Artisanal fishing in the municipality of Guarapari, state of Espírito Santo, Brazil: An approach to the perception of fishermen working in small-scale fishing

Juliana Silva de Abreu[1]
Ana Paula Madeira Di Beneditto[2]
Agnaldo Silva Martins [3]
Camilah Antunes Zappes[4]

Abstract

In the municipality of Guarapari, Espírito Santo (ES), southeastern Brazil, artisanal fishing is practiced along the coastline. The objective of this study is to describe the fishing activity practiced in the municipality of Guarapari (ES), southeastern Brazil based on the perception of artisanal fishermen. Ethnographic interviews were individually conducted by applying semistructured questionnaires through dialog with fishermen working in the region (n = 80). Information was also obtained through participant and direct observations recorded in a field diary. Data were organized into categories and analyzed using the triangulation method and descriptive statistics. All interviewees were men aged between 27 and 77 years and had a low level of schooling; fishing experience varied between 3 and 60 years. According to the fishermen, line, gillnet, harpoon and trawl line are the most commonly used. Fishing is developed along the coast of this municipality, especially in the areas near Três Ilhas, Rasas Islands and Escalvada Island, southeastern Brazil. In the perception of the interviewees, fishing is one of the main sectors of the local economy.

Keywords: Artisanal fisherman. Traditional knowledge. Mesoregion of Espírito Santo.

[1] Programa de Pós-Graduação em Geografia, Universidade Federal Fluminense, Departamento de Geografia de Campos, Campos dos Goytacazes, RJ, Brasil. juliana_abreu@id.uff.br
[2] Universidade Estadual do Norte Fluminense Darcy Ribeiro, Laboratório de Ciências Ambientais, Campos dos Goytacazes, RJ, Brasil. anadibeneditto@gmail.com
[3] Programa de Pós-Graduação em Oceanografia Ambiental, Universidade Federal do Espírito Santo, Goiabeiras, Vitória, ES, Brasil. agnaldo.ufes@gmail.com
[4] Programa de Pós-Graduação em Geografia, Universidade Federal Fluminense, Departamento de Geografia de Campos, Campos dos Goytacazes, Brasil. camilahaz@yahoo.com.br

Introduction

Artisanal fishermen mainly work in inland and coastal waters, where fishing is usually their only source of income (FAO, 2012). This is an activity performed by professionals who can work alone or in partnership with family members or local community actors and catch fish using low-tech gear, such as manually launched lines and gillnets and relatively simple and basic navigation and fishing technologies, such as radio communication and small-sized wooden vessels (DIEGUES, 1988). Production is considered small scale, and the products caught are usually resold and/or marketed through middlemen or directly to the end consumer (BEGOSSI et al., 2010).

Artisanal fishermen are in constant contact with the marine environment and develop knowledge about the local ecosystem (ZAPPES et al., 2016a). This traditional knowledge is developed from cognitive and cultural practices and transmitted orally in communities (DIEGUES, 1988). Under Brazilian law, traditional knowledge is defined as "information or practice of indigenous peoples, traditional community or traditional farmers on the properties or direct or indirect uses associated with genetic heritage" (Federal Law No. 13.123/2015 Art. 2 subsection II). This knowledge assists in the creation and/or restructuring of management plans relevant to fishing resources, aiming at sustainable exploitation, facilitates the conservation and use of natural resources, and contributes to the maintenance of artisanal fishing as a local cultural activity (KALIKOSKI et al., 2006).

According to the Food and Agriculture Organization of the United Nations (FAO), global fish production in 2015 reached 199.7 million tons, with approximately 94 million coming from artisanal catches (FAO, 2016). With an approximate production of 842.00 tons, Brazil ranks 21st in the world, and the largest producers in Brazil are the states of Santa Catarina (SC) (200,000 tons), Pará (PA) (150,000 tons) and Maranhão (MA) (100,000 tons) (FAPAES, 2015). The state of Espírito Santo (ES), southeastern Brazil, has a coastline 521 km long, and artisanal fishing is practiced throughout the 14 coastal municipalities, which house 48 fishing communities and approximately 15,000 fishermen (FAPAES, 2015; KNOX; TRIGUEIRO, 2015). In 2010, there were approximately 11,600 jobs generated from artisanal fishing in ES, which indicates the importance of the activity to the state (KNOX; TRIGUEIRO, 2015). In the 2000s, the state fishing production ranged from 12,000 to 21,000 tons; however, the most recent data released in 2015 show a catch of approximately 9,000 tons, which indicates a drop in production. The main species caught are mahi-mahi (*Coryphaena hippurus*), Atlantic seabob (*Xiphopenaeus kroyeri*), yellowfin tuna (*Thunnus albacares*), skipjack tuna (*Katsuwonus pelamis*), red snapper (*Lutjanus purpureus*), tiger shark (*Galeocerdo signatus*), whitemouth croaker (*Micropogonias furnieri*), bigtooth corvina (*Isopisthus*

parvipinnis) and smooth puffer fish (*Lacephalus laevigatus*) (FAPAES, 2015).

In the municipality of Guarapari (20°38'S - 40°27'W), on the southern coast of ES, fishing is predominantly artisanal due to the relevance of historical, social and economic factors, in addition to the use of small-scale production means and gear, which include lines, gillnets and traps (NETTO; DI BENEDITTO, 2007; CARVALHO, 2014; LIMA et al., 2018). In 2011, fishing production in the municipality totaled approximately 300 tons of fish and 106 tons of crustaceans (INCAPER, 2013; BOLETIM ESTATÍSTICO DA PESCA E AQUICULTURA, 2011). In 2016, the gross domestic product (GDP) per capita of Guarapari generated approximately BRL 17,098.94, with fishing activity accounting for 7% of this GDP (IBGE, 2017). In 2016, artisanal fishing, which is part of the agricultural sector, generated BRL 47 million for the municipality, which demonstrates the economic importance of this activity for the region (IJSN, 2018).

As in other regions of the Brazilian coast, fishermen in Guarapari, face difficulties in catching fish because the location of schools is increasingly distant from the coastline, due to overfishing, which increases activity costs and risk for the fisherman (SILVA, 2014; KNOX; TRIGUEIRO, 2014; MUSIELLO-FERNANDES et al., 2018). Thus, to understand how artisanal fishing is practiced in the region, the objective of this study is to describe how fishing is practiced in Guarapari based on the perception of artisanal fishermen working in the region.

