

ECONOMIC POTENTIAL OF THE BRAZILIAN MARINE RECREATIONAL FISHERY

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ABSTRACT

The number of recreational fishing licenses in Brazil has been increasing exponentially since 2000, but a drop occurred in 2014, probably associated to an economic crisis. On average, only 20% of the licenses issued in 2011-2014 were for anglers fishing in marine waters. From those, 20% were type A licenses (shore-based) and the remainder were type B-C licenses (boat-based). Based on the licenses database, it was possible to estimate a mean annual expenditure by marine anglers of US\$ 524 million between 2011 and 2014. The absolute mean expenditure per trip was usually higher for men but women tended to spend more as a percentage of their income. This was mainly due to the lower average income of women relative to men. Some inconsistencies in the licenses database were found which could be easily corrected in the future and the estimates presented here improved.

Key words: economic assessment; sport fishery; amateur fishery; angler; saltwater fishing.

POTENCIAL ECONÔMICO DA PESCA AMADORA MARINHA NO BRASIL

RESUMO

O número de licenças de pesca amadora no Brasil tem aumentado exponencialmente no Brasil desde 2000, mas uma queda ocorreu em 2014, provavelmente associada com uma crise econômica. Em média, apenas 20% das licenças foram emitidas para pescadores amadores que pescam em águas marinhas. Destas, 20% eram do tipo A (desembarcada) e o restante dos tipos B-C (embarcada). Com base no banco de dados de licenças, foi possível estimar um gasto médio anual pelos pescadores amadores marinhos de US\$ 524 milhões entre 2011 e 2014. O gasto médio absoluto por viagem foi geralmente mais elevado para homens, mas mulheres tenderam a gastar mais em relação à sua renda. Isto ocorreu principalmente devido ao fato da renda das mulheres ser inferior à dos homens. Algumas inconsistências foram encontradas no banco de dados de licenças que podem ser facilmente corrigidas no futuro e as estimativas apresentadas aqui poderão então ser melhoradas.

Palavras-chave: avaliação econômica; pesca esportiva; pesca recreativa; pescador esportivo; pesca marinha.

INTRODUCTION

Studies on the economic evaluation of Brazilian fisheries are scarce. The first study found on a national scale was Sodr  Filho (1976). Other local studies followed including Matsuura (1981), Carvalho et al. (1996), Pincinato and Gasalla (2010), and Silva et al. (2013). Nationally, Abdallah and Bacha (1999) analyzed the evolution in ‘fish’ price per region and later an analysis of subsidies for the commercial sector was carried out by Abdallah and Sumaila (2007).

For Brazilian recreational fisheries, economic studies are even scarcer and mainly associated to fresh waters: Venturieri (2002) for fish-and-pay, Shrestha et al. (2002) for Brazilian Pantanal, and Angelo and Carvalho (2007) for Araguaia River.

As pointed by Abdallah and Castello (2003), after the observation of declining catches in Brazil from the late 1980s to early 1990s, rethinking the economics of Brazilian fisheries is required. This includes thinking about ways to aggregate value

to each kilogram of 'fish' exploited. Within this approach, one should consider the trend of replacing commercial by recreational fisheries, mainly in continental waters of highly industrialized countries (Arlinghaus et al., 2002). A displacement of fishers from commercial fisheries to act as guides for recreational fishers has been already observed in some economies in transition such as Brazil (Barcellini et al., 2013; Ramires, 2014).

