



Competitive marine fishery in the state of Sergipe

Pesca competitiva marinha no estado de Sergipe

Kátia de M. Felizola FREIRE, Maria Camila dos Santos BISPO & Rodrigo Melins Costa A. LUZ

Departamento de Engenharia de Pesca e Aquicultura, Universidade Federal de Sergipe - UFS

*Email: kfreire2006@yahoo.com.br

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Abstract - Although recreational fishery has increased in importance since the 1990s in Brazil, it is a secondary activity in most of the country, even though it is widespread in marine and continental waters. However, its economic importance may be higher than commercial fishery in some regions. Brazilian recreational fisheries have been scientifically analyzed only in the last 15 years but no analysis was found for the state of Sergipe. Thus, this study was proposed with the objective of describing fishing activities of recreational fishers in Sergipe, quantifying the number of competitive fishing events, and estimating total catch. Two fishing clubs were found in Sergipe: CPAM-SE in 1967-1992 and ASPA-BV in 1993-current. ASPA-BV has promoted an average of 15 events annually with a maximum catch observed of 1.8 t in 1998. A total of 6 to 157 teams fished in these events (1-5 fishers/team). Median weight of individual specimens caught were 21 to 918 g. Fishing tackle used were multi- or monofilament line (width: 0.20-0.50 mm) and nickel or stainless steel J-hook (usually 14 or 16 sizes). “Molinete” was used in all fishing events. Only natural baits are allowed in these fishing events. Shrimp is the preferred bait, followed by mullet, sardine, and ghost shrimp. The events ranged from 3 to 7 hours and occurred mainly during summer. Campeonato Sergipano de Pesca Bons Ventos” (championship) is the fishing event with the highest number of results available, where each fisher catches about 7.6 fishes and 701 g per fishing day (8-12 rounds/year). The main species reported as the heaviest fishes were: ray, catfish, and pufferfish. However, there is no information of total catch per species. We recommend catch data are collected by species in the near future to allow for better comparison between recreational and commercial fisheries.

Keywords: Sport fishery, recreational fishery, northeastern Brazil.

Resumo - Embora a pesca esportiva tenha aumentado em importância no Brasil desde a década de 90, trata-se de uma atividade secundária, na maior parte do país, mas amplamente espalhada por águas marinhas e continentais. Contudo, sua importância econômica pode ser mais elevada do que a da pesca comercial em algumas regiões. A pesca esportiva brasileira tem sido analisada cientificamente apenas nos últimos 15 anos, mas nenhuma análise foi encontrada para o estado de Sergipe. Assim, este estudo foi proposto com o objetivo de descrever as atividades de pesca dos pescadores esportivos em Sergipe, quantificando o número de eventos de pesca competitiva e estimando a captura total. Dois clubes de pesca foram encontrados em Sergipe: CPAM-SE em 1967-1992 e ASPA-BV em 1993-atual. ASPA-BV tem promovido em média 15 eventos por ano, com uma captura máxima observada de 1,8 t em 1998. Um total de 6 a 157 vezes pescaram nesses eventos (1-5 pescadores/time). A mediana do peso individual dos espécimes capturados variou de 21 a 918 g. O material de pesca utilizado foi linha multi ou monofilamento (espessura: 0,20-0,50 mm) e anzol tipo-J de níquel ou aço (geralmente de tamanho 14 ou 16). Molinete foi usado em todos os eventos de pesca. Apenas iscas naturais são permitidas nesses eventos. A isca preferida é o camarão, seguida por tainha, sardinha e corrupto. A duração dos eventos foi de 3 a 7 horas e ocorreram principalmente durante o verão. O Campeonato Sergipano de Pesca Bons Ventos é o evento de pesca com o maior número de resultados disponíveis, onde cada pescador capturou cerca de 7,6 peixes e 701 g por dia de pesca (8-12 rodadas/ano). As principais espécies registradas como peixes mais pesados foram: arraia, bagre e baiacu. Contudo, não há registro de captura total por espécie. Nós recomendamos que dados de captura sejam coletados por espécie no futuro próximo para permitir melhor comparação entre a pesca esportiva e a comercial.

Palavras-Chave: pesca amadora, pesca esportiva, nordeste do Brasil.



