

REPORT 2022 - ECOLOGIA HUMANA DO OCEANO GROUP - BRAZIL

In this report we present the initial results of the research projects and educational program supported by Yaqu Pacha in 2022 to the Ecologia Humana do Oceano Group coordinated by Camilah Antunes Zappes, professor of the Universidade Federal do Espírito Santo, southeast Brazil. During 2022 the Yaqu Pacha Society for the Protection of Aquatic Mammal Species of Latin America funded two projects, totaling US\$ 4,609.96 (R\$ 23.498,3 Brazilian real). All of these projects will continue during 2023.

Research Program

Project 1: Ethnobiology of the Guiana dolphin (*Sotalia guianensis*) in Espírito Santo state, southeast Brazil

Introduction

In the coastal mesoregion of the state of Espírito Santo (ES), southeast Brazil, there are several artisanal fishing communities that work in areas close to populations of Guiana dolphin (*Sotalia guianensis* van Benedén, 1864) (Figure 1). This overlap of area use between fisheries and these dolphins causes accidental capture by gillnets (Zappes *et al.*, 2009; 2010). Records of negative interactions between cetaceans and artisanal fisheries through fisher's reports indicate the need for studies that rescue traditional knowledge, especially during the Ocean Decade and in Agenda 2030 actions. In this sense, the objective of this study is to identify the areas of occurrence and use of the Guiana dolphin in the coastal mesoregion of ES and interactions between these dolphins and artisanal fisheries based on information from the traditional knowledge of artisanal fishers.

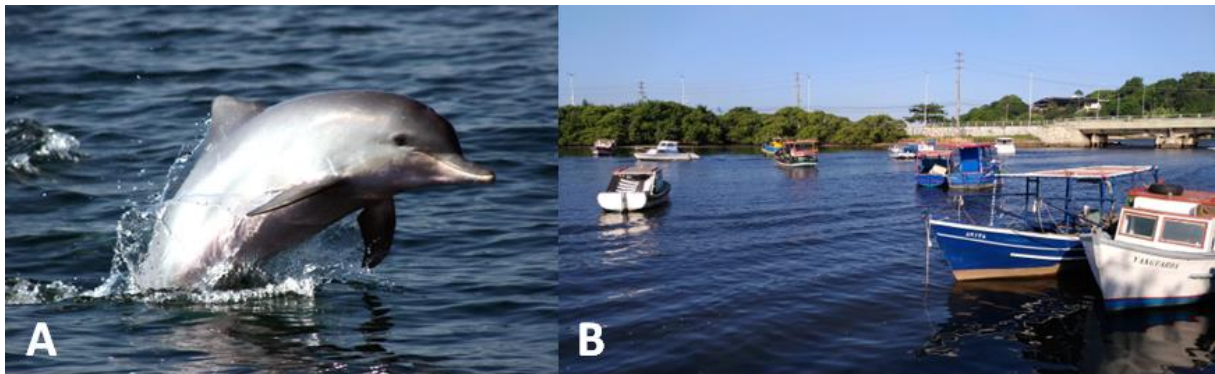


Figure 1. A – Guiana dolphin, *Sotalia guianensis*, mesoregion of the central coast of Espírito Santo, southeast Brazil; B – boat used during artisanal fishery, Espírito Santo, Brazil. Photos: a) Mariana Freitas Nery e b) Camilah Antunes Zappes.

Study area

This study is been carried out in four fishing communities registered in Fishermen Colony Z-2, Vila Velha municipality, coastal mesoregion of the coast of the state of Espírito Santo (ES) (Figure 2): 1) Fishermen Colony Z-2 in the Prainha; 2) Praia da Costa fishery community; 3) São Pedro Fishermen/Itapuã fishery community; and 4) Itaparica fishery community (Figure 3). In these region there are public schools to children of the fisheries communities.

This project occur together these four fisheries communities almost 400 fishermen and their families. Together with these objectives will occur environmental education actions in 3 (three) public schools totaling approximately 700 children between 6 (six) and 15 years old (Elementary school). All these children living in fisheries families or low income householdes. All these communities suffer with the exclusion caused by real estate speculation that expels fishing families from their territories. Around these communities there is pressure to build large real estate projects.

The present study is registered to the Plataforma Brasil (Brazilian base for research registers involving humans) and to the Sistema de Gestão Nacional do Patrimônio Genético e do Conhecimento Tradicional Associado (SISGEN); and approved by the Ethics Committee (CAAE 62511922.2.0000.5542).

