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Environmental aspects and management preferences: A case study of small pelagic fisheries in the Crucita parish of the Portoviejo canton

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ABSTRACT

The extractive context of artisanal fishing in Ecuador is very broad and diverse considering the different fishing equipment that is used to capture a very varied set of species. As part of this broad sector, there is a small pelagic fishery, which is in the Crucita parish of the Portoviejo canton and is a long-standing and economically very relevant resource for the community. The objective of this article is to analyze the environmental and management aspects of this fishery as aspects relevant to achieving sustainable exploitation. To this end, information was collected from the beneficiaries of the purse-seine fishing fleet with the use of a structured questionnaire. The results revealed that there is widespread ignorance of the environmental aspects that affect the conservation of ecosystems and marine bioresources. On the other hand, the fishermen are aware of a general need to implement management measures that guarantee the sustainability of their fishing. However, they consider that the current regulations are not adapted to the current local context. Finally, from the perspective of those involved, the implementation of minimum capture sizes as a management measure could guarantee the sustainable capture of the species.

1. Introduction

The environmental variable of the anthropogenic activities that significantly affect marine ecosystems [1,2] is a common factor of analysis worldwide. Economic and environmental concerns arise from the impacts of artisanal fishing activities on the ecosystem and related marine species [3–5]. Habitats and population structures may be altered by the impacts generated by human actions such as the emission of polluting gases, the generation of waste and over-extraction of the resource. Two of the main ecological issues affecting all ecosystems are the increase in mortality and the modification of the community's composition [3,6]. In addition, the absence of new environmental management strategies that mitigate any negative impacts on marine resources may create an environment of limited

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scope and with few prospects for development. Consequently, conservation policies that could be established to improve the conditions under which artisanal fishing takes place might contribute to creating a better production scenario and guarantee its sustainable development in the medium and long term.

The presence of microplastics has been identified as an additional problem in superficial and deep sediments [7,8]. Previous scientific studies have estimated in quantitative terms the high impact of plastic waste in coastal marine ecosystems [9,10]. Many different land- and sea-based sources contribute to the introduction of microplastics into the ocean [11,12]. Many studies worldwide have only examined land-based sources, which are thought to be the primary sources of microplastic pollution. However, this ignores the sea-based sources that also contribute significantly to plastic contamination in marine environments [10,13,14]. In this context, one direct effect originates from the fishing nets lost during fishing activities, known as ghost nets, which have severely affected the population of cetaceans and marine animals of all kinds [15,16]. It is estimated that, after one year, ghost nets from 192 gillnet fishing boats can capture around 5,305,560 individuals [17]. In addition, climate change affects the abundance of species and fishing activity [18–20]. Despite this concern, environmental deterioration continues to increase, turning the oceans into gigantic plastic landfills [21].

Industrial and artisanal fisheries are significant sea-based sources of such problems that require further attention. Fishing equipment, including nets, ropes and ports, is made largely of plastic. In addition, the mechanical abrasion of fishing nets and ropes during use may add to the plastic waste in the oceans. According to Quiñonez [22] more than three thirds of waste entering the ocean is plastic that affects the health of marine species in general and goes on to represent a threat to human health as it is transferred throughout the food chain [23,24]. One of the most important contributions by fisheries to this problem is through abandoned or lost fishing gear (ALDFG) whose global and regional effects are not fully known [25]. Artisanal fishery worldwide, which accounts for one-fifth of global marine fishery catches, has become a significant potential source of plastic pollution in the form of ghost nets due to the use of gillnets and trammel nets [26]. There is currently an international agreement for the development of preventive strategies to reduce the ALDFG [27] derived from small pelagic fishing activities.

An analysis of some global statistics relating to small pelagic fishery is required to highlight its international importance. According to FAO [28] small pelagic fish account for the largest amount of worldwide marine catches with 16.6 million tons in 2019, or 18% of global captures. From 2015 to 2019 [28–32] small pelagic fisheries reported a global contribution of 85.2 million tons and have maintained an average contribution of 19%. These catches mainly consist of herrings (*Clupea harengus* and *Clupea pallasii*), sardines (*Sardina pilchardus*), chub mackerel (*Scomber colias*) and anchovies (*Engraulis encrasicolus*) [28–33]. These species, especially *S. pilchardus* and *S. colias*, are mainly captured using purse-seine nets [33,34]. The importance of purse-seine fishery worldwide has been analyzed in prior studies from socio-economic [35], physical-economic [36], environmental [37], and biological [38] perspectives. Also, others scientific studies have emphasized its role in the coastal populations of different countries such as: Spain [34], Korea [35], Vietnam [36], Mozambique [37], and Indonesia [39], and for various regional contexts such as the Atlantic and Indian Oceans [38,40], the Mediterranean Sea [41] as well as the European [42] and Eastern Pacific [43].

