sociedade & natureza

DOI: http://dx.doi.org/10.14393/SN-v31n1-2019-37481

Artisanal fishing, shrimp farming and mangroves: perspectives on the Federal Law nº 12651/2012 and the use of "*apicum*" and "*salgado*" areas in Canguaretama/RN, Brazil

Pesca artesanal, carcinicultura e manguezal: perspectivas da Lei n° 12.651/2012 e o uso de apicuns e salgados em Canguaretama/RN

Thaís Bezerril Brandão de Lima[1]
Márcia Regina Farias da Silva[2]
Rodrigo Guimarães de Carvalho[3]

ABSTRACT
This paper presents considerations on the Federal Law nº 12651/2012, better known as Brazil's new Forest Code, which granted the use of "*apicum" (*swamp in the Tupi language*)"* and "*salgado*" sectors (regions of mangrove) to shrimp farming. This code approved that 35% of these ecotones can be used for shrimp farming. Thus, this study aimed to look into the way these legislative updates have influenced or will influence the social, economic and environmental aspects of the shrimp farming activity in Rio Grande do Norte (RN), particularly in the municipality of Canguaretama. A quali-quantitative approach was used, with questionnaires and semi-structured interviews applied to the artisanal fishermen, shrimp farmers and to the State Environmental Agency. Artisanal fishermen understood that this legislative change degrades and unbalances the ecological environment, especially that there will be loss of territory and damage to their fishing resources, so they were against such change, the same opinion of the State Environmental Agency. On the other hand, shrimp farmers were in favor of the changes, claiming to be a legal incentive for their activity, contributing to the legalization of previously illegal enterprises, in addition to expanding their area of cultivation.
Keywords: New Brazilian Forest Code. Mangrove. Shrimp farming. Artisanal fishing. Environmental perception.

RESUMO
Esse artigo apresenta considerações sobre a Lei n 12.651/2012 mais conhecida como o novo Código Florestal Brasileiro, o qual garantiu o uso de *apicuns* e salgados, feições do ecossistema manguezal, para atividade da carcinicultura. Os carcinicultores poderão utilizar uma área de 35% desses ecótonos. Assim, este estudo objetivou investigar de que forma as mudanças na legislação influenciaram ou influenciarão os aspectos sociais, econômicos e ambientais da atividade de carcinicultura no Rio Grande do Norte (RN), particularmente, no município de Canguaretama. Para tanto, utilizou uma abordagem qualiquantitativa com questionários e entrevistas semiestruturadas aplicados aos pescadores artesanais, carcinicultores e ao

[1] State University of Rio Grande do Norte, Mossoró, RN, Brazil. e-mail: thaisbezerril@gmail.com
[2] State University of Rio Grande do Norte, Mossoró, RN, Brazil. e-mail: mreginafarias@hotmail.com
[3] State University of Rio Grande do Norte, Mossoró, RN, Brazil. e-mail: rodrigo.ufc@gmail.com
Article received in: 06/02/2017. Accepted for publication in: 08/03/2019.

órgão ambiental licenciador da atividade no Estado. Os pescadores artesanais entenderam que essa alteração na legislação degrada e desequilibra o ambiente ecológico, sobretudo, que haverá perda de território e o comprometimento dos seus recursos pesqueiros, desse modo, apresentaram-se contra a mudança, mesma opinião compartilhada pelo Órgão Licenciador do Estado. Em contrapartida, os carcinicultores se mostraram favoráveis as alterações, alegando ser um incentivo legal para atividade a fim de contribuir para a legalização dos empreendimentos antes ilegais, além de ampliar sua área de cultivo.
Palavras-chave: Novo Código Florestal. Manguezal. Carcinicultura. Pesca artesanal. Percepção ambiental.

Introduction

Shrimp farming – cultivation of shrimp in captivity – is the commercial activity that has increased the most in Northeast Brazil, despite the crisis from 2004 to 2009, which posed difficulties to the obtaining of environmental licenses, due to the diseases caused to crustaceans, floods occurred during this period, among other factors which made the cultivation unstable (ROCHA; BARBOSA; NOGUEIRA, 2013). After such phase, the activity has reacted and Brazil continues to be among the largest shrimp producers of the Americas, with a production of 90.000 tons in 2014, exporting only 277 tons (ROCHA, 2015).

Given this scenario, shrimp farming has been granted additional space for exploitation with the reformulation of the Brazilian Forest Code (Law nº 12.651/2012), which controls and regulates forest preservation and exploratory practices in the biomes of the country, but explicitly excludes *apicuns* and *salgados*.

Would it perhaps be a political maneuver solely aimed at not characterizing these two features as Permanent Protection Areas (PPAs), so that they are no longer under legal protection?

A study conducted by Oliveira and Freitas Filho (2017) highlights the importance of *apicuns* and *salgados* for the balance of mangrove ecosystem and conservation of the biodiversity associated with this environment. These authors point out the existence of environmental studies justifying

the implementation of effectively or potentially polluting enterprises in areas of *apicum* and *salgado*.