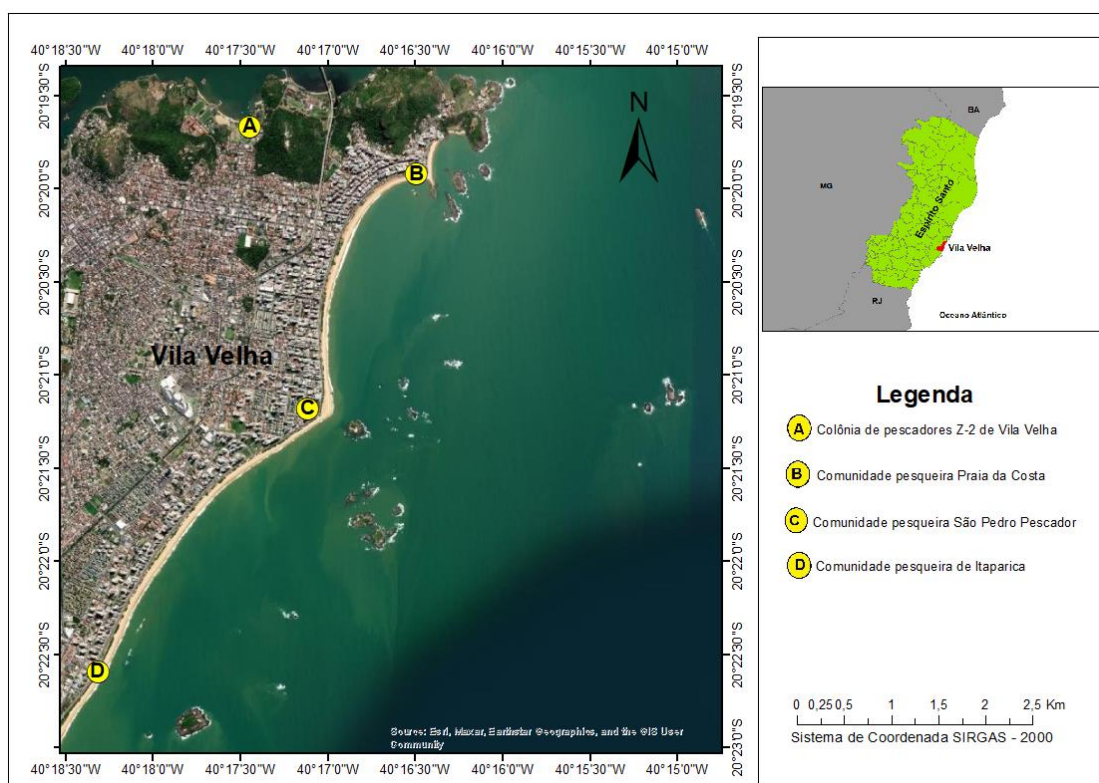


Figure 2. Fishing communities registered in Fishermen Colony Z-2, Vila Velha municipality, coastal mesoregion of the coast of the state of Espírito Santo, southeast Brazil.



Figure 3. Fisheries communities in the Vila Velha municipality, coastal mesoregion of the coast of the state of Espírito Santo, southeast Brazil. A and B) Fishermen Colony Z-2 in the Prainha; C and D) Praia da Costa fishery community; E) São Pedro Fishermen/Itapuã fishery community; and F and G) Itaparica fishery Community.

Material and Methods

In this project is applied the ethnographic method of participant observation, field diary and interviews with questionnaire and participatory map to obtain the traditional knowledge data (Figure 4). The selection of fishermen for interviews was carried out in three steps: 1) assistance provided by the presidents of the fishing associations or by fishermen who represented the groups in each area studied; 2) snowball sampling technique; and 3) randomization of the sample. The selection of the first interviewee involved the collaboration of the president of the fishermen's association, while the second respondent was identified using the snowball sampling technique. The snowball method could be stopped, and the approach to the next fisherman occurred at random through opportunistic encounters. Three criteria were established for the application of these methods: 1) all respondents should be artisanal fishermen; 2) fishing should be their main professional activity; and 3) artisanal fishery activities should be practiced in areas with Guiana dolphin occurrence. After the questionnaire, photos of local cetacean species (*Orcinus orca*, *Tursiops truncatus*, *S. guianensis* e *P. blainvillei*) is presented. From these photos, respondents were asked to indicate which images represented the guiana dolphin.