To estimate the relative economic importance of commercial and recreational fisheries, each component should be properly assessed, considering also their social importance. In the United States, for example, it was estimated that saltwater anglers spent about US\$ 33 billion in recreational fishing (US\$ 61 billion in sales impact), which is much higher than the benefits accrued from fish landed by commercial fishers (NOAA, 2016). In Canada, both marine and inland recreational fishers spent about US\$ 2.3 billion in 2010 (Fisheries and Oceans Canada, 2012). For Europe, current estimates indicate an expenditure of around US\$ 7.0 billion by marine recreational fishers in 2015 (Hyder et al., 2017). In Australia, a total annual expenditure of about US\$ 1.1 billion was estimated for both marine and continental waters in 2000-2001, based on The National Recreational and Indigenous Fishing Survey (Henry and Lyle, 2003). In South America, estimates for Chile and Argentina indicate that recreational fisheries are valued at US\$ 10-15 million and US\$ 150 million, respectively (Parrado, 2008). Globally, total expenditure by recreational fishers was estimated at US\$ 190 billion (The World Bank, 2012). For marine waters only, Cisneros-Montemayor and Sumaila (2010) presented a global estimate of US\$ 40 billion in 2003. At that time, those authors found no data for Brazil, even though the importance of recreational fisheries was recognized. Thus, global estimates such as the ones presented are usually based only on information from a few countries for which national estimates are available.

Thus, this study was conducted aiming at presenting the first account on the economic potential of Brazilian marine recreational fisheries at the national level, using expenditure by recreational fishers, and pointing out some of the information gaps and pitfalls in the estimation process to allow for improved estimates in future national and global initiatives. Additionally, some differences in expenditure associated to gender are discussed. Effort was concentrated on marine fisheries as existing data on expenditure was already mainly available for freshwater and due to data requirements for this analysis, which are currently available only for marine habitats. Hopefully this account will

call the attention of government authorities to the importance of recreational fisheries in Brazil to keep current basic management measures in place and possibly improve the data collection system in the near future.

METHODS

All anglers are required to carry an annual fishing license in Brazil (including foreigners), but enforcement is rather poor. An electronic questionnaire responded by recreational fishers (hereafter referred to as anglers for simplicity) when obtaining their fishing licenses was used to assess the economic importance of recreational fisheries through the direct expenditure method. Several questions are included in this questionnaire and a subset was chosen for this study: category (shore-based, boat-based, spearfishing), personal register (CPF), state of residence, gender, monthly wage, expenditure by fishing trip, fishing in the state where resides, frequency of fishing in the state of residence, fishing in other state, frequency fishing in other state, preferred state for fishing, and fishing type (fish-and-pay, mangrove, reservoir, beach, river, offshore). For the period studied, the license was issued online (http://pndpa.mdic.gov.br/pndpa/web/pesca_amadora.php), but only after the questionnaire is filled online and the fee is paid (currently at R\$ 20.00 or US\$ 5.35 for a land-based and R\$ 60.00 or US\$ 16.04 for a boat-based annual fishing license, respectively). To estimate the total annual expenditure by anglers the steps 1-9 listed below were followed:

Step 1: monthly income translated into monetary value

The monthly income of each angler was translated into monetary value according to Table 1. For the last category ($\geq 20\times$ minimum wage), which corresponds to an open interval, the lower limit of the interval was used to be more conservative. Monthly income was included to allow for comparison with expenditure.

Table 1. Mean monthly income (R\$) reported in the license database (2011-2014) by anglers fishing in Brazilian marine waters.

| Income range | Income (R\$) | | | |
|------------------------------------|--------------|--------|--------|--------|
| | 2011 | 2012 | 2013 | 2014 |
| No income | 0 | 0 | 0 | 0 |
| Up to 3× minimum wage ¹ | 818 | 933 | 1 017 | 1 086 |
| 3-5× minimum wage | 2 180 | 2 488 | 2 712 | 2 896 |
| 5-10× minimum wage | 4 088 | 4 665 | 5 085 | 5 430 |
| 10-20× minimum wage | 8 175 | 9 330 | 10 170 | 10 860 |
| $\geq 20\times$ minimum wage | 10 900 | 12 440 | 13 560 | 14 480 |

¹Minimum wage: R\$ 545.00 (2011), R\$ 622.00 (2012), R\$ 678.00 (2013), and R\$ 724.00 (2014).

