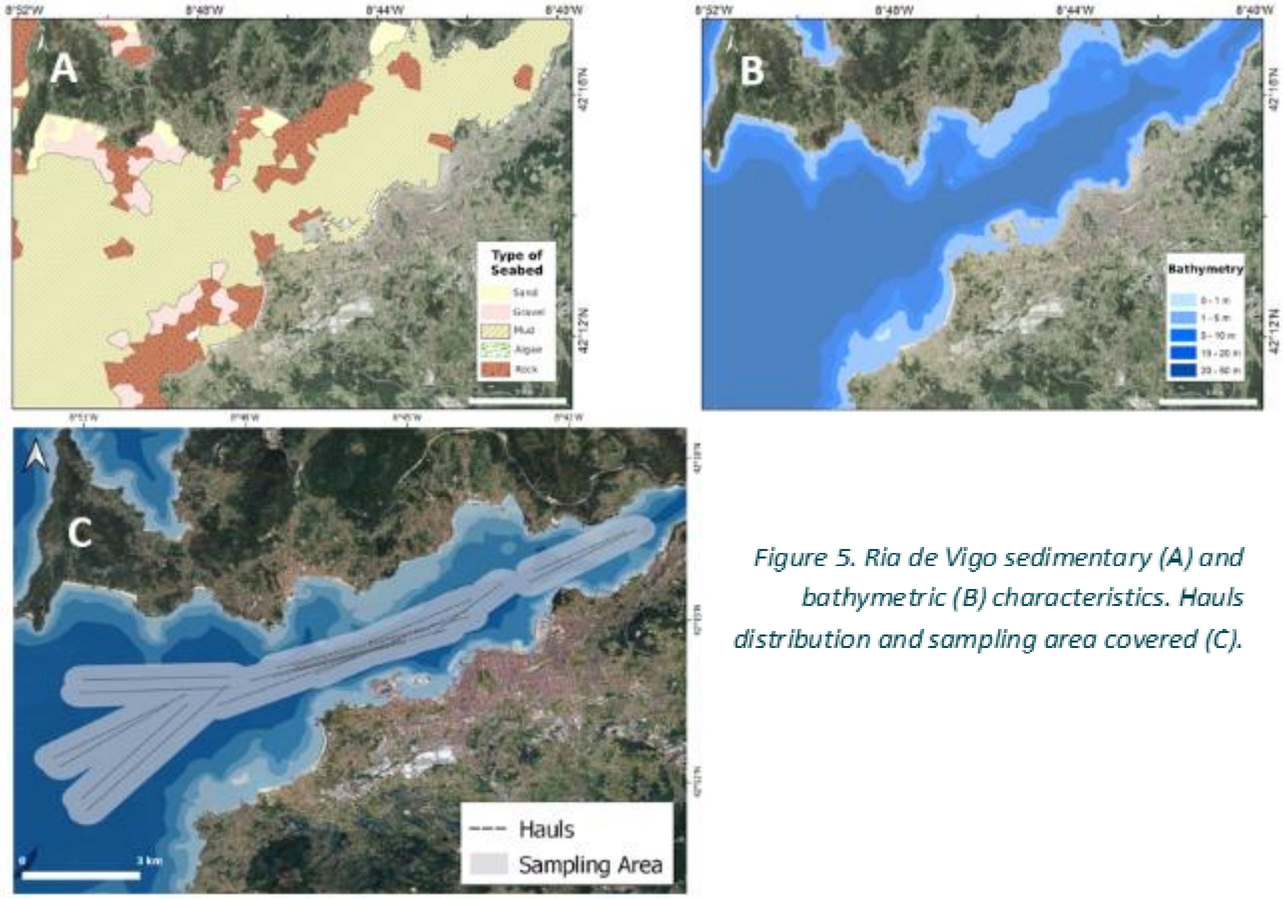


Figure 5. Ria de Vigo sedimentary (A) and bathymetric (B) characteristics. Hauls distribution and sampling area covered (C).

Information provided by the vessel skipper and the nautical charts was taken into account to identify the trawling zones. During this period a total of 17 hauls were carried out distributed among 6 different days. Haul's duration oscillated between 40 and 90 minutes. To optimize the ship and net characteristics performance, towing speed was kept between 2 and 3 knots, and the position of the gear was controlled to keep it in contact with the seabed during the entire haul. The area swept of each haul was calculated as wingspan width multiplied by the length of the trawl, thus total area surveyed over the study period covered a surface of 2.57 km^2. The main characteristics of each haul (date, location, depth, type of sediment, duration and trawl speed) were recorded and are summarized in ANNEX I.