The aim of the present study is to analyze environmental and management aspects associated with the small pelagic fishery in the Crucita parish of the province of Manabí – Ecuador. The objective is to determine how much is known about the anthropogenic impacts generated by this activity in the environment and identify priority factors in order to manage the fishing activity sustainably. The fishermen in this geographical context were therefore considered the object of study and the conclusions reached are based on the statistical analysis of the answers provided by these artisanal fishermen.

This background information justifies this research, which was performed to analyze the factors that the artisanal fishermen of Crucita consider fundamental to the environmental and management aspects of this small pelagic fishery. The article is divided into five sections. This introductory section sets out the objectives and fundamental ideas that justify this research, as well as the general, regional and local theoretical framework linked to small-scale pelagic artisanal fishing. The second section presents a description of the methodology used in the study to obtain the results that will be presented in the third section. In the fourth section, there is a discussion of the study's findings. Finally, the fifth section presents the conclusions derived from the investigation.

2. Materials and methods

2.1. Sampling survey

Sampling was carried out among the stakeholders of this purse-seine artisanal fishery, namely the fishermen and boat owners. This study was conducted in the Crucita cove, specifically the sector of Las Gilces. The study area is located within 0°49′48″ South and 80°31′36″ West. According to Tomalá-Parrales and Zambrano-Yépez [44] the sector has an estimated 40 people involved in the activity hence a sample of 22 fishermen was determined. The finite population formula was used to determine the sample with a confidence level of 95% and 14.19% error. The sample considered for this study includes fishermen and small boat owners who play a role in catching the fish. Questionnaire surveys were conducted among the fishermen from Las Gilces. The sample of people surveyed was random, rather than deliberate, based on our assumption of egalitarian proportional participation in the fishing activity.

2.2. Study area

The work was carried out in the Crucita coastal parish of the Portoviejo canton, belonging to Manabí, the third most populated province of Ecuador (Fig. 1), with an extension of 6228.08 ha and valuable natural resources due to its biodiversity. The study focused on the Las Gilces commune where the purse-seine fishing fleet is dedicated to the capture of small pelagic fish in the Pacific Ocean in

the Exclusive Economic Zone (ZEE) of Ecuador. It has an area of 447.29 ha, characterized by a tropical or equatorial climate, dry in the summer (between May and December), warm and rainy in the winter (between January and April). Due to the geographical position of Ecuador, which is to the northwest of the South American continent, it is influenced by the cold Humboldt current and the southern coast is characterized by: "estuaries, rivers, mangroves, and coastal ridges and an external domain of beaches and marine terraces, that are subject to morpho-climatic processes of a desert or sub-desert type" [45].

The inhabitants of the Las Gilces commune are dedicated mainly to artisanal fishing, with ancestral practices that sustain the family economy, in approximately 200 small fiberglass boats and two 30-ton sardine boats. Their tasks last 21 days, with the active participation of both men in the capture and women in the evisceration process. The population is made up of 2356 inhabitants, 66% of them in the 15–64 age group. The productive structure of the population is centered on 883 inhabitants who are dedicated to gutting (322 = 36.5%) and fishing (121 = 13.7%) [44].

2.3. Questionnaire

A questionnaire prepared for the fishermen was divided into two sections, the first part enquiring about the relationship between the environment and the fishery, taking into consideration: oceanographic and meteorological variables, the way in which the solid waste generated from the gutting is managed, as well as analyzing the landing and commercialization of the fish. The influence of these human activities was investigated, as well as the potential ecosystems and marine communities affected by the fishing. The second part evaluated the management preferences, posing a series of questions focused on exploring the level of knowledge and/or training in aspects of management and handling of this small pelagic fishery in Ecuador. The evaluation table proposed by Dinkel and Sánchez-Lizaso [46] was implemented with seven management strategies, which were adjusted to the reality of this context. Each strategy was rated from one to five, one being the value that expresses little utility or effectiveness of the management strategy; and, five expresses the usefulness or effectiveness of it. The categories evaluated for each strategy were efficacy, control, and implementation. In addition, the areas of greatest abundance of the target fish species were evaluated according to the fishermen's perception. The entire questionnaire is presented in Appendixes A and B in the original Spanish and translated English versions, respectively.