These studies highlight the number of jobs generated and the growth promoted in the local economy. Nonetheless, it is impossible to present social and especially economic indicators without considering the environmental dimension, with its due relevance. Thus, shrimp farming may compromise not only environmental dynamics and balance, but also the local population's way of life.

In this direction, the present paper aimed to investigate how the changes in the Law nº 12.651/2012 have influenced or will influence the social, economic, environmental and shrimp farming aspects in the municipality of Canguaretama, Rio Grande do Norte (RN), Brazil.

Shrimp farming scenario in the Northeast region.

The Northeast region concentrates more than 99.3% of the Brazilian production, which indicates that the national shrimp farming activity is situated in this region, confirming its great potential, due to favorable edaphoclimatic conditions (characteristics defined by environmental factors such as: climate, relief, lithology, temperature, air humidity, type of soil, wind, atmospheric composition and rainfall) and availability of coastal lands. Regarding the producing states, Ceará and Rio Grande do Norte stand out with production of 31.982 t and 17.825 t, respectively (ROCHA; BARBOSA; NOGUEIRA, 2013).

In Rio Grande do Norte, shrimp farming started in 1973, with the creation of the "*Projeto Camarão*" (Shrimp Project) by the then Governor Cortez Pereira, who wanted to prove the technical and economic viability of marine shrimp farming to solve the problem of unemployment in the salt evaporation ponds through incentives to small- and medium-scale producers. The site chosen as starting point was on the left bank of the Potengi River, referred to as "*Núcleo Potengi*" (Potengi Center). The first shrimp farming center was in operation in the municipality of

Canguaretama/RN, which was the cradle of shrimp farming in the state (GUIMARÃES, 2007).

According to the last survey conducted by the extinct Ministry of Fishing and Aquaculture (*Ministério da Pesca e Aquicultura* – MPA) in partnership with the Brazilian Association of Shrimp Farmers (*Associação Brasileira de Criadores de Camarão* – ABCC), in 2013, Canguaretama remains in the first place of shrimp production, even after the crisis of 2004, with production of 2.441 ton/year distributed in 839 hectares and 28 producers. These numbers of production would be very positive if not accompanied by serious environmental damage and threats to the living conditions of traditional communities established in areas targeted by shrimp farmers.

Importance of mangroves and the Law n° 12.651/2012

Mangroves are natural coastal ecosystems inserted in the Atlantic Forest biome and originated in the regions of the Indian and Pacific oceans. According to Donato et al. (2011), they are important carbon storage sites and may contain up to four times more CO_2 than any tropical forest, in both their arboreal structure and their sediments. They are also source of recreation and leisure, source of protein and several processes associated with the subsistence of traditional riverside communities.

Nevertheless, the New Brazilian Forest Code partitioned the mangrove ecosystem into three features: *"apicum"*, "*salgado* or hypersaline tropical marsh", and "mangrove forest". Although there are separate definitions for *"apicum"* and "*salgado* or hypersaline tropical marsh", researchers point to an error of the legislator, because the correct option would be to identify "*apicum* or *salgados*" and "marshes" (SCHAEFFER-NOVELLI, 2000; POLÍZIO JÚNIOR, 2014).

Given this divergence, the present study adopted the division established in the Law n° 12.651/2012 in the Art. Third, subsections XIV and XV, which define:

> *Salgados* or hypersaline tropical marshes: areas situated in zones with intermediate frequency of floods between syzygy and neap tides, with soils whose salinity varies from 100 (one hundred) to 150 (one hundred and fifty) parts per 1000 (one thousand) and which may have the presence of specific herbaceous vegetation;
>
> *Apicum*: areas of hypersaline soils situated in upper intertidal zones, flooded only by syzygy tides, which have salinity higher than 150 (one hundred and fifty) parts per 1000 (one thousand), with no vascular vegetation.

These ecotones are areas that play an essential role in the functionality of mangrove forests and maintenance of diversity.

Therefore, tide variations deposit a layer of phytoplankton on the soil, forming the basic level of the food chain. These areas are reservoirs of nutrients for the mangrove ecosystem, essential to maintaining mineral and organic balance. In the low tide, the network of channels distributes nutrients, regulates temperature, salinity and pH, and channels freshwater from underground sources to rivers and streams. On the other hand, in the high tide, the channels are flooded and serve as a pathway to spread seeds all over the mangrove area that, after germination, will contribute to vegetation maintenance. *Apicuns* and *salgados* are home to several species of crabs (especially *uçá* crab), mollusks and are seasonally frequented by migratory birds (SCHAEFFER-NOVELLI, 2000; SCHMIDT; BEMVENUTI; DIELE, 2013).

Shrimp farming is the aquaculture sector that most acts on mangroves. Shrimp farming ponds are originally excavated in the ecosystem called *apicum*, but the pumping system crosses the entire mangrove, causing negative impacts on the environment. This fact demonstrates that the current environmental protection regulations alone do not ensure the system's sustainability (SCHAEFFER-NOVELLI et al., 2012).