In order to compare samples and areas inside the ria, as well as our results with previous studies carried out in European shelf seas, results are given in density (number of items/ km^2).

Except in the case of the first 3 hauls carried out on September 2019, when main operational conditions were established, all marine debris items caught in each tow were separated from the net and stored in a big bag and once in the port they were categorized, counted, weighed and recorded. Litter items were classified into six groups based on their composition: plastic, metal, rubber, glass/ceramic, natural products and other items, which were subsequently broken down in a total of 53 subcategories. This classification was the same as that used in previous fishing for litter projects implemented in the Galician coasts ("Nada pola Borda" and PESCAL), that was based in the categories of items used in other programmes (ICES/OSPAR) but adapted to the characteristics of the predominant marine litter found in Galician waters

The data was recorded during the survey and information used as part of the outreach through creation of a video which can be used as a communication tool in the framework of the CleanAtlantic project (https://www.youtube.com/watch?v=YU6oTl3UUOM).

4. Results

The performance of the modified fishing gear at trawling speeds between 2 and 3 knots was satisfactory in terms of efficient sampling/retrieval operations coupled with very low captures of fish. Benthic invertebrates and flatfish and dogfish species retained in the cod-end were returned to the sea once on board with low mortality rates, thanks to a fast-opening system, minimizing the ecological impact of this intervention. The video recording system allowed watching the entrance of litter items and the escape of fish species. Seabed marine litter was found in all the 17 hauls and the total amount collected was **1,222** items and which weighed **473.35 kg**. Collected debris typology was quite heterogeneous, with presence of at least one or more items corresponding to 37 out of 53 established subcategories. The predominant material of benthic litter was plastic (figure 6), accounting for more than 50% of the total amount of items and around the 35% of the total weight. The most common items in this category were bag fragments, ropes, bottles, nylon gillnets, mussel nets, which are abundant in this ria seabed. Glass items surpassed those of metal, rubber and natural products regarding the number of items, but this category is only the sixth in weight because it is outweighed by the categories metal, rubber and natural products.

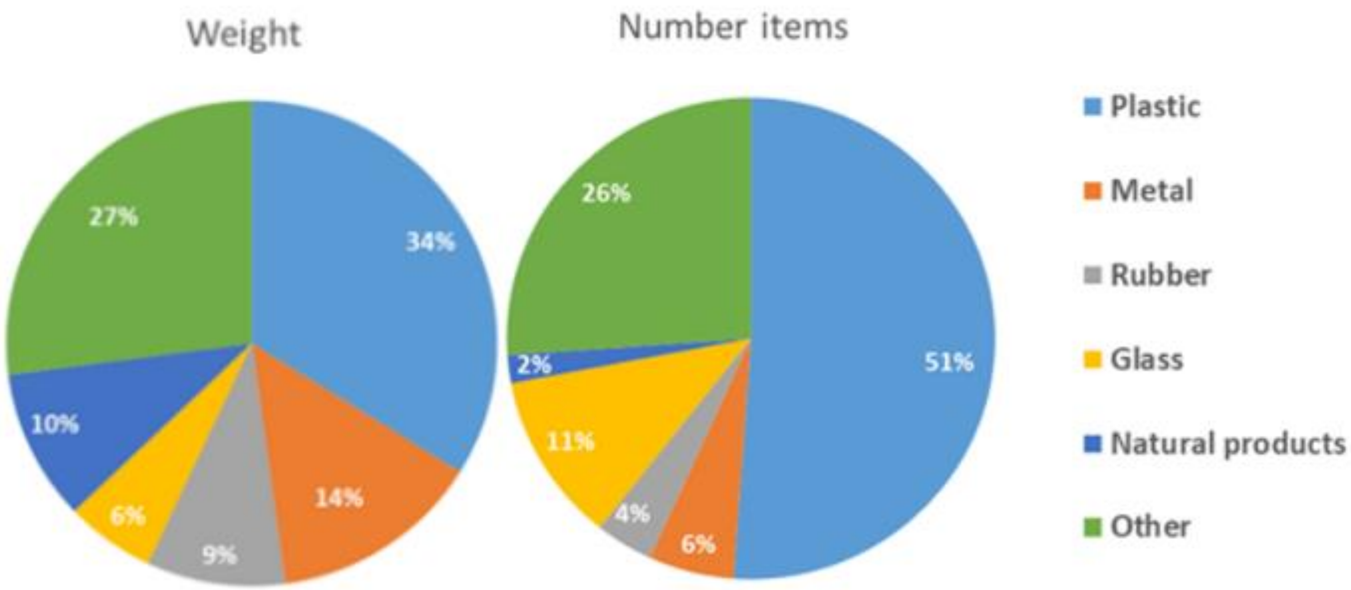


Figure 6. Percentage of the contribution of the main categories in number of items and weight.

