



IMPACT OF BEACH CLEANING ON ENVIRONMENTAL AWARENESS: A CASE STUDY IN BEIRA, MOZAMBIQUE

Sónia Esperança Momoi¹

Jaime Ernesto Naene^{two}

Albino Cândido Zacarias³

Helena Selsa Matola⁴

Carlos José Domingos Lettuces

Summary

This study investigated the environmental awareness of volunteers during Estoril beach cleaning activities in the city of Beira, Mozambique. The research involved 150 volunteers, of which 42 were interviewed. Structured questionnaires were administered after the activities to assess knowledge about marine pollution. Additionally, participant observations were carried out to record volunteer involvement and the effectiveness of cleaning activities. Quantitative analysis of questionnaire data revealed a significant increase in volunteers' environmental awareness after participating in the activities. The qualitative analysis identified factors that influence volunteer engagement, highlighting the importance of environmental education and awareness campaigns. The main limitations of the study included the sample size and limited observation time. The study followed strict ethical principles, ensuring the informed consent of participants and the confidentiality of the data collected. This work contributes to understanding the effects of beach cleaning activities on civic environmental awareness and highlights the need for ongoing environmental education programs to promote marine conservation.

¹Degree in Veterinary Medicine from Eduardo Mondlane University, 2007 (Mozambique). Senior Technician at the National Institute of Fish Inspection, IP – Sofala Delegation. Email:sonia.gemo@gmail.com

^{two}Graduated in Chemistry Teaching from the Pedagogical University of Maputo, 2011 (Mozambique). Master's student in Public Health at Alberto Chipande University, Mozambique. Senior technician at the National Institute of Fish Inspection, IP – Sofala Delegation. Email:jaimenaene@gmail.com

³Degree in Chemistry Teaching from Licungo University, Beira Extension, 2024 (Mozambique). Intern Technician at the National Institute of Fish Inspection, IP-Sofala Delegation. Email:albinozacarias27@gmail.com

⁴Graduated in Chemistry Teaching from the Pedagogical University of Maputo, 2013 (Mozambique). Senior Technician at the National Institute of Fish Inspection, IP – Sofala Delegation. Email:selsamatola77@gmail.com

⁵Graduated in Chemistry Teaching from the Pedagogical University of Maputo (Mozambique). Master in Chemistry Education/Teaching from the Pedagogical University of Maputo. PhD student in Analytical Chemistry at Uberlândia University, Brazil. Email:carlosalface9@gmail.com

Key words: Environmental awareness, Beach cleaning, Marine pollution, Environmental education, Volunteer engagement.

Abstract

This study investigated the environmental awareness of volunteers during beach cleaning activities in Estoril, Beira, Mozambique. The research involved 150 volunteers, of whom 42 were interviewed. Structured questionnaires were administered after the activities to assess knowledge about marine pollution. Additionally, participant observations were conducted to record volunteer involvement and the efficiency of the cleaning activities. Quantitative analysis of the questionnaire data revealed a significant increase in environmental awareness among volunteers after participating in the activities. Qualitative analysis identified factors influencing volunteer engagement, highlighting the importance of environmental education and awareness campaigns. The main limitations of the study included the sample size and the limited observation period. The study followed strict ethical principles, ensuring informed consent from participants and confidentiality of collected data. This work contributes to the understanding of the effects of beach cleaning activities on environmental civic awareness and underscores the need for ongoing environmental education programs to promote marine conservation.

Keywords: Environmental awareness, Beach cleaning, Marine pollution, Environmental education, Volunteer engagement.

1. Introduction

World Ocean Day is an opportunity to mobilize actions that promote the health of marine ecosystems and the sustainability of ocean resources. In the city of Beira, Mozambique, one of the central activities of this celebration is the cleaning of the beaches, organized by the Provincial Economic Activities Services (SPAЕ). This annual event aims to not only remove solid waste from beaches, but also raise awareness in the local community about the harmful effects of marine pollution.

Beach pollution is a significant environmental problem that affects marine biodiversity and human health. The presence of trash, especially plastics, in coastal environments can lead to serious damage to marine organisms and contaminate the food chain (Thompson et al., 2004; Rochman et al., 2013). Beach cleaning activities, in addition to mitigating these direct impacts, play an important educational role, increasing community awareness and engagement in environmental protection.

