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Report on franciscana fisheries interaction in FMA Ia, Brazil

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INTERNATIONAL WHALING COMMISSION

REPORT ON FRANCISCANA FISHERIES INTERACTION IN FMA Ia, BRAZIL.

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1. Introduction

The franciscana dolphin (*Pontoporia blainvillei*) is a small odontocete inhabiting coastal waters of the Southwestern Atlantic Ocean from Itaúnas (18°25'S), Brazil, to Golfo San Matías (42°10'S), Argentina (Crespo et al., 1998; Siciliano, 1994). IUCN listed the species as *Vulnerable* (Reeves et al., 2015); in Brazil it is listed as *Critically Endangered* (Edict 444 of 17th December 2014). The species range has been divided into four 'Franciscana Management Areas' (FMAs I to IV, Secchi et al., 2003). FMA I corresponds to the northern portion of the franciscana range in Espírito Santo (ES) and Rio de Janeiro (RJ) States, Brazil, and is geographically isolated from the remainder of FMAs (Siciliano et al., 2002). A gap in the distribution of franciscanas is also seen within FMA I (Siciliano et al., 2002). In fact, recent analysis of mitochondrial DNA indicated that the two groups separated by this gap (termed FMA Ia and FMA Ib) constitute genetically distinct populations (Cunha et al., 2014).

Incidental mortality in fishing nets is likely the greatest threat to the franciscana in FMA I. Estimates of bycatch have not been conducted since the early 2000s when Di Beneditto (2003) monitored one of the largest fishing ports in the region, Atafona (FMA Ib). In FMA Ia there are records of bycatch (e.g. Frizzera et al., 2012) but no systematic evaluation of mortality.

More recently, recovery of animals found ashore showing evidence of fisheries interactions in northern Rio de Janeiro (Moura et al. 2009a,b) and Espírito Santo (Marcondes et al., 2017 submitted as SC/67A/SM/04) indicate that bycatch of franciscana is ongoing. Thus, current levels of fishing-related mortality are unknown.

In 2016 the Brazilian Humpback Whale Institute/Instituto Baleia Jubarte (IBJ) initiated a survey in FMA Ia to interview fishermen and evaluate franciscana bycatch. When funds ran out the survey was temporally interrupted. With the financial support of the International

Whaling Commission (IWC) we resumed the survey and completed a first round of interviews covering all the fishing communities in the north of Espírito Santo State (SC/67A/SM/04).

In March 2017 the Institute signed a contract with the Brazilian Fund for Biodiversity (FUNBIO) for a three-year project to evaluate the incidence of franciscana bycatch in FMA I and work with the fishermen to propose solutions in order to mitigate the problem. This report presents preliminary data from 2017 of this study in Espírito Santo State (FMA Ia) and data on strandings of franciscana in the same area.

2. Study Area

During the 2016/2017 first round we covered ten localities of four townships which were visited in the north coast of Espírito Santo State and interviewed 76 fishermen (Figure 01). During 2017 we selected five of the ten localities based on the results of the previous survey to do a fine scale diagnostic of fishing activities and franciscana bycatch. Table 01 presents all localities visited during the 2016 campaign and in yellow the communities chosen for the 2017 campaign. Table 02 present the human residents in the region in 2015 and boat fleet in 2005.

