CleanAtlantic

Tackling Marine Litter in the Atlantic Area

Marine Litter and offshore Aquaculture: a survey-based case study in Madeira

WP 4: Marine Litter in the Atlantic Area

Activity 3 – Review of economic sectors impacted by marine litter in the Atlantic Area

Interreg Atlantic Area
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Clean Atlantic

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ACTION	4.3 - REVIEW OF ECONOMIC SECTORS IMPACTED BY MARINE LITTER IN THE ATLANTIC AREA
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INDEX

Marine Litter and offshore Aquaculture: an interview survey-based case study in Madeira.

1. Introduction

The main goals of the Clean Atlantic project are to enhance capabilities and knowledge for the monitoring and diagnosis of marine litter impacts to effectively promote prevention and removal of marine litter in the Atlantic Area. In addition, this project aspires to raise awareness and change attitudes among stakeholders to improve marine litter managing systems. To reach this last goal, it is essential to investigate how marine litter may interfere with stakeholders' activities. In this context, the Clean Atlantic team developed a survey questionnaire addressed to open-ocean/off-shore marine aquaculture companies to investigate marine litter's possible interaction with this activity.

This report showcases results gathered from interview-based surveys of aquaculture personnel in Madeira Island (Portugal) to investigate interactions between marine litter and this activity. Data were analysed globally to maintain anonymity of the respondents. Results are exposed following the original structure of the questionnaire (**Annex I**). The survey was translated and conducted in the native interviewed language (Portuguese) to reach the highest number of participants.

There are three open-ocean aquaculture facilities in Madeira Island, all located on the island's south coast (Figure 1). The three fish farms produce only the Seabream *Sparus aurata*. This pilot survey-based study aimed to interview all employees from each of the companies.
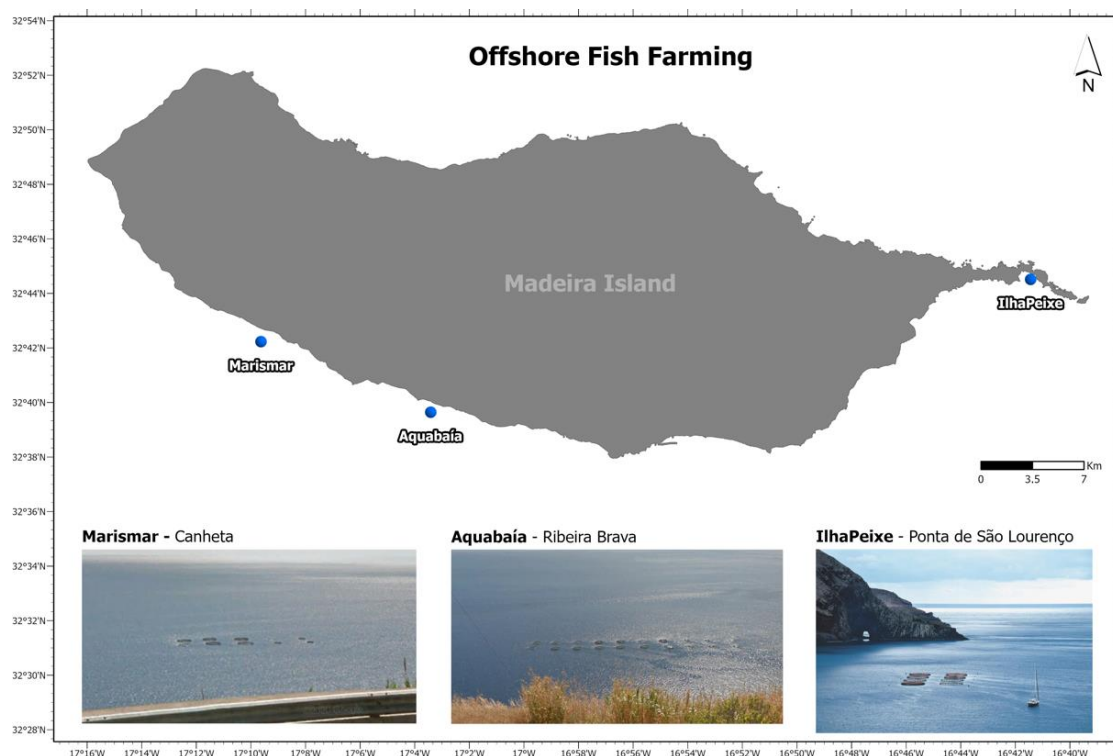

Figure 1. Maps of aquaculture facilities in Madeira Island (Portugal).

The survey was conducted between September and October 2020. After an in person explanation and instructions' session, the survey was distributed to aquaculture facilities' staff and had a response rate approximately of 70% (n=27). Overall, the age range of interviewees varied between 28 and 46 years. Most responses were given by men (76% men, 24% were women), and 44.4% of interviewees held a university degree.

2. Survey Study – detailed feedback assessment

2.1 General questions

The great majority of the respondents (96.3%) considered marine litter a threat to aquaculture activities. The most common concern is marine litter's ingestion, such as plastic, which threatens caged fish's quality and survival. Interviewees considered that solid waste is the primary type of inorganic residue generated by aquaculture (93%), composed mainly of plastic (33.3%), nylon cables (29.6%), food bags (18.5%), cable ties and nets (both 11%). As dissolved residues, respondents use as examples lye (14.8%) and detergent (14.8%). Fish food and excrement were erroneously cited as dissolved inorganic waste by 14.8% of the respondents. While fuel for boats was classified in the category "Other inorganic waste".

There was no general knowledge on whether the aquaculture facilities carry out adequate management of inorganic waste. Besides, 44.4% of the respondents stated that fish farms manage their inorganic residues, while 51.9% denied it. Moreover, only 63% of the respondents affirmed that the facilities in which they work had implemented inorganic waste recycling practices.

2.2 Marine Litter interference

Only a low percentage of the respondents recognize that marine litter interferes with aquaculture's daily work (Figure 2).
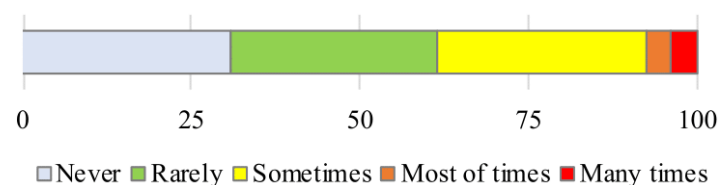
Figure 2. Perception of marine litter interference with daily work activities. Data are expressed in percentage.

