

Artisanal fishing and local conflicts: the case of the ‘Pedras de Una’ fishing community, Bahia, Brazil*

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ABSTRACT

Artisanal marine fishing is practiced throughout all the coastal cities in the southern region of the State of Bahia (Brazil); it provides an economic and cultural base of support for local families. Using action-research as an investigatory method while treating traditional knowledge from the actors in the region as an indispensable information source, this study aimed to identify the main socio-environmental conflicts that exist in an artisanal fishing community located in the south of Bahia, Brazil. The research methods used in this article, starting with the action-research that allows the researcher to have access to the community with a view to jointly look for solutions to specific problems, following a cycle where there is systematic oscillation between actions in the field of practice and its investigation. In this way, it was possible for the authors to provide educational assistance which included performing diagnostics, training initiatives, productive structuring, introducing new income sources and searching for markets for the fishermen's products, and at the same time, undertaking socioeconomic and environmental research at the heart of the community. Thus, the authors were able to verify that the local fishing environment is considered, by local fishermen and those from other regions, as one of the major fishing areas in southern Bahia. This characteristic means that the situation is dichotomous, because on the one side it is a matter of interest for artisanal fishermen in the local community, on the other hand, other fishermen from different regions of the country end up being attracted in order to catch fish, thereby generating conflict among local artisanal fishermen. The action-research method made it possible to verify six types of conflict: i) conflict with recreational amateur anglers; (ii) trawl fishing on the beach; (iii) using the net method for catching shellfish; (iv) picking up shellfish while they walk on the surface; (v) reluctance to using safety equipment; (vi) closed season for snook fishing. When focusing on the relationship with amateur fishermen it is possible to see, according to native fishermen, that these individuals can contribute to the local stock depletion due to the practices adopted by these fishermen; which therefore makes this conflict of primary importance among all the others that were analyzed. It was noticed that supervision and law enforcement by competent bodies is a rare thing in this analyzed fishing environment and thus, the fishermen seek partnerships through their association with various regional actors in order to find solutions to conflicts and to encourage community development.

Keywords: south of Bahia; snook; traditional knowledge

RESUMO

Pesca artesanal e conflitos locais: o caso da comunidade de pescadores de “Pedras de Una”, um sul da Bahia, Brasil.

Na região sul do Estado da Bahia (Brasil), a pesca marinha artesanal é praticada em todos os seus municípios costeiros, sendo responsável pelo sustentáculo econômico e cultural das famílias locais. Utilizando a pesquisa-ação como forma de investigação e considerando o conhecimento tradicional dos atores da região como peça indispensável no levantamento das

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* Submission: 11 JUL 2014; Peer review: 15 AUG 2014; Revised: 15 OCT 2014; Accepted: 26 NOV 2014; Available on-line: 1 DEC 2014



informações, o presente trabalho objetivou identificar os principais conflitos socioambientais existentes em uma comunidade de pescadores artesanais localizada no sul da Bahia, Brasil. Através da pesquisa-ação, os autores puderam realizar ações de extensão as quais englobam realização de diagnósticos, ações de capacitações, estruturação produtiva, introdução de novas fontes de renda e busca de mercado para os produtos dos pescadores, e concomitantemente, realizar pesquisas socioeconômicas e ambientais no seio da comunidade. Dessa forma, foi possível verificar que o ambiente pesqueiro local é considerado, pelos pescadores locais e de outras regiões, como um dos principais pesqueiros da região sul da Bahia. Essa característica acaba sendo dicotômica, pois de um lado é interessante para os pescadores artesanais da comunidade, por outro, acaba atraindo pescadores de diversas regiões do país para captura do pescado, gerando situações conflituosas com os pescadores artesanais locais. A pesquisa-ação possibilitou verificar seis tipos de conflitos: i) conflito com pescadores amadores; (ii) pesca de arrasto na praia; (iii) uso da redinha para captura do marisco; (iv) captura do marisco no período da andata; (v) resistência para utilizar equipamentos de segurança; (vi) período de defeso do robalo. Com destaque maior para o primeiro conflito.

Palavras-chave: sul da Bahia; robalo; conhecimento tradicional

1. Introduction

Due to fishing being considered to be one of the oldest productive activities in human existence, it took on large dimensions, primarily because of its dynamism and complexity (Mazoyer & Roudart, 2010). Along with its development, fishing has generated different situations, on the one hand it represents an economic mainstay for several actors (Santos *et al.*, 2012a), on the other, it has had an impact on natural resources (Berkes *et al.*, 2001) and various socio-environmental conflicts (Charles, 1992).

Artisanal fishing, conducted by professional fisherman autonomously or within the family, or with momentary help from other partners (Oliveira & Silva, 2012), has been performed on the Brazilian coast since before colonization of the region (Santos *et al.*, 2012a). This activity is influenced by various factors, such as lack of management (Pitcher & Lam, 2010), environmental problems (Capellesso & Cazella, 2011), excessive exploitation (Colloca *et al.*, 2004; Porcher *et al.*, 2010), stock reduction in some regions (Bender *et al.* 2013), as well as being, susceptible to possible impacts caused by climate change (Badjeck *et al.*, 2010; Egler & Gusmão, 2014; Seixas *et al.*, 2014).

With the growing need to meet the world's growing demand for fish (Berkes *et al.*, 2001), small-scale artisanal fishing has an important role to play (Tubino *et al.*, 2007). Artisanal fishermen are responsible for catching more than half of all the world's fish and the industry employs approximately 51 million fishermen (Berkes *et al.*, 2001), which reaches approximately 84 million people when the direct and indirect labor markets are considered (Silva *et al.*, 2013).

Due to the complexity of the activity (Fatima *et al.*, 2011), fishing has generated various conflicts (Charles, 1992). The fact that these conflicts exist has led to environmental debates which put pressure on the composition of agendas in society in order to clarify the different social uses of environmental resources (Santos, 2009).