Material and Methods

Study area

The municipality of Guarapari has 123,166 inhabitants (IBGE, 2017) and is located approximately 50 km from the municipality of Vitória, capital of ES (Figure 1). It has approximately 1,400 active fishermen and 346 registered vessels in the General Register of Fishing Activities (acronym in Portuguese: RGP – Registro Geral da Pesca), responsible for the registration of vessels and fishermen in the ES. In the municipality, there are four ports for fish disembarkation located in the neighborhoods of Perocão, Barra do Una, Meaípe and downtown (FAPAES, 2015).

Local development began in the 1950s, with economic activities related to civil construction, agriculture, livestock, fishing and especially tourism. The natural landscape of the region attracts numerous tourists annually, resulting not only in economic growth but also in urban expansion. During Carnival in 2016, the municipality welcomed 43,711 tourists, and in the summer months of 2017, 151,636 tourists visited the region (SETUR, 2016; 2017). The flow of people, goods, interventions and investments define the integration of this municipality into a national tourism destination, leading to the occasional use of households ("second homes") in coastal areas (PIRES, 2016). This expansion led to intense coastal occupation and irregular occupation of areas with greater environmental fragility, such as river banks, wetlands and mangroves (PIRES, 2016).

Figure 1 - Location of the municipality of Guarapari, Espírito Santo, southeastern Brazil, and of the coastal islands and artificial reef/shipwreck, whose surroundings represent important fishing grounds in the region.
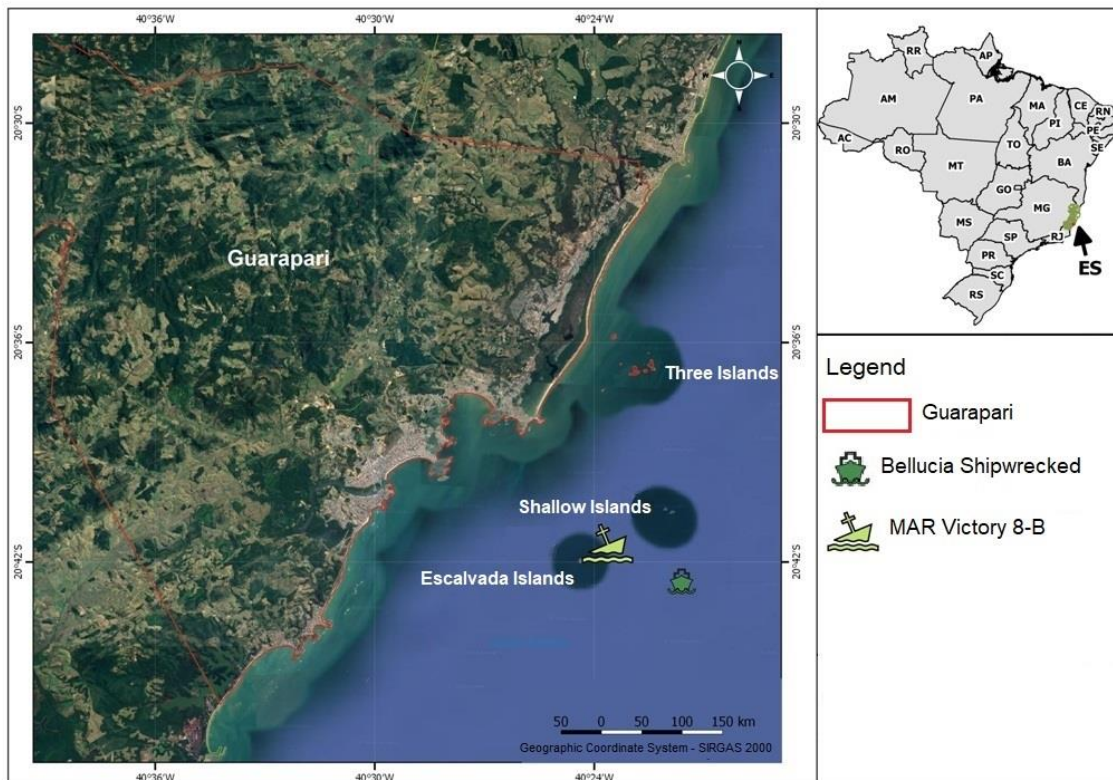
Source: the author, 2019.

Fishing Locations

The coast of the municipality of Guarapari (ES) has topographic irregularities due to the presence of submerged reefs, calcareous algal banks and an insular complex (GUAITOLINI, 2010). This complex is composed of rock formations such as Três Ilhas, Rasas Island and Escalvada Island, whose surroundings are important fishing grounds for local vessels. Três Ilhas (20°40'S – 40°19'W) is formed by five small islands 3.5 km from the coast at depths ranging from 5 to 15 m, with water visibility to 20 m (FLOETER et al., 2007). The region has natural pools, coral reefs, sandy bottom, and wide diversity of fish species

(FLOETER et al., 2007). The Rasas Islands (20°40'S – 40°21'W) are composed of a set of slabs 11 km from the coast, with depths of up to 20 m, and the bottom includes rock formations covered by cnidarians (GUAITOLINI, 2010). Escalvada Island (20°42'S – 40°24'W) is located 10 km from the coast and is surrounded by extensive sandy substrate and a dense benthic cover comprising algae and cnidarians under the direct influence of currents and waves and a maximum depth of 23 m (CORREA; KROHLING, 2010). In addition to these islands, in the coastal region, there is Marine Artificial Reef (MAR) Victory 8-B (20°41'S – 40°23'W) and the shipwreck Bellucia (20°40'S

– 40°21'W), which act as important areas for fish feeding, spawning and protection and areas where artisanal fishing production is high because of the high concentration of species of commercial value (RECASENS et al., 2006).