The perception of daily disturbances by marine litter depended on the function performed by the respondents. Indeed, divers and those responsible for maintaining cages' nets reported more marine litter experiences than the rest of the staff.

Using a five-point Likert scale from 1="very bad" to 5="very good", 30.8% of respondents rated their aquaculture's waste collection system as very good. However, as assessed in a previous question

about inorganic waste management (Annex I, Question A-3), the responses were not homogeneous (Figure 3). Unfortunately, recycling containers appear to be mostly absent in fish farm facilities (74.1%).
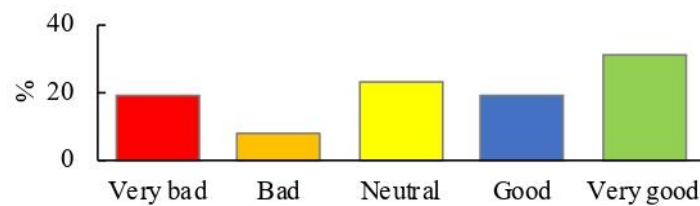
Figure 3. Perception of waste collection system on fish farms.

2.3 Marine Litter characterization

From the eight types of waste referred into the survey, plastic (52.56%) was the one found more often (Figure 4a) and considered more dangerous (Figure 4b). Among the 27 respondents, two justifications stand out: plastic has a high decomposition time, and it accumulates along the food chain, jeopardizing the survival of fishes.
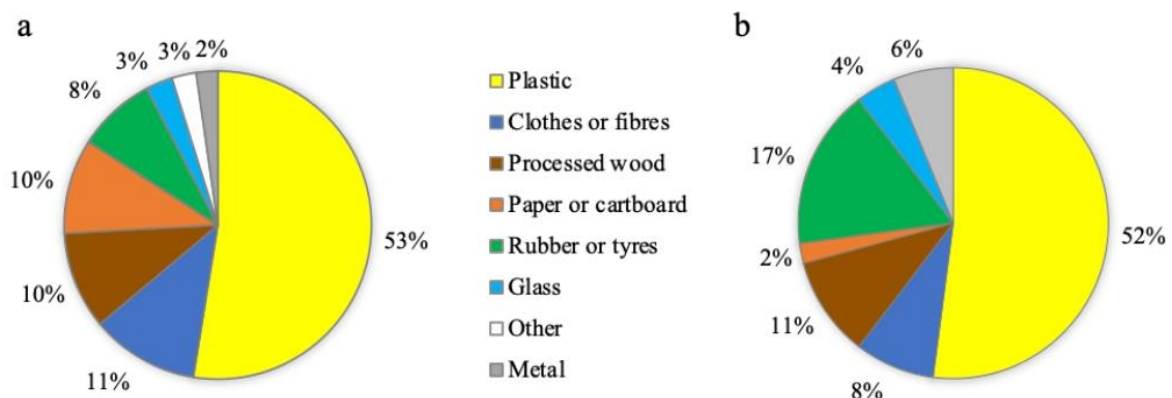
Figure 4. a) Perception of marine waste abundance. **b)** Perception of what type of marine waste is more dangerous.

Among the different effects of marine litter in the aquaculture sector, "Reduction of water quality" was the one that was considered more important. While "Staff safety" was the one that has been classified as a less important effect (Figure 5).

Figure 5. Perception of marine litter effects.

2.4 Marine Litter Costs

This section of the survey had the highest number of not given answers: 68.75%. On average, fish farmers declared to lose 49 minutes (SD = ±37) per day due to marine waste. It was impossible to estimate the cost associated to time lost as respondents miss-interpreted question A3.2 and failed to provide an estimated value o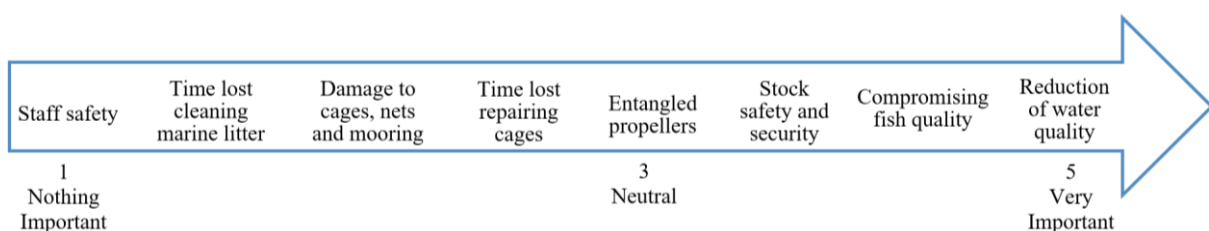f the cost of one hour spent dealing with marine litter interference. Instead, respondent have presented a value of possible damages that marine litter may create (e.g. rope in boat propellers or clogged engine). This value of potential damages was highly variable (between 0€ and 200€) and does not depict the average loss associated to time spent during their daily routine, dealing with marine litter. In the month before the survey, 14.8% of the respondents declared to have had costs directly linked to marine litter, and just 7.4% reported to have had costs indirectly linked by marine litter. Unfortunately, they were unable to make an accurate estimation of the money lost.

2.5 Information and Awareness on Marine litter

Overall, 81.5% of the respondents believed that fish farmers are informed and concerned about marine litter problems even if just 29.6% declared to have received training or education specific to the marine litter problem. Training actions were mostly given by the employing company and/or by NGOs. Overall, 63% of respondents considered that they are partially responsible for the amount of waste in the sea. However, respondents report a general lack of knowledge on the quantity of marine litter generated by their activity (Figure 6).
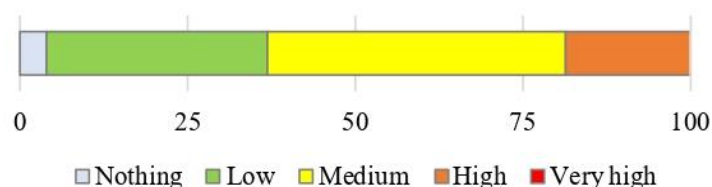

Figure 6. Awareness of marine litter generated by aquaculture express in percentage. Using a scale from 1= "Nothing aware" to 5 = "Very high aware".