In the case of RN, a state within the Caatinga biome, shrimp farming can occupy an area of 35% of *apicuns* and *salgados*, according to the Art. 11-A, § 1st, subsection I of the Law nº 12.651/2012 (BRASIL, 2012), besides the

areas of enterprises occupied in these ecotones, which will change from illegal to legal according to the article 11-A, § 6th, which informs:

> Activities and enterprises of shrimp farming and salt evaporation ponds whose occupation and implementation have occurred prior to July 22 of 2008 can be legalized, provided that the entrepreneur [...], proves their location in *apicum* or *salgado* areas and commits, by a term sheet, to protecting the integrity of adjacent shrub mangroves.

As described above, the law has guaranteed the legalization of shrimp farming enterprises whose occupation has occurred prior to the mentioned date. However, how can anyone prove that the previously occupied area was in fact *apicum* or *salgado* and not mangrove? According to the manual of environmental impacts created by the Brazilian Northeast Bank – BNB (2008), this ecosystem after being degraded by shrimp farming and salt evaporation ponds does not become mangrove again; the area does not regenerate even after the activities have been discontinued, becoming dry, sandy and with no vegetation, exhibiting the typical appearance of *apicum*.

According to Schaeffer-Novelli et al. (2012, p. 25), there are no reports of the *apicum* feature recorded in official maps, making regulation and inspection more difficult. These authors raise the possibility that some coastal states with no conditions for shrimp farming and salt production, especially in the South and Southeast regions, "decide to invoke the principle of isonomy, requesting authorization to use mangrove areas claiming public utility or social interest" to implement other enterprises.

Transformations of mangrove areas into shrimp farming enterprises would have disastrous implications also for riverside communities whose subsistence relies on artisanal fishing, directly and indirectly depending on goods and products from mangroves and their ecological services, especially the loss of the notorious cultural heritage and habitat for the fauna, some species of which are endemic to this ecosystem.

Tradition in fishing

For Diegues (1973), artisanal fishing is when the fisherman, alone or in groups, directly participates in the catch, using relatively simple equipment, and obtains most of his/her income from fishing, even if complementary activities are performed seasonally. This activity is responsible for a high number of jobs and maintenance of cultural diversity.

Artisanal fishing plays an important role of subsistence and social reproduction for several "traditional" communities, a term designated by Diegues (1983), and their knowledge on fishing is passed on from generation to generation or through direct observation, as in the municipality of Canguaretama – RN.

In this region, communities that depend on artisanal fishing have suffered with the changes caused by the implementation of shrimp farming activities (SILVA, 2004). The situation of environmental degradation of mangroves is at times associated with a cultural devaluation faced by these traditional communities who have lived there and preserved these environments for a long time.

Hence, understanding the concerns of riverside communities and perceptions of shrimp farmers regarding their production in mangrove areas, and especially of the State Environmental Agency, is of great importance so that future public policies can favor bilateral interests.

Environmental perception

For Tuan (1974) each individual perceives, reacts and responds in a different and very personal manner to the environment, configurating the first step towards knowledge and practice of environmental citizenship. In this direction, environmental perception (EP) allows the individual to establish relationships of affectivity towards the environment, hence it can be understood in the individually experienced context.

Therefore, EP is not a task of a single field of knowledge – different theories are found in several fields with different approaches. In general, it is an interdisciplinary study because it aims to understand the human-nature relationship, valuing the experience of the subject in different aspects and situations, a relationship called topophilia. Thus, EP is like an environmental awareness by humankind (TUAN, 1974; MELAZO, 2005; FERNANDES; REZENDO FILHO, 2010; KLEIN et al., 2015).

Using the concept of environmental perception as a theoretical tool, the present study aimed to investigate the effects of the new Forest Code as perceived by artisanal fishermen, shrimp farmers and State Environmental Agency, with respect to the protection of mangroves and to shrimp farming.

Methodology

Research typology and study site

This study opted for adopting qualitative and quantitative approaches, considering that both are complementary. In the quantitative phase, we used statistical methods as complementary tools to ensure precise results, avoiding distortion of analysis and interpretation (RICHARDSON, 1999). The qualitative phase used Content Analysis in accordance with Bardin (2009).

The study site was the municipality of Canguaretama, located in the *Leste Potiguar* mesoregion and *Litoral Sul* microregion, in the state of Rio Grande do Norte, Northeast region of Brazil (IDEMA, 2008).

Its territory is 66% inserted in the area of the Curimataú River Basin, 18.02% in the area of the Catu River Basin and 15.98% in the area of the Guajú River Basin (CPRM, 2005). Hence, the municipality is located close to one of the main estuarine systems of the state, the Curimataú/Cunhaú, which includes a vast region of mangroves, important for environmental equilibrium.

Instruments of data collection, analysis and treatment

Data production began with the exploratory phase, which started in April 2015, period of the first visits to the research actors in order to recognize the area and establish research criteria. We applied questionnaires and interviews from April 2016 to January 2017.

We used semi-structured interviews and questionnaires to produce data. Questionnaires were applied to the population of artisanal fishermen of the Fishing Colony Z-06 and contained 24 open and closed questions. We evaluated the data by analyzing the perception of the involved individuals about the shrimp farming activity. We used Excel 2013 to process data, along with *Statistical Package for the Social Sciences* – SPSS version 21.0 for Windows system, aiming at a basic descriptive statistics.