Introduction

Recreational fishery is a very ancient activity, with a first treatise published in 1496 by Dame Juliana Bernes: *A Treatise of Fysshynge Wyth an Angle*. After hundreds of years, it has become the most important fishery sector in some regions in Europe and North America (Arlinghaus, Mehner & Cowx, 2002; Coleman, Figueira, Ueland & Crowder, 2004). Although recreational fishery has increased in importance since the 1990s in Brazil, it is a secondary activity in terms of total catch in most of the country, even though it is widespread along the entire coast and in inland waters. However, in the state of Mato Grosso do Sul, recreational catches have surpassed those originating from commercial fishery (Catella, 2006). Besides, the assessment of the importance of recreational fishery goes beyond catch, as the pleasure of fighting with fishes may be the most important criterion used to define the success of a fishing experience.

Brazilian recreational fisheries benefit from the highest richness of freshwater species in the world (3124 species) and one of the highest for marine species (1231 species; Froese & Pauly 2013). Besides, Brazil has an extensive coastline and important hydrographic basins which provide the most diverse fishing experiences for recreational fishers.

Marine recreational fishers usually organize themselves around fishing clubs which promote several tournaments per year (Freire, 2005). This differentiates marine from inland fishing events, which are mainly promoted by governmental institutions or private fishing businesses (personal observation).

In Brazil, the number of fishing clubs/associations is unknown. In the northeastern region, Freire (2010) estimated there were forty five fishing clubs, which promote about one hundred events a year. In Sergipe, one of the states in northeastern Brazil, the first fishing club was created in 1967, in the municipality of Aracaju: “Clube de Pescadores Amadores de Molinetes” (CPAM-SE), which used to promote championships, tournaments, and jamborees. This club was dismissed in 1992. In 1993, the “Associação Sergipana de Pesca Amadora Bons Ventos” (ASPA-BV) was established with the objective of promoting recreational fishery in the state and disseminate knowledge about local ichthyofauna (both marine and continental). ASPA-BV has organized several fishing events since then and makes available online partial results of these events (www.aspabonsventos.com.br). Currently, this association has 136 members.

The first study found dealing exclusively with recreational fishery analyzed the composition of catches in a fishing ground in the state of Rio Grande do Sul (Lewis, Braun & Ferreira, 1999). The authors pointed out that species caught were different from those targeted by commercial fisheries. Since then, many other studies were carried out in Brazil (Basaglia & Vieira, 2005; Freire,



2005; Barcellini, Motta, Martins & Moro, 2013). However, competitive fishing only was analyzed in the states of Bahia, Rio Grande do Norte, and Pará (Frédou *et al.*, 2008; Nascimento, 2008, Alves, 2011). No analysis on recreational and/or competitive fishery was carried out in waters of the state do Sergipe. Thus, this study was proposed with the objective of describing fishing activities of recreational fishers in Sergipe, quantifying the number of competitive fishing events, and estimating total catch originating from these events.

Material and methods

This study was carried out through a historical survey of all data available online on fishing competitive events promoted by ASPA-BV in the state of Sergipe. Missing data were obtained through contact with its members. These events include championships, tournaments, and jamborees (*gincanas*), and are called here by the generic term “fishing events”. Championships are restricted to members of ASPA-BV, and tournaments and jamborees are open to the general public or restricted to the organization promoting the event together with that association.

The description of fishing tackle used in the fishing events in Sergipe was given by the Technical Director of ASPA-BV. The following information was obtained: reel, hook, line, sinker, and bait.

Data compiled included place and date of the fishing event, duration of each event (hours), total number and weight of all specimens caught per team in each event, and weight (g) of the heaviest fish caught reported by common name. For years in which total catch was not available, data were estimated based on linear interpolation. Catch per unit effort (CPUE) was estimated for each year as total number and total weight caught per fisher per event. CPUE analysis was performed only for the “Campeonato Sergipano de Pesca Bons Ventos” and “Gincana Norte-Nordeste de Pesca”, comparing with minimum length when defined in the regulation of the event. These events were chosen due to the longer time series available.

Results and discussion

CPAM-SE promoted at least two types of fishing events during its lifetime, Campeonato Sergipano de Pesca and Gincana Norte-Nordeste de Pesca (Figures 1 and 2). However, no results for these events were found.

An average of 15 fishing events has taken place each year in Sergipe since 1993, with a minimum of 10 and a maximum of 20 (Figure 3). Most of these events are promoted or organized by ASPA-BV, but there is one event organized by a club from the state of Bahia, Torneio dos Pescadores Independentes (TPI), which promotes a few rounds a year in the state of Sergipe (Table 1).