This study aims to evaluate the impact of beach cleaning activities in Beira on volunteers' environmental awareness and behavior. The level of

participation, the effectiveness of the event organization and the participants' perception of the importance of marine conservation.

Previous research indicates that practical activities such as beach cleaning can have a positive effect on changing environmental attitudes and behaviors (Hartley et al., 2015; Nelms et al., 2017). This article aims to add to these findings by providing a detailed analysis of the local context and dynamics specific to Beira.

1. 1 Impact of beach cleaning on environmental awareness

Marine pollution, especially that caused by plastic waste, is one of the biggest contemporary environmental challenges (Thompson et al., 2004). Beach cleaning initiatives not only remove waste, but also serve as a practical form of environmental education (Hartley et al., 2015).

Collective action theory, as discussed by Olson (1965), can be applied to understand the dynamics of participation in beach cleaning activities. This theory suggests that participation in collective actions, such as beach cleaning, is motivated by both personal incentives and the perception of community benefits. Beach cleaning activities also promote a sense of environmental responsibility and can transform attitudes and behaviors (Nelms et al., 2017).

Furthermore, Paulo Freire's theory of critical awareness (1970) emphasizes the importance of educational processes that involve dialogue and critical reflection. During cleanup activities, participants are encouraged to reflect on the causes of pollution and discuss practical solutions, which can lead to greater awareness and sustainable action.

2 Methodology

2.1 Study area

The city of Beira is located in the province of Sofala, in Mozambique. Geographically, it is located on the east coast of the country, along the Indian Ocean. Coordinates: Approximately 19°50' S latitude and 34°50' E longitude. Beira is located at the mouth of the Púngué River and has an important port on the Indian Ocean.

Figure 1: Geographic location of the city of Beira



Source: https://upload.wikimedia.org/wikipedia/commons/thumb/5/56/Mozambique_map_cities.png/428px-Mozambique_map_cities.png

2.2 Procedure

Beach cleaning activities in Beira involved community volunteers and employees from various institutions, who participated not only in waste removal, but also in awareness campaigns about the impacts of marine pollution.

The sample for this study included 150 volunteers, 42 of whom were randomly chosen for structured interviews, ensuring diversity in terms of age, gender and history of participation in environmental activities. Various data collection tools were used, including a structured questionnaire, administered after cleaning activities to measure environmental awareness and knowledge about the impacts of marine pollution. Additionally, participant observation sheets were used to record the level of volunteer involvement, the efficiency of cleaning activities and the interaction between participants.

Data from the questionnaires were analyzed quantitatively using statistical analysis tools to identify changes in volunteers' environmental awareness. At the same time, a qualitative analysis of the observations was carried out to identify factors that influence volunteer engagement and the effectiveness of activities, categorizing responses and identifying recurring patterns and themes.

The study followed a specific procedure divided into three main stages. Subsequently, participant observation was essential to monitor the involvement of volunteers, the efficiency of the organization and the interaction between participants, in addition to recording the quantity and types of waste collected. In the post-activity stage, to assess changes in environmental awareness, structured interviews with 42 randomly selected volunteers were applied, providing a deeper understanding of their perceptions and motivations.

Ethical considerations were strictly followed throughout the study. All volunteers were informed about the objectives of the study and consented to participate, with the guarantee that their responses would be kept confidential and used exclusively for research purposes. Participation in the activities aimed to promote a positive impact both on the environment and on raising awareness among participants about the importance of marine conservation.