The differences between groups of artisanal fishermen, according to the variables gender and knowledge on the new Forest Code, were tested using Student's t-test, with independent samples and for non-homogeneous variances. Variance homogeneity was tested using Levene's test, based on the significance/confidence level ($\alpha = 0.05$) (BARBETTA, 2002).

The semi-structured interview was applied to shrimp farmers of the region in an attempt to investigate their understanding on the alteration of the legislation, which favors shrimp production in areas of *apicum* and *salgado*, and how it affects their activity and the ecosystem. The interviews were carried out in person, lasting on average 35 minutes, and subsequently transcribed and analyzed according to the Content Analysis method of Bardin (2009), using Excel (2013).

In addition, we thoroughly read the material to identify the most relevant topics as well as the central ideas, in order to establish descriptive categories. The same procedure was adopted in the reading and analysis of observations recorded in the field notebook. Thus, 4 shrimp farmers and 71 artisanal fishermen of the region of Canguaretama/RN were interviewed.

Results and Discussion

Understanding of Artisanal Fishermen about the Law n ° 12.651/12.

Most fishers were male (63%) while 37% were female. Fishing activity is sometimes understood as an essentially male activity, but in reality, the work is socially divided by gender in fishing communities, and many women make a living by fishing, usually shellfish, which corroborates Vasconcellos, Diegues, Sales (2007), who claims that there is an increasing movement of women assuming a more predominant role in the activity.

These people were asked if they knew about the existence of any Permanent Preservation Area (PPA) in the municipality of Canguaretama-RN. 59.2% said they knew that there is such area in the region; when asked which area that was, 100% answered 'mangrove'. In spite of that, a significant portion of the interviewees (40.8%) said they did not know, even after explanations on what a PPA is. Thus, traditional communities that depend on resources from mangroves and live nearby has knowledge and environmental concern about this ecosystem, including its biotic and abiotic components and its importance for their lives.

Therefore, given their understanding on a PPA in the studied region, the same interviewees were asked about their knowledge on the new Brazilian Forest Code, and 85.9% claimed they did not know this legislation. The others, who said they had minor knowledge, when asked about the Law, were clearly confused with some resolutions related to fishing.

Despite this scenario, in which people did not know about the legislation, we provided a succinct unbiased explanation about the changes in the Forest Code.

They were also asked about the shrimp farming activity in *apicuns* and *salgados* and were informed that the Law since 2012 has granted the use of 35% of this area per state for the construction of shrimp ponds. It is worth mentioning that these individuals refer to these features as

"*salgadinhos*" and added that it is the site where a vegetation called "*pirrixiu*" grows. *Pixirriu* (*Batis maritima*) is a halophyte typical of hypersaline environments (*salgados* or hypersaline tropical marshes) and it is found in coastal zones, in mangroves (MARCONE, 2003; LONARD; JUDD; STALTER, 2011).

In relation to the question above, 62% of the interviewees said that the use of these features for shrimp farming, even in a relatively low percentage, is very bad for both fishing and mangroves. In a conversation with old fishermen of the region, they said that, before the introduction of salt production in the 1970s, from Canguaretama all the way to *Barra do Cunhaú*, the areas currently occupied by shrimp farming and that were saline in the past could be environments of *apicum*. We point out that such information is only speculation since there is no research on the subject. However, it could be observed that there are few features like that in the region.

According to the accounts of these fishermen, there were frustrations about the gap in the legislation.

> The *"Salgadinho"* is a more elongated portion of the mangrove and, for me, it is the same as deforesting the mangrove (45-year-old fisherman).

> This is going to further reduce our passage space and further increase theirs [shrimp farmers]. I will lose my fishing [...] I am afraid one day we will not be allowed to enter the mangrove. (57-year-old shellfish fisherwoman).

Once again, it can be noted that there is an environmental concern about the impact of the new legislation on the space used by artisanal fishermen, mangrove deforestation and scarcity of fish. Although some interviewees are concerned about the environment, with small acts of preservation, greater awareness and straightforward actions by the Municipal Government are still necessary, especially regarding the protection and preservation of environmental resources.

In this context, according to Barbetta (2002), it was necessary to analyze the perceptions of men and women about the use of these features for shrimp farming, whether they are the same or different, because women spend most of their time on dry land and men in the sea. Such difference between the groups of artisanal fishermen was analyzed based on the variables gender and knowledge on the new Forest Code, using Student's t-test, which allowed independent samples to be compared (Table 1).

Table 1 – Test of independent samples using t-test for Equality of Means between perceptions of fishermen and shellfish fisherwomen.

		Levene's test for equality of variances		T-test for Equality of Means					
		F	Sig.	t	Sig. (2 extremities)	Mean difference	Standard error of the difference	95% Confidence interval of the difference	
								Lower	Upper
Question	Equal variances assumed	9.744	**.003**						
	Equal variances not assumed			**-1.213**	**.232**	-.362	.298	-.964	.241

Source: field research, 2016.

