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Environmental Infractions and Fines Imposed for Illegal Fishing in the State of Pará, Amazon, Brazil

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Abstract

Environmental regulation and the implementation of formal sanctions, including fines, are part of the environmental policy of almost all nations, including Brazil. The Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA) is the main environmental body responsible for the supervision of fishing in Brazil. This study aimed to characterize environmental infringements and fines related to illegal fishing in the state of Pará between 2009 and 2016 by means of data interpretation, using the Corporate System of Registration, Collection, and Monitoring of IBAMA, which contains management information on environmental monitoring. A total of 886 notices of infringement against illegal fishing were recorded in Pará, with 2009 having the highest (198) and 2015 the lowest number of notices (42). The main infractions against fishing in the state were for fishing in an unauthorized season or zone and fishing without prior registration, inscription, authorization, license, permit or registration of the competent body, or contrary to obtained permit. According to the notices conducted by IBAMA, fisheries resources have been exploited illegally in estuarine and coastal environments in the state of Pará.

Keywords: environmental inspection, notices of infringement, mesoregion

1. Introduction

Concern about the rational management of natural resources has resulted in several actions to reverse or mitigate indiscriminate and predatory use. This shows the engagement of governmental bodies in the formulation of public policies, supervision, control, and monitoring of natural resources. These institutions are critical, together with the local resident population and users of these environmental goods, and need to develop effective strategies that allow the continued and indefinite use of natural resources (Ruffino, 2005; Furtado, 2008).

Brazilian fishery production in 2010 was approximately 1,240,000 tons, generating 3.5

million direct and indirect jobs and a fishery Gross Domestic Product of R$5 billion (MPA, 2011). However, the extensive Brazilian hydrographic network, coupled with the low availability of scientific information (including statistical data) (Ruffino, 2008) and a lack of monitoring, are limiting factors on curbing illegal fishing (Dias-Neto, 2010), which has caused environmental and economic damage in different regions of Brazil, but especially in the Amazon due to its geographical vulnerability (Borges et al., 2007).

Environmental regulation and the implementation of formal sanctions, including fines, are part of environmental policy of almost all nations, including Brazil. This is due to growing environmental concerns about the preservation of ecosystems and the awareness that it is necessary to preserve the environment for the quality of life of future generations. Thus, the community and, above all, public powers have been delegated the power to regulate and supervise the rules created by society (Peres et al., 2016).

Environmental oversight is needed to suppress and prevent the occurrence of conduct harmful to the environment. By punishing those who cause environmental damage, environmental oversight promotes the deterrence of these harmful acts. The application of fines, seizures, embargoes, restrictions, etc., aims to discourage not only the individuals punished from committing further infringements, but also others who may commit environmental infringements (IBAMA, 2016). The economic theory of crime indicates that this procedure is important to combating environmental violations and the consequent environmental degradation (Uhr and Uhr, 2014).

This study is part of the National Policy for the Sustainable Development of Aquaculture and Fisheries, which provides for the supervision of aquatic resources, from fishing to marketing, as one of the pillars of sustainable development of fishing activity. The information contained in the notices of infringement (NIs) is rarely analyzed by environmental agencies to map fishing areas, periods, and regions that are more susceptible to illegal fishing. The characterization of environmental infringements and identification of main municipalities in which illegal fishing occur in the state of Pará can serve as a basis for future planning of inspections and to analyze compliance with fishing legislation.

2. Material and Methods

The area covered by this work is the state of Pará, which has 144 municipalities and an area of 1,247,955.381 km^2, corresponding to 14.7% of Brazilian territory and 32% of the North Region. In order to analyze the data, the geographical mesoregion classification of Pará was used: Lower Amazonas, Marajó, Belém, Northeast Paraense, Southwest Paraense, and Southeast Paraense (IBGE, 1990) (Figure 1).