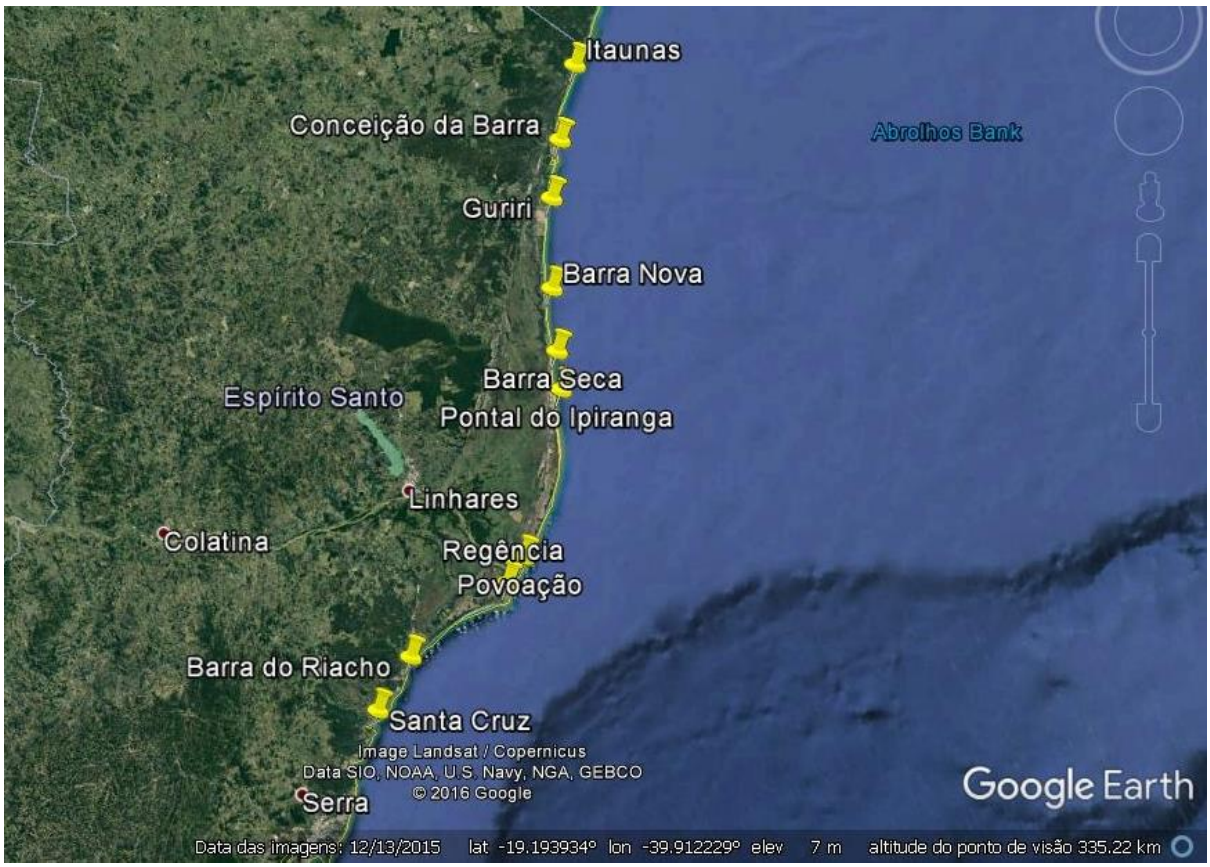

Figure 01. Localities visited in the first round of the survey to evaluate franciscana bycatch in Espírito Santo State, Brazil.

Table 01. Localities visited during the first round of the survey (2016) to evaluate franciscana bycatch in Espírito Santo State, Brazil. In yellow are those places chosen for 2017.

Township	Locality	Acronym	Coordinates
Conceição da Barra	Itaúnas	ITA	-18.420099° S; -39.699120° W
	Conceição da Barra	CON	-18.598762° S; -39.729941° W
São Mateus	Guriri	GUR	-18.736929° S; -39.745603° W
	Barra Nova*	BNN and BNS	-18.949920° S; -39.737067° W
Linhares	Barra Seca	BRS	-19.097440° S; -39.718483° W
	Pontal do Ipiranga	PON	-19.187368° S; -39.705250° W
	Povoação	POV	-19.585348° S; -39.782455° W
	Regência	REG	-19.647193° S; -39.821885° W
Aracruz	Barra do Riacho	BAR	-19.830252° S; -40.057819° W
	Santa Cruz	SAN	-19.959558° S; -40.135767° W

* Two small places at North and South of the Cricaré River mouth, Barra Nova Norte (BNN) and Barra Nova Sul (BNS).

Table 02. Human Population and boat fleet in North of Espírito Santo State.

City	Human Population (IBGE, 2015)	Estimated Fishing Fleet (PROZEE, 2005)
Conceição da Barra	31,127	80
São Mateus	124,575	77
Linhares	163,662	42
Aracruz	95,056	96
Total	**414,420**	**295**

3. Methodology

During the first round (May 2016 – March 2017) we interviewed 76 fishermen using a standard questionnaire and collected three levels of information: socioeconomic data of interviewees, information about the boats and gear used in the fisheries, and knowledge of cetaceans and interactions between cetaceans and fishing gear. For a better view of this result see SC/67A/SM/04.

In the 2017 campaign we selected five localities and performed a frame survey (a census-based approach) in order to provide reliable information to develop a sampling-based design for landing survey approach (Stamatopoulos, 2002). The frame survey was carried out with a standard questionnaire and collected data about the vessel (class, size, engineering, number of crew), fishing gear (type, size and mesh of the nets), the fisheries (seasonality, time at the sea) and interactions with dolphins (captures and destination of dolphins in the last 12 months).

From the frame survey outcomes were developed a stratified random sampling design in terms of landing sites, gear types, minimum sample size and variables to be collected. After that, the sampling approach was implemented at each landing site. We selected local people in each locality to collect fishing data when the boats returned to the harbor. Data was collected using a standard form to register the fishing effort, fishing gear used, the amount and species captured (in Kilograms), the fishing ground (area) and bycatch of franciscanas. The monitoring of fisheries in the five localities started in July 2017 and will keep on for two years ahead. Here we present the partial results from 2017 only, either relative to the complete frame survey or preliminary results from landings surveys.

The strandings of franciscanas and Guiana dolphins in the North of Espírito Santo State were recorded in a partnership between the Institute and the Beach Monitoring Program (BMP), sponsored by Petróleo Brasileiro S.A. (Petrobras). Since 2012 the BMP monitored the beaches daily, and informed the Institute when a stranded marine mammal was found. A necropsy was then performed.