Figure 1. Historical photos of recreational fishing in Sergipe: a) Fishing event with the presence of the mayor of Aracaju, Godofredo Diniz (probably in 1967); b) Fishing team during one of CPAM-SE's event; c) Pampo fishing team with Dr. Piva, Alfredo Gentil, and Herculino Gentil among others (in 1975); d) Photo of the ICAJU team during the 13th Fishing Championship of Sergipe promoted by CPAM-SE (in 1979) (Photos provided by Ricardo Hagenbeck).



Figure 2. Posters of past editions of “Gincana de Pesca do Nordeste” promoted by CPAM-SE (a- b), and “Gincana Norte-Nordeste de Pesca”, promoted by ASPA-BV (c-e). Note that these events have changed the name, even though only states from the northeastern region participate. Thus, the number of the sequence of editions has also changed.

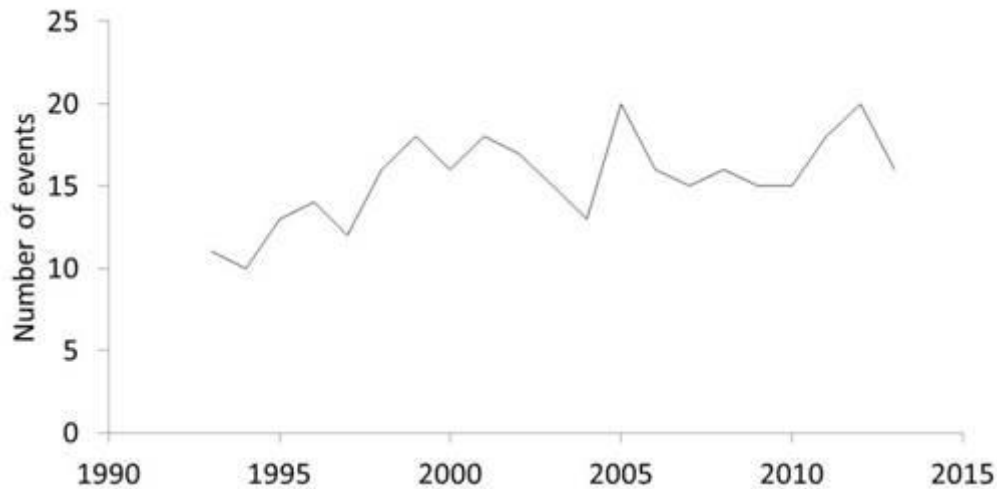


Figure 3. Number of fishing events promoted each year in Sergipe (1993-2013).

Table 1. Name of all fishing events that took place in Sergipe from 1993 to 2013 and the number of editions.

FISHING EVENTS	NUMBER
Campeonato Sergipano de Pesca Bons Ventos	20
Gincana Norte Nordeste de Pesca	19
Gincana de Pesca de Arremesso do CEPE*	17
Gincana Embarcada de Pesca da Carapeba	10
Gincana Dia da Criança	6
Gincana Sergipana de Pesca Embarcada	6
Torneio da Turma de Pescadores Independentes (TPI)	3
Gincana de Pesca Embarcada	2
Torneio de Integração Bons Ventos	2
Gincana de Pesca da UFS	1
Gincana da Safadeza	1?
TOTAL	87

*CEPE- Clube dos Empregados da Petrobrás

Any number of teams can participate in fishing events in Sergipe, but in average 26 teams have registered (Table 2). In the Campeonato Sergipano de Pesca Bons Ventos, each team may be constituted of any number of fishers, but only five can fish simultaneously. For the other events, the number of fishers by team varies from one to three (Table 2). All fishing events took place on the beach or close to estuaries (Figure 4), with exception of Gincana Embarcada de Pesca da Carapeba, Gincana Sergipana de Pesca Embarcada and Gincana de Pesca Embarcada, where fishers go fishing in boats. Jatobá, Naufragos, and Abaís beaches were the main fishing grounds (Table 3).



Table 2. Number of teams and number of fishers per team in each fishing event that took place in Sergipe from 1993 to 2013. Numbers within parentheses represent the average number of teams.