The interviews with the fishermen took place in the study area during November 2021. Prior to using the questionnaire, the interviewers requested the fishermen's informed consent, as well as providing a brief description of the research project and its objectives. The surveys were given out individually in a closed and quiet environment without an established time limit by a team previously trained for this purpose. This allowed the fishermen to speak without any pressure and to provide comments or observations. Descriptive statistics such as the mean and standard deviation were used with the data from the evaluation table of the second section of the survey. Infostat software was used for statistical analysis.

2.4. Data analysis

A template was designed in Microsoft Excel to record the replies on the form. Bar graphs were used to represent the distribution of responses to multiple-choice questions and pie charts were used to show the proportion of participants who answered the various

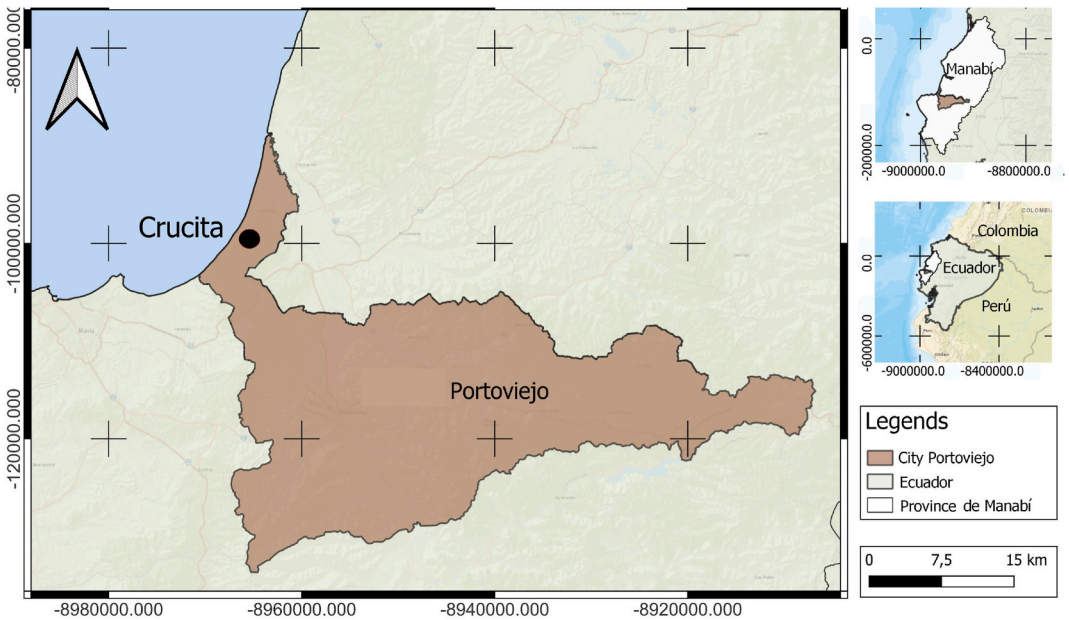

Fig. 1. Location of the Crucita parish in the Portoviejo Canton, Manabí, Ecuador.

options. For the evaluation of management preferences, the mean and standard deviation of the strategies proposed were calculated. In addition, an analysis of variance (ANOVA) was performed to assess whether there were significant differences between the management strategies. To check if there was significance, the Tukey test was used using a confidence level of 95%. The Infostat version 2020 software was used for the statistical analysis [47].

3. Results

From the total population of 40 people involved in the purse-seine fishing, 22 fishermen were surveyed. The process was face-to-face and lasted between 30 and 45 min. We achieved a 100% survey response rate. 77% of the fishermen have wooden boats with dimensions ranging between 15 and 20 m in length and are considered to have a low capacity. 23% of the fishermen own fiberglass boats with outboard motors and are used as aids for the main boats. Only 18% of the fishermen surveyed own more than one boat.

3.1. Distribution map

Between the months of January to May, Crucita fishermen observe a greater abundance of the target species. They state that the current fishing regulations that have been implemented, categorizing their fleet as industrial and restricting the fishing to eight miles from the coast, force them to move away from the areas with the greatest abundance of small pelagic fish that they report as being between three and five miles from the coast. In the months of June and July, there is a notable decrease in catches and size of sardines and alewife, below 12 cm in total length. Despite the fact that artisanal pelagic fishing is carried out along the entire continental coast of Ecuador and that the resources they exploit are migratory and have a wide range of distribution, the fishermen of Crucita, either due to technical limitations, equipment and/or logistics, do not fish any further than between Bahía de Caráquez and Jaramijó (Fig. 2).

3.2. Influence of oceanographic events and meteorological variables

The most common oceanographic events for 59% of the fishermen were the spring tides; they are the most frequent in the fishing areas where they fish, and their influence on the fishing activity is positive, that is, they favor the capture of more organisms. However, 41% of the fishermen point out that tidal surges and strong waves are events that negatively influence fishing activity since they make it difficult.