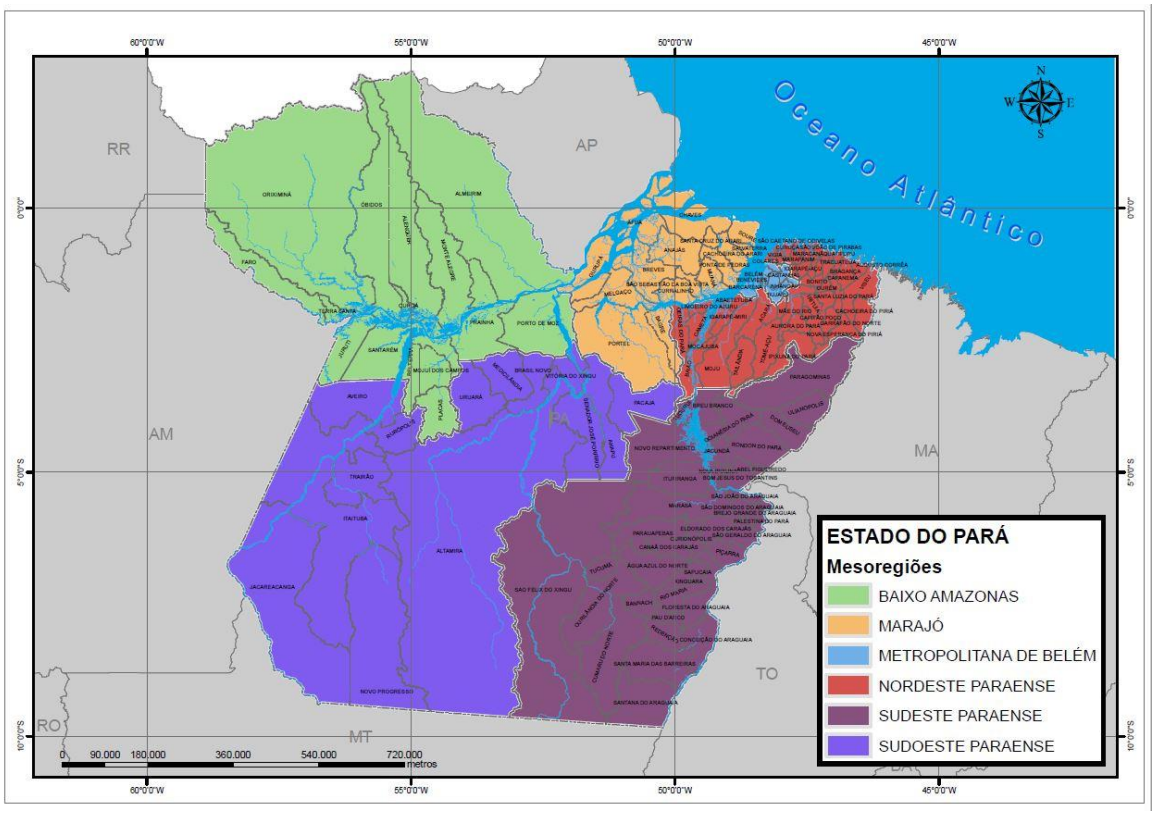

Figure 1. Map of the six geographical mesoregions of the state of Par á

The data for the study were obtained from the Integrated System for Registration, Collection, and Monitoring (SICAFI) of the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), consisting of a corporate computing system containing the management information of environmental inspections that resulted in NIs, with the respective details of seizure, deposits, embargoes, suspensions, and donations written up by the environmental body.

All administrative infringements committed from 1 January 2009 to 31 December 2016 were selected. The referential adopted for definition of data collection period was established from the year subsequent to the publication of Decree No. 6.514 of 22 July 2008 (Brazil, 2008).

An NI indicates the administrative sanction of a warning or fine (simple and daily), the sanction that can be applied for administrative infringements of lesser harm to the environment, with a maximum imposed fine not exceeding R$1,000.00 (one thousand reals).

The information obtained for NIs for each year indicated the municipality, offender's name, individual or legal entity, fine's amount, type (fine or warning), infringement description, typification, and sanction date.

The qualitative and quantitative data were statistically analyzed using Excel software (Supplements and Data Analysis), being organized, tabulated, and analyzed by descriptive statistics.

In order to spatialize the fishing infringements, the spreadsheet was classified by the number

of records written up by municipality. Next, the municipalities were grouped by the division of mesoregion of Pará in order to analyze the efforts exerted by IBAMA's inspections.

The main infringements committed against fishing and their respective quantitative procedures were identified and listed. The administrative infringement types selected for the analysis were listed in light of Federal Decree 6514/2008, Subsection I, Infractions Against Fauna (Brazil, 2008).

3. Results

A total of 886 NIs against illegal fishing were recorded in Pará—95 warnings and 791 simple fines recorded by IBAMA/PA from 2009 to 2016—which generated a total of R$ 75,422,330.40. The highest number of notices occurred in 2009, with 198, and 2015 had the lowest number of fines, 42 (Table 1).

Table 1. Number of NIs written up and total value/year generated by IBAMA/PA from 2009 to 2016

Year	Acts of infringement (N)	Warning	Fine	Recurrence (%)	Total value/year (R$)
2009	198	20	178	3.5	6,277,214.40
2010	134	06	128	3.0	2,860,648.00
2011	152	6	146	6.0	2,497,329.20
2012	151	50	101	6.0	11,943,596.80
2013	86	09	77	3.5	41,108,826.00
2014	64	03	61	1.5	1,632,230.00
2015	42	0	42	2.0	6,762,440.00
2016	59	01	58	5.0	2,340,046.00
Total	886	95	791	4.8	75,422,330.40

Of the total number of NIs, 765 were written up against individuals, with a recidivism rate of 4.8%. The highest number of cases filed for the same individual was three, for fishing in a period or place in which fishing was prohibited or fishing without a permit or contrary to the permit held (Brazil, 2008).