Procedures

Individual ethnographic interviews with artisanal fishermen (n = 80) were conducted between December 2017 and January 2018 through dialogs to ensure robust information on artisanal fishing practiced in the region (SCHENSUL et al., 1999). Before each interview, the objectives of the study were explained to each fisherman, each fisherman was informed that the interview was anonymous, and each fisherman was asked if he was willing to participate. Terms of Prior Consent for this study was obtained from the president of Fishermen's Colony Z-3, who is the legal representative of this category of workers in the region (AZEVEDO, 2005). The research project to which this study is linked was submitted to the Brazil Platform and approved by an ethics committee (CAAE: 03219018.0.0000.5243), in addition to being registered in the Management of Genetic Heritage and Associated Traditional Knowledge National System (acronym in Portuguese: SISGEN – Sistema Nacional de Gestão do Patrimônio Genético e Conhecimento Tradicional Associado), electronic system created in compliance with the legislation in force (Federal Law 13.123 of May 20, 2015) as an instrument to assist the

Genetic Heritage Management Council (acronym in Portuguese: CGen – Conselho de Gestão do Patrimônio Genético) in the management of heritage, associated genetic and traditional knowledge.

In the first phase of the 10-day study, participation and direct observation were applied through the presence of two researchers and consisted of integrating the researchers into the group studied to understand local routines (MALINOWSKY, 1978). At the end of each observation day, a field diary was used to record additional observations regarding the fishermen's routine (CLIFFORD, 1998). In the second phase of the study, a semistructured questionnaire with open (n = 52) and closed questions (n = 14) was used; however, there was flexibility to add reports from fishermen when necessary (SCHENSUL et al., 1999). The number of interviews (n = 80) proved to be adequate because, generally, after the tenth interview, the pattern of responses among respondents was repeated, and little new information was added to the subject (THIRY-CHERQUES, 2009).

In qualitative studies, new data may become repetitive because they may not present new information related to the study objectives (MASON, 2010). Frequencies with large sample sizes are rarely important in this type of study, especially if they involve cultural perception (CROUCH; MCKENZIE, 2006). Moreover, the level of reality in some reports cannot be quantified because it is related to culture and symbolism, which cannot be reduced to variables (KENDALL,

2008). Thus, reports from local actors allow the observation of the relationship between people and the environment they inhabit. Thus, studies related to traditional knowledge indicate an ideal sample size between 30 and 60 interviews to collect information on a given population stratum (MORSE, 1994; BERNARD, 2000; MASON, 2010). This explains the sample size in this study.

The choice of the first interviewee occurred through help from the president of Fishermen Colony Z-3. From the second interview, the snowball method was used, which consists of the referral of a possible interviewee by fishermen who had already been interviewed (BAILEY, 1982). This method could be interrupted at any time, and new interviewees were randomly selected through opportunistic encounters with fishermen during field work. This randomness allowed obtaining reports from fishermen from different community political groups and avoided perceptual tendencies. The interviewees met the following selection criteria: 1) artisanal fisherman registered in the Z-3 Fishermen's Colony; 2) practiced artisanal fishing as the main source of income; and 3) practiced artisanal fishing on the coast of the municipality of Guarapari.

Data analysis

The reports were organized into categories related to the questionnaire, which allowed the grouping of reports and information by topic, facilitating the interpretation of the interviews (BOGDAN; BIKLEN, 1994; RYAN;

BERNARD, 2000). The themes or keywords used to interpret the reports were sex, age, experience in fishing, schooling, fishing time and period, time of boarding, fishing areas, fisheries, islands, artificial reef Victory 8-B, shipwreck, type and characteristics of vessels, fishing gear and artifacts, fish, and target species. Discourse analysis, which is the use of speech and language to understand the meaning of social and cultural aspects, was used for the analysis of the reports (ORLANDI, 2010). The triangulation method was used to cross the information collected with the ethnographic tools (participant and direct observations, field diary, interviews-questionnaires), broadening the understanding of the object of study (TEIS; TEIS, 2006). To compare the information contained in the respondents' speeches, the repeated information technique was used in a synchronous situation, in which the same questionnaire was applied to all interviewees on different days (GOLDENBERG, 1999; OPDENAKKER, 2006). Thus, it was possible to obtain fidelity in the reports and establish comparisons between the information contained in the speeches of the interviewees (SILVA; FOSSÁ, 2015).

Results and Discussion

Respondents profile

The fishermen interviewed are men between 27 and 77 years old, with up to 60 years of experience in artisanal fishing and a low level of education; the majority (n = 68; 85%) did not

complete elementary school (Figure 2). A total of 60% of the fishermen (n = 48) work from before dawn until the evening, i.e., they leave at approximately 2:00 am and return at 6:00 pm. Some fishermen remain up to 1 day (24 hours) on board (Figure 3). All respondents fish year round.
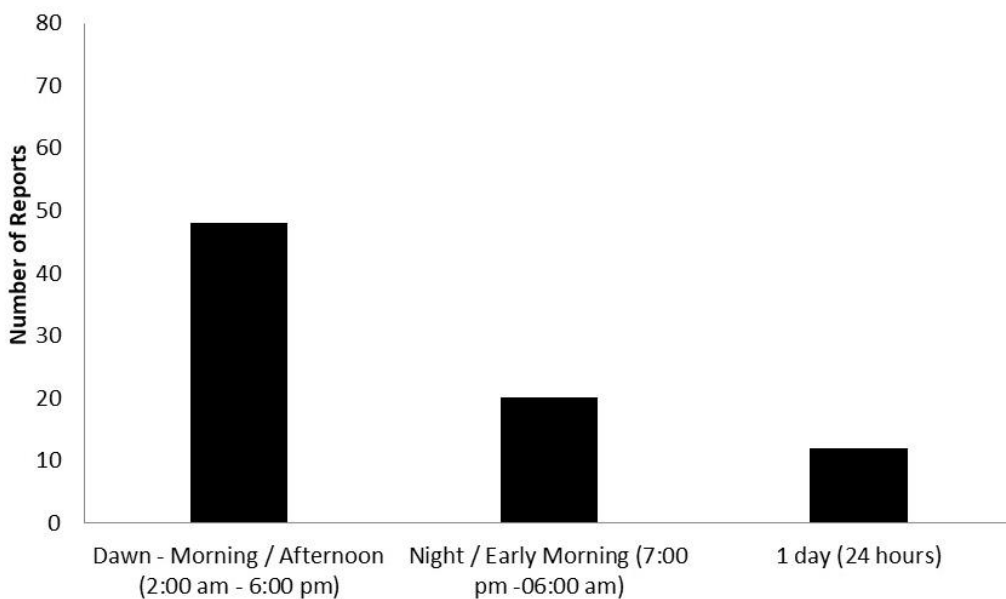
Figure 2 – Schooling level of the fishermen of Guarapari, Espírito Santo, southeastern Brazil, according to reports of the fishermen interviewed.
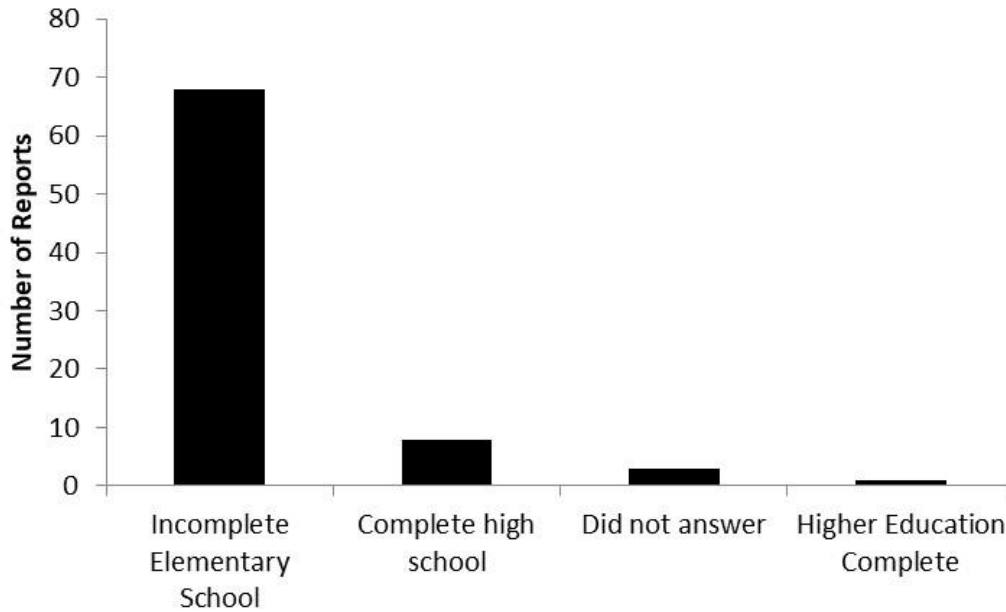
Source: the author, 2019.