On the Brazilian coast, one cannot see serious direct or apparent conflict among users in coastal communities, however, there is apparently a division in terms of marine space caused by the restrictions imposed by different technologies used by fishermen (Begossi, 2006), favoring those who have the best resources to the detriment of those who do not. This context makes it clear that the conflict can be interpreted in several ways, ranging from obstacles to propellers in the process of social changes (Santos, 2009).

1.1 Establishing study objectives

Conflict analysis is a fairly complex issue due to various aspects that are involved, such as natural resources, the life quality of social agents and economic growth in a determined geographical area (Brito *et al.*, 2011). When fishing activities are performed, which involves the wishes of several users, conflicts manifest themselves as one of the factors that affects the local fishing sector (Silva, 2011). This situation demonstrates that it is possible to highlight the effects of man and nature interacting when one is able to verify irregularities in fish stocks, environmental changes, or when they occur with economic losses for fishing, among other factors (Colloca *et al.*, 2004).

There is a similar situation that occurs in southern Bahia, Brazil, where coastal artisanal fishing happens along its entire coastline, which stretches over approximately 250 km. In this environment, effects from tourism, merchant shipping, amateur fishing, oil exploration studies and endogenous practices developed by local fishermen are faced with the activities of traditional communities, thereby generating a confrontational situation, demonstrating that the artisanal fishermen, due to the complexity in which they perform the activity, are more vulnerable to conflicts at sea (DuBois & Zografos, 2012).

It is noticeable that, on the one hand artisanal fishing appears to be a vital asset for the traditional communities' socioeconomic development, but on the other

hand, given its complexity and dynamism, it is faced with various conflicts. In this context, this article aims to demonstrate the major conflicts within an artisanal fishing community located in the southern region of Bahia State, Brazil, where the fishing and shellfish collecting characteristics of those using the local fishing environment to extract fish and seafood are artisanal.

2. Material and methods

2.1 Characterizing the study area

The research was performed in a community that is known as 'Pedras de Una', located in the municipality of Una in the southern region of Bahia State, Brazil. This region has a monocultural history in terms of agricultural exportation, with cocoa being its main product (*Theobroma cacao*). Currently, it is seeking to achieve economic recovery after its last major crisis that was caused by a disease known as witches' broom disease (*Moniliophthora perniciosa*), a crisis that began in 1989 (Paim *et al.*, 2006; Fioravanti & Velho, 2011).

The 'Pedras de Una' fishing community, according to local community officers who are responsible for health promotion, has a population of around 950 people, approximately 90% of which depend on fishing. This typically traditional community is located on the banks of the river Una, which includes a mangrove area and is close to the coastal strip (Figure 1). Its historical formation refers to how fishing has contributed to communities becoming present along the Brazilian coast

(Diegues, 1999), with the figure of the initial agent being jangadeiro.

In the vicinity of the community, there are two environmental conservation units: the Reserva Extrativista de Canavieiras (Cardozo *et al.*, 2012) that aims to protect and promote sustainability in the use of natural resources by local communities, thereby constituting itself as a strategy of protection and coastal management (Diegues, 1999) and a necessary requirement in order to avoid conflicts over resources (Begossi, 2006). The second is the Refúgio de Vida Silvestre de Una (Castilho *et al.*, 2013; Sollberg *et al.*, 2014), which aims to protect natural environments, in order to ensure conditions that protect the existence and reproduction of species or communities of local resident or migratory flora and fauna.

2.2 Research methods

When faced with social, economic and environmental challenges, new forms of methodological approaches are required to overcome the prevailing economic points of view which have proved to be restrictive for understanding social complexity (Thiollent & Silva, 2007). In this context, this article's research methods originate in the action-research method (Miskovic & Hoop, 2006; Thiollent & Silva, 2007), this is based on the authors' engagement in educational initiatives in this community of fishermen and shellfish collectors in 'Pedras de Una'.