Since a value of p= 0.003 was found in the Levene's test, thus rejecting the hypothesis that the variances are equal, Student's t-test for different variances was used. As the t-test showed t= -1.213 with p= 0.232, higher than the assumed error of 0.05, it can be stated that both genders expressed the same opinions about the use of *apicuns* and *salgados* for shrimp farming. It demonstrates that, despite not using these features directly, men have felt/will feel as negatively affected as the women who use these areas more frequently.

Besides opposing to the permission of new occupations in *apicum* features, 58% of the interviewees disagreed with the amnesty granted for shrimp farmers in relation to deforestations carried out until July 22, 2008.

The frustration of fishermen is reported in their accounts:

> They must pay for their crime. Fishermen who catch crabs out of season [closed season, known in Portuguese as 'defeso'] have to pay, so why don't they have to? (31-year-old shellfish fisherwoman)
>
> They should have to replant the trees. Laws are just the opposite for them, how can it be? (58-year-old fisherman).

The new Forest Code, besides amnestying shrimp farmers who were illegal prior to July 22 of 2008, ensuring the continuity of the exploitation in these areas, also granted more exploitation areas in *apicum* features. Therefore, we can note that previously illegal areas are not taken into the account of the 35% (use of *apicuns* and *salgados*) for being considered as Consolidated Rural Area. This nomenclature defined by law allows legitimating illegal deforestations and environmental degradations occurred before July 22, 2008, and disrespects to PPAs and to the Legal Reserve. Therefore, it was necessary to understand the view of shrimp farmers about this topic.

Understanding of Shrimp farmers about the Law n°12.651/12.

The interview script presented to shrimp farmers addressed the following questions:

A) What is your opinion about the applicability of the laws in the protection of the mangrove ecosystem?

We observed that the interviewed shrimp farmers are sensitive to environmental preservation because they claim they depend on this ecosystem to continue their activity. Despite that, they believe that minor deforestation in the mangrove will not make much difference for the system as a whole. Along the interview, they revealed that they felt marginalized by both the environmental organs with their protective laws and the environmentalists, as demonstrated in the account below:

> There is a great misconception in the applicability of inspections by competent bodies and in the society's view. Our activity is

> commercial and we are often marginalized and unfairly classified as polluters. Our activity is constantly inspected and we are always adjusting to any new law that may be created (Shrimp farmer Nº 02).

After this question, shrimp farmers were then asked questions related to the alteration of the new Forest Code.

B) Do you agree with the alteration of the new Forest Code, which permits the use of 35% of *apicuns* and *salgados* in the state?

Unlike artisanal fishermen, shrimp farmers agree with this permission, believing it is a great incentive for the activity, maybe a significant resumption after the crisis that affected the shrimp farming activity, which is still recovering. Despite that, they claim that the region has few areas of *apicuns* and *salgados*.

> It could be a higher percentage, because in the municipality of Canguaretama this is one of the few activities that bring some positive socioeconomic return (Shrimp farmer Nº 02).

Lastly, the legalization of shrimp farming enterprises divides opinions between shrimp farmers and fishermen. Legalization demanded that enterprises' occupation and implementation occurred prior to July 22 of 2008, that entrepreneurs proved that they were located in *apicum* and *salgado* and committed to protect the integrity of mangroves, especially the attribution of shrimp farming as an agrosilvopastoral activity, according to the Cortez Pereira Law currently valid in RN (BRASIL, 2015; BRASIL, 2012).

> We, shrimp farmers, are not criminals, we generate jobs. Deforestation has really expanded, I saw it. After the salt evaporation pond, the mangrove which regrew was deforested. The deforestation of the main mangrove started when the investments began. However, shrimp farmers are now more aware, we handle the wastes, water and the *meta* [sodium metabisulfite], which is virtually not used because the internal market does not require. This new code is a major advantage, because most of the existing farms were built prior to this date, as well as the activity being considered as agrosilvopastoral (Shrimp farmer Nº 04).

Based on the account above, this is a verbal confirmation of the mangrove deforestation in the region. Despite claiming awareness regarding mangrove preservation, shrimp farmers agree with the amnesty for producers who have deforested because, according to them, it is essential for the continuity of their activity.

Understanding of the Environmental Agency about the Law n° 12.651/12

Based on the questions, it was possible to verify the perception of the State Environmental Agency about the current legislation and possible implications for the mangrove ecosystem and the traditional community in the municipality of Canguaretama. The questions are presented below:

A) The state of Rio Grande do Norte is in compliance with the Art. 11-A, § 5th of the Law nº 12.651/2012, which states that:

> The expansion of the occupation of *apicuns* and *salgados* will respect the Ecological-Economic Zoning of the Coastal Zone – ZEEZOC, with the individualization of the areas still available for use, at a minimum scale of 1:10.000, which must be finished in each state within a maximum period of 1 (one) year from the date this Law was published (BRASIL, 2012).

Has it led to an increase in the requests for licensing for legalization in these areas of the state and especially in Canguaretama/RN?