4. Results

We recorded 240 fishing boats in the study. Santa Cruz has 68, Regência 59, Barra do Riacho 48, Conceição da Barra 37 and Barra Nova 28 with 14 in Barra Nova North and 14 in Barra Nova South (Figure 02 and 03). Boat length varied from two to 15 meters long with a mean value of nine meters (Figure 04) and crew size varied from one to 11, mostly with two or three fishermen (Figure 05).

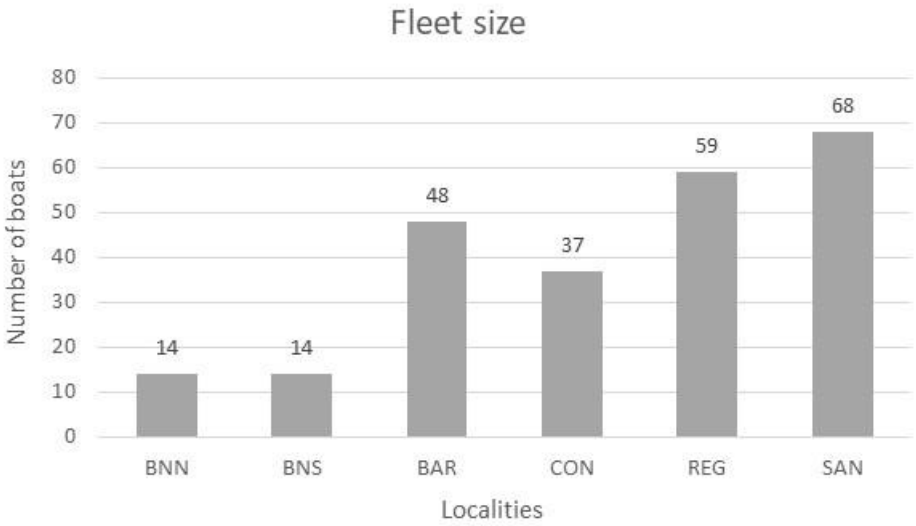

Figure 02. Number of boats (fleet size) recorded in each locality selected for monitoring the fisheries and evaluate franciscana bycatch of Espírito Santo State: Barra do Riacho (BAR), Barra Nova North (BNN), Barra Nova South (BNS), Conceição da Barra (CON), Regência (REG) and Santa Cruz (SAN). Frame survey data.

Figure 03. Boats used in Regência.

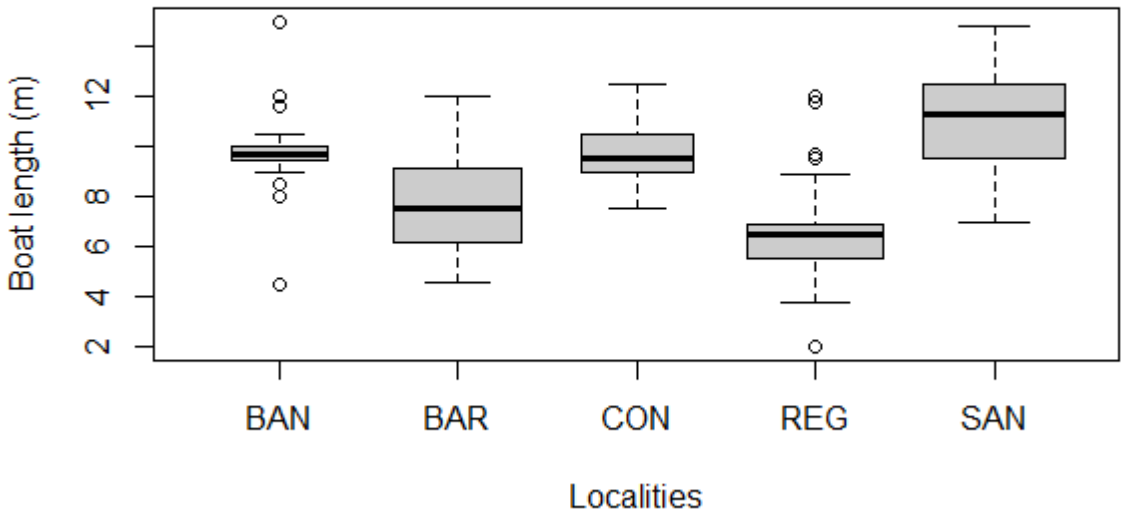

Figure 04. Boat length (in meters) recorded in each locality selected for monitoring the fisheries and evaluate franciscana bycatch of Espírito Santo State: Barra do Riacho (BAR), Barra Nova North (BNN), Barra Nova South (BNS), Conceição da Barra (CON), Regência (REG) and Santa Cruz (SAN). Frame survey data.