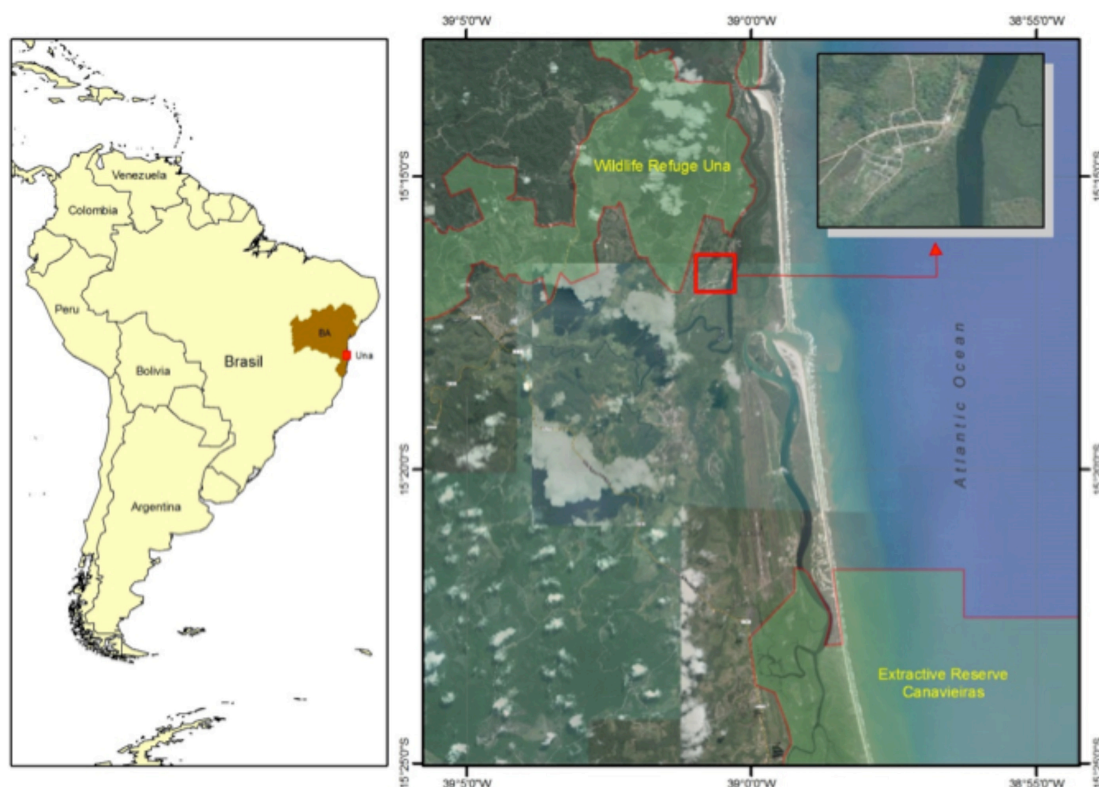


Figure 1 - Location of the 'Pedras de Una' community, Bahia State, Brazil.

Figura 1 - Localização da Comunidade de Pedras de Una, Estado da Bahia, Brasil.

Using methodologies that focus on participatory actions are flexible methods which enable the researcher to have access to the community in order to jointly seek solutions to specific problems (Thiollent & Silva, 2007). In this process, the action-research method follows a cycle where there is systematic oscillation between actions in the field of practice and its investigation. (Tripp, 2005). “One can plan, implement, describe and evaluate a change (...), learning more throughout the course of the process, both in terms of practice and own investigation”(Tripp, 2005: 446), this situation is demonstrated in Figure 2.

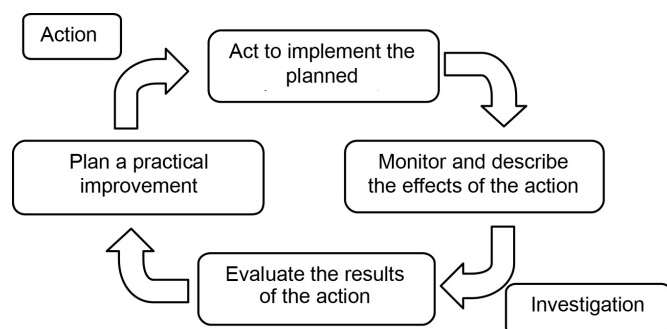


Figure 2 - Demonstrating the basic cycles of action-research. (Adapt. Tripp, 2005: 446)

Figura 2 - Demonstração dos ciclos básicos da pesquisa-ação. (Adapt. Tripp (2005: 446)

Action-research emerged as a new methodological approach within a context that is characterized by several theoretical and practical concerns that focus on the search for new forms of intervention and research (Baldissera, 2001), it is a tool that can understand the practice, assess it and question it, thereby demanding, in this way, forms of action and making conscious decisions (Abdalla, 2005), with a focus on provoking social change (Abraham & Purkayastha, 2012). Its characteristics are situational in nature, since it looks to diagnose a problem that is specific to a particular situation, this in order to achieve a practical result (Nichter, 1984; Novaes & Gil, 2009).

In the fishermen and shellfish collector community in ‘Pedras de Una’, results were obtained by performing initial diagnoses, training initiatives, productive structuring, introduction of new sources of income and a market search for products coming out of the community, this in order to solve a local problem, namely, the lack of income-generating opportunities. This relationship, which was initiated at the end of 2010 and is still running today, and has made it possible to install several actions in the community, as listed in Table 1, with emphasis on participation by women in these actions.

Researcher participation in the events listed in Table 1 made it possible to use action-research as a methodological conception, and also as a way to understand the local reality. The sampling method used in this article was for convenience only without any pretense to be statistically representative (Santos *et al.*, 2012b), it sought to involve as many fishermen and shellfish collectors in the various meetings held in the community. As the systematization instrument, a report was prepared at every meeting that contained the points raised during the discussions as well as the established goals. In this way, in preparing this article, these reports are used as one of the research sources.

Developing the action-research in the community enabled the use of techniques and tools which made it possible to perform surveys with local fishermen in a participative manner, this technique is known as rapid and participatory diagnosis (Verdejo, 2006; Di Ciommo, 2007; Moura *et al.*, 2012). This technique used instead sought to confront participants with previously formulated questions, these were used so as to examine the community and indicate options to improve it (Verdejo, 2006).

By using action-research, it was in line with the fishermen’s activities, thereby deepening local knowledge, while also adding, as a key element in the research, the traditional knowledge of local fishermen. This understanding, such as the knowledge passed down from

Table 1 - Activities performed in the fishing community.

Tabela 1 - Atividades realizadas na comunidade de pescadores.

Actions	Amount	Public	Men	Women
Rapid diagnostic and participatory	2	32	17	15
Strategic planning	2	180	25	155
Meetings to analyze goals / outcomes	16	128	48	80
Meetings for assemblies of production units	12	50	24	26
Meetings with institutions related to fishing	5	111	45	66
Meetings to training	25	300	50	250
Totals	62	801	209	592

generation to generation, is fundamental in maintaining traditional local communities with strong cultural roots (Pereira & Diegues, 2010; Delicado *et al.*, 2012).

In this article, the traditional knowledge held by the local community was not seen as a contradiction to the scientific knowledge, but rather as a complement to it, these being, in some cases, subjected to less conventional tests when compared to laboratory ones, which were involved from research up to the practical application of the research object (Lacey, 2012). From what the traditional local fishermen pointed out during the action-research development, technical analysis was used to confirm such information.

The fishermen reported that the closed season for snook, fat snook and common snook (*Centropomus parallelus*, *Centropomus undecimalis*, *Centropomus* spp.) did not take into account the entire spawning period for the species, as established by Ordinance No. 49, May 13th, 1992, (Ibama, 1992), with snook being caught in the period after the period established by the law becoming commonplace. Therefore, a local fisherman was asked to monitor and register individuals that produced spawn, this was done so that the information reported by local fishermen could be verified.