> The RN state still needs to finish the ZEEZOC of the Northern coast; currently, only the one of the Eastern coast is finished. There was no increase in the requests for licensing in these areas due to the new Forest Code. As a matter of fact, in general, the RN state had a gradual reduction in the requests for licensing for shrimp farming from 2014, probably due to the white spot virus. The municipality of Canguaretama was not different. (Representative of the State Environmental Agency).

Therefore, we can note that Canguaretama has already been zoned and there was no increase in the number of licenses, especially due to the alteration in the Forest Code. A study conducted by Silva (2003) found that

at that period there were 1072.4 hectares of shrimp ponds occupied, of which 914.33 were licensed, while the others were in the process of licensing.

Our study found 588.8 hectares of licensed shrimp ponds, thus confirming the statement of the State Environmental Agency, claiming a reduction in the number of licenses, probably due to the white spot syndrome virus, a factor corroborated by Rocha, Barbosa and Nogueira (2013).

B) On the permission of use of *apicum* and *salgado* regions for shrimp farming activities, consolidated by the new Forest Code, can this prerogative cause significant impacts on the mangrove and on the social-economic aspects of these regions?

> Yes, the use of *apicum* and *salgado* areas by any economic anthropic activity leads to direct and indirect impacts on the estuarine system. These impacts, despite the attempts on mitigation, generate consequences for the entire estuarine chain, with impacts on all trophic levels in this type of ecosystem. The environmental impacts caused by the occupation of *apicuns* and *salgados*, by whatever activity, also generate a series of consequences and socioeconomic impacts associated. It is known that the subsistence of many communities directly depends on the estuarine/marine environment, so the impacts of a poorly managed activity, whatever it is, on these areas may directly affect the communities involved (Representative of the State Environmental Agency).

Medeiros, Carvalho and Pimenta (2014) express a similar opinion in a study with professionals in the fields of environment and teaching, including university professors, an environmental analyst from IBAMA, a fishing engineer, among others. These authors observed that four of the interviewees think that the use of these mangrove features can suppress some functions, habitats and environmental services which are directly and indirectly associated with the ecosystem.

In summary, several authors think that the negative impact caused by an activity in *apicuns* and *salgados*, especially by shrimp farming, may

have disastrous implications for the mangrove ecosystem, particularly for riverside communities whose subsistence is based on artisanal fishing (SCHAEFFER-NOVELLI, 2000; MAIA; et al., 2005; SCHMIDT; BEMVENUTI; DIELE, 2013).

Conclusions

It is noticeable that shrimp farming has generated direct and indirect jobs, but has not aimed at the target of sustainable development, which is the improvement in the standard of living of traditional coastal communities, social equality and environmental preservation. This environmental problem tends to emerge in situations in which the benefit is individualized but the loss is collective.

Given the importance of environmental quality, the artisanal fishermen interviewed are against the change in the Forest Code, although they were unaware of such change, because they understand it worsens environmental degradation and ecological imbalance, especially with the loss of territory and damage to fishing resources.

By contrast, shrimp farmers are in favor of the new Forest Code, although they were unaware of this law or knew it superficially. They think this instrument is a legal incentive for the activity, which has contributed to the legalization of previously illegal enterprises, besides expanding their cultivation area.

The State Environmental Agency thinks that any poorly managed activity in *apicum* and *salgado* regions will cause a negative impact on both the ecosystem and the local community.

The present study presupposes that the dissemination and expansion in the access of the population to knowledge related to the environment and particularly to the consequences of law changes on the environment where people live are fundamental and flawed. Thus, it became evident that the

applicability of laws, as well as protection of the mangrove ecosystem, requires political, economic and social efforts.

The public power must provide inspection and have technical resources, especially political will, to protect threatened mangrove areas. The economic sector should be in charge of its socio-environmental responsibility towards the ecosystems, while the society should seek to know legal norms and not abdicate its role of inspection and claiming of its right to an ecologically balanced environment. When the local communities take the discussion, degradation and unorganized occupation of coastal areas can be reversed more easily.

The greatest challenge lies in proposing viable alternatives to implementing integration programs, which conciliate sustainable environmental exploitation with the real world, and not in mischaracterizing coastal communities, whose traditions should be recovered and maintained.

Shrimp farming projects are economically beneficial, provided that there is an environmental plan considering, for instance, ecological corridors, which maintain virgin zones interspersed with shrimp ponds in order to avoid negative impacts on the environment.

References

BARBETTA, P. A. *Estatística Aplicada às Ciências Sociais*. 5. ed. Florianópolis, SC: Editora da UFSC, 2002.

BARDIN, L. *Análise de Conteúdo*. 70. ed. Lisboa, Portugal: LDA, 2009.

BNB. Banco do Nordeste**.** *Manual de impactos ambientais:* orientações básicas sobre aspectos ambientais de atividades produtivas. 2. ed. [S. l.]: BNB, 2008. Available in: < http://www.mma.gov.br/estruturas/sqa_pnla/_arquivos/manual_bnb.pdf>. Accessed in: 20 mar. 2016.

BRASIL. Lei nº 9978, de 9 de setembro de 2015. Denomina Lei Governador Cortez Pereira, dispõe sobre desenvolvimento Sustentável da Carcinicultura no Estado do Rio Grande do Norte e dá outras providências. *Diário Oficial do Estado Rio Grande do Norte*, 10 set. 2015.