Step 2: expenditure by trip translated into monetary value

Expenditure by fishing trip was translated into monetary value based on Table 2. It should be noted that no information on duration of each trip was provided in the questionnaire. Thus, we assumed 1 day-long fishing trips for marine shore-based anglers. For marine boat-based anglers, we used a national mean of 2 days-long fishing trips based on Schork et al. (2010), Menezes et al. (2012), Barcellini et al. (2013), and Tubino et al. (2013).

Step 3: total number of fishing days (marine and freshwater together)

The number of days fishing in the State of residence and in other States presented in the questionnaire could not be directly used as they ranged from -1 to 999. Thus, the fishing frequency, defined only using a 1-5 code (in the database we used here), was translated into fishing days, according to Table 3. This step includes freshwater as the questionnaire does not separate between fishing frequency in marine and freshwaters.

Step 4: number of fishing days (marine waters only)

The number of fishing days in marine waters was obtained by multiplying the total number of fishing days obtained in Step 3 by the proportion of marine water habitats (estuarine, coastal or offshore) out of the stated number of fishing areas (estuarine,

coastal, offshore, fish-and-pay, reservoir or river). Thus, if all areas were mentioned, the proportion was 1/6 for each area and the angler would spend half of days defined in Step 3 fishing in marine waters (3/6).

Step 5: separation of type A (shore-based) from type B-C (boat-based) licenses

This separation was necessary due to the differences in the duration of each fishing trip. Type B and C licenses were treated together. Type C licenses used to correspond to spearfishers (Freire et al., 2012), but were abolished after the Instrução Normativa MPA/MMA N. 9 (13 July 2012). However, they were still included in the 2012-2014 license databases.

Step 6: minimum and maximum marine annual expenditure (AEm)

Marine annual expenditure (AEm) was calculated separately for type A and B-C licenses as: $AEm = (\text{fishing days in marine water/trip duration}) \times \text{expenditure per trip}$. For those anglers not answering the question related to expenditure per trip, a null value was considered and an AEm minimum estimated. We also estimated an AEm maximum replacing the null values by an average expenditure per trip calculated for type A and B-C licenses, separately.

Step 7: marine annual expenditure (AEm) raised to the total number of anglers

AEm was raised to all anglers in Brazil, considering an average proportion of licensed anglers based on local studies available: 25% for type A (Chiappani, 2006; Sant'Anna, 2011; Freire et al., 2012; Barrella et al., 2016) and 50% for type B-C (Schork et al., 2010; Menezes et al., 2012; Barcellini et al., 2013; Tubino et al., 2013; Freire et al., 2018).

Step 8: total marine annual expenditure (TAEm)

The total marine annual expenditure was calculated as the sum of the raised marine annual expenditure for type A licenses and type B-C licenses, as calculated in Step 7.

Step 9: total marine annual expenditure corrected to present value (December 2016)

For this study, the IPCA (Índice Nacional de Preços ao Consumidor Amplo or Consumer Price Index) provided by the Brazilian Institute for Geography and Statistics (IBGE) was chosen to correct TAEm calculated in Step 8, as this index includes a larger number of localities and it is the most widely used in Brazil. A time series of IPCA values is available through the Brazilian Central Bank webpage (Banco Central do Brasil, 2018) under the code 433. Values in R\$ (Brazilian reais) were then converted into US\$ (American dollars).

Table 2. Expenditure by trip for marine recreational fishers in Brazil (2011-2014).

| Expenditure range (R\$) | Expenditure value used (R\$) |
|--------------------------|------------------------------|
| Up to 300 | 150 |
| 300-1 000 | 650 |
| 1 000-2 000 ¹ | 1 500 |
| More than 3 000 | 3 000 |

¹Note that intervals are not exhaustive as expenditure of R\$ 2000-3000 were not included in the questionnaire (this error is corrected in the 2018 version of the questionnaire currently available online).