Action-research, by means of researcher involvement in the community, made it possible to verify the presence of fishing-related conflicts. Upon this finding, it was decided, jointly with the community, to conduct random interviews with a group of fishermen who were fishing at the community's moorings on a certain day of the week. Thus, on February 19th, 2014, 20 randomly selected fishermen and shellfish collectors, who were berthed at the two moorings in the community, were interviewed.

In order to perform the research with the fishermen and shellfish collectors, a tool called Open Data Kit (ODK) was used that is compatible with a set of free tools based on the android system, this allows the interviewer to bring up necessary information using a mobile device. The ODK system enables the sending of forms that are filled out in the field to a database where they

can be exported to software such as Excel and Google Earth, thereby eliminating the task of manually entering information that is obtained using paper forms.

Firstly, questions were asked regarding the main conflicts that the respondent understood to exist in the community. Then, after the relationship of the conflicts were specified, the relevance level of each conflict was noted by asking the fisherman which, among the cited conflicts, was the one that caused most damage to local fishing. Following this, the respondent was asked which was the second, the third, and so on.

The information collected using ODK were grouped so that the weighting assigned to each conflict by each respondent could be observed. In order to measure the weights, a Likert scale was used (Murshed-e-Jahan *et al.*, 2014) in which the lowest weight (zero) signified the greatest impact on fishing stocks and vice versa.

To classify the conflicts to their respective weight, the levels of impacts caused by conflicts jointly with what they may cause to the local fish were verified during the interviews. To do so, it was questioned what the impacts would be that could be caused by the conflicts. By doing this, it was possible to organize the impacts generated by local conflicts along with their respective weights (Table 2).

The results of this research represent a profile of a set of activities developed in the 'Pedras de Una' community. These were obtained by means of involving the authors with the community through educational initiatives and, from insights obtained locally, the research instruments were incremented in order to analyze the given point and subsequently generate feedback for the community, in a dynamic that can be shown by Figure 3 which was prepared from the model exposed by Tripp (2005).

3. Results and discussions

3.1 Characteristics of the local community

Through the diagnostics made and the action-research actions, it was found that in the 'Pedras de Una' fishing community there are fishing families whose fishing

Table 2. Weights and impacts caused by fishing-related conflicts in the analyzed community.

Tabela 2. Pesos e impactos causados pelos conflitos relacionados a pesca na comunidade analisada.

Impact	Weight	Impact Level	Action Impact
A	0 (zero)	Impacts greatly	Eliminates fish stocks
B	1 (one)	Impacts very	Decreases the fish stock
C	2 (two)	Reasonably impacts	Decreases the amount of catches by local fishermen
D	3 (three)	Little impact	Generates inconvenience to local fishermen (fishing implements of destruction by another fisherman)
E	4 (four)	Very little impact	Cause overlapping of fishermen fishing in the same and in the same period
F	5 (five)	Does not impact	Without prejudice to the fishery

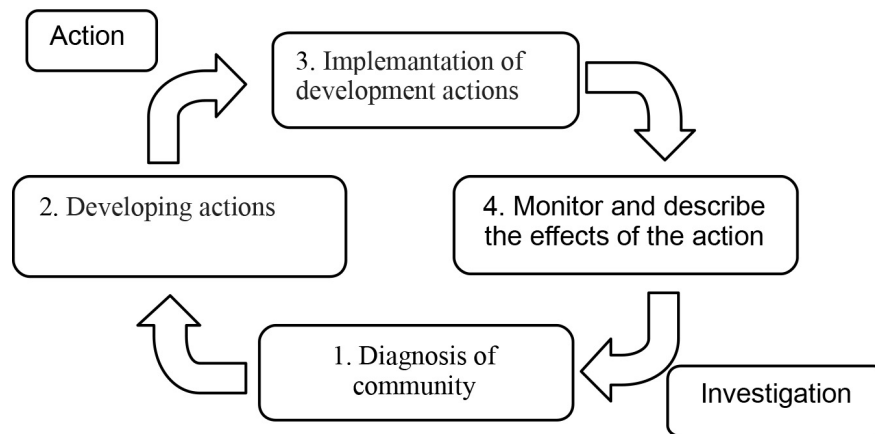


Figure 3 - Demonstrating the developed actions in the analyzed community.

Figura 3 - Demonstração das ações desenvolvidas na comunidade analisada.

practices are characterized in three different fishing methods, these being with the use of; lines, nets and cast nets, in two local environments - the river and the sea. These families also catch shellfish in the mangrove area that exists in the vicinity of the community.

The families use small canoes with a motor or paddles, rafts and small motorized boats intended mainly for shrimp fishing. Their catch is intended for consumption by the fishermen's families and any surplus is consumed by the local markets. By means of the activities performed within the community, as is shown in Table 1, it was noticed that fishing production (fish and shellfish), in the analyzed community, is faced with many bottlenecks, namely: (i) need for equipment (boats and fishing equipment) suitable for fishing activities; (ii) limited trade expertise that would provide better financial returns for their products; (iii) need for study of the mechanisms that make up the productive and commercial links in the fish productive chain; (iv) limited systemic and interconnected vision by the productive process agents; and the main bottleneck, (v) the decline in the region's fish stocks. The decline in fish stocks was emphasized by the more experienced local fishermen.

Fishing equipment maintenance is performed locally, primarily by fishermen who no longer fish to the same extent as they used to as a result of their advancing years. These individuals focus their time on preparing and repairing fishing equipment as well as on other agricultural activities as a means to provide income supplementation. The main sources of income in the community come from fishing, public service, which provides services in civil construction and a retired fishermen fund, which is a social benefit that is given citizens based on their age and/or their contribution to the social fund.

The community involved in this study has some social services, such as public health, public schools for elementary education, a municipal guard and street light

ing, but is lacking in other features, for example, the telephone system is limited and communication is difficult, thereby preventing the community from having access to the internet. In order to ease these local difficulties, in 1996, the community established the Association of Fishermen and Shellfish Collectors in 'Pedras de Una' (Amepedras) which is an institution that defends local interests.