Figure 4. Ethnographic method (participant observation, field diary and interviews) in fisheries communities in Vila Velha, Espírito Santo state, Brazil: A) Participant and direct observation application by Maria Luiza Furtado researcher; B) meeting with 'Daré', Fishers Colony's president with Camilah A. Zappes and Maria Luiza Furtado researchers.

Initial results

Until December 2022, 30 artisanal fishermen were interviewed, of which 23 identified Guiana Dolphin as belonging to the species *Sotalia guianensis*. From this point on, all the results are based on the reports of these fishermen who recognize the species. According to the interviewees, this dolphin is popularly known as 'boto' (porpoise), 'tuninha', and 'bobo-cinza', and occurs throughout the year along the coast of the municipality of Vila Velha. According to the interviews, there has been an increase in the population size of Guiana Dolphin in the region where groups of more than 5 individuals are sighted near the coast in shallow areas. This area use is justified by diet, since the fishermen describe that the presence of sardine shoals attracts these dolphins, besides the absence of predators (39.1%, n=9). This result indicates that fishers observe Guiana Dolphin and recognize foraging behavior, diet, and area use.

In addition, 78.3% (n=18) of respondents report that infants are also sighted, year-round (50%, n=13) and more frequently during summer and spring (42.3%, n=11). This perception indicates that fishers identify age groups and differentiate infants from adults mainly by body size and coloration. Some fishers (21.7%, n=5) described a difference in behavior, as infants 'jump and play' more often than adults, and are always accompanied by their mothers.

When asked about the interference of these animals in fishing, 73.9% (n=17) said that the 'dolphins scare the fish away' and that is why sometimes it is necessary to look for another fishing area. The occurrence of accidental capture by a fishing net was mentioned by 90.5% (n=19) of the interviewees and was justified by the fact that the animal can not see the fishing net under the water. According to 12 (48%) fishers the carcass is discarded overboard and no consumption is mentioned.

Some interviewees (43.5%; n=10) reported that it is not possible to avoid bycatch because they need to use gillnets to guarantee family income. Only four (17.4%) fishers, who work with line fisheries, suggest suspending the use of nets as an alternative to reduce bycatch. As suggestions for measures to mitigate the incidental capture of Guiana dolphin it is necessary to define a bathymetric limit for artisanal fishing, as well as change the arrangement of fishing gear to avoid the areas of use of cetacean populations (Zappes *et al.*, 2013). Regardless of the actions to be defined, it is important to ensure the active participation of fishing communities in decision-making processes involving artisanal fishing (Zappes *et al.*, 2016).

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Project 2: Ethnobiology of the Franciscana dolphin (*Pontoporia blainvillei*) along Brazilian coastal

The franciscana, *Pontoporia blainvillei* (Gervais & d'Orbigny, 1844) is a small coastal mammal found between the Northern Espírito Santo State (ES), Southeastern Brazil to San Matías Gulf, Argentina (Crespo *et al.*, 2010; Danilewicz *et al.*, 2010) (Figure 5). The main threat to franciscana along its distribution is the accidental capture in artisanal fishery with fishing nets. Due to the daily practice of the activity, fishermen keep a regular contact with the marine environment, and that enables the development of the traditional knowledge about several species. Previous studies about traditional knowledge of the artisanal fishermen related to franciscana are punctual (Pinheiro & Cremer, 2003; Rosa *et al.*, 2012; Zappes *et al.*, 2016a). Thus, the aim of the present study is to describe and compare the traditional knowledge of the fishermen from small ports in Southwest Atlantic Ocean (SWAO), which is the species distribution area with its gaps, in order to evaluate its interaction with artisanal fishery.