Category type	Subcategories	Items (n)
P	Plastic bags/remains of plastic bags	285
O	Other items	177
O	Clothing/rags	118
G	Glass bottles	85
P	Ropes	71
P	Other plastic items	68
P	Plastic bottles	64
G	Glass-ceramic fragments	39
R	Other rubber items	25
P	Nylon gillnet	24
M	Cans (beverage)	24
P	Octopus pots	21
P	Mussel nets	21
N	Processed wood	21
M	Other metal pieces	16
TOTAL		**1,059**

Category Type	Subcategories	Weight (kg)
O	Other items	77.47
O	Clothing/rags	40.93
N	Processed wood	39.62
P	Ropes	37.75
R	Tires	35.57
P	Octopus pots	25.69
G	Glass bottles	20.43
M	Drums, buckets, barrels, etc.	18.29
P	Floats/buoys	13.60
P	Plastic bags/remains of plastic bags	9.90
P	Other fishing gears (mixture of nets, lines, ropes, etc.)	9.55
P	Nylon gillnet	9.12
P	Mussel pegs	8.50
P	Other plastic items	7.94
P	Plastic bottles	7.65
TOTAL		**362.01**

Table I. Ranking of the main subcategories of marine litter in terms of number of items and weight. Main categories are represented as follow: Plastic (P), Metal (M), Rubber (R), Glass (G), Natural products (N) and Other (O).

Attending to the ranking of all the litter subcategories collected from the Ria of Vigo seafloor (Table I), 15 of them accumulate more than 91.29% and 88.79% of the total items retrieved in terms of number and weight, respectively. Plastic category includes 6 and 9 subcategories among these top fifteen lists in terms of number and weight of items, which represent about the 25% and 35% respectively. In the case of the fishing and aquaculture related debris the number of items belonging to this category is less than 10% while in terms of weight reaches 38%. The remaining 22 subcategories not included in this top list represent, in both cases, around the 10% of the total debris collected and classified.

Despite the fact that the trawling time was not exactly the same in all the samples performed, the spatial variability among them was calculated. Overall debris abundance ranged from 19 to 167 pieces (82.86$\pm$42.72) and their weights between 2.58 and 99.89 kg (41.88$\pm$28.05). As represented in figure 7A, variability could be considered relatively high, with coefficient of variation values over 50%, directly related with the heterogeneity in size and weight of the items collected in each haul by the fishing gear employed.

Similarly, we analysed the variability within the plastic items among the 14 samples carried out. As aforementioned, this typology composed approximately half of the number total of items found in the ria (51%), but if we consider each haul separately its presence values oscillate between 36% and 79% of the total items. Concerning to the weight, plastics contribution is in general lower (34%) with values from 17% to 59%. Figure7B shows spatial variability of this category as well as its relation with the mean and standard deviation in number of items (42.07$\pm$24.07) and weight (16.49$\pm$14.53).