One of the greatest results achieved by this local Association, according to residents in the community, was the home construction project for artisanal fishermen. Through this public policy, the beneficiaries, about 80 families, enjoyed considerable housing improvements, leaving their previous homes that were comprised of a single space made out of wood and going to a house made of brick with better living conditions.

Through action-research, it was possible to indicate that local artisanal fishermen possess detailed knowledge regarding the local fish fauna and the morphological and behavioral characteristics of the fish. This knowledge is referred to as ethnoecology (Souza & Barrella, 2001; Carneiro et al., 2008) and can be defined as the set of knowledge and know-how regarding the natural and supernatural world, this has been passed down orally from generation to generation, developed by any society in relation to biology (Diegues, 2000), it is something perceptive in the community, especially among the more experienced fishermen, which can relate to the best fishing times in terms of the weather, tides and the color of the local water.

3.2 Verified socio-environmental conflicts in the community

The verified conflicts found by means of diagnostics and action-research were: (i) conflict with amateur anglers; (ii) conflict generated by trawling; (iii) intra-community conflicts; (iv) conflict concerning the spawning period for snook fish.

3.2.1 Existing conflicts between local artisanal fishermen and amateur fishermen.

The community involved in this study is considered, by local fishermen and by others from other areas, to be one of the best fishing waters in the region, it attracts many other fishermen from other cities, including from other states in Brazil. These non-local fishermen are equipped with fishing equipment that local fishermen do not have, for example, they have quality boats, sonar and different better equipment.

The conflict between the two types of fishermen is based on the fact that amateur fisherman take the livelihood away from fishing families in the local community. These amateur anglers can sometimes catch quantities that exceed the legally permitted amount. According to the Amateur fishing License (MPA, 2012), amateur fishermen are allowed to catch and transport a quota limit of 10 kilos of fish in continental and estuarine waters and fifteen kilos for marine waters. In reports from local fishermen during the diagnostics and research-action activities, in most cases, the amateur anglers often catch quantities exceeding the permitted set limit. These quantities are checked by the local fishermen when the fish are brought ashore at the two small moorings in the community.

Most of the amateur fishermen, about 80% of them, according to conversations with those fishing in the analyzed community area, prefer to catch snook that, financially, for 85% of the interviewed artisanal fishers, account for a large proportion of their income, thereby classifying this as a host species. Burda & Schiavetti (2008), in the city of Itacaré, in the same region, also identified that this species is one of the most lucrative commercial species among those being fished.

Although it is of significant economic importance, the local stock of snook is found to be in decline. This statement is based on information provided by older fishermen in the community, who have spent, on average, around 40 years in the fishing industry in the area. The older fisherman unanimously stated, during the activities of the study, that over the past thirty years, they have not captured snook weighing more than 20 kilos with the same frequency as was the case in the time previous to this.

This situation resembles that which is presented by Bender et al. (2013), who used information from four generations of fishermen who worked in the Parque Municipal Marinho do Recife de Fora, in Porto Seguro, Bahia's far southern region, regarding the status of nine fish species. The authors found that for the last 50 years no larger size fish have been caught in the region, where, out of nine species of reef fish, seven had significantly declining trends.

In addition to amateur anglers catching the local fishermen's food in their environment, the local fisherman

also blame the amateur anglers for damaging their fishing equipment, this is caused when they become entangled around their vessels, which creates more animosity in the relationship between the two groups. And this conflict with anglers extends to other locations beyond the 'Pedras de Una' community, the example being what happens within the Extractive Reserve (RESEX) in Canavieiras, South of Bahia, Brazil.

At the Canavieiras Resex, this conflict with amateur anglers is in fact the second most serious at the reserve, the only conflict that is judged to be more serious is the impacts generated by the captive shrimp farming. That statement was provided by a group of artisanal fishermen at a meeting of that RESEX's Deliberative Council, in which a group of amateur anglers requested a seat on that Council. On that occasion, action-research made it possible to see the conflicting scenario between the two categories of fishermen. On the one hand, the artisanal fishermen made a damning criticism to the degrading and opportunistic behavior of amateur anglers, and these, in turn, pointed to adopting conservation practices to the point of being even more conservative than the practices adopted by artisanal fishermen.

According to local fishermen, the thing that could inhibit the actions of amateur anglers in the region would be greater supervision and enforcement of the rules. However, on those rare occasions when government agencies conducted surveillance in the vicinity of the community, what was actually required from the anglers was related to them having appropriate fishing and vessel documentations, which is something that, given the abundance of resources and expertise that amateur fishermen have, is always in compliance.

The limited presence of the government in the search for solutions to the community's problems is apparent, and it enables other categories of fishermen to further deplete the local fishing stock. Something similar happened until the mid-1980s, during a modernization phase which allowed disorderly competition for catching fish, which favored the over-exploitation of resources and allowed internal conflicts to emerge (Cappellesso & Cazella, 2011).

An effective way to reduce the present conflict would be to adopt rules that establish, at least, fishing limits in areas where artisanal fishermen operate. This is a model that has been adopted in Chile, for example, where registered fishermen can only fish in areas where they are registered, as stipulated by the General Fisheries and aquaculture Act of 1991, which decreased the rate of migration of fishermen from other regions in search of species to other locations (Cardona & Rios, 2011).

3.2.2 Conflicts generated by trawling.

Being an area considered important for shrimp fishing, the coastal strip near the 'Pedras de Una' community

has been an disputed area by various vessels for catching the species. According to local fishermen, vessels fish in the region during the daytime and nighttime.

Trawling with motorized traction for catching shrimp is performed with fine mesh nets that are powered by engines. These nets drag the ocean floor and capture developing species and maritime flora, with no selective processes, and are therefore able to change the structure of the coastal ecosystem, thereby endangering the sustainability of target species, the accompanying fauna and the entire surrounding biological community (Sedrez *et al.*, 2013).