EVENTS	NUMBER OF TEAMS	NUMBER OF FISHERS/TEAM
Gincana Norte Nordeste de Pesca	46-157 (89)	3
Gincana Sergipana de Pesca Embarcada	44	3
Gincana Embarcada de Pesca da Carapeba	24-47 (33)	3
Gincana Dia da Criança	18-40 (31)	1
Torneio da Turma de Pescadores Independentes TPI	13-35 (27)	1
Gincana de Pesca Embarcada	22-25 (24)	3
Campeonato Sergipano de Pesca Bons Ventos	15-25 (19)	5
Gincana de Pesca da UFS	17	5
Torneio de Integração Bons Ventos	14-16 (15)	5
Gincana de Pesca de Arremesso do CEPE	6-15 (12)	5
Gincana da Safadeza	12	2



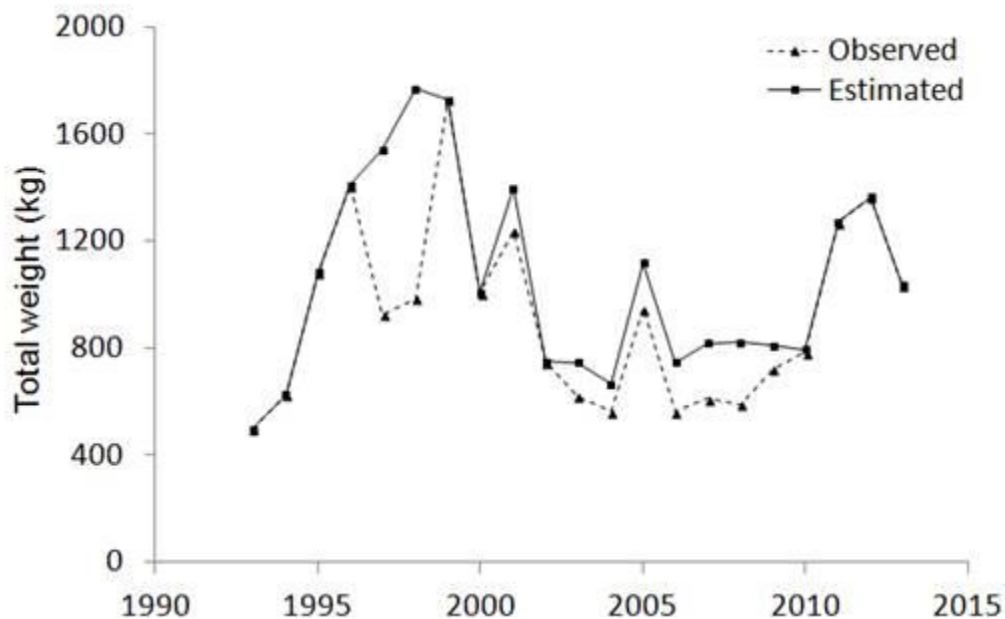
Figure 4. Caueira Beach, one of the fishing grounds of competitive events in the state of Sergipe. Foto: Rafael Barbosa dos Santos.

Fishing tackle used in fishing events in Aracaju were multifilament or monofilament line (width: 0.20-0.50 mm) and nickel or stainless steel J-hook, usually 14 or 16 sizes (even though the hook size is free choice). “Molinete” was the reel type used in all fishing events. Only one recreational fisher used “carretilha”. This fisher lives in the state of Bahia, but he is member of ASPA-BV and participates of its annual championship in Sergipe. Only natural baits are allowed in the fishing events and the preferred baits were shrimp, followed by mullet, sardine, and ghost shrimp. Artificial or live baits are prohibited. The duration of events ranged from 3 to 7 hours (usually 5 hours) and occurred mainly during the summer. The lowest number of events took place in May-August.

**Table 3.** Fishing grounds of fishing events that took place in the state of Sergipe from 1993 to 2013.

FISHING GROUND	NUMBER OF EVENTS
Jatobá Beach	73
Naúfragos Beach	64
Abais Beach	49
Ponta dos Mangues Beach (Pirambu)	29
Saco Beach	20
Estuary of Vaza Barris River (Mosqueiro)	12
Costa Azul Beach	10
Caueira Beach	9
Sarney Beach	7
Jubiabá Beach	2
Estuary of Fundo River	2
Costa Beach	1

Mean annual catch of all fishing events in Sergipe was 800 kg of fishes (1993-2013), with a maximum estimated catch of 1766 kg in 1998 (Figure 5). It is worth pointing out that this is a minimum estimate as there are still results missing for several events that could not be interpolated. The downward trend observed in 2000 and 2002-2004 may be explained by oceanographic conditions. However, the main reason for the declining trend in 2006-2010 was the lower number of teams registered. All these events are catch-and-kill, even though catch-and-release is commonly practiced by local fishers as well as in the entire coast of Brazil during their daily activities (Chaves & Freire, 2012). ASPA-BV only reports total catch data in number and weight. No detail on catch composition by species is provided as in other states (Freire, 2005).