Overall, the interviewees perceived Madeira sea as medium polluted (Figure 7). This perception is somehow in line with litter contamination levels in Madeira[1].
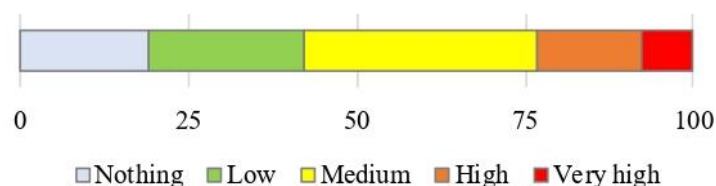
Figure 7. Perception of Madeira sea pollution in percentage. Using a scale from 1= "Nothing polluted" to 5= "Very high polluted".

The respondents believed that marine litter has a negative impact on "human health", "fauna and flora", "landscape", and all listed "economic activities", with the latter being less frequently selected (Figure 8a). When asked to identify who is most affected, "fishermen", "aquaculture" and the "general public" were the three most selected options (Figure 8b).
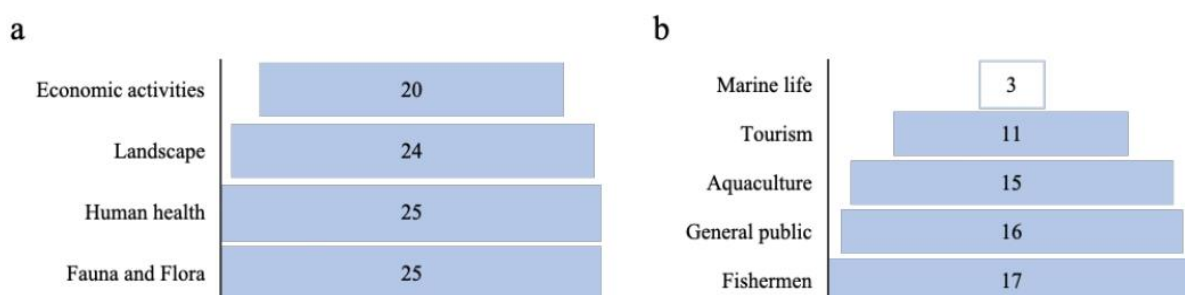
Figure 8. a) Perception areas/activities that can be affected by marine litter. **b)** Perception of who is most affected by marine litter; the respondents cited "marine life" in the category "other". Results are expressed in numbers; the totality of respondents in both cases is 27 people.

When asked to assess how committed different stakeholders are in the fight against marine litter, the interviewees believed that, among the seven categories given by the survey, "researchers" and "ONGs" are the most committed. In contrast, "port authorities" and "marine and coastal industries" were the categories identified as less committed (Figure 9).

Between the eight examples of possible marine litter producers given by the survey, "fishing waste" has been identified as the main responsible. While "aquaculture" has been considered an activity with irrelevant importance in marine litter production (Figure 10).

Overall, respondents believed that marine litter does not particularly affect the aquaculture sector. However, respondents strongly believed that the amount of marine waste could become a real threat for this sector in the future.

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[1] Álvarez S, Gestoso I, Herrera A, Riera L, Canning-Clode J (2020) A Comprehensive First Baseline for Marine Litter Characterization in the Madeira Archipelago (NE Atlantic). Water, Air, & Soil Pollution 231(4): 182, DOI: 10.1007/s11270-020-04517-x
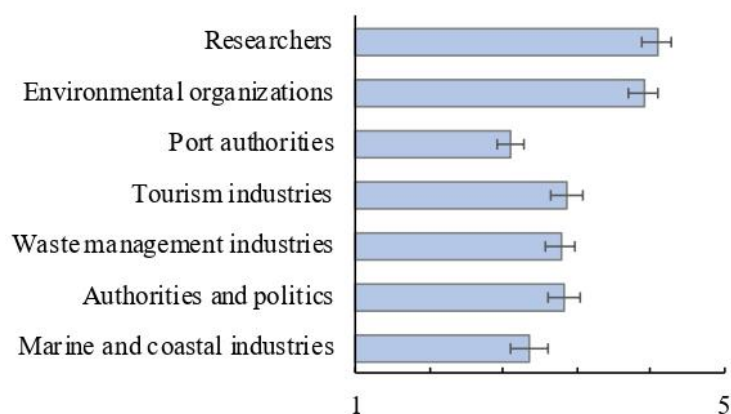
Figure 9. Perception of commitment with the fight against marine litter. Using a scale where 1 = "Nothing committed" to 5 = "Very committed". The bars on the graph represent the average value and the respective standard error.
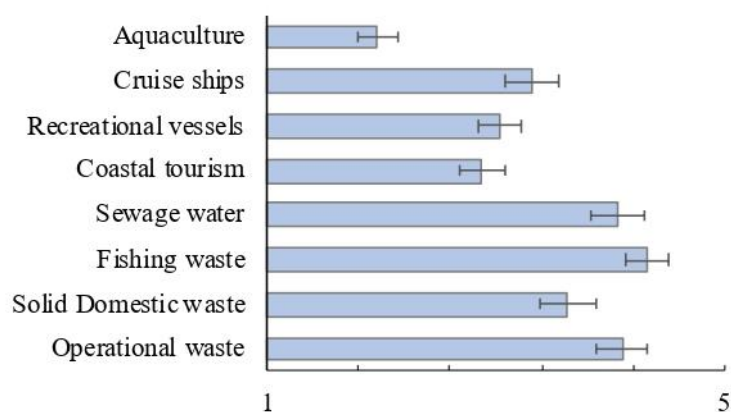
Figure 10. Perception of marine litter source importance. Using a scale where 1 = "Nothing important" to   5 = "Very important". Bars on the graph represent the average value and the respective standard error.

2.6 Tackling Marine Litter

Opinions and answers were greatly divided when asked for their willingness to pay some sort of tax on marine litter (Table 1), however, opinions become more in agreement when asked if they would be willing to participate in actions to reduce marine litter and if they believed that the increasing quantity of marine litter can compromise aquaculture activities in the future (Table 1).