3 Results and Discussion

3.1 Interviews with beach cleaning volunteers

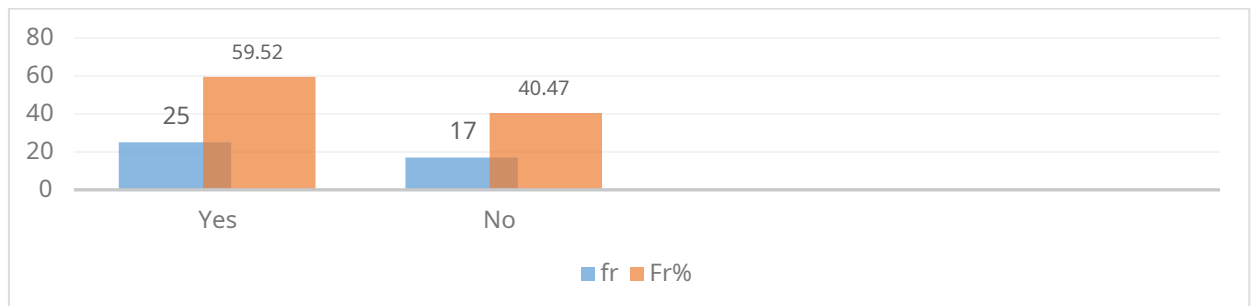
3.1.1 Sample profile

Of the volunteers in beach cleaning activities, 73.8% are men and 26.19 are women. Analysis of this data reveals a balanced participation between men and women. This balance is significant as it indicates equal inclusion in environmental preservation efforts, which is crucial to the success of community initiatives.

The age range is distributed between 21-30 years (26.19%), 31-40 years (26.19%), 41-50 years (42.85%) and 51-60 years (4.7%) . This indicates that the age diversity of participants, with the presence of young people and adults, highlights the broad attraction of beach cleaning campaigns. Literature suggests that involving different age groups in environmental activities is crucial to creating a comprehensive and intergenerational ecological awareness (Ballantyne, Fien, & Packer, 2001).

3.1.2 Participation in beach cleaning activities

Figure 2: Participation in beach cleaning activities



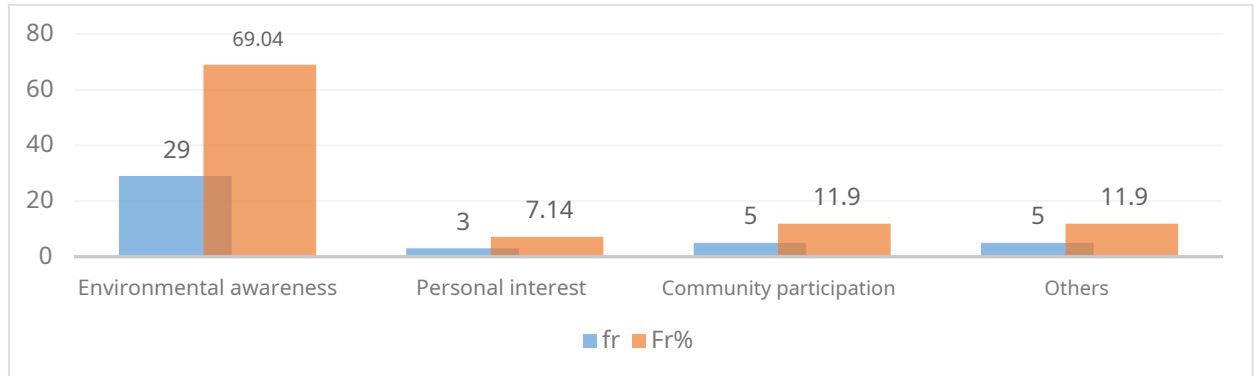
Source: Authors, 2024

The high participation of volunteers in beach cleaning activities, with a percentage of 59.52% previously involved, reinforces the effectiveness of these campaigns in community mobilization. According to McKenzie-Mohr (2000), participation in collective actions is crucial to promoting sustainable behavior changes. These activities not only increase the perception of personal effectiveness, but also reinforce personal responsibility towards the environment. This ongoing involvement is vital to the sustainability of environmental practices,

as it fosters a sense of community and long-term commitment to protecting marine ecosystems.