**Figure 5.** Annual catch for all fishing events that occurred in Brazil from 1993 to 2013.



Mean individual weight for each fish caught in fishing events in Sergipe in 1993-2013 ranged from 21 to 918 g, with 88% of all values under 300 g (Figure 6). No clear pattern was observed in the analysis of the average individual weight though time, probably as results from events with very different regulations are presented together. There is no information on mean individual weight per species as catch is not reported by species, as previously mentioned.

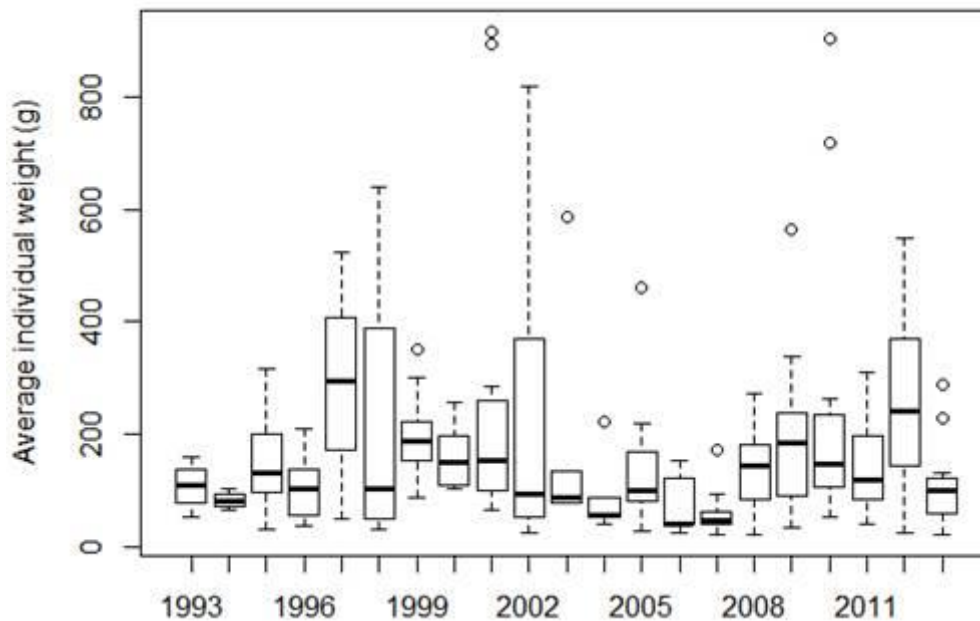


Figure 6. Mean individual weight of fishes caught in all fishing events taking place in Sergipe from 1994 to 2013. Horizontal dark line indicates medians, boxes are interquartile ranges, whiskers are extreme values excluding outliers, and dots represent outliers.

The only information available per species (reported as common name) is usually the weight of the three heaviest fishes caught in each round of each event. In 79% of the cases, no common names were associated with the reported weight of the heaviest fishes. The main species cited were ray (Rajiformes), catfish (Ariidae), pufferfish (Tetraodontidae), mojarra (*Diapterus* spp.), and crevalle jack (*Caranx hippos*) (Table 4; Figure 7). During the twenty years of the “Campeonato Sergipano de Pesca Bons Ventos”, there were some modifications in the regulation. From 1994 to 2007, there was no minimum catch size defined. In 2008-2010, a minimum size was established for the first time at 20 cm. The following year, the minimum size was decreased to 15 cm, to be increased again in 2012 to 20 cm. In 2013, the minimum size was abolished. Thus, we opted for analyzing maximum size caught only for the “Campeonato Sergipano de Pesca Bons Ventos”. The heaviest fish ever caught was a ray with 49.5 kg, which was captured during the 5th edition in 1997.



The second heaviest was also a ray with 37 kg, caught in 2013 during the 20th edition. The median weight of the heaviest fish was usually lower than 10 kg, with the exception of 1997, when the heaviest ray was caught (Figure 8). We noticed a decreasing median value of heaviest fish while the 20 cm minimum size was used. The median value decrease furthermore, as expected, when the minimum size was 15 cm and increased again when set back to 20 cm. However, when minimum size was abolished in 2013, surprisingly median size in fact increased. These rules should be kept for a minimum period of time to better assess their effect considering interannual environmental fluctuations. In all other fishing events in Sergipe, there was no minimum size.

Table 4. Heaviest fishes reported in the results of all fishing events promoted in the state of Sergipe from 1993 to 2013.