Table 1. Opinion about marine litter' impacts on aquaculture facilities and willingness to be involve in marine litter reduction.

	Response (yes %)
Would you be willing to pay a tax on marine litter?	55.6
Do you think that marine litter affects your sector more than other ones?	48.1
Would you be willing to participate in some initiative to reduce marine litter?	88.9
Do you think that aquaculture could be compromised in the future due to the quantity of waste on seas and oceans?	96.3

The great majority of the respondents (88.9%) believed that politicians and governments need to create measures and regulations to reduce marine litter. Five main measures were suggested: 1) training and awareness actions; 2) awareness measures for recycling; 3) application of taxes and fines; 4) supervision of waste separation and collection, and 5) reuse of materials.

The majority of respondents (76.9 %) have also shown willingness to participate in voluntary initiatives for cleaning marine litter for a maximum of 10 hours per month. Overall, they expressed a positive willingness in conducting all listed actions, revealing no particular interest in doing one over the other (Figure 11).
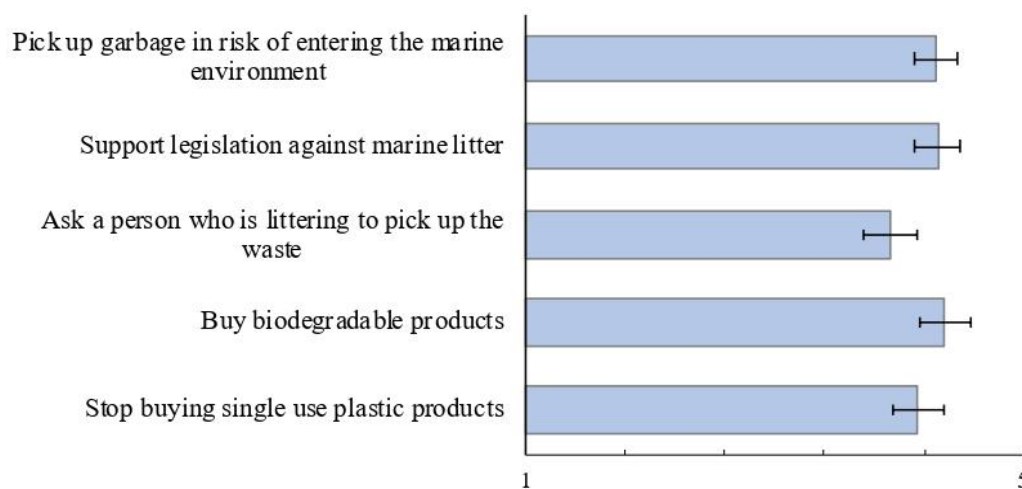
Figure 11. Respondents will in conducting actions aiming to reduce marine, using a scale where 1 = "Nothing willing" and 5 = "Very willing". Bars on the graph represent the average value and the respective standard error.

When asked to rank seven actors that should be more helpful in reducing marine litter, respondents classified "consumers" as the most helpful and "NGOs" as the least (Figure 12).
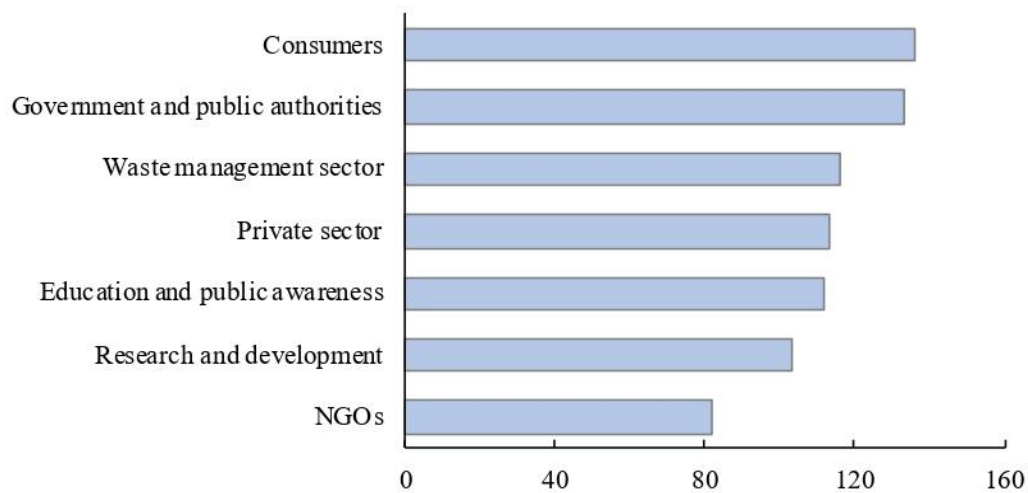
Figure 12. Respondents' perception about which actors are more helpful in reducing marine litter. Using a scale where 1 = "help the lowest" and 7 = "help the most". Bars in the graph represent the summatory for each category.

The majority (67%) of the respondents believed that actions to reduce marine litter should be done globally; however, none selected the European level option (Figure 13). Finally, the respondents suggested that the aquaculture sector should reduce plastic use and start to use more recyclable and biodegradable materials.
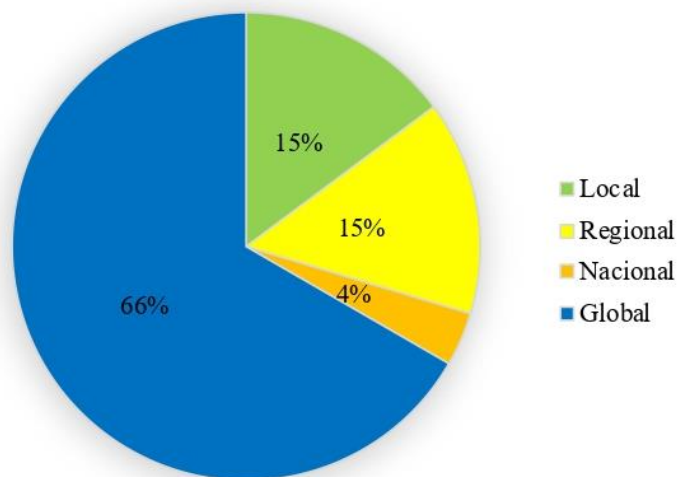
Figure 13. Actions to reduce marine litter.