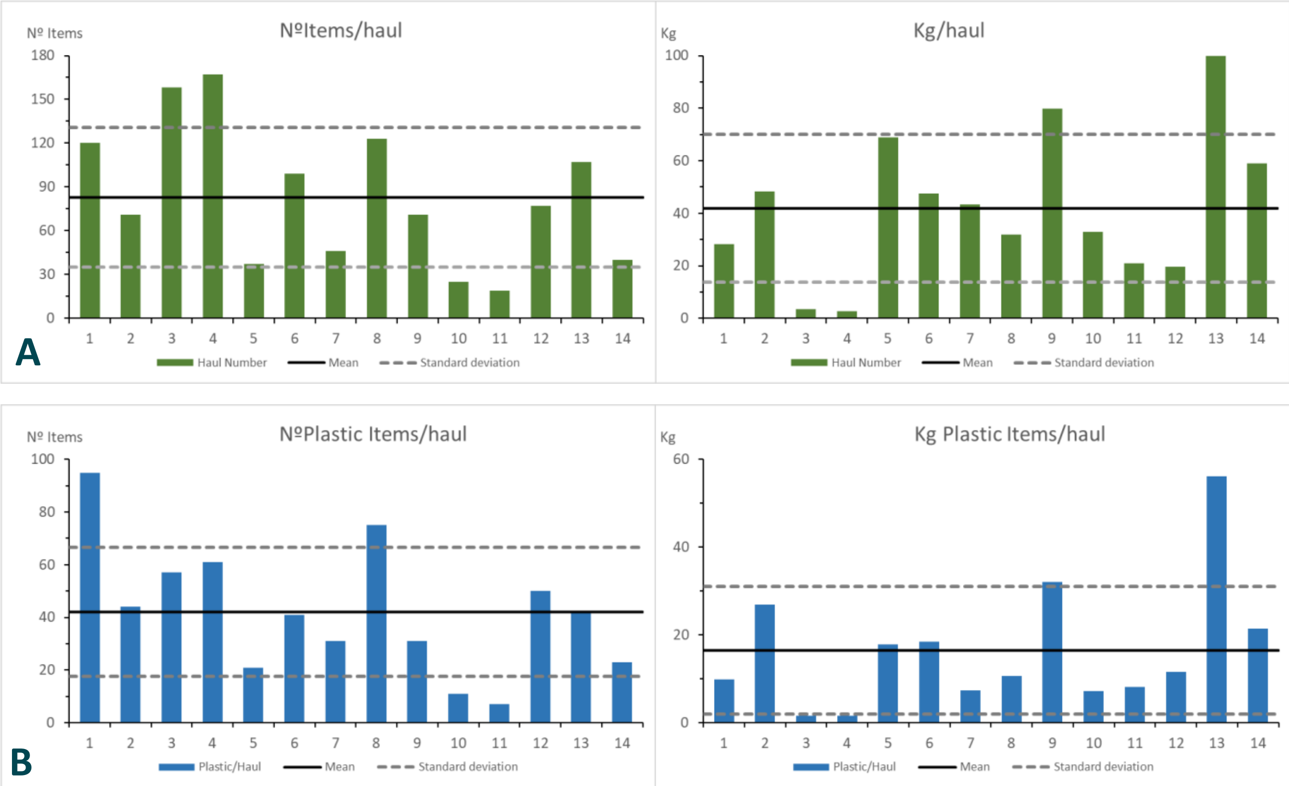


Figure 7. A) Debris in number of items and weight and B) plastic contribution per haul in number of items and kilograms. Mean (continuous line) and standard deviation (dotted line) values are represented for each graph.

Fishing and aquaculture related debris is considered a specific marine litter category in many studies and scientific publications (Moore and Allen, 2000; Moriarty *et al.*, 2016). It causes different environmental impacts and represents a direct hazard for marine wildlife mainly due to entanglement and ingestion. In addition, some of the waste fishing items (e.g., ropes or nets) are normally among the most common marine litter found on beaches and seabed. According to the marine litter master list of categories used during the classification protocol, 19 of the 53 subcategories were considered as items derived from fishing and aquaculture practices (see ANNEX II). Only 177 items, representing 14% of the total number of items retrieved, were included in this category. On the contrary, regarding the weight, this category amounted the 34% mainly due to heavy subcategories like ropes, octopus pots, or tires that are used as defences by the small fishing and aquaculture auxiliary vessels that operate inside the ria.

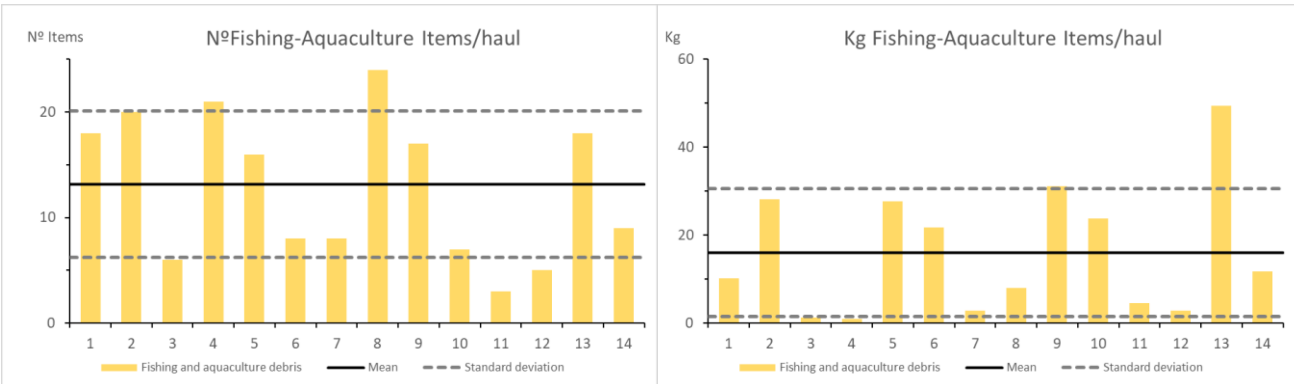


Figure 8. Contribution of Fishing and Aquaculture related debris per haul in number of items and kilograms. Mean (continuous line) and standard deviation (dotted line) values are represented for each graph.