With regard to legal persons, 121 NIs were written up. These companies had a recidivism rate of 17.4% in the sanctions imposed, and ornamental fish trade companies accounted for 42% of recurrences, with one company having eight NIs recorded.

The monthly analysis of the infringements from 2009 to 2016 demonstrates that the months of February and November concentrated the largest numbers of infractions recorded against illegal fishing in Pará (Figure 2).

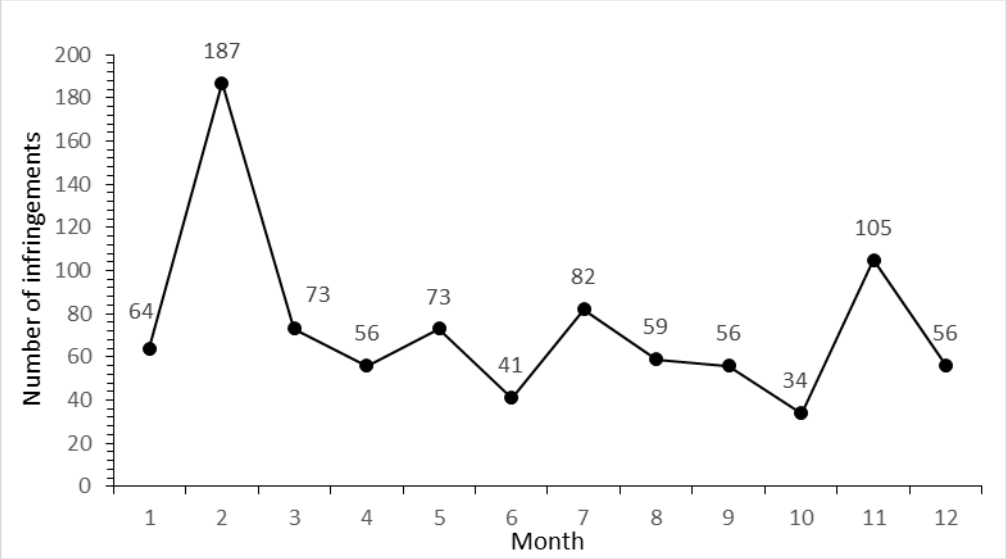

Figure 2. Number of fishing infringements per month written up by IBAMA/PA from 2009 to 2016

Analyzing the number of infringements for each year, one can observe that there is no standard for imposed fines, there is a decrease of infringements recorded from 2013, and in some months no fine was imposed against illegal fishing (Figure 3).

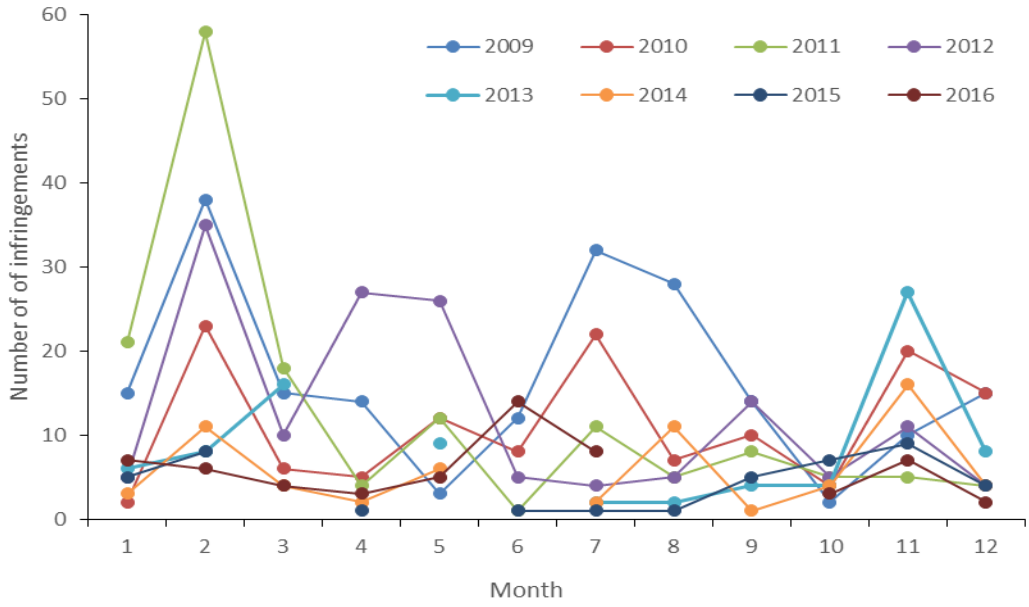

Figure 3. Number of fishing infringements per month written up by IBAMA/PA from 2009 to 2016

Fishing infringements were recorded in 78 of the 144 municipalities in the state of Pará. Most of procedures that resulted in fines are concentrated in the municipalities of Belém (20.54%), Santarém (13.54%), and Altamira (4.63%), which have IBAMA offices. The rest were

recorded in other municipalities of the state (Table 2).