3. Final Considerations

The present case-study aims to provide an initial assessment and baseline information on the interactions and impacts of marine litter and offshore aquaculture facilities and activities. The study focused on staff working in all three companies and facilities present in Madeira Island, Portugal, which enables an overall assessment of the current situation and perception. Despite the relevant findings that could be, to some extent, extrapolated to other geographic settings, this case-study is limited to the specificities of Madeira and existing facilities, warranting particular care in drawing general conclusions.

However, a critical analysis of the provided answers enables outlining the following considerations:

- Aquaculture facilities and activities contributes to producing **solid inorganic residues that are mostly of plastic nature (e.g., plastic bags and plastic bag fragments, fishing lines and nylon cables).** The lack of agreement and divided opinions from interviewed staff illustrates a lack of strong policies and well implemented practices for managing or recycling inorganic solid residues. This is also clear by the perception on the quality of waste collection systems and lack of recycling containers reported. From the present survey it is apparent the **need of improvement in recycling and waste management practices** as well as required infrastructure for collecting, transporting and managing this waste.
- Based on the survey answers, **marine litter is mostly not perceived as a major disruptor of activities in open-ocean aquaculture facilities in Madeira**, with only a few interviewees reporting marine litter interfering with their daily tasks at high rates. Not surprisingly, the ones reporting higher rates of interference in their activities are those tasked to work in the offshore cages' maintenance. This perception of low interference in aquaculture is reflected in the overall perception of the most affected sectors, where **aquaculture was never listed as being particularly affected.** However, **Aquaculture ranked close to the top two sectors identified as most affected** (Figure 8.a).
- When asked to be specific on estimating the amount of time spent due to marine litter and associated money loss, most interviewees were unable or unwilling to respond. From the provided answers, the time spent and cost was very variable, with a daily average of 49 minutes (SD=±37) spent dealing with litter and the respective cost varying from 0 to 200€. The wide range of these reported values and low number of reported losses suggest that **money loss directly and indirectly linked to marine litter in aquaculture facilities in Madeira is residual and likely to be sporadic** (or less variable estimates and more complete reports on the matter would have been delivered).
- With a general perception that Madeira marine waters are mostly not highly polluted, concerns of increased impacts under scenarios of increased marine litter contamination were reported. Among **the largest concerns are related to the reduction of water quality, the compromise of fish quality and the security of their stock**
- Despite the general belief of being well informed on marine litter related issues, only **less of a third of the interviewees had received any form of training on the subject**. However, there is still a large number of interviewees that were **unable to acknowledge their role in partially contributing to marine litter** and a **general lack of knowledge on the amount of marine litter originated in the sector.**
- Overall, **Fishing waste**, **industrial waste** and **sewage water** were the sources identified as most contributing to marine litter. Despite the lack of knowledge on the amount of marine litter originated in the sector, **Aquaculture was listed as the least important source of marine litter.**

- The general perception is that **Fauna and Flora** and **Human Health** are most impacted by marine litter**,** with **fishermen** and the **general public** being those most affected, whereas **Researchers** and **Environmental Organizations** were the stakeholders listed as the most committed in the fight against marine litter.
- Interviewees identified individual **consumers and governmental entities as the most helpful in reducing marine litter**. They have also shown a general willingness to participate and engage in voluntary clean-up activities, support legislation against marine litter and adopt consumer habits that favours biodegradable products and reduces single-use plastic items consumption. However, opinions were more divided when asked if they would agree with special taxes targeting marine litter. The reported answers suggest that the overall perception is **that individual choice and consumers are more relevant than government issued regulations** and **that marine litter reduction policies should not be based on taxing.**
- Finally, when asked about the geographic scope of actions needed to tackle marine litter issues, the interviewees **acknowledged the global nature of the problem**. However, it is noteworthy that **Regional** and **Local** actions ranked higher than **National** actions, and there was a **complete dismissal of the importance of European-level actions**. This dismissal seems surprising, given that many of the current policies and legislation targeting marine litter reduction are European, but should not be ignored as it can be signalling lack of knowledge and information or a lack of trust in the efficiency of European mechanisms used to address marine litter pollution.

4. General recommendations

Based on the conducted survey, data analysis and drawn considerations, it is clear that the current knowledge on the interactions between marine litter and offshore aquaculture facilities and activities is still limited. This case-study provides core relevant information on the concerns related to marine litter towards aquaculture, but it is not able to provide insight into the financial loss and/or economic costs to the sector nor does it provide a clear insight into how much this economic activity contributes to marine litter contamination. Based on the findings and data interpretation we recommend:

- Developing a dedicated monitoring program to assess inorganic litter management, specifically plastic waste, associated with aquaculture activities. The program should not be disruptive of daily operations and should focus on reporting the quantities of litter produced based on total volume or weight per day, week or month. Such a program could be implemented by liaising with local authorities and/or waste management entities that can make available specific containers that are solely used for plastic litter from daily operations and by registering the collecting frequency for estimating the monthly plastic waste volume produced;
- Creating an incentive program for companies to include passive litter collectors (e.g. Seabin[2]) in the outside of their cage structures;
- Creating locally run programs to provide custom made outreach materials and organize periodic information sessions where staff and companies can get updated training, voice specific concerns and report relevant information on how litter may be affecting the sector;

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[2] https://seabinproject.com

- Further promote European strategies, policies and actions targeting the reduction of marine litter with custom designed outreach programs and initiatives that focus on the issues and reality of the different stakeholders across different geographic regions, in order to better engage the local audiences and stakeholders.
- European Union and EU-member states should continue and increase their support of multidisciplinary, international research cooperation, networks and projects aiming to better diagnose marine litter related issues to detect sources, reduce waste, mitigate impacts and restore marine ecosystems and ecological services.

Annex I

[*Greeting*], we would like to make you a survey as part of a Project called CleanAtlantic, about the way that marine litter affects your sector. This Project aims to tackle the problem of marine litter improving data, monitoring, mapping and waste collection in the Northeast Atlantic zone and, in this particular case, on Madeira. Answering our questions, you would help us to develop this project so it could improve the health of the seas where you work.