Table 3. Fishing frequency in the State of residence and in other States in Brazil (2011-2014).

| Code | Frequency | Number of days/year |
|--------------------|-------------------------|-------------------------------|
| 1 | Every week ¹ | 52 |
| 2 | Once per month | 12 |
| 3 | Once per year | 1 |
| 4 | Twice per year | 2 |
| 5 | Others ² | 27(Residents)/7(Other States) |
| Blank ³ | | 0 |

¹Note this option was not reported as fishing frequency in other states; ²Average of all other possible values from 1 to 52 for the State of residence and from 1 to 12 for other States; ³For no response, a value of zero was considered; as the fishing frequency in both the State of residence and in other States was never simultaneously null, then the total number of fishing days was never null.

RESULTS

The total number of licenses issued to Brazilian anglers has been increasing exponentially since 2000 (Figure 1), but lowered in 2014. Using a unique number to identify anglers (CPF = Cadastro de Pessoas Físicas or personal register), we were able to reveal that only 4% of anglers obtained a fishing license every year during the period from 2011 to 2014 (Figure 2).

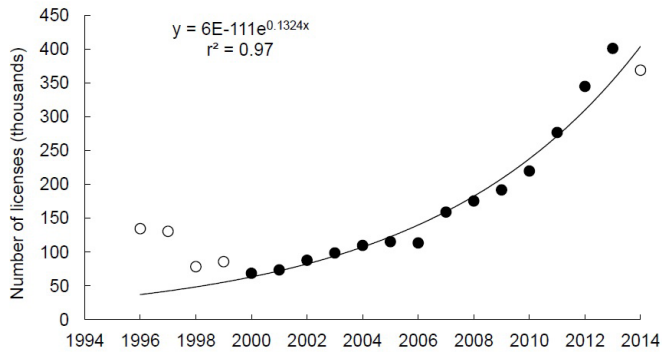


Figure 1. Number of licenses issued for recreational fishers in Brazil for the period 1996-2014 (updated from Freire et al., 2012). White dots represent outliers.

Only 20% of the licensed anglers declared they fish in marine waters (Table 4). The number of type B-C licenses was higher than type A, representing 80% of the anglers fishing in saltwater in 2011-2014 (Table 4).

An estimated annual average of US\$ 320 million was spent by anglers in Brazilian marine waters in 2011-2014 (Table 5). Due to some pitfalls presented here, this represents a minimum estimate as many anglers did not provide expenditure per fishing trip and no value was used in those cases. Total expenditure increased from 2011 to 2013 and decreased by 15% in 2014 (Table 5). If blank responses for expenditure per fishing trip are replaced by mean values for types A and B-C licenses, respectively, the average annual expenditure increased to about US\$ 524 million, which was called maximum expenditure (Table 5).

During the period analyzed (2011-2014), the proportion of women holding type A licenses (shore-based) was 8%. For type B-C licenses (boat-based) holders, this proportion was about 4%. The expenditure per trip by women was usually lower than by men, particularly for boat-based anglers (Table 6). However, in 2011 and 2014, women holding type A licenses stated an annual expenditure 1% and 3% higher than men. However, it is worth noting that women expend more with recreational fishery in Brazilian waters in relation to their monthly income (Figure 3), particularly for type B-C license