Figure 3 – Period of artisanal fishing in Guarapari, Espírito Santo, southeastern Brazil, according to reports of the fishermen interviewed.

Source: the author, 2019.

The characteristics of Guarapari's fishermen reflect the social reality of artisanal fishing practiced in Brazil by middle-aged men, with decades of work in the profession, a low education level and, therefore, a high degree of dependence on the activity for their livelihood (ALVES et al., 2018; ZAPPES et al., 2016b; MUSIELLO-FERNANDES et al., 2018). In fishing communities, young people engage in fishing activity early in life to earn family income, leading to dropout and low levels of education of those in this profession (OLIVEIRA et al., 2016; ABREU et al., 2017).

The low level of schooling and insecurity of everyday life at sea can affect the socioeconomic status and interfere with the quality of life of those who depend on fishing, leading them to engage in other economic activities in parallel with fishing to obtain financial security, such as informal tour guides and janitors (MUSIELLO-FERNANDES et al., 2018; DOMINGUEZ et al., 2016; SAAVEDRA-DÍAZ et al., 2015), as described in the fiherman's report below:

> "In the past, I could support my family with fishing only, now I can barely buy milk for my grandson. I have to have side jobs to earn enough money for food."

Characterization of artisanal fishing practiced in the municipality of Guarapari, (ES), southeastern Brazil

According to the interviewees (n = 46; 57.5%), artisanal fishing is practiced along the entire coast of Guarapari especially in the area encompassing Três Ilhas, Rasas Islands, Escalvada Island, MAR Victory 8-B and the Bellucia shipwreck (Figure 1). These coastal islands have high biodiversity and provide a habitat for several marine species (ROCHA et al., 1998; COSTA et al., 2014) and MAR Victory 8-B and the Bellucia shipwreck also attract several species, including fishery resources. Thus, the area is a fishery rich in biodiversity that attracts the attention of artisanal fishermen in search of commercial fish.

The fishing gear used in the region is described in Table 1; the most commonly used is line (n = 78; 79%), followed by gillnets (n = 16; 16%), harpoon (n = 2; 2%) and trawl line (n = 2; 2%). Each fisherman uses more than one type of gear, which explains the number of responses (n = 99) greater than the number of respondents (n = 80). The variety of fishing gear is related to the varied environments exploited, as well as diversified fish production, which is a characteristic of coastal artisanal fishing (LIMA et al., 2018).

Table 1 – Fishing gear used in the municipality of Guarapari, Espírito Santo, southeastern Brazil, according to reports by the fishermen interviewed.

Fishing gear	Features
Line (n= 78; 79%)	Made of nylon, it can be up to 100 m long and between 0.2 and 0.8 mm thick. It is thrown at depths of 5 to 1,000 m and used throughout the year.
Gillnet (n= 16; 16%)	It has a length of 15 to 50 m, a mesh between 30 and 75 mm, 4 to 8 cm diameter buoys in the upper mooring line and 50 g lead weights in the lower mooring line (to ensure the gillnet is stretched in the water). The net is positioned at depths of 15 to 50 m. In some cases, there are treble hooks (or anchors) and flags that mark the location where the gillnet is stretched. It is used year-round.
Harpoon (n= 2; 2%)	Used in apnea diving or diving with the use of an oxygen tank, with a crossbow (harpoon firing gun). It is operated approximately 30 m deep, throughout the year.
Trawl line (n= 2; 2%)	A 100 m-line on which up to 25 hooks are attached. Buoys are placed at the extremities to facilitate locating the gear, which is thrown at a depth of 5 m and used throughout the year.

Source: the Author, 2018.

The line is also described by LIMA et al. (2018) as one of the most used gear in the port of Guaxindiba, located on the northern coast of the state of Rio de Janeiro, in the vicinity of an artificial reef complex installed more than 20 years ago. This gear has adequate operational conditions of use in areas close to MARs, algae banks and rocky bottoms (MARTINS et al., 2005). Other factors that encourage its use are the low operating cost and the target species are highly accepted by the consumer market (MARTINS et al., 2005).