This survey will only take a few minutes, and your collaboration is very valuable for us. Keep in mind that there are no right or wrong answers, we just want to know your opinion. All the information provided to us will be used **only for this study**, your **identity** will remain **anonymous** and **data absolutely confidential**. Would you like to help us?

PART A. GENERAL QUESTIONS

1. Do you consider **marine litter** as a **threat for** the **aquaculture** sector?　　[　] YES　　[　] NO

   Explain **why**: _____

   _____

   _____

2. What **types of inorganic waste** are **generated** on your **fish farm**? (mark **one or more** and show some **examples** of each one)

   [　] Solid waste: _____

   [　] Dissolved waste: _____

   [　] Other waste: _____

3. Does your farm manage **inorganic waste**?　　[　] YES　　[　] NO

4. Have **inorganic waste recycling practices** been implemented on your farm?

   [　] YES　　[　] NO

<div align="center">

A1: CONTRIBUTION WITH MARINE LITTER

</div>

1. Daily, how often does marine litter disturb your job (in average terms)? Rate from **1** (**never**) to **5** (**many times**)　　[　] 1　[　] 2　[　] 3　[　] 4　[　] 5

2. How do you rate the collecting system on your fish farm? Rate from **1** (**very bad**) to **5** (**very good**)　　[　] 1　[　] 2　[　] 3　[　] 4　[　] 5

3. Are there **recycling containers** on your fish farm?　　　[　] YES　　[　] NO

A2: INTERACTIONS WITH MARINE LITTER

1. Between the different types of waste on the sea, how often you find the following types (**in approximate percentage)**?

Metal	Plastic	Glass	Paper or cardboard	Processed wood	Clothes or fibres	Rubber or tyres	Other materials

2. From the following types of waste, which ones do you found **more dangerous**?

Metal	Plastic	Glass	Paper or cardboard	Processed wood	Clothes or fibres	Rubber or tyres	Other materials

Why do you find them more dangerous? _____

_____

_____

3. Which of those effects of marine litter do you find to be more **important** for the aquaculture sector? Rate from **1** (**nothing important**) to **5** (**very important**)

	1	2	3	4	5
Compromising fish quality					
Stock safety and security					
Reduction of water quality					
Entangled propellers					
Time lost cleaning marine litter					
Damage to cages, nets and mooring					
Time lost repairing cages					
Staff safety					

A3: MARINE LITTER COSTS

1. How many **hours a day** do you **lose** due to marine litter? (for example, the time cleaning the nets). _____ hours.

2. What is the **cost of an hour** lost due to marine litter? _____ €.

3. On the last month, have you got **costs caused directly by marine litter**? (for example, fouled propellers or blocked intake pipes) [   ] YES   [   ] NO

    In case of affirmative answer, **how much**? _____ €.

4. On the last month, have you had **costs caused indirectly by marine litter**? (for example, from different environmental conditions) [   ] YES   [   ] NO

    In case of affirmative answer, **how much**? _____ €.

A4: INFORMATION AND AWARENESS

1. Do you think that fish farmers are informed and concerned enough about the **problems** that **marine litter** represents? [   ] YES   [   ] NO

2. Do you find yourself, at least, partly **responsible** for the quantity of waste that it is on the sea? [   ] YES   [   ] NO

3. **Have you received** any type of **training or education** on how to tackle the problem of marine litter?   [   ] YES   [   ] NO

    In case of affirmative answer, **who provided it?**

    [   ] Your company   [   ] Local authorities

    [   ] NGO   [   ] Governmental Agency

    [   ]   Other:

    _____

    4. How polluted do you think Madeira seas are? Rate from **1** (**nothing polluted**) to **5** (**very polluted**)   [   ] 1 [   ] 2 [   ] 3 [   ] 4 [   ] 5

    5. In your opinion, marine litter has a **negative impact** on:

        [   ] Human health   [   ] Fauna and flora   [   ] Landscape

        [   ] Economic activities: [   ] Tourism, [   ] Fishing, [   ] Aquaculture, [   ] Others:_____

        [   ] Others:_____

6. Are you aware of the **quantity of marine litter** generated by the aquaculture sector? Rate from **1** (**nothing aware**) to **5** (**very aware**)   [   ] 1   [   ] 2   [   ] 3   [   ] 4   [   ] 5

7. In general, how committed with the fight against marine litter do you think the following agents are? Rate from **1** (**nothing committed**) to **5** (**very committed**)

	1	2	3	4	5
Marine and coastal industries (fishing, aquaculture...)					
Authorities (nationals, regionals and locals) and politics					
Waste management industries					
Tourism industries					
Port authorities					
Environmental organizations (ONGs...)					
Researchers					

8. **Who** do you think that is **more affected by marine litter**? (Mark **one or more** options)

[   ] Tourism   [   ] Aquaculture   [   ] Fishermen   [   ] General public

[   ] Others:_____

9. How **important** do you think the following **sources** are **in producing marine litter**? Rate from **1** (**nothing important**) to **5** (**very important**)

	1	2	3	4	5
Operational waste (chemicals, drums...)					
Solid Domestic waste (food, kitchen oil...)					
Fishing waste (derelict or abandoned fishing gear...)					
Sewage water					
Coastal tourism (sun and beach tourism, scuba diving…)					
Recreational vessels					
Cruise ships					
Aquaculture					

10. Mark **with one X** your answer to the following questions:

	YES	NO
Would you be willing to pay a tax on marine litter?		
Do you think that marine litter affects your sector more than other ones?		
Would you be willing to participate in some initiative to reduce marine litter?		
Do you think that aquaculture could be compromised in the future due to the quantity of waste on seas and oceans?		

A5: MEASURES AND ACTUATIONS

1. Do you find **necessary** for politicians and governments to create new regulation to reduce marine litter? [   ] YES   [   ] NO

2. Which **measures** do you think should be applied to reduce **marine litter**? _____

   _____

   _____

   _____

   _____

   _____

   _____

3. Would you be willing to join volunteer initiatives clean marine litter? [   ] YES   [   ] NO

   If the answer is YES, ¿how many **hours per month**? _____ hours per month.