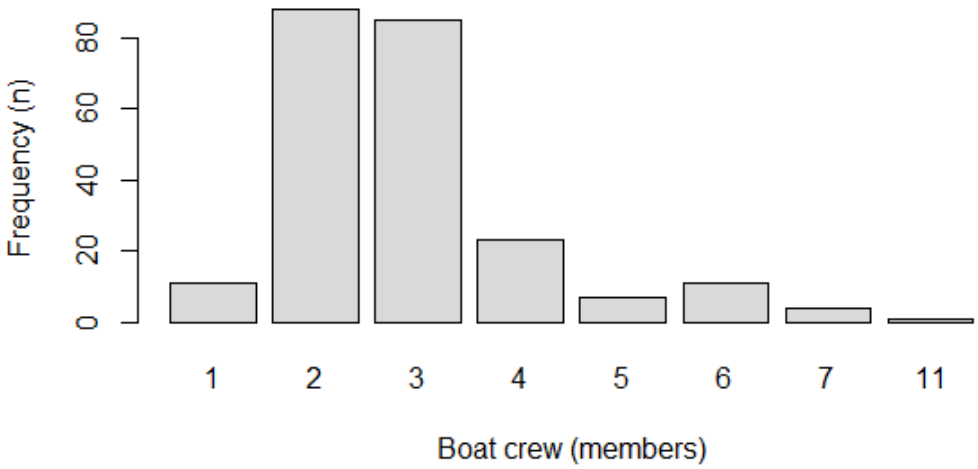

Figure 05. Frequency of crewmembers by boat recorded in the localities selected for monitoring the fisheries and evaluate franciscana bycatch of Espírito Santo State. Frame survey data.

The boats used from one to six different fishing gear, but 49.6% used only one type of gear. Considering only gillnets, there are six types: a combination of surface, midwater and bottom nets, either fixed or drifting. Most of the boats (62.4%) used only one type of gillnet but some boats used up to four different types (Figure 06).

The fishing boats used mainly bottom fixed gillnets (57.8%) followed by surface fixed gillnets (18.6%) as shown in Figure 07. The total length of the gillnets ranged from 90 to 16,668 meters with the upper average in Santa Cruz (5,556 meters) and the low average in Regência (1,875 meters) as shown in Figure 08.

We had 15.5% of responses confirming entanglements of dolphins in the last 12 months and 84.5% of responses denying entanglements, considering the data from frame survey.

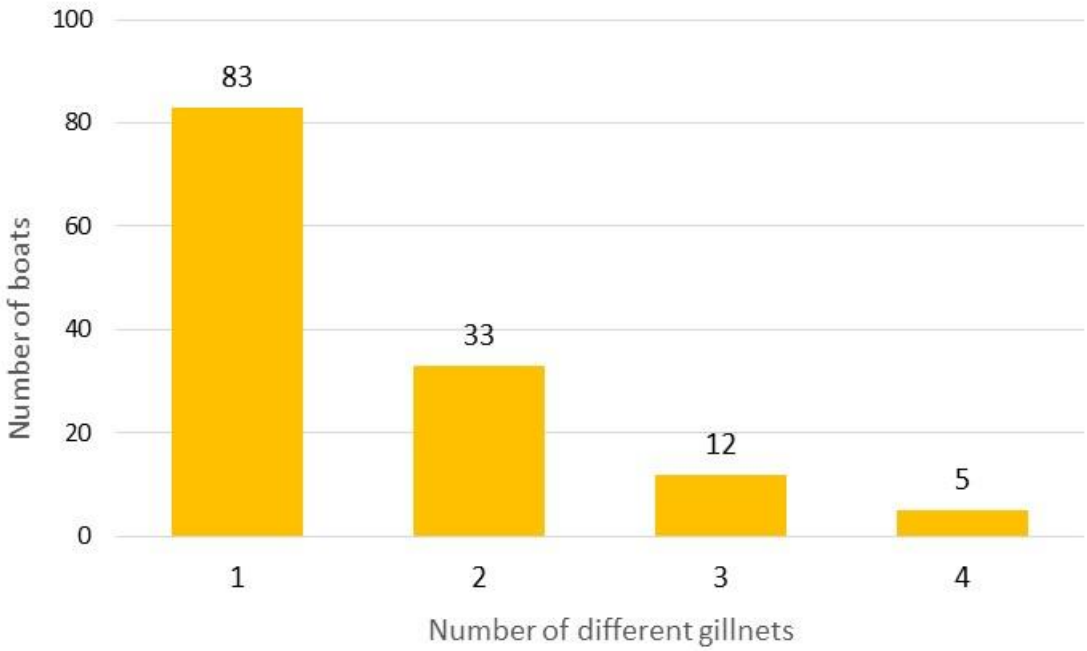

Figure 06. Number of different gillnets used by boats recorded in the localities selected for monitoring the fisheries and evaluate franciscana bycatch of Espírito Santo State. Frame survey data.