Fishermen cited several species of bony fish as preferential targets of fishing practiced in the region (Table 2). These resources are described as demersal species that live in the vicinity of MARs, in addition to pelagic species that visit nearby areas in search of prey (CLARK et al., 1997; LIMA et al., 2018). The vessels, which are made of wood, can have or not have a boathouse, vary between 5.5 and 11 m in length, and utilize motors that range in power from 10 to 140 HP (Figure 4A, 4B). Such boats have limitations regarding fishing autonomy; they can only remain at sea up to one day (24 hours) because of a lack of a cold chamber to store fish for several days, a lack of accommodations for the crew, a fuel tank adapted for short trips, and little space on the deck for the crew to work safely (FREITAS NETTO; DI BENEDITTO, 2007; ISAAC et al., 2011).

Table 2. Target species caught by artisanal fisherman in Guarapari, Espírito Santo, southeastern Brazil, according to reports by the fishermen interviewed.

Ethnospecies	Probable family ∞	Probable identification	Habit *	Fishing gear #
Weakfish	Sciaenidae	*Cynoscion* sp.	D	GN/L
Weakfish	Sciaenidae	*Isopisthus parvipinnis*	D	GN/L
Croaker	Sciaenidae	*Micropogonias furnieri*	D	GN/L
Sarda	Scombridae	*Sarda sarda*	P	L/H
Skipjack tuna	Scombridae	*Katsuwonus pelamis*	P	L
Pufferfish	Tetraodontidae	*Lacephalus laevigatus*	D	L
Mahi-mahi	Coryphaenidae	*Coryphaena hippurus*	P	L/LTL
Queen triggerfish	Balistidae	*Balistes vetula*	D	L
Yellowtail amberjack	Carangidae	*Seriola lalandi*	D	L
Whiting	Serranidae	*Mycteroperca bonaci*	D	L
Grouper	Serranidae	*Epinephelus marginatus*	D	L
Snowy grouper	Serranidae	*Epinephelus niveatus*	D	L
Sea bass	Centropomidae	*Centropomus undecimalis*	D	GN/L
Caitipa mojarra	Gerreidae	*Diapterus rhombeus*	D	GN
Red snapper	Sparidae	*Lutjanus purpureus*	D	L
Tiger shark	Carcharhinidae	*Galeocerdo signatus*	D	L
Dog snapper	Lutjanidae	*Lutjanus jocu*	D	L
Atlantic goliath grouper	Serranidae	*Epinephelus itajara*	D	L
Beltfish	Trichiuridae	*Trichiurus lepturus*	D	L
Tuna	Scombridae	*Thunnus* sp.	P	L/ LTL
Anchovy	Pomatomidae	*Pomatomus saltatrix*	P	L
King mackerel	Scombridae	*Scomberomorus cavalla*	P	L
Yellowtail kingfish	Carangidae	*Seriola lalandi*	D	L
Yellowtail snapper	Lutjanidae	*Lutjanus chrysurus*	D	L
Namorado sandperch	Pinguipedidae	*Pseudopercis numida*	D	L

Legend: ∞ BOLZAN, 2014; * VIEIRA; GASPARINI, 2007; * MARTINS et al., 2005; ∞ BERTONCINI et al., 2013; o D – demersal, P – pelagic; # L – line, GN – gillnet, LTL – long trawl line, H – harpoon. Source: the Author, 2018.

Figure 4 – A) Ships with no boathouse and B) vessels with a boathouse, both used in artisanal fishing practiced in the municipality of Guarapari, Espírito Santo, southeastern Brazil.

Source: from the author, 2018.

In the region, there are no suitable places for artisanal fishermen to sell fish or moor fishing vessels. This causes fishermen to improvise, using inappropriate places, which can damage vessels, as described in the following report from a fisherman regarding the lack of vessel-mooring sites:

> "We have no place to anchor the boats to unload, and there is no place to 'sell' our fish… we often improvise a boat dock, and we pass the fish to other people to resell it for twice the price."

Small vessels are favored because of the ability to navigate in shallow waters closer to the coast but are limited regarding long distance voyages to fishing grounds (MARTINS et al., 2011). In the mesoregion of the ES coast, southeastern Brazil, artisanal fishermen have demanded the construction of docks for unloading fish as well as places suitable for selling fish and disposing of waste derived from the processing of caught products. Such improvements are directly related to the success of fishing activity and the production chain involved (MUSIELLO-FERNANDES et al., 2018).

Final Considerations

The fishing activity in Guarapari (ES), southeastern Brazil, is typically considered artisanal and can be characterized by fishing modality, fish species, equipment used, vessel motorization and length of stay of the fisherman at sea. According to the fishermen interviewed, the area used for fishing encompasses the entire coast of the municipality, especially areas close to natural islands and artificial structures.

Fishing in the region is one of the main subsistence sectors, although it is not the only activity utilized by fishermen to address the insecurity of daily life and compensate for a low education level. Because of financial insecurity and a low education level,

fishermen perform other activities to supplement family income. In addition, a low educational level can affect the socioeconomic status and interfere with the quality of life of those who depend on fishing because fishermen may have difficulty organizing themselves as a group to fight for their rights.

With the information obtained in this study, it was possible to understand the perception of artisanal fishermen operating in the municipality of Guarapari, ES, southeastern Brazil. Such data are important to environmental management agencies in the region because the dialog between local actors and governors is facilitated by understanding the lives of fishermen, which helps in fishing management and in the resolution of possible conflicts between those involved.

Acknowledgments

References

ABREU, J. S.; DOMIT, C.; ZAPPES, C. A. **Is there dialogue between researchers and traditional Community members? The importance of integration between traditional knowledge and scientific knowledge to coastal management**. Ocean; Coastal Management. v. 141. p. 10–19, 2017. https://doi.org/10.1016/j.ocecoaman.2017.03.003

ALVES, L. D.; BULHÕES, E. M. R.; DI BENEDITTO, A. P. M. **Ethnoclimatology of Artisanal fishermen:** Interference in coastal fishing in southeastern Brazil. Marine Policy, v.96. p. 69-76, 2018. https://doi.org/10.1016/j.marpol.2018.07.003

AZEVEDO, C. M. A. **A regulamentação do acesso aos recursos genéticos e aos conhecimentos tradicionais associados no Brasil.** São Paulo: Biota Neotropica, v5, n1, 2005. https://doi.org/10.1590/S1676-06032005000100002

BAILEY, K. D**.** *Methods of Social Research.* 2ed. New York: McMillan Publishers. The Free Press. 1982.