   If the answer is NO, ¿why not? _____

   _____

   _____

4. Would you be willing to do the following actions to contribute to marine litter reduction? Rate from **1 (nothing willing)** to **5 (very willing)**

	1	2	3	4	5
Stop buying single use plastic products					
Buy biodegradable products					
Ask a person who is littering to pick up the waste					
Support legislation against marine litter					
Pick up garbage in risk of entering the marine environment (that you are not responsible for)					

5. In your opinion, which of the following actions would be more helpful to reduce marine litter? Order **from 1** to **7**, **being 7 the one that helps the most to reduce marine litter.**

☐ Government and public authorities (monitoring, penalties, waste treatment…)

☐ Waste management sector (recycling)

☐ Private sector (marine and coastal industries)

☐ Consumers (changes in the behaviour)

☐ Research and development (products and innovative solutions)

☐ Education and public awareness

☐ NGO

6. Actions to reduce marine litter should be done **at which level**? (mark **only one**)

[   ] Local   [   ] Regional   [   ] National   [   ] European   [   ] Global

7. Which **measures** do you think that could help **aquaculture to produce less waste**?

_____

_____

_____

_____

PART B: ADITIONAL DATA

1. Which is your willingness to take risks in general? Rate from **1 (nothing willing)** a **5 (very willing)**   [   ] 1   [   ] 2   [   ] 3   [   ] 4   [   ] 5

2. What species of fish are produced on your fish farm? (mark **one or more**)

☐ Gilt head bream

☐ White seabream

☐ Common seabream

☐ Other species (**specify**) _____

_____

3. Are **algae** produced or collected on your fish farm? [   ] YES   [   ] NO

In case of affirmative answer, **what types** of algae are collected or produced? _____

_____

4. Year of birth: _____

5. Gender: ☐ Man ☐ Woman

6. Your level of **end studies** is:

☐ No studies (1)

☐ Primary studies (2)

☐ Secondary studies (3)

☐ Professional training (4)

☐ University degree/diploma (5)

☐ Post degree (Master, Doctorate...) (6)

Here ends the survey!

THANK YOU SO MUCH FOR YOUR COLLABORATION!!

No âmbito do Projeto CleanAtlantic gostaríamos de lhe fazer um questionário sobre a forma como o lixo marinho afeta o vosso sector. Este Projeto aborda o problema lixo marinho com a obtenção de novos dados por monitorização, mapeamento e recolha de resíduos, na zona Nordeste do oceano Atlântico, neste caso particular, na Madeira. Ao responder a este questionário, está a ajudar a impulsionar o desenvolvimento do Projeto CleanAtlantic e por sua vez, a melhorar a saúde dos mares onde trabalha.

Este questionário apenas lhe tomará alguns minutos e a sua colaboração é importante para nós. Mantenha em mente, que não existem respostas certa ou erradas, apenas queremos saber a sua opinião. Toda a informação que nos facultar será usada **unicamente neste estudo**, a sua **identidade permanecerá anonima** e os **dados obtidos confidenciais**. Gostaria de nos ajudar?

Parte A. QUESTÕES GERAIS

1. Considera o **lixo marinho** como uma **ameaça** para o sector da **aquacultura**? [   ] SIM   [   ] NÃO
   Explique **porquê**: _____
   _____
   _____

2. Que **tipo de resíduos inorgânicos** são **gerados** na **piscicultura**? (escolha **um ou mais** e dê **exemplos**)
   [   ]   Resíduos   sólidos   :
   _____
   [   ] Resíduos dissolvidos: _____
   [   ]   Outros   resíduos:
   _____

3. Fazem tratamento de **resíduos inorgânicos**? [   ] SIM   [   ] NÃO

4. A **reciclagem de resíduos inorgânicos** é praticada no seu setor? [   ] SIM   [   ] NÃO

A1: CONTRIBUIÇÃO COM LIXO MARINHO

1. Diariamente, com que frequência o lixo marinho perturba o seu trabalho? (em que: **1 – nunca** e **5 – muitas vezes**)
   [   ] 1   [   ] 2   [   ] 3   [   ] 4   [   ] 5

2. Como classifica o sistema de recolha de resíduos na sua piscicultura? (em que: **1 – muito mau** e **5 – muito bom**)
   [   ] 1   [   ] 2   [   ] 3   [   ] 4   [   ] 5

3. Existem **contentores de reciclagem** na sua piscicultura? [   ] SIM   [   ] NÃO

A2: INTERAÇÕES COM LIXO MARINHO

1. Entre os diferentes tipos de resíduos existentes no mar, com que frequência, encontra os seguintes tipos (numa **percentagem aproximada**)?

Metal	Plástico	Vidro	Papel ou Cartão	Madeira Processada	Roupas ou Fibras	Borracha ou Pneus	Outros Materiais

2. Dos seguintes tipos de resíduos, qual considera **mais perigosos**?

Metal	Plástico	Vidro	Papel ou Cartão	Madeira Processada	Roupas ou Fibras	Borracha ou Pneus	Outros Materiais

Porque o considera o mais perigoso? _____

_____

3. Qual dos seguintes **efeitos** do lixo marinho considera mais **importante** no sector da aquacultura? (em que: **1 – sem importância** e **5 – muito importante**)

	1	2	3	4	5
Comprometer a qualidade do peixe					
Segurança do stock					
Redução da qualidade da água					
Hélices danificadas					
Tempo perdido em limpeza de lixo marinho					
Danos em gaiolas, rede e amarras					
Tempo perdido a arranjar gaiolas					
Segurança do Staff					

A3: DESPESAS COM LIXO MARINHO

1. **Por dia**, quantas horas **perde** por causa de lixo marinho? (exemplo: tempo a limpar redes) _____ horas

2. Qual é o **custo**, de **uma hora perdida**, devido ao lixo marinho?_____ €.

3. No último mês, teve **despesas diretamente causadas por lixo marinho**? (exemplo: hélices bloqueadas, tubos entupidos)
   [ ] SIM   [ ] NÃO
   Se sim, **quanto**? _____ €.

4. No último mês, teve **despesas indiretamente causadas por lixo marinho**? (exemplo: diferentes condições ambientais)
   [ ] SIM   [ ] NÃO
   Se sim, **quanto**? _____ €.