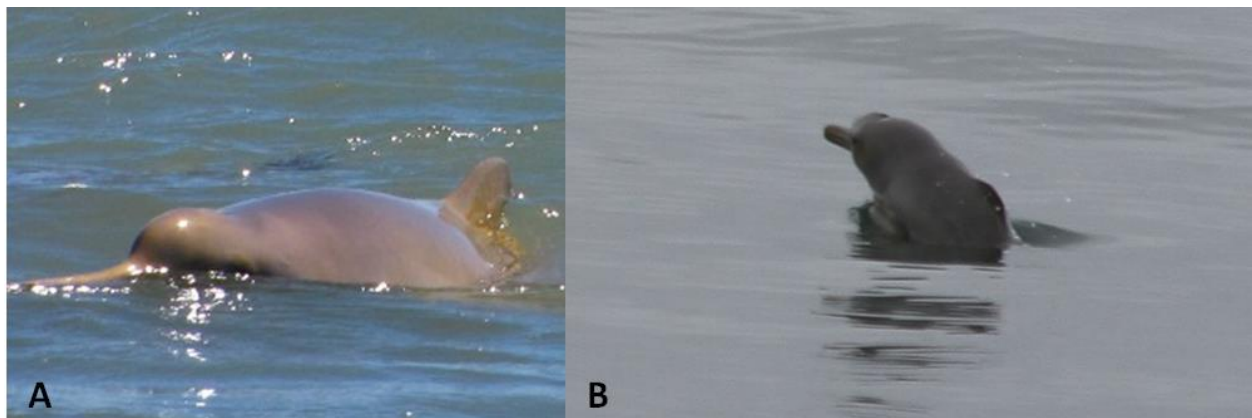


Figure 5. Franciscana Dolphin (A – Image: Marta Cremer/Projeto Toninhas; B – Camila Domit/LEC/CEM/UFPR)

Study area

This study was developed in ten artisanal fishing communities selected for LEK comparison, distributed in the Southwest Atlantic Ocean (SWAO), along the coast of three Brazilian states: ES, RJ and PR (Figure 6). Six of these communities show records of the species, being Conceição da Barra, Regência, Barra do Riacho, Atafona, Peças Island and Superagui Island) and four of them are located in its distribution gap (Piúma, Anchieta, Arraial do Cabo and Cabo Frio). The community selection followed the guidelines of the National Action Plan

(PAN) of the species, which indicates priority areas for its conservation in the Brazilian coast (ICMBio, 2010).

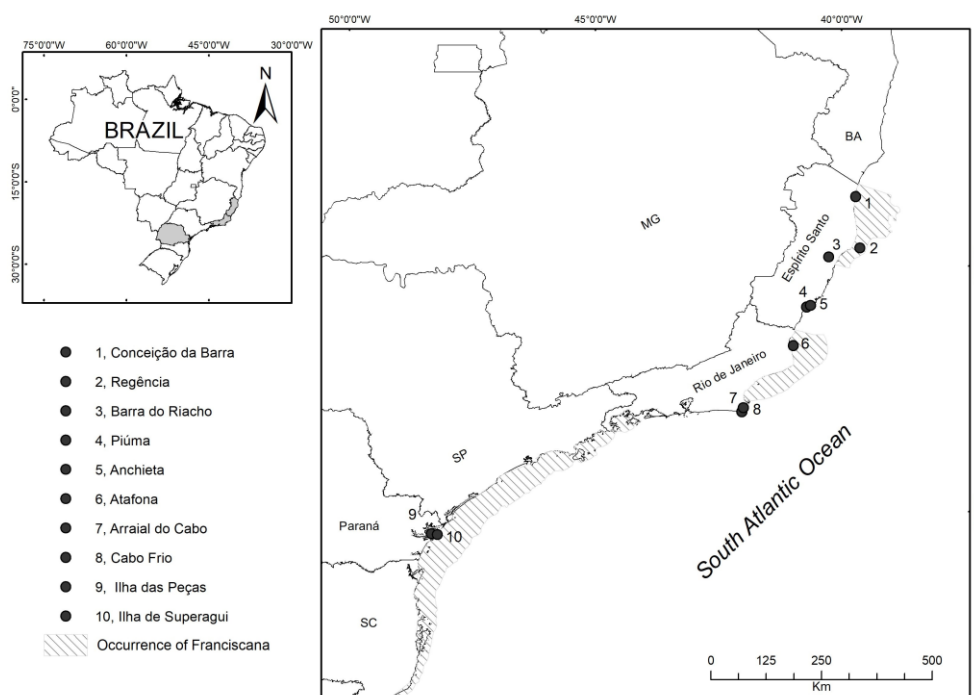


Figure 6. Fishing communities location along the Southwest Atlantic Ocean (SWAO) with gaps and *Pontoporia blainvillei* occurrence areas close to the studied localities. Image: Sérgio Carvalho Moreira.