The sea surface temperature (SST) stands out as the most influential meteorological variable. According to 50% of the fishermen, when the SST is high, the capture of the target species increases. They point out that during the months of June and July, when the SST

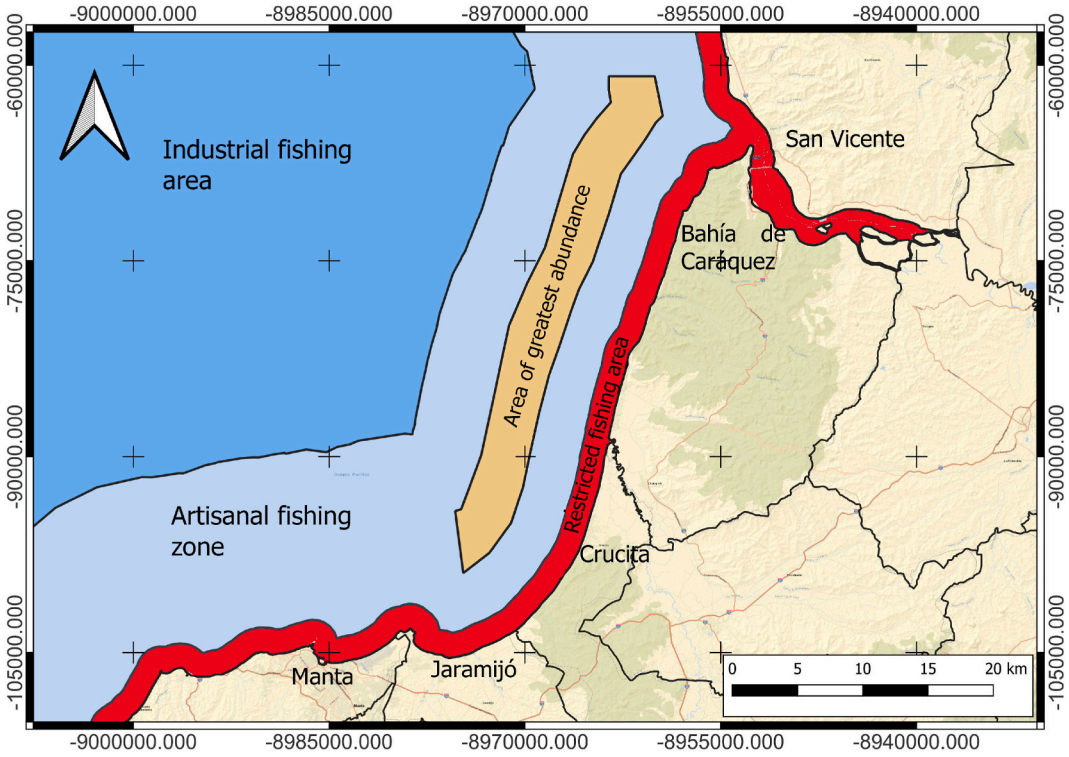

Fig. 2. Artisanal fishing zones (between mile 2 and 8) and industrial fishing (from mile 8). Areas of greater abundance of sardines and alewife (between mile 3 and 5). Restricted area for fishing (1 mile from coast). Own elaboration from Castillo, 2022 survey data.

drops, catches decrease.

3.3. Ecological aspects associated with the fishery

The marine ecosystems they fish are mainly (68%) in the open sea, 8 miles from the coast. A worrying 32% of those questioned report fishing near the coast, in an area where industrial fishing is prohibited.

The discard generated from each fishing trip can represent between 3% and 5% of the total catch and is made up of a great proportion by pelagic fish (73%) followed by demersal fish (17%), which are the communities most affected. They point out that sea turtles, a species that is the object of conservation, are sometimes captured (Fig. 3); however, all the fishermen say they release them.

Despite discarding a significant percentage of the total catch, 87% of the fishermen indicate that the discarded organisms are adults and have already reached the average size of sexual maturity.

3.4. Pollution of the marine environment

Regarding the anthropic activities that harm the fishing activity, specifically the pollution of the marine environment, 95% fishermen state that marine litter is the main pollution problem, while only 36% of the fishermen point to marine litter as a second cause of pollution. Hydrocarbons and, to a lesser extent, wastewater (23%) are also referred to (Fig. 4).

The fishermen consider that pollution has generated environmental impacts, mainly the deterioration of marine ecosystems (43%), affecting the populations of the target species, reducing catches (Fig. 5).