BEGOSSI, A.; LOPES, P. F.; OLIVEIRA, L. E. C.; NAKANO, H**. Ecologia de Pescadores Artesanais da Baía de Ilha Grande**. São Carlos: Rima Editora, FAPESP, p. 298, 2010.

BERNARD, H. R. **Social research methods:** qualitative and quantitative approaches. California: Sage Publications, Thousand Oaks, p. 412, 2000.

BERTONCINI, A.; RANGEL, C.; CHAVES, L.; MENDONÇA-NETO, J.; MONTEIRO-NETO, C. Peixes Recifais do Monumento Natural das Ilhas Cagarras. In: MORAES, F.; BERTONCINI, A.; AGUIAR, A. (Org.). **História, Pesquisa e Biodiversidade do Monumento Natural das Ilhas Cagarras.** Rio de Janeiro: Museu Nacional, p.107-138, 2013.

BOGDAN, R.; BIKLEN, S. **Características da investigação qualitativa. In: Investigação qualitativa em educação:** uma introdução à teoria e aos métodos. Porto Editora. Porto, p.47- 51, 1994.

BOLETIM ESTATÍSTICO DA PESCA E AQUICULTURA. 2011. Available at < http://www.icmbio.gov.br/cepsul/images/stories/biblioteca/download/estatistica/est_2011_bol__bra.pdf > Access on May 21, 2018.

BOLZAN, M. S. **Peixes em Áreas Rasas do Estuário do rio São Mateus, Espírito Santo**. Dissertação de Mestrado. Programa

de Pós-Graduação em Biodiversidade Tropical. Universidade Federal do Espírito Santo, São Mateus, 2014.

BRASIL. **Lei Federal nº 13.123 de 20 de Maio de 2015**. Regulamenta o inciso II do § 1o e o § 4o do art. 225 da Constituição Federal, o Artigo 1, a alínea j do Artigo 8, a alínea c do Artigo 10, o Artigo 15 e os §§ 3º e 4º do Artigo 16 da Convenção sobre Diversidade Biológica, promulgada pelo Decreto no 2.519, de 16 de março de 1998; dispõe sobre o acesso ao patrimônio genético, sobre a proteção e o acesso ao conhecimento tradicional associado e sobre a repartição de benefícios para conservação e uso sustentável da biodiversidade; revoga a Medida Provisória no 2.186-16, de 23 de agosto de 2001; e dá outras providências. Diário Oficial da República Federativa do Brasil. Brasília, 2015.

CARVALHO, R. H. **CONHECIMENTO LOCAL DE PESCADORES EM RELAÇÃO A CONSERVAÇÃO DE TARTARUGAS MARINHAS (REPTILIA: TESTUDINES) NO SUL DO ESPÍRITO SANTO, BRASIL.** Dissertação de Mestrado. Programa de Pós-Graduação em Ciências Biológicas Comportamento e Biologia Animal da Universidade Federal de Juiz de Fora, Juiz de Fora, 2014.

CLARCK, R. B.; FRID, C.; ATTRILL, M. Marine Pollution. Oxford. Claredon Press. 161p., 1997.

CLIFFORD, J. Sobre a autoridade etnográfica. In: GONÇALVES, J. R. S. **A experiência etnográfica: antropologia e literatura do século XX.** Rio de Janeiro: Editora UFRJ, p.17-6, 1998.

CORREIA, L. B.; KROHLING, W. **Densidade e distribuição vertical de peixes Pomacanthidae (Teleostei) na Ilha Escalvada, Guarapari – ES**. Natureza online, v.8, p. 1-7, 2010.

COSTA, E. S.; ANDRADE, R. R.; JUNIOR, L. B.; GAIGHER, L. P.; OLIVEIRA, C. M. S.; JUNIOR, C. D.; NETO, R. R. **Controls on Temporal and Spatial Variation of Nutrients in a Tropical Marine Artificial Reef:** The Case of the Victory 8B on the Southeastern Brazilian Coast. Revista Virtual de Química, v. 6, p. 834-843, 2014.

CROUCH, M., MCKENZIE, H. **The logic of small samples in interview-based qualitative research.** Social Science Information, v.45, p. 483-499, 2006. https://doi.org/10.1177/0539018406069584

DIEGUES, A. C. **Pesca artesanal no litoral brasileiro:** Cenários e Estratégias para sua

sobrevivência. São Paulo. Instituto Oceanográfico, 287p, 1988.

DOMINGUEZ, P. S.; ZEINEDDINE, G. C.; ROTUNDO, M. M; BARRELLA, W.; RAMIRES, M. **A pesca artesanal no arquipélago de Fernando de Noronha (PE).** Boletim do Instituto de Pesca, São Paulo, v.42, p. 241–251, 2016. https://doi.org/10.20950/1678-2305.2016v42n1p246

FAO - Food and Agricultural Organization of the United Nations. **The State of the World Fisheries and Aquaculture**, 209p. 2012.

FAO – Food and Agriculture Organization of the United Nations. The State of the World Fisheries and Aquaculture, Rome, 2016.

FAPAES- Federação das Associações de Pescadores Profissionais, Artesanais e Aquicultores do Espírito Santo. 2015. Available at <http://pedeag.es.gov.br/assets/uploads/apresentacoes/a37f2-palestras_pesca_serra.pdf> Access on September 29, 2016.

FEITOZA, L. R.; CASTRO, L. L. F.; RESENDE, M.; ZANGRANDE, M. B.; STOCKING, M. A.; BOREL, R. M. A.; CERQUEIRA, A. F.; SALGADO, J. S.; FEITOZA, H. N.; FULLIN, E. A.; STOCK, L. A.; FILHO, N. D.; MANK, A. M.; FERINGA, W.; MARTINEZ, J. A. **Mapa das Unidades Naturais do Estado do Espírito Santo.** Informações básicas. Vitória, ES: Incaper. 2010.

FLOETER, S. R.; KROHLING, W.; GASPARINI. J. L.; FERREIRA, C. E. L; ZALMON, I. R. **Reef fish community structure on coastal islands of the southeastern Brazil:** the influence of exposure and benthic cover. Environmental Biology of Fishes. p. 147-160, 2007. https://doi.org/10.1007/s10641-006-9084-6

FREITAS NETTO, R.; DI BENEDITTO, A. P. M. **Diversidade de artefatos da pesca artesanal marinha do Espírito Santo.** Biotemas, v. 20. p. 107-119, 2007.