3.1.3 Motivations for participating in beach cleaning activities

Figure 3: Motivations for participating in beach cleaning activities

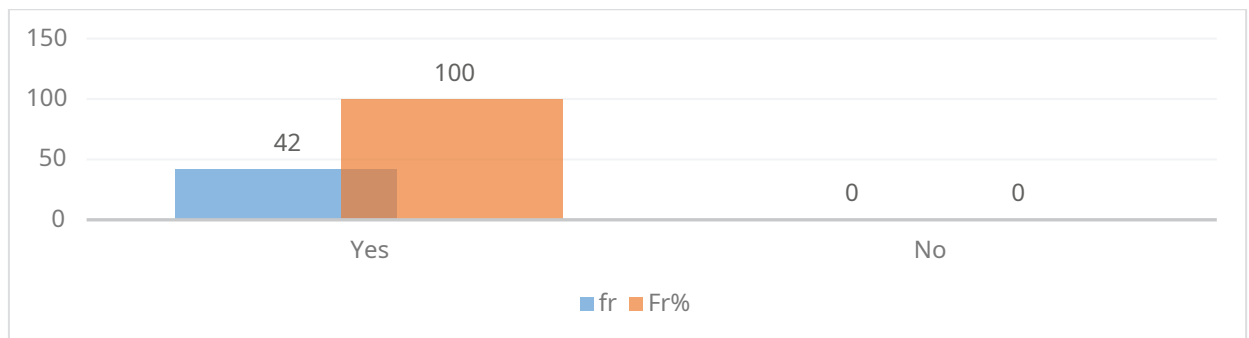


Source: Authors, 2024

Volunteers' motivations vary, but include altruistic reasons such as protecting the marine environment and community. According to Deci and Ryan (2000), intrinsic motivation, where individuals participate for personal satisfaction and alignment with their values, is more sustainable in the long term than extrinsic motivation.

3.1.4 Importance of beach cleaning for the marine environment

Figure 4: Importance of beach cleaning for the marine environment

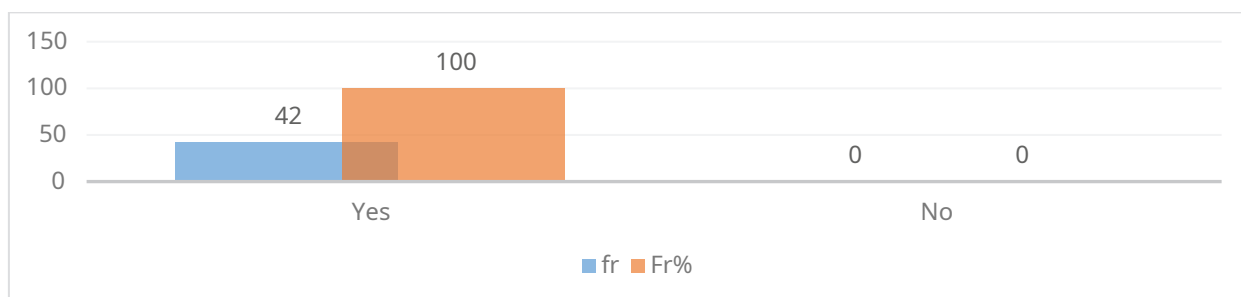


Source: Authors, 2024

Participants widely recognize the importance of beach cleaning for the health of the marine environment (100%). Studies show that marine pollution, especially plastics, has devastating effects on marine life and coastal ecosystems (Jambeck et al., 2015).

3.1.5 Awareness of marine pollution after the activity

Figure 5: Awareness about marine pollution after the activity

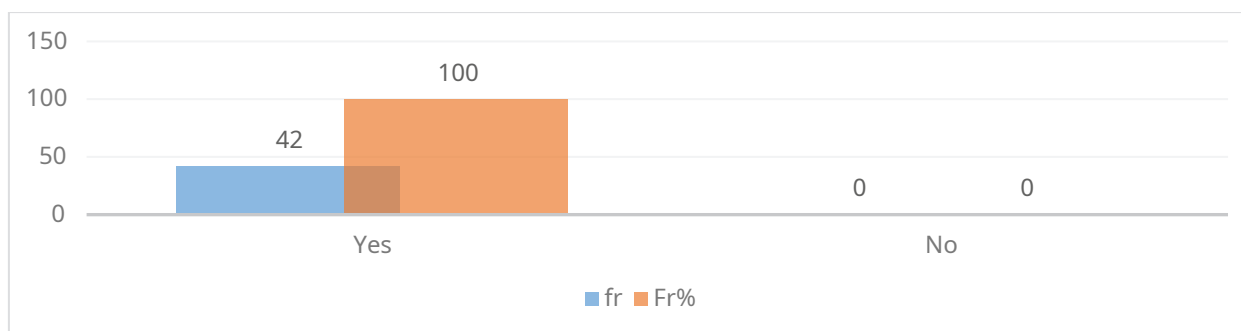


Source: Authors, 2024

There was a significant increase in awareness about marine pollution among volunteers after the activity (100%). Schultz (2011) suggests that direct and practical experiences are effective in increasing environmental awareness and promoting pro-environmental behaviors.