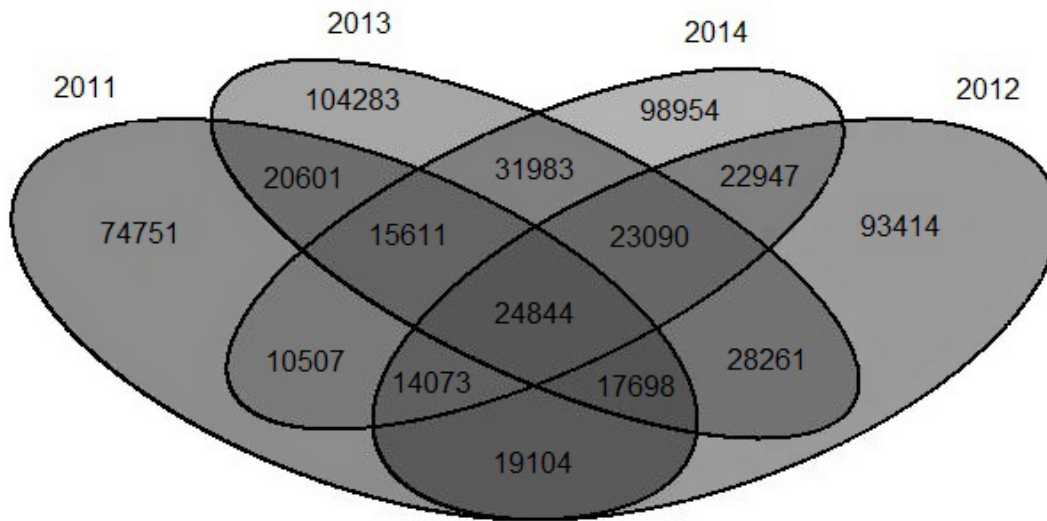


Figure 2. Venn diagram indicating the total number of recreational fishing licenses (A and B-C) issued in Brazil from 2011 to 2014. License A = shore-based and B-C = boat-based (including spearfishers).

Table 4. Total number of licenses issued in Brazil (Brazilians and foreigners) and number of licenses for recreational fishers stating fishing at least in one of the marine habitats included in the questionnaire (estuarine, coastal, and offshore). License A = shore-based and B-C = boat-based (including spearfishers).

| Year | Total number of licenses | Marine licenses A | Marine licenses B-C | Marine licenses Total |
|------|--------------------------|-------------------|---------------------|-----------------------|
| 2011 | 276 938 | 11 091 | 36 852 | 47 943 |
| 2012 | 345 094 | 14 083 | 51 228 | 65 311 |
| 2013 | 401 550 | 15 101 | 64 887 | 79 988 |
| 2014 | 369 093 | 14 190 | 62 809 | 76 999 |

Table 5. Annual expenditure by licensed recreational fishers in Brazilian marine waters from 2011 to 2014 for license type A (shore-based), type B-C (boat-based) and all licenses (A-B-C). Values extrapolated to the total number of marine recreational fishers and conversion to current value (Dec/2016) is provided, using a Consumer Price Index (IPCA/IBGE).

| Year | 2011 | 2012 | 2013 | 2014 |
|---|------|------|------|------|
| Based on type A license (current value in million US\$) | 37 | 41 | 40 | 33 |
| Based on type B-C licenses (current value in million US\$) | 113 | 127 | 141 | 112 |
| Based on type A-B-C licenses (current value in million US\$) | 150 | 168 | 181 | 144 |
| Extrapolation to all anglers (current value in million US\$) | 374 | 419 | 441 | 354 |
| Extrapolation – minimum ¹ (Dec/2016 in million US\$) | 271 | 336 | 361 | 305 |
| Extrapolation – maximum ² (Dec/2016 in million US\$) | 447 | 551 | 593 | 503 |

¹Considering expenditure equals to zero when no response was provided; ²Considering expenditure equals to the average expenditure stated by all anglers in each category A or B-C when no response was provided.

Table 6. Expenditure by trip in R\$ (present value) by men and women fishing in marine waters off Brazil for type A (shore-based) and B-C (boat-based) licenses issued in 2011-2014. W/M indicates the ratio between expenditure by women and men; n corresponds to the number of licenses for which information on expenditure was available.