3.5. Waste management of fishing residue

Regarding the elements that generate or become waste, single-use containers and the organic waste associated with food such as canned goods (81%), plastics (68%), food (68%) stand out, and which were referred to by many fishermen. 50% of the fishermen indicate that the generation of hydrocarbon residues such as oils or gasoline is common, reaching the sea in most cases (Fig. 6). In relation to the management of the solid waste generated during the fishing itself, all the fishermen report that this waste is stored on the boat and disposed of on land in common garbage containers.

Regarding fishing nets, the fishermen state that they lose an average of one net every three months. In particular, nets lost in aquatic ecosystems (ghost nets) are one of the elements that can significantly affect marine ecosystems, which is why when questioning fishermen about what they do when they lose a net, only 59% say they communicate the loss to the authorities responsible for the removal of lost fishing nets.

Regarding the organic solid waste generated by evisceration, they state that it is put in temporary storage containers so that it can later be transferred for final disposal. As there is no fishing infrastructure to facilitate this work, the evisceration is carried out in private facilities where it takes place in an orderly manner and the waste generated is properly managed.

3.6. Fishing infrastructure

Currently, Crucita fishermen do not have any official infrastructure to facilitate their fishing activity. However, a port is under construction by the national government. 55% of the fishermen said they knew about the construction of the port, 36% considered the infrastructure as a dock and in lower percentages they expressed some knowledge of the port's facilities, that is, whether it will have warehouses for storing fish, an unloading area, trade area or evisceration area (Fig. 7).

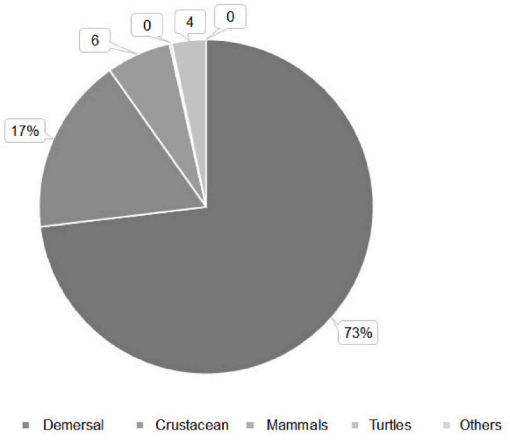

Fig. 3. Percentage averages for composition of the discard from the purse-seine fishing fleet - Crucita. Own elaboration from Castillo, 2022 survey data.

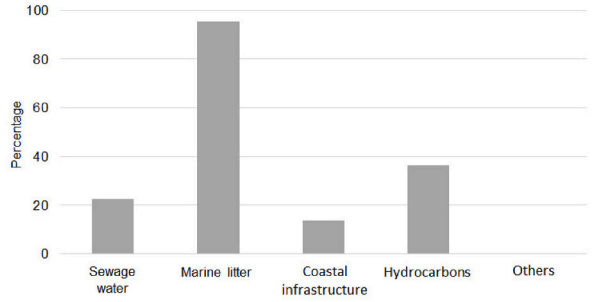

Fig. 4. Most frequent type of pollution in marine ecosystems. Own elaboration from Castillo, 2022 survey data.

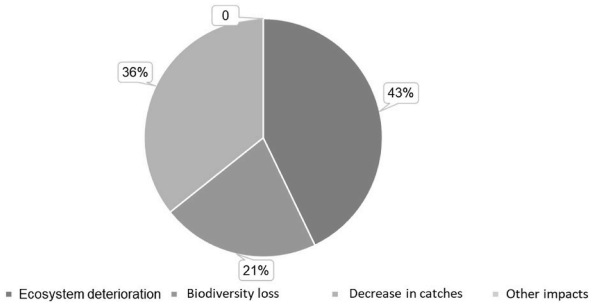

Fig. 5. The perception of environmental impacts generated by marine pollution. Own elaboration from Castillo, 2022 survey data.

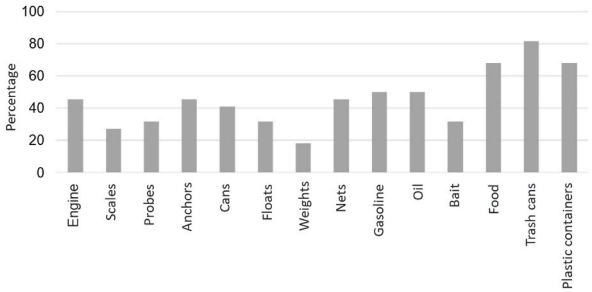

Fig. 6. Elements that produce or become waste during fishing. Own elaboration from Castillo, 2022 survey data.