In addition to the pressure on the local fishing grounds, many of these vessels are equipped with cranes for large trawling nets that fish extremely close to the beach, even coming within the thousand yard limit from the shore in this location, as decreed in the Regulatory Statement No. 14, October 14th, 2004 (Ibama, 2004). According to the accounts given by the community's fishermen and therefore, by the observations achieved through action-research, this conflict extends beyond the coast and also involves the estuary formed by the bar, one of the main fishing areas used by the analyzed community.

Local fishermen believe that the lack of supervision by competent government bodies does nothing to halt the unsustainable practice that is trawling. This is a similar aspect regarding the conflict with amateur fishermen, where the absence of the government does not defend the interests of smaller fishermen.

3.2.3 Intra-Community conflicts: using the net method, catching shellfish while they are walking on the surface, and reluctance to using safety equipment.

Previous conflicts with amateur anglers and with trawling activities involved actors who were external from the community and local actors, this is different from the existing intra-community conflicts in the analyzed the net method to catch shellfish, picking up shellfish while they walk on the surface and the reluctance to using safety equipment.

The traditional model for catching mangrove crabs (*Ucides cordatus*) and mangrove tree crabs (*Aratus pisoni*), which are shellfish with economic appeal for the community, involves the person putting his or her arm inside the burrow to catch the crab, without being able to see what is at the bottom. This technique is known as braceamento (Magalhães *et al.*, 2011) or the arm method.

Braceamento is an activity that demands time, skill and courage. However, not all the actors utilize the braceamento technique to catch shellfish, they prefer instead to use the net method. This technique consists of a

small net made with a braided polypropylene bag, which is placed at the entrance of the animal's burrow, so that the crab is caught when it exits its hole.

The conflict is focused on the fact that traditional shellfish collectors, who know about the importance of respecting the mangroves and their attributes, will not admit that other shellfish collectors use the net method because it does not distinguish the sex of the caught animals, since many ovigerous females and young individuals end up being caught. In addition to causing pollution in the local environment (Magalhães *et al.*, 2011), it increasingly causes the mangroves to be degraded.

It should be noted that the mangroves are important for life in the coastal area, not only for fish and crustaceans, which make up part of the mangrove ecosystem, or for their role in supporting other species that use it in their reproductive phase, but also as an element of stability and protection for the coastline (FAO, 1994). Thus, actions that have an impact, for example, using the net method, results in a decrease in the availability of raw materials, which in turn requires that fishermen search for new more distant fishing grounds and, consequently, demands more effort, resources and time (Walter *et al.*, 2012) on their part, thereby reducing their net income from production.

Another confrontational situation, regarding the activities of shellfish collectors, is about the periods in which the crabs walk on the surface. This period refers to the time when the crab comes out of his burrow with the goal of mating, thereby becoming an easy target. During this period, according to the local shellfish collectors, crabs being caught by opportunists has become more frequent and intense, which is something that directly affects the supply of the species.

This situation has generated at least two conflicts: firstly for the shellfish collector in terms of the crab closed season, taking into account their need for natural replenishment of wild fauna, and the resulting absence of income due to the fact that there is no unemployment benefit for this species. Secondly, they confirmed the existence of this illegal practice that ends up affecting the reproductive abilities of the species, and consequently, reducing future shellfish supply.

Such a scenario, expressed the contradictions between individual and collective rationality (Cunha, 2004), resembling a social trap, a tragedy of the commons, which can jeopardize this economic activity because of its over-exploitation (Hardin, 1980). In turn, it demands a collective action aimed at the writing and adaptation of common rules that look to encourage cooperation and the sharing of fishing spaces (Sabourin, 2010), thereby allowing local communities to manage the collective resources (Ostrom, 1998).

In the context of local fishermen practices, it is possible to note another conflict that is evidenced by the strong resistance to using safety equipment. It is rare that fishermen consistently use a life-jacket when fishing, for example.

The fishermen justify this non-use of safety equipment by claiming them to be an inconvenience when fishing and, of course, by a certain level of overconfidence. However, to contrast to this situation regarding fishermen, the shellfish collectors are keen to use life jackets as well as other safety gear (pants, hats, gloves and boots) when catching shellfish, thereby evidencing that the search for alternatives and improvements in production processes, the community's women are more receptive and embrative to new ideas (Di Ciommo & Schiavetti, 2012).

3.2.4 Conflict referring to the snook spawning period.

Another noticeable conflict connected to the traditional knowledge of the fisherman, refers to the snook spawning period. According to legislation, ministerial order No. 49, May 13th, 1992 (Ibama, 1992), the closed season for the species happens from May 15th to July 31st, when fishing is banned in coastal and inland waters of the States of Espírito Santo and Bahia.

The local fishermen say that the deadline set by the legislation is too short, as they claim spawning takes place up to September. According to them, this situation can contribute to reduced numbers of the species. Based on this information provided local fishermen, a procedure was adopted to verify the amount of pregnant snook after the period set by the law.

During August and September, every fisherman who landed at the community's moorings with snook had his catch checked to verify if the fish were pregnant. During the eight weeks of the two months under analysis, August and September, it was possible to observe a sample composed of 120 individuals, on average 70% of which were carrying eggs (Figure 4), i.e. during the reproductive period as well as the period when fishing is permitted.

Regulating bodies should pay attention to the importance of the spawning period for this species which, on the one hand, if the period is extended, may demand that more resources be allocated to the unemployment benefit that the fisherman already receive based on the current off-season period, on the other hand, the period in which the species is not be under anthropogenic pressure should be lengthened, thereby allowing the species to replenish itself naturally. It is important to take into account the traditional knowledge of the fisherman, who possess detailed understanding about the local ichthyofauna (Alarcon *et al.*, 2009; Caló *et al.*, 2009; Barbosa Filho *et al.*, 2014; Ferreira *et al.*, 2014) and who have specific knowledge about the sea and the coast (Delicado *et al.*, 2012).