3.1.6 Participation in future beach cleaning activities

Figure 6: Participation in future beach cleaning activities

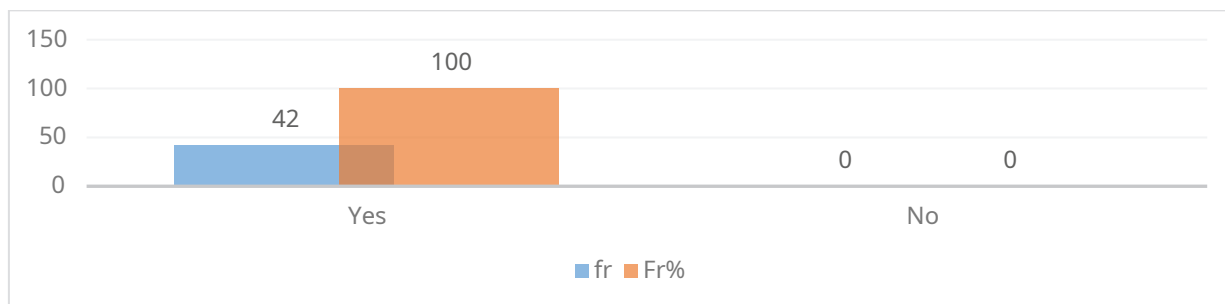


Source: Authors, 2024

The willingness of volunteers to participate in future activities suggests a positive and motivating experience (100%). This is in line with the concept of community empowerment, where active participation reinforces ongoing commitment to environmental action (Zimmerman, 2000).

3.1.7 Frequency of beach cleaning activities: a necessity?

Figure 7: Frequency of beach cleaning activities

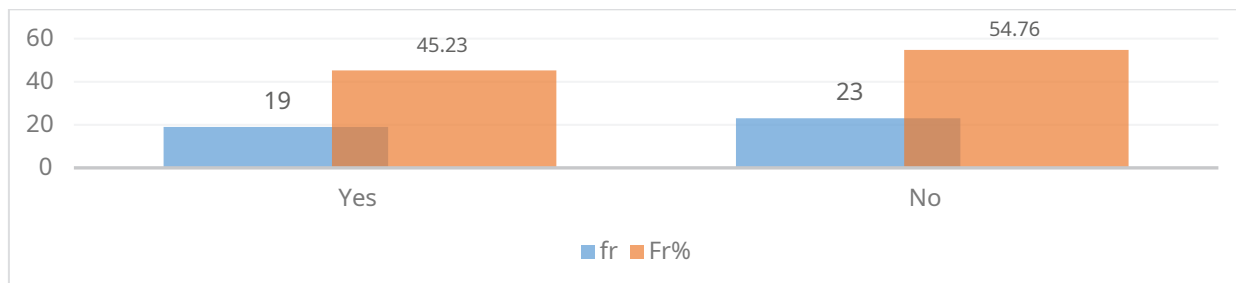


Source: Authors, 2024

The perception that the frequency of cleaning activities is necessary highlights the continuity of these actions to maintain environmental health (100%). Talsma and Schreurs (2006) point out that continuous actions are essential to maintain and reinforce pro-environmental behaviors in the community.

3.1.8 Community engagement in environmental preservation actions: sufficient or insufficient?

Figure 8: Community engagement in environmental preservation actions



Source: Authors, 2024

Although there is notable engagement, the perception of insufficiency indicates the need for additional strategies to increase participation. McKenzie-Mohr (2000) suggests that social marketing techniques and educational campaigns can be effective in expanding the reach and effectiveness of environmental initiatives.

3.2 Participant observation in the cleaning of Praia do Estoril

General information

- Date: *06/08/2024*
- Local: *Estoril – City of Beira*
- Total number of volunteers: *150 approximately*
- Activity duration: *45 min*
-

Participation

- Level of volunteer involvement: *high (X), average (), low ()*
- Diversity of participants: *age (X), Sex (X), background ()*

The beach cleaning activity in Estoril, City of Beira, carried out on 06/08/2024, had the participation of approximately 150 volunteers. The level of volunteer involvement was rated as high, and the diversity of participants in terms of age and gender was notable. The high participation and involvement are consistent with studies that show that community mobilization in environmental actions tends to be high when there is clear communication of the environmental and social benefits of these activities (Hart & Nolan, 2021). Additionally, the inclusion of diverse demographics can increase the effectiveness of cleanup campaigns as different groups can bring varying perspectives and skills, as noted by McLeod et al. (2020).