As previously shown for the total number of items and plastics spatial variability, difference among the hauls was high regarding the fishing and aquaculture related debris contribution (figure 8). Mean in term of number of items (13.15±6.93) and especially in kg (16.02±14.56) is not representative due to their high standard deviation.

We also tried to investigate a possible spatial pattern that could influence the marine litter distribution along the ria. As mentioned before, due to its bathymetry and the characteristics of the vessel employed, the study excluded the innermost part, estuarine area generally known as San Simon Bay. The rest of the ria was surveyed from the Strait of Rande (600 m wide), the narrowest part of area controlled by tide and with a strong fluvial influence, to its entrance. This outer area is characterized by two mouths separated by the Cies Islands that are annually used by approximately 2,000 big vessels (merchant ships, cruises, warships and fishing vessels) that dock in the Port of Vigo (Port Authority of Vigo, 2019).

In addition to the port influence, this ria is also under the pressure of many anthropogenic activities (maritime routes, anchorage areas, fishing grounds, shellfish beds and mussel aquaculture). As previously mentioned, an important aquaculture, shellfish and artisanal fishing activity are concentrated in its waters.

For the purpose of our study, the surveyed part of the ria was subdivided in three different areas according with the following criteria (figure 9):

• *Rinn*: representing the inner part of the Ria de Vigo sampled in this study, closely influenced by the Rande Strait, which acts as a water tidal exchange gateway that connect the San Simón bay, where the main rivers are discharging into the Ria.

• *Rint*: representing the intermediate part of this ria, which is directly influenced by the presence of the biggest port and the highest concentration of population in the municipality of Vigo.

• *Rext*: representing the external part of the ria and the gate connection with the continental shelf. The two mouths form part of the Port of Vigo marine traffic-lanes.

The average density recorded for the whole surveyed area was **628.5±288.4** items/km^2, higher than that of other Atlantic areas and specific zones of the Mediterranean Sea (e.g., Malta or some locations in the French and Greek coasts), whose densities do not normally exceed the 250 items/km^2 (Galgani *et al*., 2000; Mifsud *et al*., 2013; Stefatos *et al*., 1999) or even in Galician circalittoral areas (depth stratum 71–120m) where the litter amount was considerably lower, around 100 items/km^2 (Lopez *et al*., 2017). However, in closed seas, values described in previous studies are similar or even much higher than those found in our study area, registering over 6,000 items/km^2 (Sanchez et al., 2013).

Several drivers are directly related to the amount of marine litter recorded from the seabed, including distance to coast, depth, human population, harbours, fishing and aquaculture activities or rivers effect. Since our study site is a small semi-enclosed area where diverse anthropogenic activities take place, most of these land- and sea-based variables can influence the density and type of items collected. Although the sampling effort in the ria was different between the three subzones, being higher in the *Rint*, some differences could be remarkable regarding the marine litter density, and could be linked to the coastal and marine characteristics and uses of each of these subzones.

The highest density was found in *Rext*. Hauls carried out in this area (n=4) collected a mean of **842.8±480.7** items/km^2. It corresponds with the two ria entrances, that are separated by the Cies Islands. However, a significant difference was found between both entrances. Thus, while in the North the values were around

150 items/km^2, in the South densities registered were considerably higher, with a mean close to 1,000 items/km^2. These results could be directly influenced by its physical geography, with a South entrance deeper and wider (practically twice in width) than the North entrance and with most of the water exchange with the platform being carried out through the South. Besides, due to their dimensions it is very likely that the majority of the Port of Vigo maritime traffic takes place through the southern mouth channel.

Although *Rint* is directly influenced by the city and harbour of Vigo, it presents the lowest density of the three subzones, with **529.9±205.5** items/km^2. Due to the accessibility of this area, without the navigational limitations that affect traffic-lanes located in the ria outermost part or the tidal forces that make the trawl difficult in the zone surrounding the Strait of Rande, it concentrated most of the sampling intensity (n=9).

Finally, intermediate density values were found in the innermost zone (*Rinn*) **(755.6±76.3** items/km^2**).** Despite the reduced number of samples collected in this subzone (n=2), we noticed that the categories that mainly contribute in terms of number of items are almost similar in both hauls. Low weight items, like plastic bags and bottles were among the five most abundant typologies. Due to their buoyancy, it is possible that these subcategories could come from the estuarine part of the ria, which receives the main freshwater inputs, and have been transported to more external areas by the tidal currents that occurs through the Strait of Rande.