Material and Methods

In that study the data was obtained by interviews using standard semi-structured questionnaire composed by open and closed questions. This project is registered to the Plataforma Brasil (Brazilian base for research registers involving humans) and to the Sistema de Gestão Nacional do Patrimônio Genético e do Conhecimento Tradicional Associado (SISGEN); and approved by the Ethics Committee (CAAE 07863218.7.0000.5542). All fishermen were interviewed individually in order to avoid interference on others. The selection of the first interviewee was made with the help of a local guide. From then on we used the snowball method, as well as random meetings with fishermen in the studied communities. The criteria used to select them were: (1) be an artisanal fisherman, (2) have fishing activity as the main source of income and (3) practice artisanal fishery in one of the studied communities.

At the end of each interview we showed the fisherman an illustrative board containing photographs of small cetacean species that occur along the study area, among which there was a picture of franciscana. Visual stimulation helps with data analysis of the interviews.

Initial results

Among those who identified franciscana as *P. blainvillei* ($n = 95$), 23 (25,5%) are from Northern ES; one (1,6%) is from Southern ES (Anchieta); 20 (66,6%) from Northern RJ and 51 (56,6%) from PR. Percentages were calculated from the interview number in each region. Among the 120 fishermen that worked in the species distribution gap, all but one could not identify the species [Southern ES - Piúma ($n = 30$) and Anchieta ($n = 29$); Central RJ - Cabo Frio ($n = 30$) and Arraial do Cabo ($n = 30$)]. The only one who recognized it was from Southern ES and described the species according to sighting during eventual fishing close to Rio Doce river mouth (Northern ES). Thus, areas were classified as: ‘no identification’ - Central RJ; ‘extremely low identification’ - Southern ES; ‘partial identification’ - Northern ES and ‘good identification’ - Northern RJ and PR (Table 3). Regarding ethno-denomination, the species is recognized by them as porpoise, ‘tuninha’, dolphin, ‘boto’, ‘bicuda’, ‘vermelho’, ‘boto-cachimbo’ and ‘boca de panela’. From that result, the following analysis were based on reports made by 95 fishermen who recognized the species.

Interviewees described positive ($n = 15$), negative ($n = 8$) and neutral ($n = 2$) interactions involving franciscana. Positive interactions are related to the fact that the dolphin “*helps to find fish and shrimp*”, “*makes fish approach the net*” and “*makes the fisherman happy when he sees it*” [Northern ES ($n = 7$), Northern RJ ($n = 2$) and PR ($n = 6$)]. Negative interactions are related to accidental captures and, thus, to the damage caused to the nets, described as: “*the animal destroys the net*” [Northern ES ($n = 2$); Northern RJ ($n = 3$) and PR ($n = 3$)]. Neutral interactions do not interfere with the fishing routine, and are described as “*the porpoise does not approach the boat*” e “*the porpoise does not attack, staying in the water*” [PR ($n = 2$)].

When interviewees were asked about the accidental dolphin captures, 87,4% ($n = 83$) reported its occurrence [Northern ES ($n = 23$), Southern ES ($n = 1$), Northern RJ ($n = 20$) and PR ($n = 39$)], and gillnet was pointed as the responsible artifact. According to some of them, accidental capture is a rare event ($n = 33$) [Northern ES ($n = 7$), Southern ES ($n = 1$) and PR ($n = 25$)], and is caused by the fact that the dolphin does not perceive the net in the water.

Fishermen from Northern ES [(Regência ($n = 7$) and Conceição da Barra ($n = 1$))] reported that the dolphin harpoon fishing was common, but 15 years ago the environmental inspection was intensified, so the practice ended. Captured dolphins are mostly discarded in the sea [Northern ES ($n = 11$), Southern ES ($n = 1$), Northern RJ ($n = 16$) and PR ($n = 35$)].

Furthermore, some of the uncommon uses are: i) use of fat and muscle tissue as bait for shark fishing with longline [Northern ES ($n = 7$), Northern RJ ($n = 7$) and PR ($n = 2$)], ii) body delivery to researchers from conservation programs and management and inspection organs [Northern ES ($n = 8$), Northern RJ ($n = 1$) and PR ($n = 2$)] and iii) use as food [Northern ES ($n = 2$), Northern RJ ($n = 2$) and PR ($n = 1$)]. Twelve fishermen reported more than one use for the dolphins, which explains why the number of answers ($n = 95$) was greater than the number of fishermen who described the species accidental capture ($n = 83$).