A4: INFORMAÇÃO E CONSCIENCIALIZAÇÃO

1. Na sua opinião, acha que os piscicultores estão informados e preocupados com os **problemas** que o **lixo marinho** representa?
   [ ] SIM   [ ] NÃO

2. Considera que tem uma cota de **responsabilidade** pela quantidade de resíduos que está no mar? [ ] SIM   [ ] NÃO

3. **Recebeu** algum tipo de **formação** sobre como lidar com o problema do lixo marinho? [ ] SIM   [ ] NÃO
   Se sim, por qual **entidade**?
   [ ] A sua empresa   [ ] Autoridades Locais
   [ ] Organizações não Governamentais   [ ] Agências Governamentais
   [ ] Outros: _____

4. Quão poluído acha que estão os mares da Madeira? (em que: **1 – nada poluídos** e **5 – muito poluídos**)
   [ ] 1   [ ] 2   [ ] 3   [ ] 4   [ ] 5

5. Na sua opinião, o lixo marinho tem impacto negativo na:
   [ ] Saúde Humana   [ ] Fauna e Flora   [ ] Paisagem
   [   ] Atividades Económicas: [   ] Turismo, [   ] Pesca, [   ] Aquacultura, [   ]
   Outros:_____
   [ ] Outros:_____

6. Tem conhecimento da **quantidade de lixo marinho** que é produzido pelo setor da aquacultura? (em que: **1 –nada ciente** e **5 – muito ciente**)
   [ ] 1   [ ] 2   [ ] 3   [ ] 4   [ ] 5

7. Em geral, quão comprometidos na luta contra o lixo marinho acha que as seguintes entidades estão? (em que: **1- nada comprometidos** e **5 – muito comprometidos**)

	1	2	3	4	5
Indústrias marítimas e costeiras (pesca, aquacultura ...)					
Autoridades (nacionais, regionais e locais) e política					
Indústrias de gestão de resíduos					
Indústrias do turismo					
Autoridades portuárias					
Organizações ambientais (NGOs ...)					
Investigadores					

8. Na sua opinião, quem é o **mais afetado pelo lixo marinho**? (marque uma ou mais opções)

[   ] Turismo   [   ] Aquacultura   [   ] Pescadores   [   ] Público em geral

[   ] Outros:_____

9. Na sua opinião, qual das seguintes **fontes** são as mais **importantes na produção de lixo marinho**? (em que: **1 – nada importante** e **5 – muito importante**)

	1	2	3	4	5
Resíduos Industriais (químicos, baterias...)					
Resíduos Urbanos (alimentos, óleos de cozinha...)					
Resíduos de pesca (equipamento de pesca abandonado ou negligenciado)					
Água de esgoto					
Turismo costeiro (mergulho, praias concessionadas, ...)					
Embarcações de recreio					
Cruzeiros					
Aquacultura					

10. Assinale com um **X** a sua resposta para as seguintes questões:

	SIM	NÃO
Estaria disposto a pagar um imposto sobre o lixo marinho?		
Na sua opinião, o lixo marinho afeta mais o seu sector do que outros?		
Gostaria de participar em alguma iniciativa para reduzir o lixo marinho?		
Acha que a aquacultura pode ser afetada no futuro por causa da quantidade de resíduos nos mares e oceanos?		

A5: MEDIDAS E ATUAÇÕES

1. Considera necessário que políticos e governantes criem novos regulamentos para a redução de lixo marinho? [   ] SIM   [   ] NÃO

2. Que **medidas** considera importantes a serem aplicadas para reduzir o **lixo marinho**?
   _____
   _____
   _____

3. Gostaria de participar em iniciativas voluntárias de limpeza de lixo marinho? [   ] SIM   [   ] NÃO
   Se **sim**, quantas **horas por mês**? _____ horas por mês.
   Se **não**, porque não? _____
   _____

4. Estaria disposto a executar as seguintes ações para contribuir para a redução de lixo marinho? (em que: **1 – nada disposto** e **5 – muito disposto**)

	1	2	3	4	5
Parar de comprar produtos de plástico de uso único (não reutilizável)					
Comprar produtos biodegradáveis					
Pedir a uma pessoa que está a deixar lixo no chão que o ponha no lugar correto.					
Apoiar a legislação contra o lixo marinho					
Apanhar lixo em risco de entrar em ambiente marinho (pelo qual não é responsável)					

5. Na sua opinião, qual das seguintes ações seria mais útil para reduzir o lixo marinho? **Ordene de 1 a 7**, sendo que **7** é a que **mais ajudará a reduzir o lixo marinho**.
[   ] Autoridades publicas e governamentais (monitorização, penalizações, tratamento de lixo)
[   ] Sector do tratamento de resíduos (reciclagem)
[   ] Sector privado (indústrias marítimas e costeiras)
[   ] Consumidores (mudanças de comportamentos)
[   ] Pesquisa e desenvolvimento (produtos e soluções inovadoras)
[   ] Educação e Consciencialização publica
[   ] Organizações Não Governamentais.

6. **Ações** para reduzir o lixo marinho devem ser realizadas **em que nível**? (marque **apenas um**)

[   ] Local   [   ] Regional   [   ] Nacional   [   ] Europeu   [   ] Global

7. Na sua opinião, que **medidas** poderiam ajudar a **aquacultura a produzir menos resíduos**?
_____
_____
_____

PARTE B: DADOS ADICIONAIS

1. Em geral, qual é a sua disposição para correr riscos? (em que: **1 – nada disposto** e **5 – muito disposto**)
[   ] 1   [   ] 2   [   ] 3   [   ] 4   [   ] 5

2. Quais são as espécies de peixe produzidas na sua piscicultura? (marque **uma ou mais**)
[   ] Dourada
[   ] Sargo
[   ] Safia ou Choupa
[   ]   Outras   Espécies   (**especifique**)
_____

3. Existem **algas** a ser produzidas ou colhidas na sua piscicultura? [   ] SIM   [   ] NÃO
Se   sim,   que   **tipo   de   algas**   são   produzidas   ou   colhidas?
_____
_____

4. Ano de Nascimento: _____

5. Género: [   ] Masculino   [   ] Feminino

6. Escolaridade:

Sem Estudos (1)   Ensino Professional (4)

Ensino Básico (2)   Ensino Superior – 1º e/ou 2º Ciclo (5)

Ensino Secundário (3)   Ensino Superior - 3º Ciclo (6)

Fim do questionário!

Obrigada pela sua COLABORAÇÃO!!