_____. Lei n° 12.651, de 25 de maio de 2012. Dispõe sobre a proteção da vegetação nativa. *Diário Oficial da União*, Brasília, DF, 25 maio 2012.

CPRM. *Diagnóstico do município de Governador Dix-Sept Rosado*. Recife, PE: Ministério de Minas e Energia, 2005. Available in: <http://www.cprm.gov.br/publique/media/hidrologia/mapas_publicacoes/atlas_digital_rhs/rg norte/relatorios/CANG027.PDF>. Accessed in: 10 out. 2015.

DIEGUES, A. C. *Pesca e marginalização no litoral paulista*. 1973. 187 f. Dissertação (Mestrado em Ciências Sociais) – Universidade de São Paulo, São Paulo, SP, 1973. Available in: <http://nupaub.fflch.usp.br/sites/nupaub.fflch.usp.br/files/color/Pesca.pdf>. Accessed in: 25 out. 2016.
DIEGUES, A. C. *Pescadores, camponeses e trabalhadores do mar*. São Paulo, SP: Ática, 1983.
DONATO, D. C. et al. Mangroves among the most carbon-rich forests in the tropics**.** *Nature Geoscience*, v. 4, n. 5, p. 293-297, 2011. https://doi.org/10.1038/ngeo1123
FERNANDES, J.; REZENDE FILHO, C. B. **Percepção ambiental**: as transformações no cotidiano de caiçaras de Ubatuba-SP na década de 1960 e na primeira década do século XIX. Curitiba, PR: CRV, 2010. https://doi.org/10.24824/978858042020.3
GUIMARÃES, I. Breve histórico do cultivo de camarões no Rio Grande do Norte. *Ciência Sempre*, Natal, RN, v. 1, n. 1, ano 3, Edição Especial, 2007. Available in: <http://adcon.rn.gov.br/ACERVO/FAPERN/DOC/DOC000000000010487.PDF>. Accessed in: 16 maio 2016.
IDEMA. Instituto de Desenvolvimento Sustentável e Meio Ambiente do Rio Grande do Norte. *Perfil do Seu Município*: Canguaretama. Natal, RN, 2008. Available in: <http://adcon.rn.gov.br/ACERVO/idema/DOC/DOC000000000016642.PDF>. Accessed in: 28 maio 2015.
KLEIN, L. et al. Mudanças do Código Florestal: uma análise institucional da percepção de produtores agrícolas de um município do Paraná. **Revista de Gestão Ambiental e Sustentabilidade – GeAS**. São Paulo, SP, v. 4, n. 1, p. 124-138, 2015. Available in: < http://www.revistageas.org.br/ojs/index.php/geas/article/view/165>. Accessed in: 15 mar. 2016. https://doi.org/10.5585/geas.v4i1.165
LONARD, R. I.; JUDD, F. W.; STALTER, R. The Biological Flora of Coastal Dunes and Wetlands: Batis maritima C. Linnaeus. *Journal of Coastal Research*, West Palm Beach, Florida, v. 27, n. 3, p. 441-449, 2011. https://doi.org/10.2112/JCOASTRES-D-10-00142.1
MAIA, L. P. et al. **Estudo das áreas de manguezais do Nordeste do Brasil: Avaliação das áreas de manguezais dos Estados do Piauí, Ceará, Rio Grande do Norte, Paraíba e Pernambuco**. Fortaleza, CE: Universidade Federal do Ceará-Instituto de Ciências do Mar/Sociedade Internacional para Ecossistemas de Manguezal–ISMEBR. 2005. Available in: <http://abccam.com.br/site/wp-content/uploads/2013/12/Estudo-das-Areas-de-Manguezais-do-Nordeste-do-Brasil-2005.pdf>. Accessed in: 11 jan. 2016.
MARCONE, M. F. Batis maritima (Saltwort/Beachwort): a nutritious, halophytic, seed bearings, perennial shrub for cultivation and recovery of otherwise unproductive agricultural land affected by salinity. *Elsevier Science*, Canadá, v. 36, n. 2, p.123-130, 2003. https://doi.org/10.1016/S0963-9969(02)00117-5
MEDEIROS, S. R. M.; CARVALHO, R. G.; PIMENTA, M. R. C. A proteção do ecossistema manguezal a luz da Lei: 12.651/2012: novos desafios para a sustentabilidade dos manguezais do Rio Grande do Norte. **Revista Geotemas**, Pau dos Ferros, RN, v. 4, n. 2, p.59-78, 2014. Available in: < http://periodicos.uern.br/index.php/geotemas/article/view/1064/714>. Accessed in: 10 mar. 2016.
MELAZO, G. C. Percepção ambiental e educação ambiental: uma reflexão sobre as relações interpessoais e ambientes no espaço urbano. **Olhares & Trilhas**, Uberlândia, MG, v. 1, n. 6, p. 45-51, 2005. Available in: <http://www.seer.ufu.br/index.php/olharesetrilhas/article/download/3477/2560>. Accessed in: 05 abr. 2016.
MPA, Ministério da Pesca e Aquicultura. *Levantamento da infraestrutura produtiva e dos aspectos tecnológicos econômicos, sociais e ambientais da carcinicultura marinha no Brasil em 2011*. Natal, RN: Associação Brasileira dos Produtores de Camarão, 2013. Available in: <http://abccam.com.br/site/wp-content/uploads/2013/12/LEVANTAMENTO-DA-INFRAESTRUTURA-PRODUTIVA.pdf>. Accessed in: 30 maio 2015.
OLIVEIRA, L. M. M. de; FREITAS FILHO, M. R. de. Quantificação dos ambientes de apicum e salgado na planície fluviomarinha do rio Coreáu – CE à luz do Novo Código