PORTUGUESE COMMON NAME	ENGLISH COMMON NAME	SCIENTIFIC NAME	NUMBER	PROPORTION (%)
Raia	Ray	Rajiformes	237	67.5
Bagre	Catfish	Ariidae	35	10.0
Baiacu	Pufferfish	Tetraodontidae	20	5.7
Carapeba	Mojarra	<i>Diapterus</i> spp.	10	2.8
Xaréu	Crevalle jack*	<i>Caranx hippos</i>	10	2.8
Coroca	Barred grunt*	<i>Conodon nobilis</i>	5	1.4
Robalo	Snook	<i>Centropomus</i> spp.	5	1.4
Pampo	Pompano	<i>Trachinotus</i> spp.	5	1.4
Prejereba	Tripletail	<i>Lobotes surinamensis</i>	5	1.4
Outros	Others	Unidentified fishes	20	5.7

* FishBase English common name.





Figure 7. Some of the heaviest specimens caught in fishing events in the state of Sergipe: a) Unidentified ray (*Rajiformes*); b) Xaréu (*Caranx hippos*). Fonte: <http://www.aspabonsventos.com.br/galeria.html>.

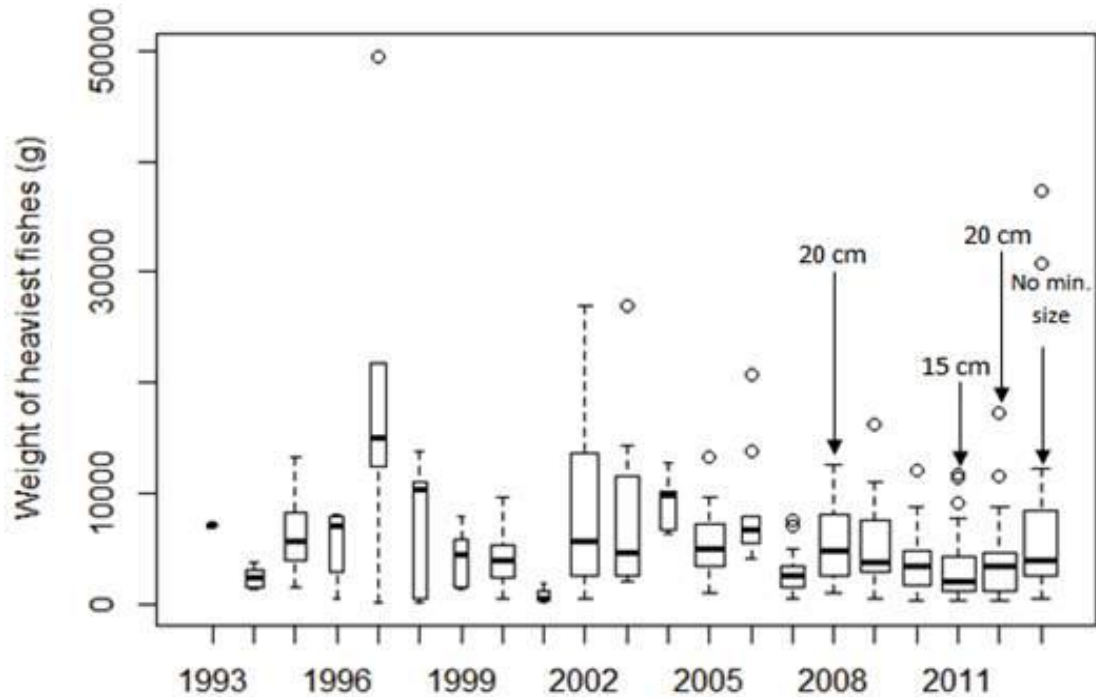


Figure 8. Weight of the heaviest fishes caught in all editions and rounds of the “Campeonato Sergipano de Pesca Bons Ventos”. Horizontal dark lines indicate medians, boxes are interquartile ranges, whiskers are extreme values excluding outliers, and dots represent outliers. Box width is proportional to the number of results available. Vertical arrows indicate minimum size for each event. Note that minimum size of 20 cm was valid from 2008 to 2010 and again in 2012.