GOLDENBERG, M. **A arte de pesquisar:** como fazer pesquisa qualitativa em Ciências Sociais. Record. São Paulo, 107 p, 1999.

GUAITOLINI, P. B. **ESTUDO DESCRITIVO DA CIRCULAÇÃO SOBRE A PLATAFORMA INTERNA E O EFEITO ILHA:** ESTUDO DE CASO DE GUARAPARI (ES). Dissertação de Mestrado. Programa de Pós-Graduação em Oceanografia Ambiental. Universidade Federal do Espírito Santo, Aracruz, 2010.

HAIMOVICI, M. (Org.). **Sistema pesqueiro marinhos e estuarinas do Brasil. Caracterização e análise da**

sustentabilidade. Rio Grande: Editora da FURG, 2011.

IBGE. 2017. Instituto Brasileiro de Geografia e Estatística. Available at <https://cidades.ibge.gov.br/brasil/es/guarapari> Access on May 20, 2018.

IENO, E. N.; BASTIDA, R. O. **Spatial and Temporal Patterns in Coastal Macrobenthos of Samborombon Bay, Argentina:** a Case Study of Very Low Diversity. Estuaries, p. 690-699, 1998.

IJSN. 2018. Instituto Jones dos Santos Neves. Available at<http://www.ijsn.es.gov.br/component/attachments/download/6437> Access at December 28, 2018.

INCAPER, Instituto Capixaba de Pesquisa, Assistência Técnica e Extensão Rural. **PROGRAMA DE ASSISTÊNCIA TÉCNICA E EXTENSÃO RURAL PROATER 2011 – 2013. 2013.** Available at <https://incaper.es.gov.br/media/incaper/proater/municipios/Centro_cerrano/Guarapari.pdf> Access at May 21, 2018.

ISAAC, V. J.; ESPIRÍTO SANTO, R. V.; SILVA, B. B.; MOURÃO, K. R. M.; FRÉDOU, T.; FRÉDOU, F. L. Uma avaliação interdisciplinar dos sistemas do estado do Pará. In: HAIMOVICI, M. (Org.). **Sistemas pesqueiros marinhos e estuário do Brasil. Caracterização e análise da sustentabilidade.** Rio Grande Editora da FURG, p. 11-24, 2011.

KALIKOSKI, D. C.; ROCHA, R. D.; VASCONCELOS, M. C. **Importância do conhecimento ecológico tradicional na gestão da pesca artesanal no Estuário da Lagoa dos Patos, extremo sul do Brasil**. Ambiente; Educação, v 11. 2006.

KENDALL, L. The conduct of qualitative interview: research questions, methodological issues, and researching online. In: COIRO, J., KNOBEL, M., LANKSHEA, C., LEU, D. (Eds.). **Handbook of Research on New Literacies.** New York: Lawrence Erlbaum Associates, p. 133-149, 2008.

KNOX, W.; TRIGUEIRO, A. **Saberes, Narrativas e Conflitos na Pesca Artesanal**. Vitória: EDUFES, 229p, 2015.

LIMA, J. S.; ZAPPES, C. A.; DI BENEDITTO, A. P. M.; ZALMON, I. R. **Artisanal fisheries and artificial reefs on the southeast coast of Brazil:** Contributions to research and management. Ocean and Coast managemente. v. 163, p. 372-382, 2018. https://doi.org/10.1016/j.ocecoaman.2018.07.018

MALINOWSKY, B. **Os Argonautas do Pacífico Ocidental:** Um Relato do Empreendimento e da Aventura dos nativos nos arquipélagos da Nova Guiné Melanésia. 2 ed. Abril Cultural, São Paulo, 1978.

MARTINS, A. S.; SANTOS, L. B.; PIZATTA, G. T.; RODRIGUES, C. M.; DOXSEY, J. R. Estudo interdisciplinar dos sistemas pesqueiros marinhos do estado do Espírito Santo, Brasil utilizando o método Rapfish. In: HAIMOVICI, M. (Org.). **Sistemas pesqueiros marinhos e estuário do Brasil. Caracterização e análise da sustentabilidade**. Rio Grande: Editora da FURG, p. 55-64, 2011.

MARTINS, A. S.; OLAVO, G.; COSTA, P. A. S. A pesca de linha de alto mar realizada por frotas sediadas no Espírito Santo, Brasil. In: COSTA, P. A. S.; MARTINS, A. S.; OLAVO, G. (Eds.) **Pesca e potenciais de exploração de recursos vivos na região central da Zona Econômica Exclusiva brasileira**. Rio de Janeiro: Museu Nacional. p.35-55, 2005.

MASON, M. **Sample Size and Saturation in PhD Studies Using Qualitative Interviews**. FQS. v. 11, n 3, 2010.

MORSE, J. M. Designing funded qualitative research. In: Denzin, N. K., Lincoln, Y. S. (Eds.), **Handbook of Qualitative Research.** Sage Publications, Thousand Oaks, p. 220–235, 1994.

MUSIELLO-FERNANDES, J. VIEIRA, F. V.; FLORES, R. M.; CABRAL, L.; ZAPPES, C. A. **Pesca artesanal e as interferências sobre a atividade na mesorregião central do Espírito Santo**. Boletim do Museu de Biologia Mello Leitão. p. 1-21, 2018.

MUSIELLO-FERNANDES, J.; ZAPPES, C. A.; HOSTIM-SILVA, M. **Small-scale shrimp fisheries on the Brazilian coast:** Stakeholders perceptions of the closed season and integrated management. Ocean and Coastal Management. v.148, p.89-96, 2017. https://doi.org/10.1016/j.ocecoaman.2017.07.018

NETTO, R. F.; DI BENEDITTO, A. P. M. **Diversidade de artefatos da pesca artesanal marinha do Espírito Santo**. Biotemas (UFSC), v. 20, p. 107-119, 2007.

OLIVEIRA, L. A. K. **Alterações morfológicas da praia do morro, Guarapari-ES em uma escala de décadas**. Dissertação de Mestrado. Programa de Pós-Graduação em Geografia Universidade Federal do Espírito Santo, Vitória, 2011.