Activity results

- Total amount of garbage collected (*in kg*): *more than 100*
- Most common types of waste: *plastics (X), metals (), organic (X), others (X)*

The total amount of waste collected was over 100 kg, with plastics, organic waste and other types of waste being the most common. The prevalence of plastic waste is a problem widely documented in environmental literature (Jambeck et al., 2015), reflecting the persistence of plastics in the marine environment and the urgent need for effective approaches to reducing them. Organic waste, although biodegradable, also represents a problem, especially in large quantities, as it can affect marine life and water quality (Martínez-Ribes et al., 2021).

Organization and logistics

- Efficiency in task distribution: *very efficient ()*, *efficient (X)*, *inefficient ()*
- Availability and quality of equipment provided (gloves, trash bags, etc.):
high (X), *average ()*, *low ()*

The efficiency in distributing tasks was considered efficient, and the availability and quality of the equipment provided were evaluated as high. According to Hinojosa et al. (2018), organizational efficiency is crucial to the success of cleaning campaigns, as it directly impacts the amount of garbage collected and the satisfaction of volunteers. Adequate equipment, such as gloves and trash bags, are essential to ensure the safety and effectiveness of activities (Moraes et al., 2019).

Impact and perception

- Volunteers' perception of the importance of the activity:
very important (X), *important ()*, *little important ()*
- Changes observed in the attitude of volunteers during the activity:
Significant (X), *moderate ()*, *none ()*

The volunteers perceived the activity as very important, and significant changes in the volunteers' attitude were observed during the activity. This aligns with research demonstrating that participation in practical conservation activities can increase environmental awareness and promote pro-environmental behaviors (Schultz et al., 2016). Direct experience with pollution can motivate volunteers to adopt more sustainable practices in their daily lives (Schwartz et al., 2018).

Additional observations

- Notable behavior of volunteers:

Reply.. *During the beach cleaning activity, volunteers demonstrated proactive engagement, taking on additional responsibilities and motivating other participants. Environmental awareness was evident, with many volunteers correctly separating waste. Cooperation between different age groups and genders was excellent, with young and old working together effectively.*

- Suggestions for future cleaning activities:

Reply. *It would be beneficial to increase the duration of the activity beyond 45 minutes, allowing for more comprehensive waste collection and more time for educational activities. Dividing the beach into specific zones with group leaders can make cleanup more organized and efficient. Partnering with local businesses can provide additional resources, such as cleaning equipment, snacks for volunteers, and sustainable giveaways. Incorporating workshops and educational sessions during the activity can raise awareness about marine biodiversity and the impacts of waste. Implementing a monitoring system to record the types and amount of waste collected and publishing post-event reports can increase transparency and attract more volunteers. Offering participation certificates or small prizes can serve as recognition and encouragement. Finally, collecting feedback from volunteers after the activity can help identify areas for improvement and incorporate suggestions into future cleaning campaigns.*

3.3 From the case study: Lecture by Secretary of State - Sofala

Figure 9: Opening ceremony of World Oceans Day celebrations



Source: Ministry of the Sea, Inland Waters and Fisheries (Mozambique), 2024

3.3.1 Importance of the oceans

The Secretary of State began her speech by recognizing the vital importance of the oceans for humanity. She enumerated the main functions of the oceans, including their ability to provide sources of life, produce oxygen, support ecosystems, regulate climate, and act as water reserves. These points highlight the need for careful management of marine resources to ensure the needs of present and future generations are met. The importance of the oceans is widely recognized in scientific literature, which highlights their crucial role in maintaining biodiversity and regulating global climate (Thompson et al., 2004; Rochman et al., 2013).

3.3.2 Alignment with SDGs

The talk also emphasized the alignment of local policies with the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda, particularly SDG 14, which aims to conserve and sustainably use the oceans, seas and marine resources. This commitment is reflected in the third priority of the Government's Five-Year Program 2020-2024 of Mozambique, which focuses on the sustainable management of natural resources and the environment. This priority reflects a growing global trend to integrate sustainable development goals into national and regional policies (UN, 2015).