Table 2. Geographical distribution of procedures applied by IBAMA/PA against illegal fishing, by municipality, from 2009 to 2016

Municipality	Infringements (N)	%	Total value (R$)	%
Belém	182	20.54	50,580,890.40	67.06
Santarém	120	13.54	8,502,864.00	11.27
Altamira	41	4.63	7,065,430.00	9.37
Jacareacanga	32	3.61	237,840.00	0.32
Tucuruí	32	3.61	250,800.00	0.33
Soure	30	3.39	2,524,160.00	3.35
Marabá	28	3.16	409,920.00	0.54
Monte Alegre	26	2.93	240,290.00	0.32
Castanhal	21	2.37	104,040.00	0.14
Bragança	20	2.26	902,736.00	1.20
Vigia	17	1.92	640,840.00	0.85
Salvaterra	15	1.69	10,300.00	0.01
Itaituba	14	1.58	50,760.00	0.07
Óbidos	14	1.58	291,880.00	0.39
São Felix do Xingu	13	1.47	431,748.00	0.57
Ananindeua	12	1.35	167,751.20	0.22
Conceição do Araguaia	12	1.35	30,880.00	0.04
Salinópolis	12	1.35	27,320.00	0.04
Itupiranga	11	1.24	150,900.00	0.20
Novo Repartimento	11	1.24	115,320.00	0.15
Abaetetuba	10	1.13	163,380.00	0.22
Marapanim	10	1.13	4,300.00	0.01
Nova Ipixuna	10	1.13	62,320.00	0.08
Oriximiná	10	1.13	15,668.80	0.02
Cametá	8	0.90	9,600.00	0.01
Curuca	8	0.90	8,680.00	0.01
São Caetano de Odivelas	8	0.90	11,240.00	0.01
Mocajuba	7	0.79	12,270.00	0.02
Parauapebas	7	0.79	64,200.00	0.09
Quatipuru	7	0.79	5,100.00	0.01
Redenção	7	0.79	16,760.00	0.02
Cachoeira do Arari	6	0.68	3,500.00	0.00
Chaves	6	0.68	50,980.00	0.07
Igarapé-Miri	6	0.68	18,740.00	0.02
Jacundá	6	0.68	83,300.00	0.11
Portel	6	0.68	15,020.00	0.02
Augusto Correa	5	0.56	23,120.00	0.03

Senador Jose Porfirio	5	0.56	6,560.00	0.01
Aveiro	4	0.45	12,800.00	0.02
Barcarena	4	0.45	10,200.00	0.01
Goian ésia do Par á	4	0.45	52,620.00	0.07
Limoeiro do Ajuru	4	0.45	96,250.00	0.13
Maracan ã	4	0.45	5,700.00	0.01
Marituba	4	0.45	474,180.00	0.63
Primavera	4	0.45	5,460.00	0.01
S ão Joao de Pirabas	4	0.45	141,920.00	0.19
Vitoria do Xingu	4	0.45	9,042.00	0.01
Almeirim	3	0.34	7,000.00	0.01
Bai ão	3	0.34	14,070.00	0.02
Breves	3	0.34	954,320.00	1.27
Novo Progresso	3	0.34	3,980.00	0.01
Prainha	3	0.34	6,440.00	0.01
Santana do Araguaia	3	0.34	54,520.00	0.07
Breu Branco	2	0.23	1,800.00	0.00
Dom Eliseu	2	0.23	15,000.00	0.02
Juruti	2	0.23	3,760.00	0.00
Palestina do Par á	2	0.23	2,160.00	0.00
Peixe-Boi	2	0.23	1,400.00	0.00
Porto de Moz	2	0.23	136,280.00	0.18
Rondon do Par á	2	0.23	2,100.00	0.00
Santa Cruz do Arari	2	0.23	2,200.00	0.00
Santa Maria das Barreiras	2	0.23	860.00	0.00
Santar ém Novo	2	0.23	2,800.00	0.00
Santo Ant ônio do Tau á	2	0.23	7,380.00	0.01
Tracuateua	2	0.23	23,740.00	0.03
Afu á	1	0.11	2,700.00	0.00
Alenquer	1	0.11	1,520.00	0.00
Anapu	1	0.11	700.00	0.00
Belterra	1	0.11	7,000.00	0.01
Capanema	1	0.11	700.00	0.00
Ipixuna do Par á	1	0.11	17,200.00	0.02
Melga ço	1	0.11	700.00	0.00
Ponta de Pedras	1	0.11	500.00	0.00
Santa Isabel do Par á	1	0.11	14,200.00	0.02
S ão Joao do Araguaia	1	0.11	4,700.00	0.01
Terra Alta	1	0.11	11,500.00	0.02
Terra Santa	1	0.11	700.00	0.00
Uruar á	1	0.11	1,520.00	0.00

With regard to mesoregions of Par á, Bel ém mesoregion had the largest number of notices of

fishing infringements (226), followed by the Lower Amazon (183), Southeast Pará (155), Northeast Pará (146), Southwest Pará (105), and Marajó (71) (Table 3).