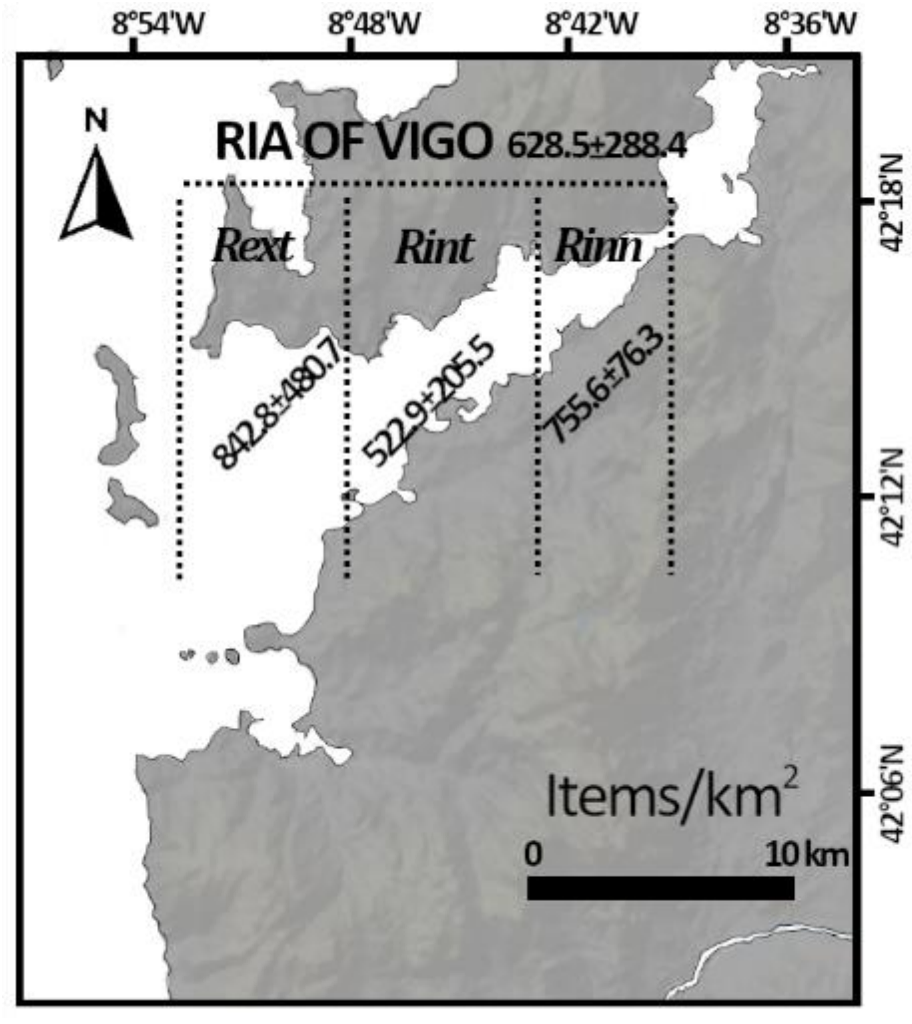


Figure 9. Mean marine litter density in the Ria of Vigo and in each subzone in which the sampling area was divide; internal (Rinn), intermediate (Rint) and external (Rext).

An important aspect to be assessed when evaluating costs and benefits of this kind of interventions is the fuel consumption as well as the carbon footprint produced as a direct result of the retrieval operations. Thus, as a preliminary approach we have estimated the CO_2 generated during the trawling cruises we conducted during the sampling days in the Ria of Vigo. For that purpose, the Carbon Footprint Calculator developed by the Spanish Ministry for the Ecological Transition (MITECO) was applied, considering the particular technical characteristics of the Galician Coastguard vessel used (crew number, engine power, tonnage measurement, fuel consumption, etc.).

https://www.miteco.gob.es/es/cambio-climatico/temas/mitigacion-politicas-y-medidas/calculadoras.aspx

The fuel consumption per working day oscillated between 60 and 100 litters, which is considerably lower than that required in the case of commercial trawlers or other fishing vessels with much more powerful engines. In addition, it should be taken into account that all trawls were carried out inside a ria, near the home port, which reduces the travel time and the fuel consumption from the docking point to the target area. According to the Carbon Footprint Calculator the carbon dioxide equivalents (CO_2 eq.) generated during the 6 trawling cruises by a vessel with an engine of similar to that used during the surveys is 2,979. If these results are expressed in car-equivalents by Ton, considering that a new car produce 2.9Tn/year of $C0_2$ in a year, using an average production of 118.1 gCO2/km) (Alonso *et al*., 2000), our values could be compared to the CO_2 generated by 1 car.