3.3.3 Conservation measures

The Secretary highlighted several concrete conservation measures that have been implemented in Sofala province. Among them, he mentioned the closure of mangrove crabs and surface shrimp, the ban on surface shrimp for 135 days, and the institutional reform of the National Institute of Hydrography and Navigation (INAHINA) and the National Institute of the Sea (INAMAR). Furthermore, inspection actions were intensified, resulting in 59 maritime patrol missions, 184 land missions, the destruction of 275 harmful fishing gear and the restoration of 1,148.43 hectares of mangroves. These measures are consistent with recommended fisheries management and environmental conservation practices that seek to balance economic exploitation with ecological sustainability (FAO, 2020).

3.3.4 Positive results

Figure 10: Increase in fishing production as a result of sustainable management measures.



Source: Fishing exposure capture (Beira, June 8), 2024

The results of these measures have been positive, with a significant increase in fishing production. Production grew 9% from 2022 to 2023 and 18% during the first quarter of 2024 compared to the same period the previous year. These data highlight the impact of conservation and sustainable management actions on improving productivity and preserving marine ecosystems. Previous studies also point to the success of sustainable management strategies in recovering fish stocks and protecting marine habitats (Pauly et al., 2002; Costello et al., 2012).

3.3.5 Community involvement and EA

Figure 11: Volunteers participating in beach cleaning in Beira



Source: Beach cleaning capture (Beira, June 8), 2024

Another crucial aspect of the speech was community involvement and environmental education (EE). The Secretary mentioned activities such as lectures in schools, awareness campaigns at Community Fisheries Councils, beach cleaning and mangrove planting. These initiatives not only raise awareness about the importance of ocean conservation, but also encourage active community participation in environmental protection. The literature highlights that direct involvement in conservation activities can significantly increase environmental awareness and engagement among participants (Hartley et al., 2015; Nelms et al., 2017).

3.3.6 Call for collaboration

Finally, the Secretary called for collaboration and coordination of all sectors at the provincial and regional level to ensure compliance with laws and regulations related to the conservation of oceans and marine resources. She highlighted the need to combat illegal fishing, properly manage marine waste, protect marine species and habitats, and ensure water quality. Intersectoral collaboration is essential to address complex environmental challenges and ensure the effectiveness of conservation strategies (Ostrom, 2010).

4 Final considerations

This case study on beach cleaning in Beira, Mozambique, during World Oceans Day, highlights the importance of beach cleaning activities not only for removing solid waste, but also for raising environmental awareness in the community. The results obtained show that these actions are effective in raising awareness about the impacts of marine pollution and in encouraging pro-environmental behaviors among participants.

Analysis of the data collected showed balanced participation between men and women, as well as significant age diversity among volunteers. This broad inclusion is essential to creating a comprehensive, intergenerational ecological awareness. The high rate of previous participation in beach cleaning activities suggests that these events are well received by the community and effective in mobilizing sustainable collective action.

The motivations of the volunteers varied, but altruistic reasons and the perceived importance of protecting the marine environment stood out. Awareness about marine pollution increased significantly after the activity, demonstrating that practical experiences are effective in educating and engaging the community on environmental issues. The willingness of volunteers to participate in future cleaning activities reinforces the effectiveness of these actions in promoting ongoing commitment to environmental conservation.

Additional observations during the activity revealed remarkable behavior from the volunteers, characterized by a high level of engagement, responsibility and cooperation. The efficiency in the organization and the quality of the equipment provided were crucial factors for the success of the cleaning, corroborating studies that point out the importance of logistics and adequate preparation for the effectiveness of environmental campaigns.

The Secretary of State's lecture in Sofala Province highlighted the importance of the oceans and ongoing conservation initiatives, aligning with the Sustainable Development Goals (SDGs). The conservation measures implemented, such as closed seasons and patrols, resulted in significant increases in fishing production, demonstrating the positive impact of sustainable management of marine resources.

Suggestions for future cleanup activities include increasing the duration of activities, intensifying awareness and recruitment campaigns, dividing cleanup areas into specific zones, and establishing partnerships with local businesses. These measures can improve organization, increase participation and expand the educational impact of cleaning campaigns.

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