Table 3. Number of NIs in mesoregions of Pará written up by IBAMA/PA from 2009 to 2016

Mesoregion	2009	2010	2011	2012	2013	2014	2015	2016	NIs (N)
Belém	39	19	26	70	13	13	15	31	226
Lower Amazon	23	55	26	34	25	6	11	3	183
Southeast Pará	21	20	26	17	36	20	5	10	155
Northeast Pará	60	25	33	3	7	5	5	8	146
Southwest Pará	19	6	28	21	4	14	6	7	105
Marajó	36	9	13	6	1	6	-	-	71
Total	198	134	152	151	86	64	42	59	886

In the period under analysis, the mesoregion of Belém displayed a high variation in the number of NIs recorded, with the largest number of administrative penalties imposed in 2012, mainly related to transportation of pirarucu *Arapaima gigas* (Schinz, 1822) in close season.

Of the total number of notices for this mesoregion, 64 related to transport or trade of pirarucu *Arapaima gigas* during close season; 34 related to trade in ornamental fish; 29 related to marketing or transporting the swamp ghost crab *Ucides cordatus* (Linnaeus, 1763) in close season; 8 related to fishing, commercializing, or transporting *Brachyplatystoma vaillanti* (Valenciennes, 1840) in close season; 8 related to marketing or transporting pink shrimp *Penaeus subtilis* (Pérez Farfante, 1967) or white shrimp *Litopenaeus schmitti* (Burkenroad, 1936) in legislation breach; and 7 related to marketing or transporting Atlantic seabob *Xiphopenaeus kroyeri* (Heller, 1862) in legislation breach.

The Lower Amazon mesoregion presented a range of fisheries infringements (183), declining from 2013. The more common NIs were for fishing or transporting the species mapará (*Hipophthalmus* spp.), tambaqui *Colossoma macropomum* (Cuvier, 1818), and pirarucu *Arapaima gigas* in close fishing seasons.

The main close seasons occurring in this mesoregion are under Amazon Basin (Brazil, 2007) for the pirarucu *Arapaima gigas* (Brazil, 2004), tambaqui *Colossoma macropomum* (35/05), and acari *Liposarcus pardalis* (Castelnau, 1855).

The Southeast Pará mesoregion presented a low number of notices per year, reaching only four in 2013. The main species appearing in the descriptions of the NIs were the tucunaré *Cichla* sp., the mapará *Hipophthalmus* spp., the surubim *Pseudoplatystoma fasciatum* (Linnaeus, 1776) and the curimatá *Hipophthalmus* spp. The main close seasons that occur in the mesoregion are from hydrographic basin of Araguaia Tocantins Basin for pirarucu (05/24) and tambaqui.

The Northeast Pará mesoregion showed a decline in notices over the period examined, especially from 2012. In the first years of the review, the notices were concentrated in the microregions of Bragantina, Salgado, and Cametá. Since 2012, records show NIs only in the

Bragantina and Salgado microregions.

The main species that appeared in notices' descriptions were the swamp ghost crab *Ucides cordatus*, mapará *Hipophthalmus* spp., tamoatá *Hoplosternum* spp., northern red snapper *Lutjanus purpureus* (Poey, 1866), and shark fin.

The Southeast Pará mesoregion presented a low number of notices over the period examined. The most notable were the notices carried out in the Kayabi Indigenous Land in the municipality of Jacareacanga and in the Baú Indigenous Land in Altamira, totaling 35 infractions related to fishing. The main species that appeared from notices' descriptions were the curimatá *Prochilodus nigricans* (Agassiz, 1829), mapará *Hipophthalmus* spp., ornamental fish, tambaqui *Colossoma macropomum*, and piau *Leporinus* sp.

The Marajó mesoregion had the lowest number of notices, with fisheries infractions only up to 2014. Forty-five NIs were recorded for fishing without prior registration, inscription, authorization, license, permit, or listing from or with the competent body (Brazil, 2008). The main species described in the infringement notices was the piramutaba *Brachyplatystoma Vaillanti*.

Two infringements committed against fishing in the state are highlighted: (a) fishing in a close period or site and (b) fishing without prior registration, inscription, authorization, license, document, or listing from or with the competent body, or contrary to the license obtained (Table 4).