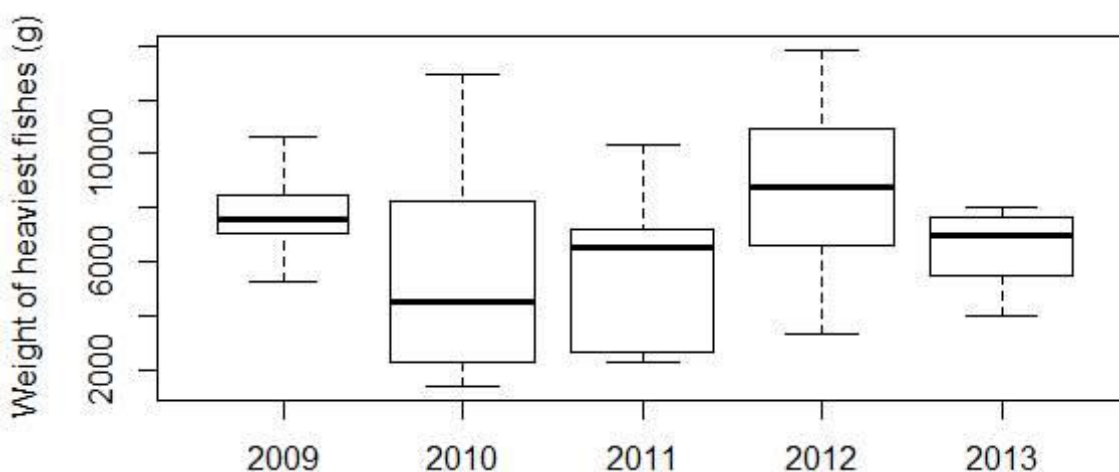


Figure 9. Weight of the heaviest fishes caught in some editions of the “Gincana Norte Nordeste de Pesca” (only years with high number of data included). Horizontal dark lines indicate medians, boxes are interquartile ranges, and whiskers are extreme values.

For comparison purpose, we present information of the heaviest fishes for the “Gincana Norte-



Nordeste”, an event open to all fishers and that attracted a maximum of 516 fishers in 2011. In order to better proceed with this comparison, we selected only the three heaviest fishes in each round of each edition from 2009-2013. The median weight of the heaviest fishes was also lower than 10 kg (Figure 9), but did not show the same pattern as the “Campeonato Sergipano de Pesca Bons Ventos”. However, we should be aware that championships take place all year around and the jamborees only in January-April. In both championship and jamboree, a decreasing pattern of maximum size through time was not observed as in the state of Rio Grande do Norte, where a much longer time series was available (Freire, 2005).

The analysis of catch per effort unit (CPUE) was performed only for “Campeonato Sergipano de Pesca Bons Ventos” (championship) and “Gincana Norte Nordeste de Pesca” (jamboree) as these were the only events with higher number of results available. Each fisher caught about 7.6 fishes per fishing day in the championship, but in some years catches were as high as 27.3 and 16.4 in 2004 and 2007, respectively (Figure 10). The reduction of CPUE in number observed in 2008-2010 was closely related to the introduction of the 20 cm minimum size. On the other side, the increase in CPUE in 2013 is associated with the elimination of any minimum size. CPUE for jamborees was 5.2 fishes/fisher·day, with a maximum of 9.2, and it was alternatively higher or lower than for championships. It is worth to point out that championships are spread over the entire year and jamborees are concentrated in February-April. When compared with coastal championships in southern Bahia, where recreational fishers caught between 4 and 20 specimens per fishing day in 2007 (Nascimento, 2008), results are very similar. Comparison with data from the state of Rio Grande do Norte is harder as they split their championship in two categories: heavy and light tackle (Alves, 2011).

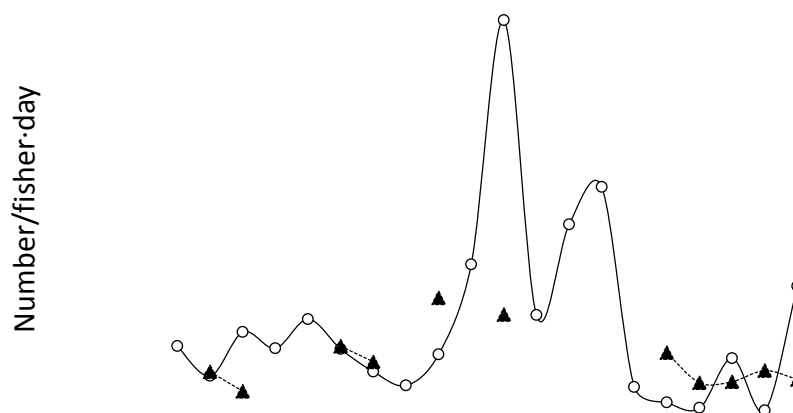


Figure 10. Catch per effort unit (CPUE; number of fishes/fisher·day) in all editions of “Campeonato



Sergipano de Pesca Bons Ventos” (championship; continuous line) and “Gincana Norte Nordeste de Pesca” (jamboree; dashed line) from 1993 to 2013.