Most of the fishermen ($n = 52$) reported that they do not know how to avoid accidental capture, 29 of them saying that there is not a solution, 13 affirming that the solution is to stop gillnet fishing and one indicating that fishing at night could be a solution. The number of answers ($n = 95$) is greater than the number of reports ($n = 83$) because two interviewees showed more than one answer.

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Environmental awareness Program

The concern about the environmental health of seas and oceans has increased in recent decades. Inharmonious issues in coastal environments such as the reduction of natural resources, and increased pollution from improper disposal of solid waste draw the attention of the lay public in the various media, besides being a subject of the basic curriculum in education. One of the ways to improve the interaction of human development in the coastal zone is the knowledge of its importance and functioning, which must be accessible to society in general and to decision-makers.

In this context, the term Ocean Literacy emerged from the partnership between scientists and education professionals to develop pedagogical resources for teaching ocean sciences. Ocean Literacy is considered a scientific literacy process that happens when the individual has access to knowledge and scientific discoveries about the ocean and can make connections with the world around him/her. In this sense, it becomes paramount that the teaching of ocean culture is inserted into people's daily lives, highlighting science as an element present in their routines (Zappes *et al.*, 2021). The more it is incorporated into people's daily lives, the greater the effectiveness of scientific literacy (Stell *et al.*, 2005). As part of the Environmental Awareness Program of the Human Ecology of the Ocean Group, two projects are carried out: 1) Ocean at the school and Digital Ocean.

- Project 3: Ocean at the school

The Ocean at the school project's main goals are to encourage marine conservation on the coast of the state of Espírito Santo (ES), southeastern Brazil, by raising awareness among elementary, middle, and high school students from public schools, and promoting scientific literacy about ocean science among the school-age public, aiming to comply with the goals of the Decade of the Ocean and Agenda 2030.

Among the activities are environmental awareness actions carried out in the schools involving research on the perception of children about the oceans; puppet shows with stories about marine fauna, coastal ecosystems, fishing culture, and impacts on the ocean (for example whales, dolphins, sea turtles, mangroves, crabs, artisanal fishing and marine debris) (Figure 8); making origamis, puzzles, drawings for coloring, and the distribution of educational kits (Figure 9). In 2022 we worked with two kindergarten public schools: 1) Child Education Center

(CRIARTE) with 78 children between 2 and 5 years old; and 2) Hospital class at the Vitória Children's Hospital with 20 children between 4 and 8 years old.

To measure the effectiveness of environmental awareness actions, interviews were conducted in two stages with children from the CRIARTE (Figure 10). The first stage occurred before the activities and the second stage occurred two weeks after. In each stage a questionnaire was used, consisting of questions related to 1) knowledge about the coastal environment, 2) marine debris, 3) marine debris's impact on the dolphins and marine turtles, and 4) how to avoid the clean beach.

In the initial pre-activities analysis, 82% (n=64) of the children interviewed stated that they frequent the beach, and of these, 78% (n=50) find garbage. Among the 50 who reported the presence of garbage, they said that there is interference with dolphins and sea turtles because the animals 'die' and 'get sick'. On the other hand, 62% (n=31) described that they did not know about the interference of garbage on the fauna. Regarding the possible measures to keep the beaches clean, they described 'collect and throw the garbage in the trash can', 'clean the beach' and 'recycle'; 17 did not know how to answer.

In the initial post-activities analysis, a change in perception was identified, in which 87% (n=68) frequent the beach, and of these, 94% (n=64) find garbage. These 64 that reported the presence of garbage informed that there is interference on dolphins and sea turtles because the animals 'get stuck' (entanglement), 'die', 'get sick/hinders breathing/causes coughing', 'feed, because it is confused with jellyfish and plastic'. Concerning the possible measures to keep the beaches clean they described 'recycle the garbage', 'clean the beach', 'throw the garbage in the trash can', 'don't throw garbage on the ground', and 'take the garbage home'; and compared to the first moment (pre-sensitization) only 7 children could not answer.



Figure 8. Environmental awareness 'Puppet theater' at public schools in Espírito Santo State, southeast Brazil.



Figure 9. Environmental awareness 'colorfull activities, games and educational Kits' at public schools in Espírito Santo State, southeast Brazil.



Figure 10. Research about perceptions of the children and marine debris impacts at public schools in Espírito Santo State, southeast Brazil.