Table 4. Incidence of infringements based on the description of notices written up, associated with the fishing industry, from 2009 to 2016

Art. of Federal Decree 6514/2008	Infringement Description	Number of Infringements
24	Using specimens of wild fauna without the proper license from the competent authority or contrary to obtained license	6
29	Maltreating wild, domestic, or domesticated native or exotic animals (ornamental fish)	2
35	Fishing in a period or place in which fishing is prohibited	677
36	Fishing with explosives or substances that, in contact with water, produce similar effects, or toxic substances, or by other means prohibited by the competent authority	8
37	Fishing without prior registration, inscription, authorization, license, permit, or listing from or with the competent body or contrary to obtained permit	176
38	Importing or exporting any aquatic species, or introducing native species, exotic or non-autochthonous, into Brazilian jurisdictional waters, without authorization or license from the competent organ, or contrary to obtained permit	1
66	Running establishments, activities, works, or services that use environmental resources without license or authorization from	7

	competent environmental bodies or contrary to obtained permit	
81	Preparing or presenting false, misleading, or incomplete information, either in the official systems of control or in the licensing or any other environmental administrative procedure	9

In addition to the notices related to fishing infractions, other articles of Federal Decree 6514/2008 (Brazil, 2008), relating to illegal fishing were taken into account, such as Article 24 for using wild species without a permit or illegally, which provides for a fine of R$5000.00 per individual of any species on the official lists of risk or threat of extinction if it is in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The six NIs that appeared in the period were related to transportation and collection of 2394 specimens of the zebra pleco *Hypancistrus zebra* (Isbrücker and Nijissen, 1991), which is threatened with extinction and on the CITES list. The infringements were concentrated in the municipalities of Santarém and Altamira.

Article 29 of Federal Decree 6514/2008 (Brazil, 2008), which provides for penalties for maltreatment, was applied due to the death of 221 ornamental fish as a result of irregular packaging during transport at Belém International Airport.

The largest number of fisheries notices were framed under Article 35, Sections I, II, III, IV, V, and VI of Federal Decree 6514/2008 (Brazil, 2008), with emphasis on Section III, with 281 NIs under the heading “transports, markets, benefits, or industrializes specimens from unauthorized collection, gathering, and fishing” and on Section IV, with 181 NIs related to “transports, preserves, benefits, adulterates, industrializes, or sells fish or products from the fishery without proof of origin or authorization from the competent body” (Table 5).

Table 5. Number of NIs framed under Article 35 and sections of Federal Decree 6514/2008 from 2009 to 2016

Art. 35	Years								
	2009	2010	2011	2012	2013	2014	2015	2016	Total
Caput	21	15	-	1	2	18	2	15	74
I	9	3	15	1	-	6	1	-	35
II	8	16	6	-	6	-	1	2	39
III	46	30	73	63	40	10	2	17	281
IV	16	42	11	61	20	9	12	10	181
V	9	5	15	8	4	6	6	3	56
VI	6	-	3	1	1	-	-	-	11

I: fishing for species that must be preserved or specimens with sizes below that permitted

II: fishing in quantities in excess of those permitted or through the use of unauthorized appliances, equipment, techniques, and methods

III: transporting, selling, transforming, or industrializing specimens from unauthorized collection, harvesting, and fishing

IV: transporting, preserving, transforming, adulterating, manufacturing, or selling fish or fishery products without proof of origin or authorization of the competent body

V: capturing, extracting, collecting, transporting, marketing, or exporting ornamental species from fishing without the authorization of the competent body or contrary to obtained authorization

VI: failing to submit a statement of stock

Article 37 of Federal Decree 6514/2008 (Brazil, 2008), which defines an infringement as "engaging in fishing without prior registration, inscription, authorization, license, permit, or registration with or from the competent body or contrary to obtained authorization," was the article with second-highest number of NIs in Pará, confirming the practice of illegal fishing in the state (Figure 4).