| Year | Parameter | Type A | | | Type B-C | | | Type A | Type B-C |
|------|-----------|--------|-------|-------|----------|-------|--------|--------|----------|
| | | Men | Women | Total | Men | Women | Total | W/M | W/M |
| 2011 | Mean | 505 | 510 | 506 | 1 034 | 934 | 1 030 | 1.01 | 0.90 |
| | St. Dev. | 583 | 603 | 584 | 950 | 919 | 949 | — | — |
| | n | 5 884 | 424 | 6 308 | 28 262 | 941 | 29 203 | — | — |
| 2012 | Mean | 514 | 468 | 511 | 987 | 915 | 984 | 0.91 | 0.93 |
| | St. Dev. | 593 | 539 | 589 | 937 | 905 | 936 | — | — |
| | n | 7 599 | 599 | 8 198 | 38 229 | 1 307 | 39 536 | — | — |
| 2013 | Mean | 529 | 507 | 528 | 966 | 833 | 962 | 0.96 | 0.86 |
| | St. Dev. | 606 | 574 | 604 | 934 | 852 | 932 | — | — |
| | n | 8 275 | 590 | 8 865 | 47 031 | 1 704 | 48 735 | — | — |
| 2014 | Mean | 560 | 576 | 561 | 1 009 | 872 | 1 004 | 1.03 | 0.86 |
| | St. Dev. | 632 | 700 | 636 | 953 | 886 | 953 | — | — |
| | n | 7 837 | 574 | 8 411 | 46 301 | 1 723 | 48 024 | — | — |

holders. Additionally, one can note that women holding both type A and type B-C licenses have a lower income than men (Figure 4).

DISCUSSION

The exponential increase in the total number of licenses issued to Brazilian recreational fishers corresponds to a good period for the Brazilian economy, with increasing wages and decreasing levels of unemployment rate (Summa, 2015). These numbers may be influenced by the issuing system of licenses. In 2002, an electronic system started, but part of the licenses was still issued on paper until 2009, when only the electronic system was in place (Freire et al., 2018). The lower number of licenses observed in 2014 (from about 402 down to 370 thousand licenses) should be closely examined when new data on licenses are made available for 2015-2017. This decline observed in 2014 may be associated with the economic recession Brazil has been facing since 2014

(Pires, 2016), but may also reflect changes in leisure interests. One should pay attention to the drop observed in 2014 as this is not only an economic issue. Among other things, recreational fishing, as a leisure activity practiced by about 10 million anglers in Brazil (Freire et al., 2012), has also a social impact as only the perception of the existence of a leisure possibility could have an impact in the health of employees (Blasche et al., 2014).

The total number of licenses issued in Brazil is not impressive considering its high population, but it is probably highly affected by a distrusting relationship between anglers and the institutions responsible for managing recreational fisheries. This means that anglers fish without a license because they probably do not trust management agencies and enforcement is rather poor. The instability of the institutional arrangement makes the problem worse. The responsibility for managing Brazilian fisheries was transferred from the Ministry of Fisheries and Aquaculture (MPA) to the Ministry of Agriculture, Livestock and Supply (MAPA) in 2015 and to the Ministry of Industry, Foreign Trade, and Services