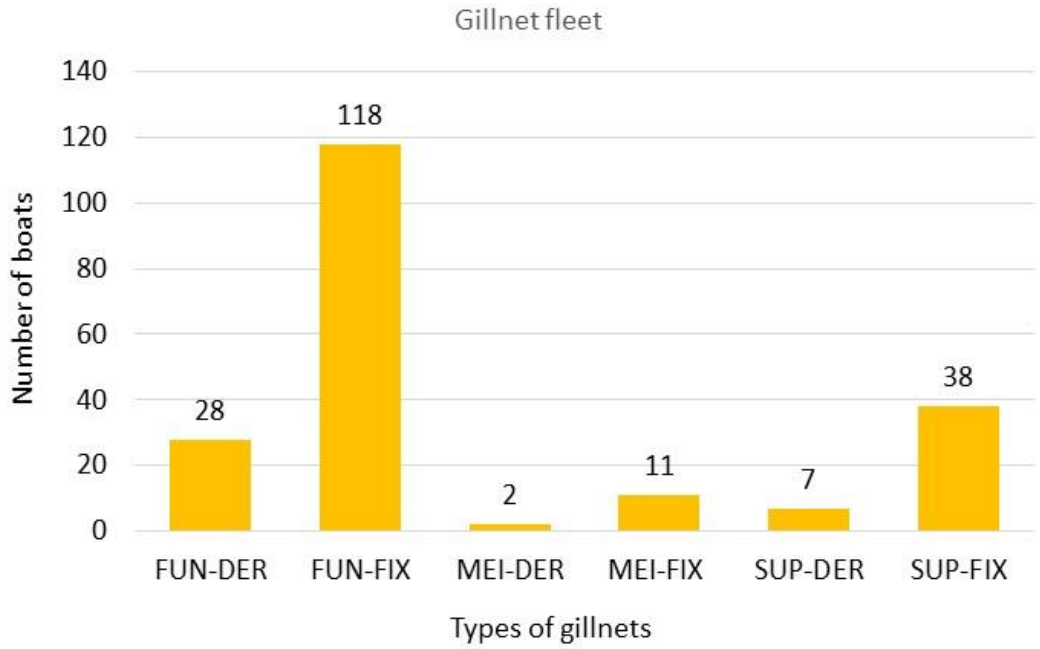

Figure 07. Gillnets used in in the localities selected for monitoring the fisheries and evaluate franciscana bycatch of Espírito Santo State: Bottom Drifting (FUN-DER), Bottom Fixed (FUN-FIX); Midwater Drifting (MEI-DER), Midwater Fixed (MEI-FIX); Surface Drifting (SUP-DER) and Surface Fixed (SUP-FIX). Frame survey data.

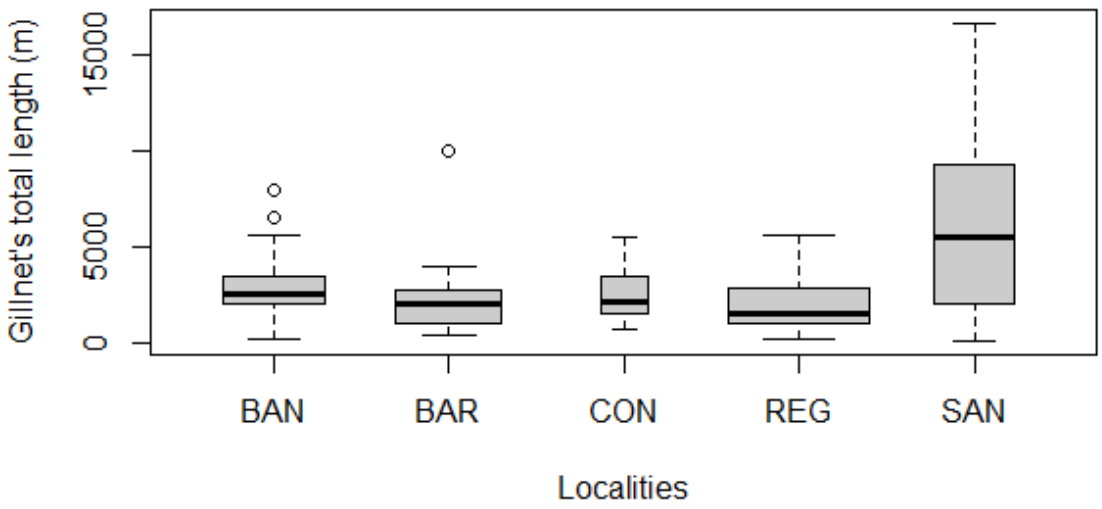

Figure 08. Gillnet's total length recorded in each locality selected for monitoring the fisheries and evaluate franciscana bycatch of Espírito Santo State: Barra do Riacho (BAR), Barra Nova North (BNN), Barra Nova South (BNS), Conceição da Barra (CON), Regência (REG) and Santa Cruz (SAN). Frame survey data.

The fishing landing survey started in July in Espírito Santo and until December were sampled 1,206 landings in the harbours (Figure 09) with 354 in Santa Cruz, 340 in Barra Nova (both North and South), 290 in Barra do Riacho, 152 in Conceição da Barra and 70 in Regência. Trawling was responsible for 53.8%, gillnets 22.1%, longline 11.1%, hook and line 10.6% and other types 2.4%. Considering only the gillnets sampled mostly were bottom fixed (83.9%) followed by bottom floating (13.3%).

Figure 09. Fishing landing survey in Barra Nova.