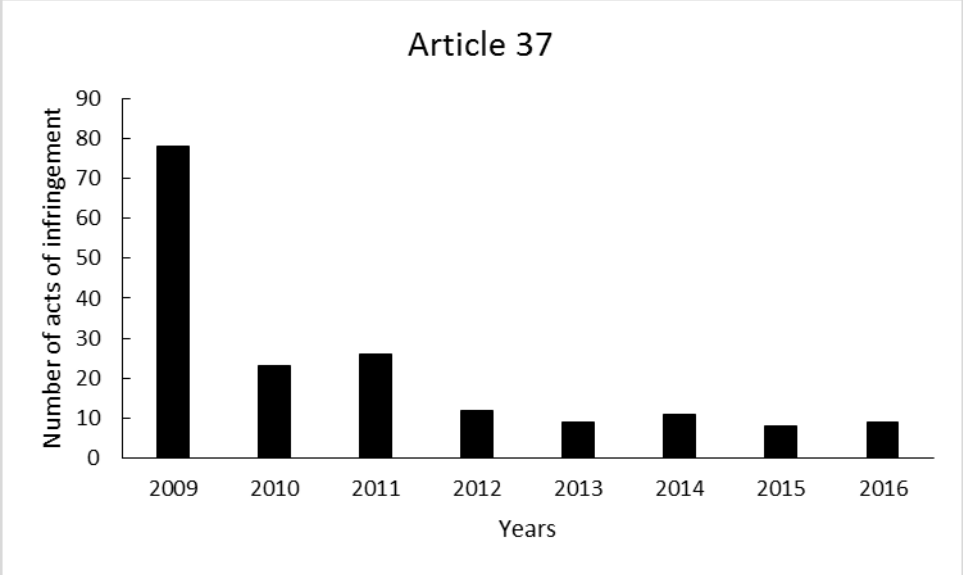

Figure 4. Number of NIs for fishing framed under Article 37 of Federal Decree 6514/2008 from 2009 to 2016

4. Discussion

According to Dias et al. (2013), who analyzed the notices of fisheries infringements in Amapá between 1995 and 2012, 2002 had the greatest number of infringements, with 72 NIs written up. The authors stated that non-systematic fishing operations explained the time spacing between the peaks of illegal fishing activity in the period evaluated.

In the state of Pará, there has been a downward trend in the case of fisheries infractions recorded by IBAMA since 2013. This institute has reduced its units throughout Brazil; the regional offices of Breves, Itaituba, Cametá, Tucuruí, Oriximiná, Soure, Conceição do Araguaia, and Xinguara have been closed and only the executive management in Marabá and Santarém and the Advanced Unit of Altamira have been retained, alongside the

Superintendency of IBAMA in Belém.

This study revealed that the months from November to February showed the highest number of NIs recorded. Close seasons for shrimp, pink snapper, lobster, pirarucu, tambaqui, swamp ghost crab, and the Tocantins, Gurupi, and Araguaia River basins are in effect in February, where environmental body inspections are intensified.

The month of November coincides with the close season of piramutaba, and the close seasons in the Amazon, Tocantins, Gurupi, and the Araguaia River hydrographic basins begin, when the statements of stocks are delivered to the environmental agency and the IBAMA/PA fishing inspections begin.

According to Rosa et al. (2017), in a study conducted in Bragança/PA, the price of shark fins saw an apparent decline in 2010/2011 and 2015. This may be linked to the intensification of supervision, through IBAMA, in curbing and fining illicit practices in this system. This agrees with the present study, in which shark fins were the main by-product seized in Northeast Pará mesoregion.

The infractions' spatialization suggests that mesoregions that do not have IBAMA units are more exposed to illegal fishing, in particular the Marajó mesoregion, which has not had an infraction notice written up by IBAMA since 2015. Inspections become inefficient due to a shortage of vessels to control illegal fishing in the area. As an alternative, IBAMA has sought to carry out joint operations with the Brazilian Navy, Federal Police, and ICMBio, in order to share the use of the vessels.

According to Dias et al. (2013), the considerable number of notices relating to the exercise of fishing without a permit in the Amapá represents illegal fishing conducted by amateur fishermen who, as a rule, act outside the law. This type of activity has a predatory bias that, depending on the intensity and location in which it is practiced, can result in the reduction of certain endemic species. According to this study, fishing without a license or registration was one of the main environmental infringements committed in the state of Pará.

According to Nascimento et al. (2011), in a study performed in the Tocantins River in Marabá, fishermen pointed out that the main causes of decline in fish productivity in the region were the use of trawlers, increases in fishermen number, inspection lack, predatory fishing, and the Tucuruí hydroelectric dam.

Most of the infractions committed in Pará indicate the illegal character of fishing activity, with fishing and the transport of species being practiced without obtaining authorization from the competent body, conducted in close seasons and in places where fishing is prohibited.

According to the Report of Evaluation of the Execution of Government Programs of the General Comptroller's Office (CGU) (2017) on the expenditure carried out by government actions relating to environmental inspections by IBAMA from 2010 to 2015, 91% of all costs are intended to defray the supervision of the activities of deforestation and 8% in the supervision of fishery sector activities.

Currently, according to Schmitt and Scardua (2015), the main environmental inspection

actions of IBAMA are aimed at combating illegal deforestation in the Amazon. Secondarily, other thematic areas are also the object of activities by the federal autarchy, such as the fight against illegal fishing, fauna protection, access to genetic heritage, transnational illicit activities, and activities related to environmental licensing.

In this context, it should be noted that in the four years from 2013 to 2016, there was also a reduction of around 42% in the environmental monitoring budget, as well as a 15% reduction in environmental inspections (CGU, 2017).