3.7. Fishery and preferences management

Concerning the management measures that regulate the small pelagic fishery, 86% of the respondents report knowing them. Despite the existence of regulations, only 45% referred to the ban according to the lunar phases (the only measure implemented). 13% of the fishermen state that the restriction of the catch size is another regulatory measure. However, there are no catch size restrictions

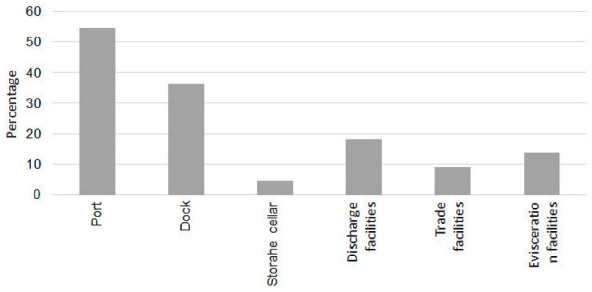

Fig. 7. Knowledge about the future fishing infrastructure in Crucita. Own elaboration from Castillo, 2022 survey data.

for either sardines or alewife. Of the people surveyed, 73% have been informed about the management measures that regulate their activity. They state that on several occasions they have been visited by various fishing authorities (from the undersecretariat for Fishery Resources) and fishing technicians (IPIAP) who provide information on the new regulations approved, as well as the results of the biological assessments of the fish stock. 73% consider that these management measures are appropriate for the management of their activity; and 86% express knowledge of the legal aspects that govern the fishing activity (restricted areas, fishing permits, vessel registration, among others).

Seven management strategies were presented, measure six, which corresponds to changing the bait was excluded because attractants are not used in this fishery. The high variability of responses in each management strategy indicates that there was a diversity of opinions within the group. The strategy related to implementing a minimum catch size for sardines and alewife was preferred, reaching an average of four, which is close to the maximum rating regarding the effectiveness of the measure, ease of implementation and ease of control. Despite this preference, the fishermen suggest that the fishing authorities should analyze the minimum catch size that would be imposed together with them. Another of the best-valued strategies is to implement bans, not only related to lunar phases but also to the breeding seasons of the target species (Fig. 8). Strategies related to limiting the number of fishermen, restriction of fishing areas, catch limitations and changes in fishing gear presented medium ratings regarding their effectiveness, control, and implementation.

Despite showing a preference for the strategy related to minimum capture sizes, the analysis of the management strategies in the group as a whole showed that there were no significant differences between the groups in relation to the variable of interest (Tukey $p > 0.05$). This indicates that the group means are similar (Fig. 9).

4. Discussion

The purse-seine boats used in Crucita are not large (15–20 m) and are mainly made of wood, and work in collaboration with at least five auxiliary (usually) fiberglass boats. These fishing characteristics converge conceptually with the characterization developed in previous studies by Herrera et al. [48,49]. The size of the purse-seine vessels, as well as the construction materials and the technology used, show that the Crucita purse-seine fishing fleet is medium-scale, which limits its actions to the exploitation of small pelagic fish in areas not far from the coast, when compared with industrial vessels that exceed 30 m in length that have greater capacities and technical conditions. Previous studies have shown a direct proportional relationship between the modernization of the fleet and the catch potential [50], which supports the need to update the fishing infrastructure to improve its extractive capacity [51]. Although the Crucita fishermen argue that the small pelagic fishery carried out by the purse-seine fishing fleet is artisanal, the Ecuadorian authorities, based on the current Fisheries Law, have classified them as an industrial fleet. This has forced them to move away from the area that they have identified as being the most abundant (Fig. 2). This contradicts the scientific studies that support the importance of taking into account the point of view of the beneficiaries in the process of drafting regulations and in decision-making [52–54]. Due to this, they currently have to move to the industrial fishing zone that is located 8 miles away from the coast, turning it into an open access fishery as has happened in other parts of the world [55]. As a consequence, the fishermen from Crucita must fish in an area that they know little about, so they not only have to invest more resources for the task, but also, there is the possibility of not obtaining the usual catches.

4.1. Influence of oceanographic events and meteorological variables

Regarding the oceanographic events that influence the fishing, it is the strong waves, regardless of their cause (tidal surges, floodwaters, currents, cyclones, etc.) that generate the greatest difficulties for the fishermen. By not having the most appropriate boats and, in addition, having auxiliary boats, the risks of accidents at sea are higher when these conditions occur.