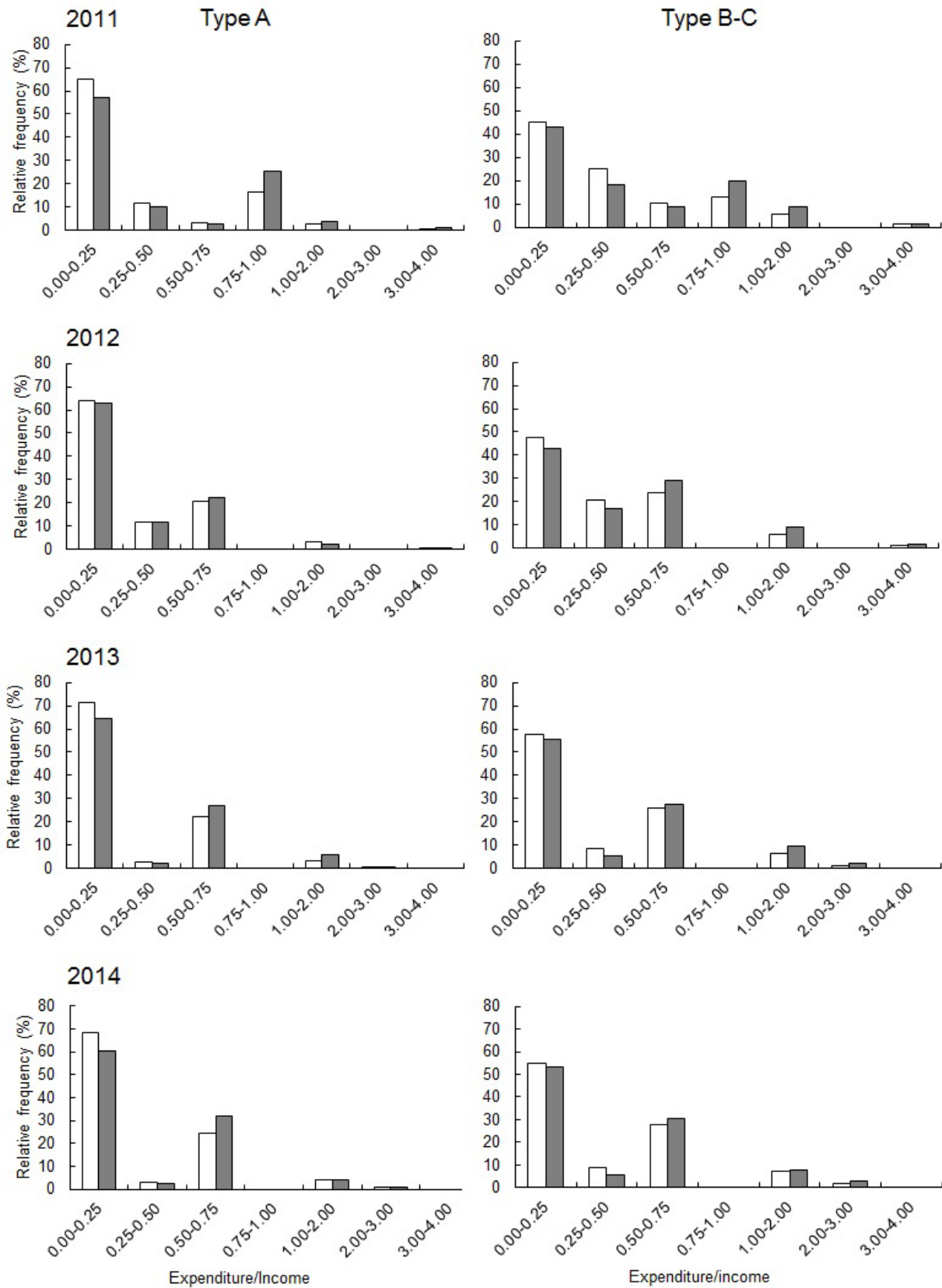


Figure 3. Ratio between stated expenditure per fishing trip in marine waters and monthly income for type A and B-C license holders in 2011-2014. White columns correspond to men and gray columns to women.

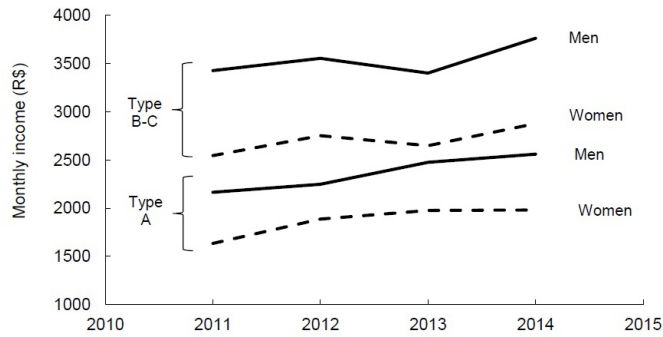


Figure 4. Mean monthly income for men (continuous line) and women (dashed line) holding type A and type B-C licenses for recreational fishing.