5. Conclusion

The fisheries resources have been exploited illegally in the state of Pará in estuarine and coastal environments, as shown by notices handed out by IBAMA. The number series of notices showed a decline over the years, indicating little supervision effectiveness, particularly in the year 2015, when there were 80% fewer notices written up than in 2009.

The results of this study showed that public powers, despite the efforts undertaken, have not systematically exercised their coercive power over illegal fishing activity in the state of Pará, mainly due to IBAMA directing its actions to combat deforestation, neglecting other thematic areas, even though they comprise its primary competence.

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References

Borges, S. H. B., Iwanaga. S., Moreira, M., & Durigan, C. C. (2007). Uma análise geopolítica do atual sistema de unidades de conservação na Amazônia. *Revista Política Ambiental*, *4*, 42f.

Brazil. (2004). Instrução Normativa IBAMA Nº 34, de 18 de junho de 2004 http://www.icmbio.gov.br/cepsul/images/stories/legislacao/Instrucao_normativa/2004/in_ibama_34_2004_normasgeraisparaoexerciciodapescadopirarucunaregiao_n.pdf (February 3, 2017)

Brazil. (2007). Portaria IBAMA Nº 48, de 5 de novembro de 2007 https://www.pescamadora.com.br/wp-content/uploads/Normas-de-Pesca-na-Bacia-Amazonica-portaria-ibama-n48-2007-defeso_amazonia.pdf (January 2, 2017)

Brazil. (2008). Dispõe sobre as infrações e sanções administrativas ao meio ambiente, estabelece o processo administrativo federal para apuração destas infrações, e dá outras providências. Decreto nº 6.514, de 22 de julho de 2008. http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2008/Decreto/D6514.htm (February 3, 2017)

CGU – Controladoria-Geral da União. (2017). Ações relativas à fiscalização ambiental sob responsabilidade do IBAMA. *Relatório de avaliação da execução de programas de governo* nº69. Brasília. 91f

Dias Neto, J. (2010). *Gestão do uso dos recursos pesqueiros marinhos no Brasil*. (2nd Ed), Brasília: IBAMA, 242 p.

Dias, G. A. D., Barboza, R. S. L., Dias Junior, M. B. F. Brito, D. M. C., & Dias, C. A. C. (2013). Diagnóstico da pesca ilegal no Estado do Amapá, Brasil. *Planeta Amazônia: Revista Internacional de Direito Ambiental e Políticas Públicas.* Macapá, *5*, 43-58.

IBAMA – Instituto Brasileiro de Meio Ambiente e dos Recursos Naturais Renováveis, A fiscalização ambiental, (2016). http://ibama.gov.br/index.php?option=com_content&view=article&id=755&catid=131&Itemid=641 (February 4, 2017).

IBGE – Instituto Brasileiro de Geografia e Estatística. 1990. *Divisão Regional do Brasil em mesorregiões e microrregiões geográficas*. Rio de Janeiro, 1.

MPA – Ministério da Pesca e Aquicultura. Boletim Estatístico da Pesca e Aquicultura. (2011). Brasília. http://www.icmbio.gov.br/cepsul/images/stories/biblioteca/download/estatistica/est_2011_bol__bra.pdf (February 3, 2012).

Nascimento, S. F., Mello, A. H., Oliveira, G. F., Pereira, V. D. N., & Mendes, A. S. (2011). Queda da produtividade de pescado no rio Tocantins: a percepção dos pescadores de Marabá – Pará. *Agroecossistemas*, *3*(1), 101-105. https://doi.org/10.18542/ragros.v3i1.1389

Peres, R. P., Uhr, J. G. Z., & Uhr, D. A. P. (2016). Infrações contra a Flora e Multas Aplicadas: Análise Espacial para o Brasil. *Revista Iberoamericana de Economía Ecológica*, *26*, 89-107.

Rosa, R. F. C., Andrade, C. E. R., & Pereira, L. J. G. (2017). Perfil dos envolvidos na captura e comercialização de tubarões em um polo pesqueiro do litoral amazônico. *Acta of Fisheries and Aquatic Resources*, *5*(3), 37-4.

Ruffino, M. L. (2005). *Gestão do uso dos recursos pesqueiros na Amazônia*. *Manaus*: IBAMA, 135 p.

Ruffino, M. L. (2008). Sistema integrado de estatística pesqueira para a Amazônia. *Pan-American Journal of Aquatic Sciences*, *3*, 193-204.

Schmitt, J., & Scardua, F. P. (2015). A descentralização das competências ambientais e a fiscalização do desmatamento na Amazônia. *Revista de Admnistração Pública*, *49*(5), 1121-1142. https://doi.org/10.1590/0034-7612131456

Uhr, J. G. Z., Uhr, D. A. P. (2014). Infrações Ambientais e a Reputação do Regulador: Análise em Dados de Painel para o Brasil. *Estudos Econômicos*, *44*, 69-103. https://doi.org/10.1590/S0101-41612014000100003

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