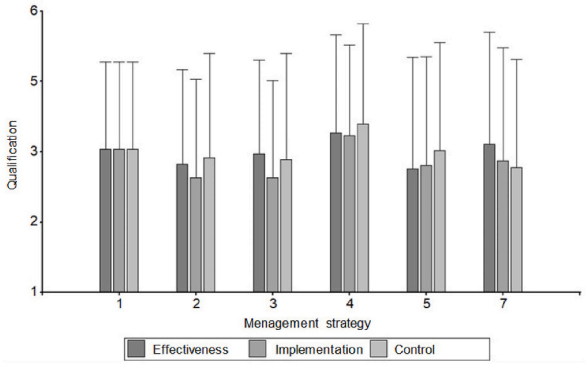

Fig. 8. Management preferences for the small pelagic fishery. The mean and standard deviations are displayed. 1. Limit fishing time (e.g. days at sea per year); 2. Limit the amount of gear used per fisherman; 3) Restrictions for specific areas or periods (space or time, marine reserves, etc.); 4) Minimum catch sizes; 5) Catch limitations (individual, annual, etc.), 7) Change to more selective fishing gear. Own elaboration from Castillo, 2022 survey data.

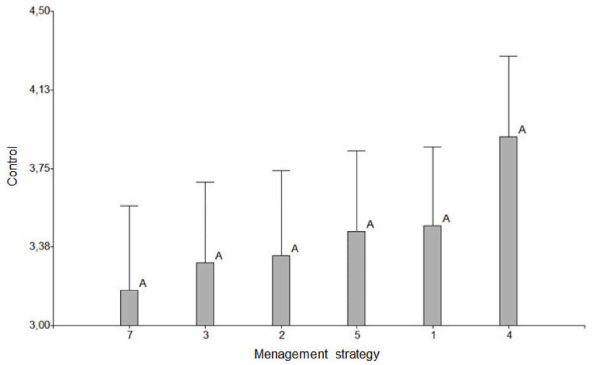

Fig. 9. Comparison of means by management strategies. Means with letters in common are not significantly different.

According to the experience of the fishermen surveyed, there is a positive correlation between the average temperature of the sea, that is, when it increases, so does the abundance of small pelagic fish, In contrast, in the months when temperatures drop (June and July), catches decrease, an aspect that could be related to the biophysical state of this area of the ocean, as in the case of East Africa in the Mozambique Channel [37] or with subsurface conditions that cause a deeper thermocline [56]. Other studies have revealed that the reduction of dissolved oxygen in the surface layers of the ocean due to global warming [57–60] has reduced habitable conditions for pelagic fish [61] creating a threat to the sustainability of these species and ecosystems.

4.2. Ecological aspects associated with the fishery

The largest proportion of fishermen (68%) claim they comply with the regulations that oblige them to fish in the industrial zone, in the open sea 8 miles from the coast, in order not to affect reproduction areas or marine-coastal ecosystems. However, 23% of the fishermen state that they fish near the coast without specifying the exact zones or catch areas. This action has generated conflicts with the industrial fleet who argue that a certain group of fishermen tend to catch in areas where juvenile specimens predominate, which is seriously affecting small pelagic populations, reducing the efficiency of catches, as shown by previous studies in other geographical contexts [62–64]. Previous studies have also evaluated the effects of selective capture on the reproductive potential of fish [65].

The associated marine fauna that is most affected by this activity is mainly made up of pelagic and demersal fish that are not of commercial interest, either because there is no demand for these species or because the organisms captured are juveniles. Although these results could indicate that this fishery is affecting an important sector of the pelagic and demersal fish populations, which are not exploited, the low percentage they represent of the total catch leads one to think that the small pelagic fishery carried out by the purse-seine fishing fleet is highly efficient, since almost all the resources captured are used and not discarded. In addition, it is pointed out that any catches of conservation target species such as sea turtles are released alive, an action that is facilitated by the characteristics of the fishery that does not threaten the life of the organisms captured before the fishing net is lifted, which facilitates this operation.

4.3. Pollution of the marine environment

Solid materials disposed of in the sea have become the main source of marine pollution and represent one of the causes of the deterioration of marine ecosystems and the decrease in fishing resources. In this regard, Vázquez-Rowe et al. [66], infer that contamination by microplastics could not only affect the health of marine ecosystems but also of humans; they point out that many of these pollutants come from other locations and are carried by sea currents towards their fishing areas. On a global level, it has been estimated that 275 metric tons are deposited in the ocean in a previous study that analyzed 192 coastal countries of the world [46].

Hydrocarbons occupy the second position of pollutants in the fishing areas to which they go and whose impacts on marine ecosystems and artisanal fishing communities have been widely documented in previous research at a global level [67], as well as of other types of contaminants such as steroid metabolites in fishing ports [68].