5. Conclusions

This pilot action demonstrated a satisfactory performance of an adapted trawling fishing gears in terms of retrieving seafloor litter for monitoring and cleaning purposes significantly avoiding fish captures. Although some benthic invertebrates and flatfish and dogfish species were retained in the cod-end they could be returned to the sea once on board with low mortality rates, thanks to a fast-opening system, minimizing the ecological impact of this intervention. Coupling a low-cost filming system in the net improved the monitoring capabilities, illustrated the entrance of litter and fish escapes and provided useful visual materials that were included in an awareness raising video (https://www.youtube.com/watch?v=YU6oTl3UUOM).

The results of this study give us a first snapshot that illustrate the current marine litter situation in the subtidal waters of the Ria de Vigo, providing valuable information about litter amount and main typologies.

The predominant material, both in number of items and weight, was plastic and the most abundant plastic item corresponded to plastic bag fragments.

Attending to their spatial distribution inside the ria the main density was 628 items/km^2. It was higher in the external part (842.8), followed by the internal part (755.6) and intermediate part (522.9).

In previous studies carried out in the Galician continental slope, densities observed were considerably lower. Thus, we consider that the distance to the coast is one of the variables mostly affecting marine litter concentration, mainly originated from land-based sources of litter. Additionally, a ria is a semi-enclosed and sheltered areas that enables a wide variety of human activities related to aquaculture and artisanal fishing, which can potentially act as sources of sea-based of litter. It is expected that other Galician rias and coastal areas, mainly the four lower rias (commonly named as "*Rías Baixas*"), where there is also a high population density and concentration of ports and industrial activities, marine litter density values are similar to these found in our study.

According to our results, litter is present in all the surveyed seabed of the ria, although density differences among the three subzones were identified, the reduced number of samples carried out in the internal and external areas did not allow us to establish the existence of distribution pattern and to assure that these differences can be attributable to a specific anthropogenic or natural variable.

This assessment was also an opportunity to evaluate possibilities and limitations of trawling as a feasible method to be employed in a small and enclosed areas to remove marine litter. Diverse factors such as depth, type of seabed and interference with other activities (mussel raft, traffic lanes, etc.) reduce its use only to suitable zones, avoiding fishing gear damages like net breakages. Besides, several authors pointed out its destructive effects on the seafloor habitats, both in sediment and biota, being especially not recommended in protected fishing areas. According to our experience, vessel employed and gears dimensions and characteristics should be adapted to the particular conditions and dimensions of the area of study. In the same way, benthic hauls time and/or length should be reduced in order to get a precise location of marine litter allowing to identify potential zones of concentration.

Another important concern that should be taken into account when an active retrieval scheme is considered for implementation is the associated greenhouse emission. Factors like the distance to the trawling zone, vessel characteristics (engine power and/or tonnage measurement) and average of litter retrieved have to be evaluated to decide how sustainable such intervention from an economic and ecological perspectives is. The results obtained show the effectiveness and proper functioning of the adapted fishing gear and that in terms of clean-up operations, its use may be suitable and advisable in areas where a hotspot had been detected, the environmental impact of the operation had been assessed and where the intervention justifies the costs and the emissions associated to this retrieval operations,

The knowledge and experience of the Galician Coastguard and the VPA crew was crucial for the development of this study and demonstrate the importance of involving sea professionals in the fight against marine litter and the key role they played in the protection of our coasts and oceans.