The time at sea ranged from one to 23 days (Figure 10) with most of the fisheries lasting from one to five days. The time at sea varied from each locality, with Santa Cruz and Conceição da Barra with the longest trips (23 and 15 days, respectively). The average time at sea for these two localities were three and two days and to the other places were one day (Figure 11).

Considering the depth of the fishing area, most of the fisheries occurred in shallow waters. The average depth was 26 meters for boats from Santa Cruz, 25 meters for those from Barra do Riacho, 16 meters for those from Conceição da Barra, 14 meters for Barra Nova and five meters for Regência (Figure 12). The main target of the fisheries were shrimps (*Xiphopenaeus kroyeri, Litopenaeus schmitti, Farfantepenaeus subtillis*) with 35.9% and dolphinfish (*Coryphaena hippurus*) 24.2%.

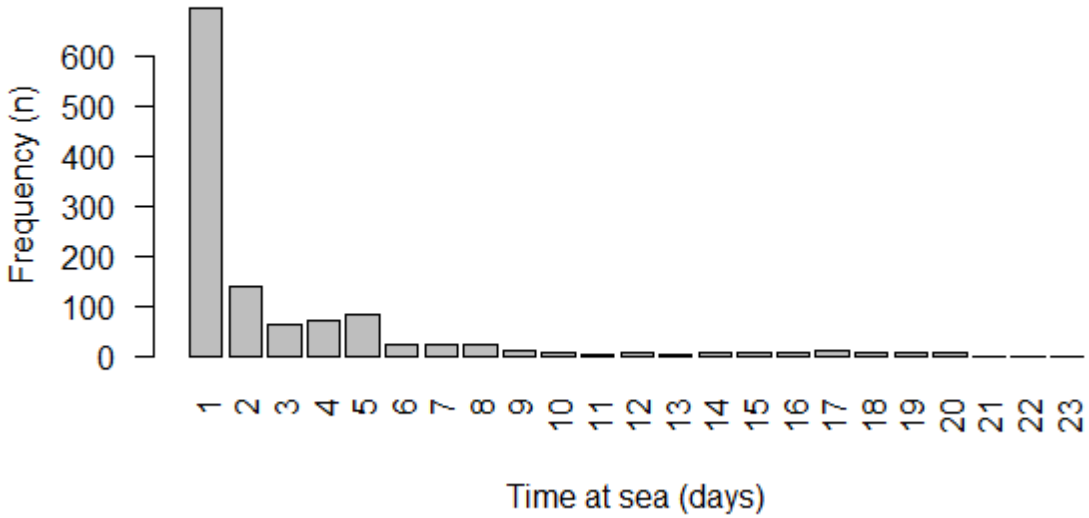

Figure 10. Frequency distribution of time at sea (in days) in the localities selected for monitoring the fisheries and evaluate franciscana bycatch of Espírito Santo State. Landing survey data from July to December 2017.

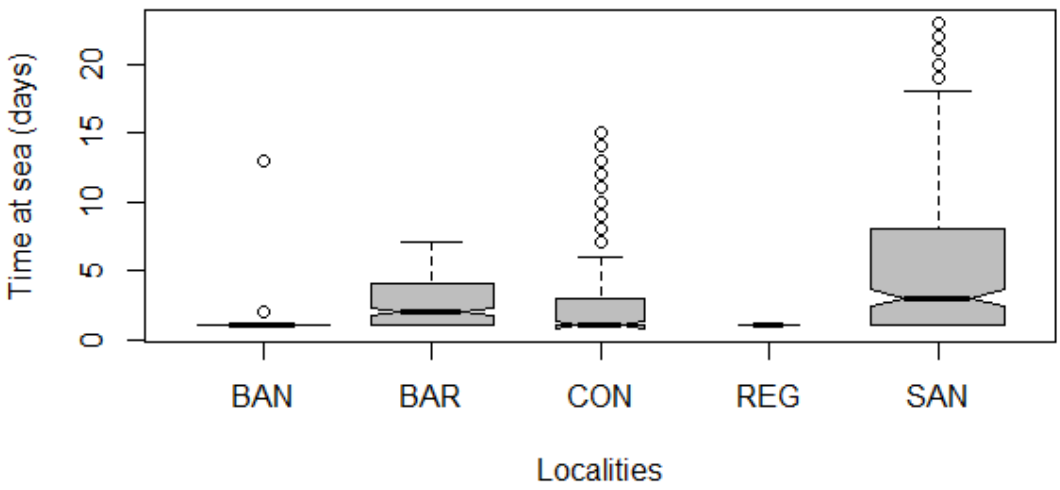

Figure 11. Time at sea (days) in each locality selected for monitoring the fisheries and evaluate franciscana bycatch of Espírito Santo State: Barra do Riacho (BAR), Barra Nova North (BNN), Barra Nova South (BNS), Conceição da Barra (CON), Regência (REG) and Santa Cruz (SAN).. Landing survey data from July to December 2017.