3.2.5 Significance of conflicts observed in the community.

When verifying the importance levels of the conflicts observed in the community, it should be noted that the relationship with amateur anglers, trawling on the beach and the snook off-season period make up the central conflicts in the analyzed community (Figure 5). Since the conflict with amateur anglers is closer to zero and

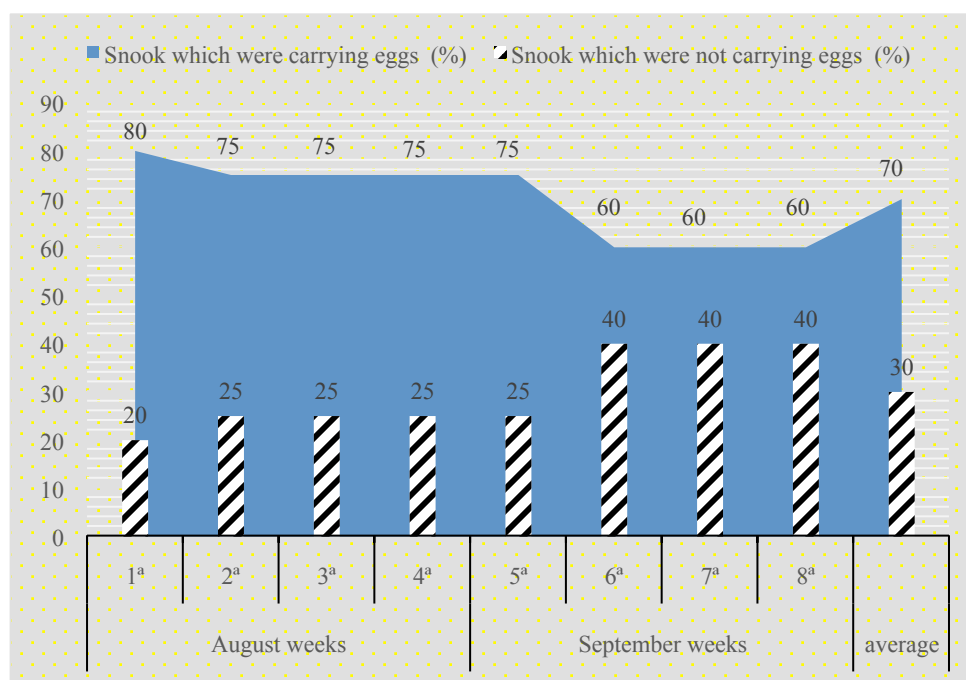


Figure 4. Analysis (%) of the snook caught in August and September, 2013.

Figura 4. Análise (%) dos robalos capturados nos meses de agosto e setembro de 2013.

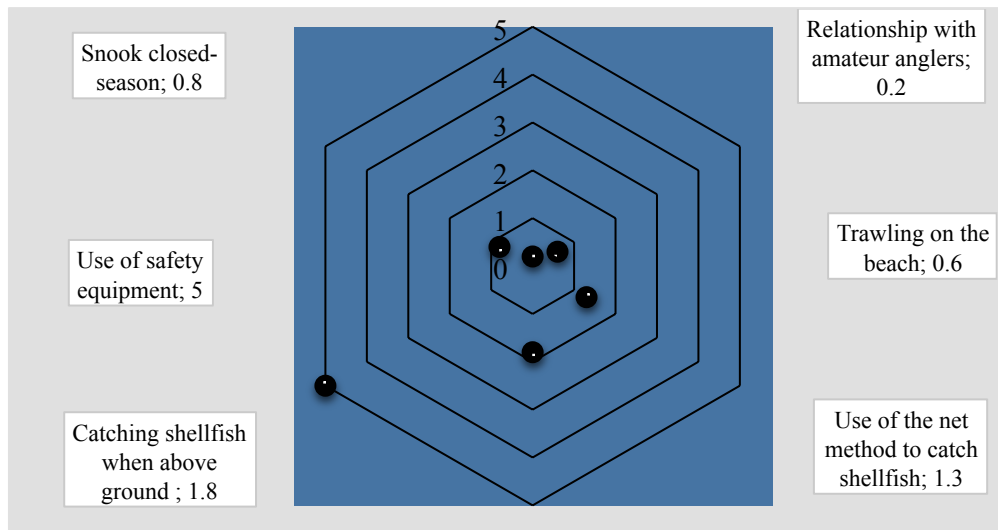


Figure 5. Ranking of the main conflicts observed by fishermen from the 'Pedras de Una' community (Bahia).

Figura 5. Ordenação dos principais conflitos observados pelos pescadores da comunidade de Pedras de Una (Bahia).

according to the definition of the constant conflict in Table 2, it impacts greatly on local fishing, with elimination if fish stocks being a possibility.

Identifying of the main conflicts in the community demonstrates the view that the local actors face the most serious aspects regarding the generation of their incomes. This scenario, in which it is possible to create economic losses (Colloca *et al.*, 2004), makes it possible to visualize the interaction between man and nature.

Currently, it is indicated that agents from around the world have been developing management models capable of mediating the conflicting relationship between the extremes. The latter is made up by those who depend on fishing for a living and environmental protection agents, both groups are demanding systemic approaches to fishing management and holistic approaches which consider the interaction between all those involved in fishing activities, this with a view to minimize the negative impacts for stakeholders (Varjopuro *et al.*, 2008).

The 'Pedras de Una' community has been looking for solutions to alleviate existing conflicts. The path taken

by the community has been dialog with the partner institutions is such a way that together they may effect a greater outcry. Thus, the forums, introductions, meetings of existing councils in the region, and members of the community have worked together to expose the existing difficulties. Another bias, used by the community and also by the institutions from the Canavieiras Resex, is the fact that they are open to scientific research in their area that can contribute to solving the existing difficulties and shortcomings.