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Date	Haul	Shooting Latitude	Shooting Longitude	Rolling up Latitude	Rolling up Longitude	Mean Depth (m)	Predominant sediment	Duration (hh:mm:ss)	Mean Speed (knots)
28/09/2019	1	42°13.62'	008°49.12'	42°12.45'	008°51.56'	37	Sand	1:00:00	2
28/09/2019	2	42°12.31'	008°51.41'	42°13.43'	008°49.45'	35	Sand	1:30:00	3
28/09/2019	3	42°13.43'	008°48.50'	42°14.33'	008°45.97'	39	Mud	0:40:00	3
05/10/2019	4	42°14.12'	008°47.42'	42°15.07'	008°43.87'	33	Mud	1:00:00	2,9
05/10/2019	5	42°15.71'	008°42.74'	42°16.68'	008°40.76'	22	Mud	0:40:00	2,3
19/10/2019	6	42°13.45'	008°49.08'	42°11.69'	008°51.04'	40	Sand	0:50:00	3
19/10/2019	7	42°11.48'	008°50.94'	42°13.79'	008°48.35'	38	Sand	0:50:00	2,9
19/10/2019	8	42°13.88'	008°47.91'	42°14.63'	008°45.11'	37	Mud	0:45:00	2,8
27/06/2020	9	42°14.84'	008°44.59'	42°14.15'	008°47.13'	36	Mud	0:40:00	3
27/06/2020	10	42°14.07'	008°47.09'	42°14.82'	008°44.29'	35	Mud	0:45:00	3
27/06/2020	11	42°15.18'	008°43.90'	42°14.01'	008°46.69'	31	Mud	0:50:00	2,8
20/08/2020	12	42°14.59'	008°45.04'	42°13.95'	008°47.50'	39	Mud	0:40:00	3
20/08/2020	13	42°13.95'	008°48.28'	42°13.90'	008°51.01'	36	Sand	0:40:00	3
20/08/2020	14	42°13.66'	008°51.07'	42°13.75'	008°48.27'	37	Sand	0:40:00	3,1
24/10/2020	15	42°14.59'	008°45.72'	42°15.39'	008°43.81'	28	Mud	0:40:00	3
24/10/2020	16	42°15.91'	008°42.63'	42°16.63'	008°40.96'	24	Mud	0:40:00	3
24/10/2020	17	42°15.69'	008°43.24'	42°14.77'	008°44.51'	22	Mud	0:40:00	3

ANNEX I. Main characteristics of each haul (date, location, depth, type of sediment, duration and trawl speed).

•Master List of Categories of Litter Items•

DATE: ____________________

PORT: ____________________ **SHIP: ________________________**

BIG BAG WEIGHT (kg): ______________________________________

A	PLASTIC	Nº items	Weight (Kg)
A1	Bottles		
A2	Plastic bag collective role what remains from rip-off plastic bags		
A3	Plastic caps and lids		
A4	Fishing line/monofilament *		
A5	Fishing line/multifilament *		
A6	Ropes *		
A7	Nylon gillnet *		
A8	Polyethylene trawling net *		
A9	Trap plastic net *		
A10	Octopus pots *		
A11	Floats/Buoys *		
A12	Other fishing gears *(mixture of nets, lines, ropes, etc.)* *		
A13	Waterproof fishing suit *		
A14	Ties, tags, clamps		
A15	Straps		
A16	Boxes, baskets, drums, gas cans, barrels, etc.		
A17	EPS boxes and fragments		
A18	Diapers/nappies		
A19	Sanitary towels/panty liners/backing strips/tampons		
A20	Mussel nets *		
A21	Mussel rafts pegs *		
A22	Mussel rafts ropes *		
A23	Other plastic items		
	Plastic Subtotal		
B	**METAL**	**Nº items**	**Weight (Kg)**
B1	Cans (food)		
B2	Cans (beverage)		
B3	Fishing items (sweeps, brides, ropes, etc.) *		
B4	Fishing items, lead, sinkers, etc.) *		
B5	Fishing items (buoys, etc.) *		
B6	Fishing items (hooks, etc.) *		

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B7	Drums, buckets, paint tins, barrels, etc.		
B8	Electric appliances (refrigerators, washers, etc.)		
B9	Car parts/batteries		
B10	Another kind of ropes *		
B11	Other metal pieces		
	Metal Subtotal		
C	**RUBBER**	**Nº items**	**Weight (Kg)**
C1	Boots		
C2	Balloons		
C3	Bobbins (fishing)		
C4	Tires (used as vessel fences) *		
C5	Gloves		
C6	Other rubber items		
	Rubber Subtotal		
D	**GLASS/CERAMIC**	**Nº items**	**Weight (Kg)**
D1	Jars		
D2	Bottles		
D3	Glass or ceramic fragments		
D4	Other glass/ceramic items		
	Glass/Ceramic Subtotal		
E	**NATURAL PRODUCTS**	**Nº items**	**Weight (Kg)**
E1	Processed wood		
E2	Vegetal fibre rope		
E3	Paper or cardboard		
E4	Wooden pallets		
E5	Other natural items		
	Natural products subtotal		
F	**OTHER ITEMS**	**Nº items**	**Weight (Kg)**
F1	Clothing/rags		
F2	shoes		
F3	Drink cartons (milk, juices, etc.)		
F4	Other items (e.g. Communication or electric wire, engine filter, etc.)		
	Other items subtotal		

* Items derived from fishing and aquaculture practices