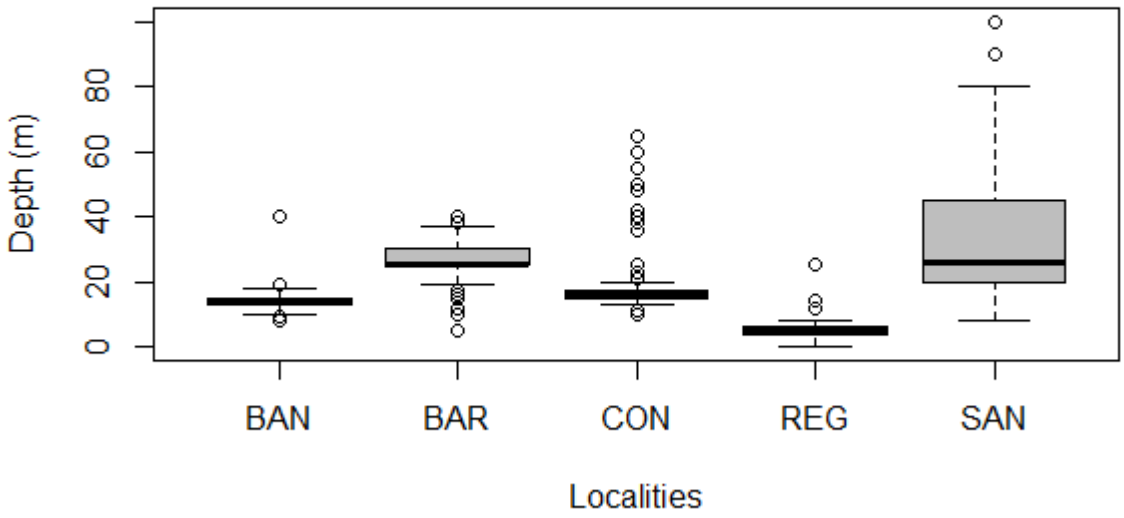

Figure 12. Depth of fishing operations (in meters) in each locality selected for monitoring the fisheries and evaluate franciscana bycatch of Espírito Santo State: Barra do Riacho (BAR), Barra Nova North (BNN), Barra Nova South (BNS), Conceição da Barra (CON), Regência (REG) and Santa Cruz (SAN). Landing survey data from July to December 2017.

From 1,206 fishing boats landings recorded, only seven (0.6%) reported bycatch of dolphins, totaling 10 animals. Forty landings (3.3%) did not want to inform and 1,159 (96.1%) informed they did not record bycatch during operations. Of those 10 dolphins, nine were identified as Guiana dolphin and one could not be identified. Seven animals were captured by boats from Santa Cruz and Conceição da Barra, while Barra Nova and Regência reported one animal for each. Two animals were captured in trawling nets and eight in gillnets (seven in bottom drifting and one in surface fixed).

From 2011 to 2017 we recorded 170 strandings of Guiana Dolphins and 41 of franciscanas in the study area. The Guiana dolphins ranged from six to 55 (average of 24.3 carcasses/year), and franciscana ranged from one to 14 (average of 5.9 carcasses/year). The ratio was 4.1 Guiana dolphins to one franciscana stranded. We observed a decline in strandings of both species in 2017 (Figure 13). Considering the time frame of the fisheries monitoring (July to December 2017), we recorded 23 strandings in the same area (22 Guiana dolphins and one franciscana).