Florestal. **Revista Caminhos da Geografia**. V. 18, n. 63, p. 184-201, 2017. Available in: < http://www.seer.ufu.br/index.php/caminhosdegeografia/article/view/37470>. Accessed in 10 dez. 2018. https://doi.org/10.14393/RCG186308

POLÍZIO JÚNIOR, V. *Novo Código Florestal*: comentando artigo por artigo, anotado e comparado com o Código Florestal de 1965. São Paulo, SP: Rideel, 2014.

RICHARDSON, R. J. *Pesquisa social*: métodos e técnicas. 3. ed. São Paulo, SP: Atlas S.A., 1999.

ROCHA, I. P. *Cultivo do Camarão Marinho*: Atividade Socialmente Justa, Ambientalmente Responsável e, Economicamente Importante, de Forma Especial para o Meio Rural da Região Nordeste. Natal, RN: ABCCAM, 2015. Available in <http://abccam.com.br/site/wp-content/uploads/2015/05/Carcinicultura-Marinha-Brasileira-Artigo-Executivo.pdf>. Accessed in: 30 maio 2015.

ROCHA, I. P.; BORBASA, M.; NOGUEIRA, J. O Censo da Carcicnicultura Nacional em 2011. *Revista ABCC*, Natal, RN, ano 15, n. 1, 2013.

SALES, L. E. M. **Investigação do vírus da Síndrome da mancha branca (WSSV) em fazendas do Estado do Rio Grande do Norte**. 2013. 46 f. Dissertação (Mestrado em Produção Animal) – Universidade Federal Rural do Semiárido, Mossoró, 2013. Available in: < https://ppgpa.ufersa.edu.br/wp-content/uploads/sites/60/2014/10/LILIANE.pdf>. Accessed in 10 jan. 2017.

SCHAEFFER-NOVELLI, Y. et al. Alguns impactos do PL 30/2011 sobre os Manguezais brasileiros. In: SOUZA, G.; JUCÁ, K.; WATHELY, M. (Org.). *Código Florestal e a Ciência*: o que nossos legisladores ainda precisam saber. Brasília, DF: Comitê Brasil, 2012. cap. 2, p. 18-27. Available in: http://www.mpsp.mp.br/portal/page/portal/cao_criminal/Boas_praticas/Relacao_Projetos/projetoflorestar1/revista_codigo_florestal_e_a_ciencia.pdf>. Accessed in: 17 fev. 2016.

SCHAEFFER-NOVELLI, Y. *Grupo de ecossistemas*: manguezal, marisma e apicum. São Paulo, SP: Caribbean Ecogical Research, 2000. Available in: <http://anp.gov.br/meio/guias/sismica/refere/manguezal_marisma_apicum.pdf>. Accessed in: 29 jan. 2016.

SCHMIDT, A. J.; BEMVENUTI, C. E.; DIELE, K. Sobre a definição da zona de apicum e sua importância ecológica para populações de caranguejo-uçá *Ucides cordatu*s (LINNAEUS, 1763). *Bol. Téc. Cient. CEPENE*, Tamandaré, PE, v. 19, n. 1, p. 9-25, 2013. Available in: < http://www.icmbio.gov.br/cepene/images/stories/publicacoes/btc/vol19/art01-v19.pdf>. Accessed in: 16 fev. 2016.

SILVA, M. R. *Povos de Terra e água*: a comunidade pesqueira canto do mangue, Canguaretama (RN) – Brasil. 2004. 126 f. Dissertação (Mestrado em Ecologia de Agroecossistemas) – Universidade de São Paulo, Piracicaba, 2004. Available in: <http://www.teses.usp.br/teses/disponiveis/91/91131/tde-20092004-162747/publico/marcia.pdf>. Accessed in: 31 maio 2015

TUAN, Y. **Topofilia**: um estudo da Percepção, atitudes e valores do meio ambiente. São Paulo, SP: DIFEL, 1974.

VASCONCELLOS, M.; DIEGUES, A. C.; SALES, R. R. Limites e possibilidades na gestão da pesca artesanal costeira. In: LOBO, A. (Org.). *Nas redes da pesca artesanal*. Brasília, DF: IBAMA: 2007. cap. 1, p.15-63. Available in: <http://nupaub.fflch.usp.br/sites/nupaub.fflch.usp.br/files/color/limitesohright.pdf>. Accessed in: 25 ago. 2016.