CPUE in weight (g)/fisher per round for the jamboree (mean = 534 g) was always close to or lower than in the championship (mean = 701 g), except for 1999 when it reached more than 1.5 kg/fisher (Figure 11). We are not able to explain this highest value as no data such as temperature or salinity is available for the region. CPUE in weight for championships in Sergipe was always higher than 400 g in opposition to values observed in southern Bahia, which were lower than 400 g. This is probably associated with the point system adopted in each state. In Sergipe, 10 points are awarded for 100 g of fishes caught plus 1 point per fish; in southern Bahia, the point system favors higher catches in number than in weight (1 point for 100 g of fishes plus 3 or 5 points for fishes smaller or larger than 15 cm, respectively). This system is reflected in the final result, with higher CPUE in weight found in Sergipe.

This is the first study on recreational competitive fishery in marine waters off the state of Sergipe. Data indicate that total catches are high and could add up to 1.8 tonnes per year which does not appear in official catch statistics of this state and add to the illegal, unreported and unregulated (IUU) component in Brazilian waters. The comparison with commercial fishery is not possible as there is no data available on daily activities of all recreational fishers in the state. Catches from fishing events in Sergipe represented about 0.03% of total commercial catches of about 2509 t and 3767 t in 2010 and 2011, respectively (Souza *et al.*, 2012; Souza *et al.*, 2013). It is worth to point out that both recreational and commercial fisheries increased by 50% from 2010 to 2011.

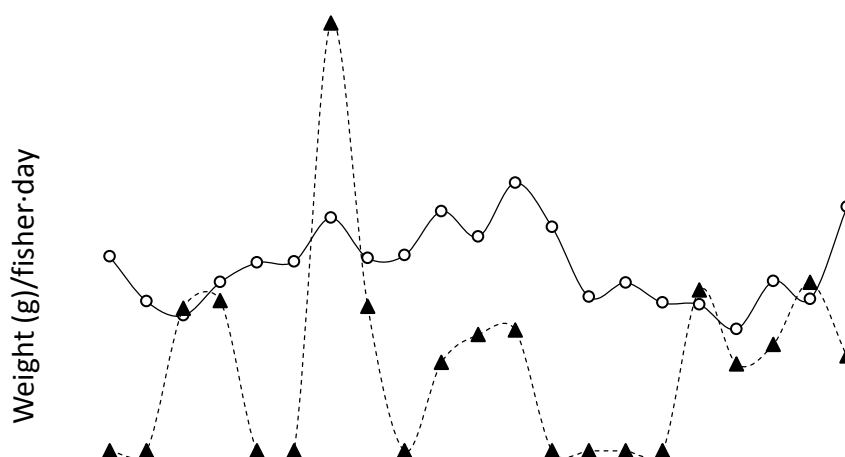


Figure 11. Catch per effort unit (CPUE) per round (weight of fishes/fisher) in all editions of



“Campeonato Sergipano de Pesca Bons Ventos” (championship; continuous line) and “Gincana Norte Nordeste de Pesca” (jamboree; dashed line) from 1993 to 2013.

Comparing catch composition per species between recreational and commercial fisheries at this present moment is not possible as catch per species is not reported by recreational fishers in their competitive events. However, seventeen out of twenty-five species (or group of species) reported as the heaviest fishes in the fishing events are also exploited by commercial fisheries: snook (“camurim” ou “robalo” *Centropomus* spp.), mojarra (“carapeba” *Diapterus* spp.), ray (“arraia” Rajiformes), catfish (bagre Ariidae), weakfish (“pescada” *Cynoscion* spp.), crevalle jack (“xaréu” *Caranx hippos*), barred grunt (“roncador” or “coroca” - *Conodon nobilis*), sharks (“cações” - unidentified species), kingcroaker (“papaterra” ou “tramitara” *Menticirrhus* spp.), mackerel (“serra” *Scomberomorus* spp.), threadfin (“barbudo” *Polydactylus* spp.), toroto grunt (sauara *Genyatremus luteus*), moray (“camuru” Muraenidae), leatherjacket (“solteira” *Oligoplites* spp.) and pompano (“pampo” *Trachinotus* spp.). Thus, both sectors are sharing the same resources. We recommend catch data are collected by species in the near future to allow for a better comparison between recreational and commercial fisheries, as well as environmental data to allow for better explanation of changes in CPUE.

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