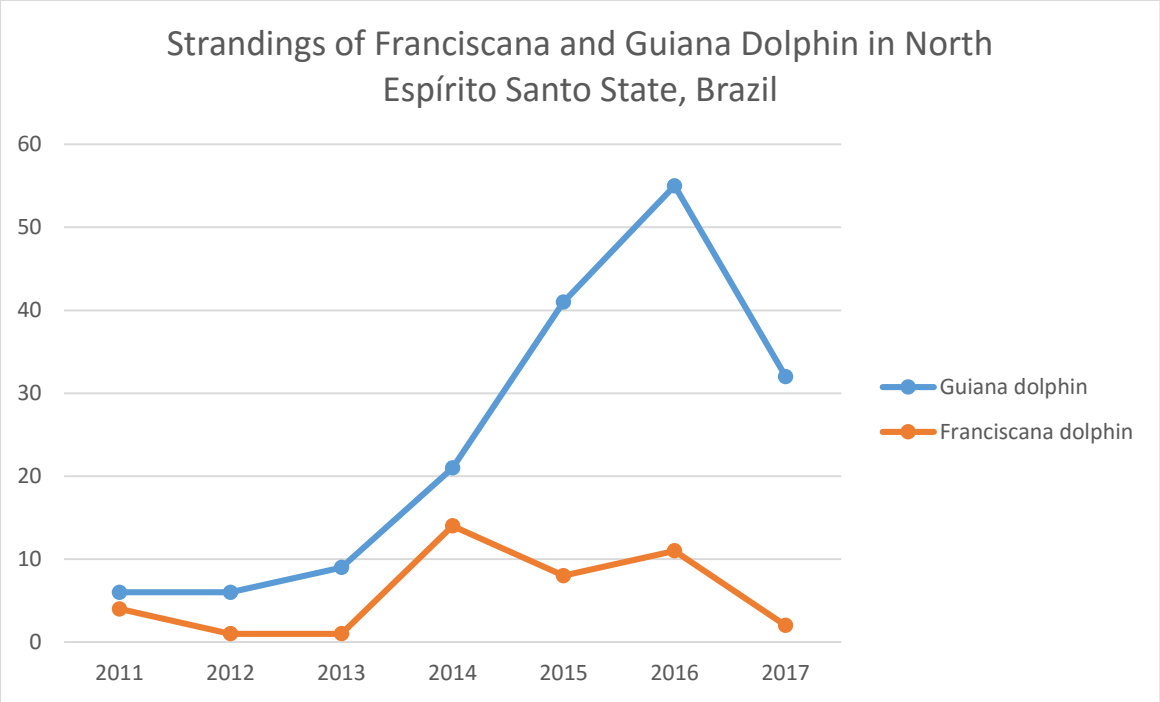

Figure 13. Strandings of Guiana and franciscana dolphins in the north of Espírito Santo State (2011-2017).

5. Discussion

The fishery in the North Espírito Santo State is artisanal in nature. The fleet in the five localities recorded was comprised of 240 boats, mainly wooden ones between two to 15 meters long with a mean value of nine meters. There are no large harbors and the communities are small and dispersed, with few people in each. The fishing boats use mainly bottom fixed gillnets and operate in shallow waters, which corresponds to the habitat of franciscanas (Danilewicz *et al*., 2009). Fishermen stay mainly one day at sea. The main target species during July to December were shrimps and dolphinfish.

Despite the nature of fishing in North Espírito Santo State its impact on franciscana should not be underestimated because gillnets of small fishing communities are also responsible for the accidental bycatch of franciscana (*e.g*.; Bertozzi & Zerbini, 2002; Di Beneditto, 2003; Frizzera *et al*., 2012). It is important to note that the abundance of franciscana in FMA Ia is probably the smaller along the species distribution (Freitas Neto & Barbosa, 2003; Freitas Neto & Siciliano, 2007; Cunha *et al*., 2014).

Cetacean bycatch was reported in at least 34.7% of the first round of interviews (SC/67A/SM/04) when we asked about cetacean capture at any time. During the frame survey we had 15.5% of responses confirming entanglements of dolphins in the last 12 months of fishing activities. During the landing survey the bycatch were reported in 0.6%. These numbers must be observed with caution. Many fishermen omit information about bycatch because they fear penalties. We will increase the monitoring through observers on board and with time we expect to have more confidence of the fishermen to report bycatch. There is also a difficulty in positive identification of cetaceans by some fishermen. Therefore, there are some mistakes especially between Guiana dolphin and franciscana, which makes it difficult to evaluate the actual impact of bycatch over a single species.

It is probable that fishing nets are the main factor related to franciscana strandings in Espírito Santo coast (Freitas-Neto & Barbosa, 2003; Frizzera *et al*., 2012; IBJ unpublished date). After a peak of strandings in 2016, there was a decline in records during 2017, especially concerning franciscanas. We do not know if this decline corresponds to less captures of Guiana dolphins and franciscana in the fisheries, if the effort of monitoring the beaches suffered any variation that led to diminished records or if there is a decline in the populations of one or both species.

Regência is located at the mouth of Doce River and suffered the impact of the rupture of the mine tailings dam of Samarco Mining Company in November 2015. This was the worst environmental disaster in Brazilian history, due to the release of toxic sludge containing several heavy metals and environmental contaminants without any effective mitigation measures being taken to remove it from the environment. This sludge reached the coastal

region and resulted in a fisheries closure down to 20 meters deep that remain in force until the present day. This situation reduced fisheries effort in Regência and made it more difficult to get data on the fisheries in this place. In our first round of interviews, Regência was the locality where most of those interviewed indicated to know franciscana and reported captures. The reduction of prey could affect franciscana feeding habits (Bassoi and Secchi, 2000) and contaminants could be accumulated through the trophic chain (Gerpe *et al*., 2000; Panebianco *et al*., 2012).

With the continued effort of monitoring we will cover a one year cycle and will have a better understanding of the fisheries in northern Espírito Santo. We are now mapping the main areas of the fisheries along the north coast of Espírito Santo and that information will be matched with data of aerial surveys of franciscana (another project supported by FUNBIO). This will help to identify areas used both by fisheries and franciscanas.

Bycatch of small cetaceans is a complex and serious problem worldwide and no simple solution seem to exist to tackle it. By deepening our understand of franciscana bycatch events in the study area, and strengthening ties with coastal communities involved, we hope to provide data and directions for the Brazilian authorities to address the problem in a pragmatic way, hopefully reducing its impact and ultimately contributing to the species' recovery not only in the study region, but throughout its range.

Future Directions

We will execute a mark-recapture experiment in 2018 with objects to simulate franciscana carcasses and evaluate the proportion of carcasses which arrive at the beaches. Fisheries monitoring will continue and will include on-board observers. We will increase the interaction with the fishermen to evaluate their perception of the bycatch and start to look for a possible solution.

Acknowledgements

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