4.4. Management of waste originating from fishing

Because the small pelagic fishery operates for approximately 20 days, it requires various resources, with the consumption of packaged or canned and perishable foods generating the greatest amount of waste. When landing the catch, what is produced is stored and disposed of properly; however, there is no authority to verify this action or to monitor the waste generated after this phase. Any other waste generated such as oils and hydrocarbons are not properly managed, their final destination is the sea. Likewise, fishing nets also often become waste when they become entangled on rocky outcrops and cannot be retrieved. Although those consulted claim they inform the authorities of their loss, it is known that there are no measures to recover these nets or prevent the damage associated with these events. The poor management of waste generated by fishing activities at the site (fishing nets) highlights the need to promote training for proper waste management, emphasizing the use of mechanisms and the preparation of strategies for this purpose.

Evisceration is handled the best, because the authorities supervise this process exhaustively, demanding that environmental regulations be complied with regarding the management of the waste generated. Despite not having fishing infrastructures in their locality, the fishermen and boat owners use private spaces to carry out evisceration and marketing activities; however, they hope to have an operational port that provides the necessary resources to facilitate their fishing activity in the future.

4.5. Management of fishing and preferences

86% of the fishermen indicate that they know that the target resources of their fishing are regulated, although when questioned about what those regulations were, they were not able to answer precisely, they even described measures that are not approved or required, such as size restrictions. Despite stating that they are regularly visited by technicians and authorities that communicate the new regulations regarding their fishing activities, it is clear that the fishermen do not fully understand the information that is shared with them. Despite this, the fishermen seem to be sensitive to the sustainable use of fishery resources, since they consider that the management measures for their fishery are useful and should continue to be used. For this reason, it is important, as has been shown in previous studies, to recognize the wide diversity of characteristics that fishing communities have in order to guarantee effective governance and the development of policies appropriate to each context [69].

The dissemination of the results of the biological fishing studies concerning the main target species (sardines and alewife) carried out by IPIAP technicians seems to have generated awareness among fishermen about the importance of respecting the smallest specimens otherwise they will not reach the size necessary to reproduce. This aspect could be the main reason why they consider it necessary to implement a management measure related to restrictions on catch sizes. Another aspect is the suggestion of banning fishing during certain periods. This is related to their fishing experiences, allowing them to identify certain months in the year where the number of egg-laying females increases or the catches decrease. Due to their experience, plus the information they have received, they understand that these reproductive times of the species are essential to add new recruits to the population that contribute to the sustainability of the resource and the activity.

5. Conclusion

Currently, the Crucita purse-seine fishing fleet cannot access the fishing areas recognized as the most abundant due to the new recategorization of its fishing fleet, which requires them to fish further than 8 nautical miles from the coast. The conflicts generated by the current recategorization of the purse-seine-coastal fishing fleet have resulted in difficulties in respecting the limits of fishing areas, since 32% of those surveyed admit not taking this restriction into account.

The oceanographic and climatic events that can generate large waves negatively affect the fishing of small pelagic species, and these increase in areas further from the coast. On the other hand, a high SST is associated with a greater abundance of resources. One of the main problems that is affecting the catching and conservation of marine resources is marine pollution that is considered the main source of the degradation of marine ecosystems. Marine pollution may be related to the lack of training and education in fishery waste management, which is added to the pollutants that come from other activities, mainly coastal. In addition, the lack of knowledge about what the term “fishing infrastructure” means is indicated by the fact that despite not having any formal, operational infrastructures, the fishermen believe that what they do have may be considered as a “dock” and even a “port”. However, and in spite of these difficulties, the fishermen are willing to implement management and conservation strategies in their activities, which provides the opportunity to reach agreements between the institutions in charge of fishing administration and the users of the resource that favor the sustainable development of this fishing activity.

This study is highly important due to the participation of a significant number of the people involved in the activity and who provided their insights concerning the environmental management of this specific activity. Given that there has been a lack of studies regarding this specific social group from an environmental perspective, we believe that the findings will be useful for policymakers in the future. Additionally, we consider the contribution our study makes to the literature may help to strengthen and develop a more participatory process, involving both decision-makers and the local population, regarding public policies that concern a common agenda to preserve this traditional activity. This study represents a first attempt to assess the variables of marine and environmental management from the purse-seine fishermen’s perspective, future studies should consider the inclusion of more of the actors involved in order to broaden their contribution to research in this field.

Dataset

Castilo, R. 2022. “Data for: Small pelagic fisheries in the Crucita parish of the Portoviejo canton: environmental aspects and management preferences”, Mendeley data, V2, https://data.mendeley.com/drafts/936wy8ybt8.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e17858.

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