- Project 4: Digital Ocean and the dissemination of Ocean Literacy

The Digital Ocean project aims to promote Ocean Literacy and encourage the conservation of the coastal environment through digital educational actions on social networks, video-sharing platforms, and educational *websites*. The digital scientific literacy actions are aimed at users of social networks and channels already used for environmental education and scientific dissemination (website <https://www.ecologiahumana.info/>, Instagram @ecologia_humana_oceano and youtube channel Grupo Ecologia Humana do Oceano - <https://www.youtube.com/c/GrupoEcologiaHumana>).

In the production of content, daily and weekly posts are made addressing various environmental and oceanic issues, as well as children's animals and videos of interviews with professionals in the area of Human Ecology, Marine Ecology, and Oceanography. The posts and animations/videos are made using language accessible to the Brazilian population, from students in basic education to diverse groups in society in general, with inclusive education.

The website www.ecologiahumana.info (Figure 11A) was created to provide support material to teachers of basic education in Brazil. There are educational materials such as primers, e-books, games to build with children, online games, comic books, animations, journalistic texts, photos, scientific articles, and sonograms of marine fauna. All these products are related to the Ocean Literacy themes and are freely available to the general public and especially for teachers

to use in the classroom.

The metrics of the social network Instagram (@ecologia_humana_oceano) (Figure 11B) are 403 fixed posts, 2,500 temporary posts (stories), and 2,746 followers. The audience is from Brazil, Colombia, Uruguay, Bolivia, United States, Portugal, and Germany. The age range of the audience varies between 25 and 34 years old (37.5%); 18 to 24 years old (29.9%); 35 to 44 years old (19.2%) and over 45 years old (7.1%) formed mainly by the female gender (67.8%).

The youtube channel 'Human Ocean Ecology Group' (Figure 11C) has 530 subscribers and 36 videos/animations available. Since its creation in June 2020, it has had 124,000 views and 276,000 viewer appearances on other channels, gaming platforms, and television. Due to the Portuguese language, the visiting public is originated from Brazil and Portugal with the age between 13 and 65 years old being the female public (71.7%) more frequently.

As part of the scientific literacy actions were carried out: 1) a scientific fair open to the public of various ages where educational materials were exhibited and distributed (Figure 12); 2) online lectures for students from Brazilian universities (Figure 13A) and educational visits with hands-on classes for kindergarten public schools (Figure 13B).



Figura 11. A - website <https://www.ecologiahumana.info/>; B - Instagram @ecologia_humana_oceano; C - Youtube Channel Grupo Ecologia Humana do Oceano - <https://www.youtube.com/c/GrupoEcologiaHumana>



Figure 12. Exhibition in Science fair of the public universities in Espírito Santo State, southeast Brazil.

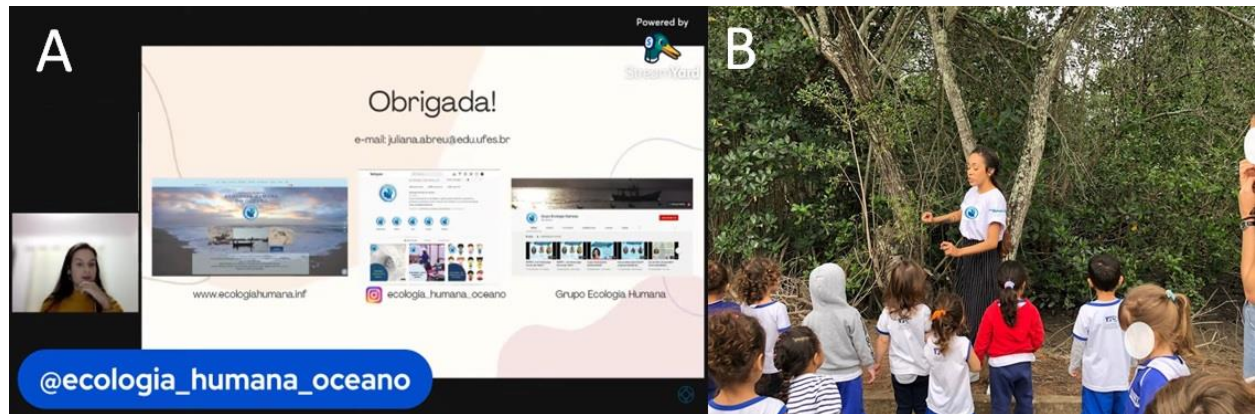


Figure 13. A) online lecture; B) educational visits with hands-on classes to the kindergarten public schools in Espírito Santo State, southeast Brazil.

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