In the case of the conflicts that were identified in the 'Pedras de Una' community, through action-research it was also possible to observe the actions that were performed and their results (Table 3). The highlight has been the awareness raising and mobilization of the supervisory bodies and researchers to disseminate the local context.

The importance of fishing refers to reflection on aspects of management for its exploitation, both by users and by local authorities, in which there must be integration between regulators of fishing activities in order to develop programs that stimulate fishing in a conscious way (Begossi *et al.*, 2011) and to incorporate local

Table 3 - Conflicts, actions and results observed in the 'Pedras de Una' community (Bahia).

Tabela 3 - Conflitos, ações e resultados obtidos na comunidade de Pedras de Una (BA).

Conflicts	Actions to curb the conflicts	Results
Amateur anglers	Awareness raising and mobilization of the supervisory bodies and researchers	Recording in the minutes of meetings of the institutions responsible for supervision; Generation of research and publications in order to disseminate and raise awareness of the competent bodies
Trawling on the beach		
Use of the net method to catch shellfish		
Catching shellfish when above ground		
Snook closed-season	Distribution of safety equipment	Use by the shellfish collectors and resistance of the male public.
Use of safety equipment		

knowledge in technical solutions (Santos *et al.*, 2012a). In addition, another way to manage fishing activities lies in the empowerment of local actors, primarily through cooperative actions and associations that make it possible for these individuals to effectively participate in decisions, this so as to become part of the organization and the process of fishing regulations in the places where they live (Reis & D'Incao, 2000).

Fishing activities have peculiar characteristics that demand, at certain times, intervention from various professionals in order to regulate their reproduction process. For example, there was regulatory intervention in the State of Virginia (USA), this involved a program that included cooperation between the regulatory agency, commercial fishermen and scientists. In this case, all the parties were looking for a way to provide supplemental income for fishermen and help restore local fishing, which resulted in economic gains, through increased income, as well as environmental gains, through the withdrawal of more than 18,000 pieces of abandoned fishing artifacts that were undermining local fishing (Havens *et al.*, 2011).

Defining parameters in which non-artisanal fishing cannot be practiced is another example of where regulating actors could possibly intervene. This policy could mitigate the conflict of interest and allow artisanal fishermen to enjoy the fruits of what their home environment offers them, as well as being less damaging to the environment, by fishing at smaller proportions and by using equipment that is not excessively sophisticated (Freire & García-allut, 2000; Whitmarsh *et al.*, 2003).

The activities in the analyzed community created the perception that its local development depends a lot more on a dynamic and multidimensional process that involves the community's history, their institutions, their interactions and their ability to build their own destiny, rather than exclusively relying on economic and conservationist aspects (Santos *et al.*, 2012b). Based on this evidence, the local community has sought, via their association, ways to improve the social conditions of the local people through income-generating projects, professional training, partnerships with different institutions and housing improvements for fishermen.

4. Final considerations

Performing education initiatives in the analyzed community assisted in performing the action-research which made it possible to identify the six main existing conflicts regarding fishing in the area: (i) conflict with amateur anglers; (ii) trawl fishing on the beach; (iii) use of the net method for catching shellfish; (iv) catching shellfish when above ground; (v) resistance to using safety equipment; (vi) closed season for snook fishing. It was also possible to verify that the relationship with

amateur fishermen has been a quite critical aspect and that, for local fishermen, these amateurs can contribute to local stock depletion due to the practices they have adopted for fishing, thereby placing this conflict at the first level of importance.

As a way to counteract the local conflicts, the fishing community has made partnerships with other similar organizations, universities and public authorities, this in order to understand the necessity and relevance of aligning traditional knowledge, accumulated in the community, with existing knowledge and negotiations among the various partners. However, not all fishermen have the same ability and enthusiasm for the negotiations and clash with the conflicting actors, which ends up resulting in an overlap of responsibilities on a particular group of local actors.

Interaction with the community was also useful, the differences between everyday reality and the information gathered during the first contacts with the community, in which the participatory diagnostics were made, through meetings with the local actors and individual interviews, reinforced the importance of action-research. Another perception, arrived at through the actions developed with the community and captured by action-research, is the responsiveness and commitment of local actors to actions that are designed to emancipate them. For these, they gave time and effort for their implementation, with emphasis on the female audience who have shown themselves to be more dynamic in the search and implementation of new development alternatives.

The fact is that the achievements, obtained by the community through educational initiative projects carried out in partnership with other institutions, has caused the local associative spirit to grow and this, given their dynamics and complexity, has attracted new actors in the development of new relationships of negotiation. One example is the Rede de Mulheres (women's network), which involves all fishing communities in the region and through it, the most diverse social problems are discussed, these range from issues related to marital rights, woman's health, income generation and the paths need to be taken by the traditional fishing communities.

The situation, exposed by daily life in the 'Pedras de Una' Fishing Community, can be represented by the fact that traditional fishing communities need to have a coastal management system that contemplates the man-nature relationship as a way to better use the fishery resources that still exist, while still demanding feedback from authorities that are responsible for inspections regarding the fulfillment of its role. The community believes, as do other fishermen from other communities, that only having the process of awareness regarding fishing limits is not sufficient to, at the minimum,

lessen the impacts generated by the conflicts cited throughout this text. It is necessary to adopt punitive and frequent measures against fishermen who do not respect the established limits.

And in this context, the authorities should be working in partnership with local communities in order to have greater powers of action. Local fishermen have knowledge regarding everyday life, boats that fish close to the coast and amateur anglers, they also know about their fellow artisanal fishermen who flout the rules in terms of fishing during the off season and going beyond

fishing limits. What is required is political and legal negotiation that would create instruments capable of encouraging talks between the local actors and the supervisory agents.

Acknowledgments

The community of Fishermen and Shellfish Collectors in 'Pedras de Una', the UESC, the Research Supporting Foundation in the State of Bahia (FAPESB) and CNPq, for the second author's scholarship.

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