OLIVEIRA, P. C.; DI BENEDITTO, A. P. M.; BULHÕES, E. M. R.; ZAPPES, C. A. **Artisanal fishery versus port activity in**

southern **Brazil.** Ocean; Coastal Management, v. 129, p. 49-57, 2016. https://doi.org/10.1016/j.ocecoaman.2016.05.005

OPDENAKKER, R. **Advantages and disadvantages of four interview techniques in qualitative research. Forum:** Qualitative Sozial for schung/Forum Qualitative Social Ressearch, 7. 2006 Available at <https://pure.tue.nl/ws/files/1948695/Metis202565.pdf> Access on March 12, 2006.

ORLANDI, E. P. **Análise do discurso.** Princípios e Procedimentos. Campinas: Pontes Editores, 101p., 2010.

PIRES, M. R. **Turismo em Guarapari (ES):** lógicas de uso e ocupação do espaço incorporando simbolismos e identidade cultural. Dissertação de Mestrado. Programa de Pós-Graduação em Geografia. Universidade Federal do Espírito Santo, Vitória, 2016.

RECASENS, L.; LOMBARTE, A.; SÁNCHEZ, P. **Teleostean fish assemblages in an artificial reef and natural rocky area in Catalonia (Northwestern Mediterranean):** an ecomorphological approach. Bulletin of Marine Science, v.78, n.1, p. 71-82, 2006.

ROCHA, K. S.; SILVA, R. S.; FREITAS, R. R. **An analysis of environmental perception and socio-economic transformation of a community of fishermen in estuarine region in southeastern Brazil.** Journal of Integrated Coastal Zone Management, v.12, p. 535-543, 2012.

ROCHA, L. A.; ROSA, I. L.; ROSA, R. S. **Peixes Recifais da Costa da Paraíba, Brasil.** Revista Brasileira de Zoologia, v. 15, p. 553-566, 1998.

ROCHA, P. A. **Solos do manguezal da Baía de Guarapari – ES:** mineralogia e fósforo como indicador de contaminação por esgoto doméstico. Tese de Doutorado. Programa de Pós-Graduação em Solos e Nutrição de Plantas. Universidade Federal de Viçosa, Viçosa, 2016.

RYAN, G.; BERNARD, H. R. Data management and analysis methods. *In*: DENZIN, N. K., LINCOLN, Y. S. (ed.). **Handbook of Qualitative Research. Londres**: Sage, p. 769-802, 2000.

SAAVEDRA-DÍAZ, L., ROSENBERG, A. A., MARTÍN-LÓPEZ, B., 2015. **Social perceptions of Colombian small marine fisheries conflicts:** insights for management. Marine Policy, v. 56, p. 61–70,

2015. https://doi.org/10.1016/j.marpol.2014.11.026

SCHENSUL, S. L.; SCHENSUL, J. J.; LECOMPTE, M. D. **Essential Ethnographic Methods:** Observations, Interviews and Questionnaires, second ed. Altamira Press, Walnut Creek. 1999.

SETUR. 2017. Secretária de Turismo do Espírito Santo. **Pesquisa de Fluxo Turístico Por Big Data.** Available at: <https://observatoriodoturismo.es.gov.br/telefonia-movel-verao> Access at May,2018.

SETUR. 2016. Secretária de Turismo do Espírito Santo. **Pesquisa de Fluxo Turístico Por Big Data.** Available at: <https://observatoriodoturismo.es.gov.br/telefonia-movel-verao> Access on May,2018.

SILVA, A. H.; FOSSÁ, M. I. T. **Análise de conteúdo:** exemplo de aplicação da técnica para a análise de dados qualitativos. Revista Eletrônica Qualitas, Campo Grande, v. 16, n. 1, p. 1-14, 2015.

SILVA, A. P. **Pesca artesanal brasileira.** Aspectos conceituais, históricos, institucionais e prospectivos. Embrapa Pesca e Aquicultura, Palmas, 2014.

SPERANDIO, E. F. **Radioatividade natural e composição das areias da Praia de Camburi (Vitória – ES, Brasil).** Dissertação de Mestrado. Programa de Pós – Graduação em Física do Centro de Ciências Exatas. Universidade Federal do Espírito Santo, Vitória, 2011.

SOARES-GOMES, A.; PITOMBO, F. B.; PAIVA, P. C. **Bentos de sedimentos não consolidados.** Biologia Marinha, 2ª ed, p.319-338, 2009.

TEIS, M. A.; TEIS, D. T. **A Abordagem Qualitativa:** A Leitura no Campo de Pesquisa. A abordagem qualitativa: a leitura no campo de pesquisa. BOCC. Biblioteca Online de Ciências da Comunicação, v. 1, p. 1, 2006.

THIRY-CHERQUES, H. R. **Saturação em pesquisa qualitativa: Estimativa empírica de dimensionamento.** Revista PMKT, n.3, p.20-27, 2009.

VIEIRA, F.; GASPARINI, J. L. Os peixes ameaçados de extinção no Estado do Espírito Santo. In: PASSAMANI, M.; MENDES, S. L. (Org.). **Espécies da fauna ameaçadas de extinção no estado do Espírito Santo.** Ipema, p. 87-104, 2007.

VEIGA, R.; SANCHES, N.; ANJOS, R. M.; MACARIO, K.; BASTOS, J.; IGUATEMY, M.; AGUIAR, J. G., SANTOS, A. M .A.; MOSQUERA, B.; CARVALHO, C.; BAPTISTA FILHO, M.; UMISEDO, N. K.

Measurement of natural radioactivity in Brazilian beach sand. Radiation Measurements, p.189-196, 2006.

ZAPPES, C. A.; OLIVEIRA, P. C.; DI BENEDITTO, A. P. M. **PERCEPÇÃO DE PESCADORES DO NORTE FLUMINENSE SOBRE A VIABILIDADE DA PESCA ARTESANAL COM A IMPLANTAÇÃO DE MEGAEMPREENDIMENTO PORTUÁRIO**. Boletim do Instituto da Pesca 42, p. 73-88, 2016a. https://doi.org/10.20950/1678.2305.2016v42n1p73

ZAPPES, C. A., SIMÕES- LOPES, P. C., ANDRIOLO, A., BENEDITTO, A. P. M. D.**Traditional knowledge identifies causes of bycatch on bottlenose dolphins (*Tursiops truncates* Montagu 1821):** an ethnobiological approach. Ocean; Coastal Management, v.120, p.160–169, 2016b. https://doi.org/10.1016/j.ocecoaman.2015.12.006