(MDIC) in 2017 (Decree N. 9.004, March 13, 2017). Indeed, only 4% of the anglers acquired fishing licenses every year during the 2011-2014 period. This clearly reflects a distrustful relationship which is also probably associated to the fact that there is no clear association between the value paid for each license and its destination, in opposition to some countries, such as Canada (Ministry of Natural Resources and Forestry, 2018). All these factors may lead to further decrease in the number of licenses issued in 2015-2017, which was certainly also affected by instabilities in the online system of license issuance (R. Melins, pers. comm.).

One should keep in mind that only 68% of all licenses issued in 2011-2014 could be used in this analysis of continuity in acquiring fishing license, as all anglers who used their passport number to obtain their licenses had to be eliminated from this analysis due to a lack of standards in the presentation of these numbers. Moreover, several CPF numbers provided by anglers did not comply with the 11 digits standard, and were also eliminated, some young anglers did not carry a CPF, and the same CPF was used to buy license for different anglers. Thus, it is urgent that the license issuing system is corrected and the continuity of this low number of returning 'customers' is analyzed using on-site interviews. In the US, the proportion of the population that engaged in recreational fishing decreased significantly during the late 1990s and early 2000s (Schramm Junior and Gerard, 2004). Similarly, recreational fishing has become less popular in Canada (Brownscombe et al., 2014). Thus, the motivation of anglers has to be continuously monitored, so the issue of retention and recruitment of new anglers can be better addressed, particularly in developing countries.

Mean annual expenditure by marine anglers in Brazil was estimated within the range US\$ 361-593 million in 2013 but declined by 15% in 2014. This trend could be partially explained by the decreasing number of licenses, as it decreased by only 4% in 2014. The expenses per trip were kept almost constant between 2013 and 2014 and thus did not exert any significant influence. In fact, most of the change could be explained by the decreasing number of fishing days per year for each angler (an average of 2.7 days for both type A and B-C license holders). This again

could be associated to the recession period observed in Brazil during the period analyzed. Even though the total expenditure is not a comprehensive indicator of the economic importance of recreational fisheries, this contribution is significant, as it provides an important economic component needed for determining the net benefit contribution of the sector.

During the period analyzed (2011-2014), the proportion of women in marine shore-based recreational fishing activities doubled the boat-based, but it is still very low (8%) if one consider the gender ratio in Brazil (51% of women in 2010; IBGE, 2016). The expenditure per trip by women was usually lower than by men, particularly for boat-based anglers, except in 2011 and 2014. In Nordic countries, with the exception of Iceland, men also tend to spend more with recreational fishing (Toivonen et al., 2004). However, women expenses in Brazilian waters in relation to their monthly income are usually higher than for men, particularly for type B-C license holders. This was mainly attributed to the lower income of women acquiring both license types. Even though the income gap between women and men has been decreasing over the past years, women had wages on average 15% lower than men in 2007 (Madalozzo, 2010). Income represents one of the constraints to decide upon leisure activities. However, other variables are also important and they are more associated to gender roles than to just biological sex (see, e.g., Jackson and Henderson, 1995).

The analysis presented here is pioneer and can be improved if the quality of the original database is monitored. Several inconsistencies were found in the license database: anglers stated not fishing in other states but a code was attributed to the frequency they fish in other states (the reverse also occurred); the number of days fishing in the State of residence and in other States could not be used as they went above the maximum of 365 days per year (highest = 999); and finally some anglers did not answer the question related to expenditure per trip. Moreover, unique identification numbers provided by anglers did not follow a proper standard and were not mutually exclusive. Some problems listed above may be easily corrected by using multiple choice questions and input masks in the license database. Finally, all questions should be answered for the license to be issued. Thus, the license database could be better used, and the estimated economic impact of Brazilian recreational fisheries could be closer to the real value.

Conversely, some other sources of bias are harder to deal with. The estimate of expenditure using this method is highly dependent on the recall capability of anglers associated to experiences occurring mostly in the previous year. Several authors have shown the effect this could have on these estimates (e.g., Herfaut et al., 2013). One alternative would be to combine this method with on-site surveys, which are much more expensive and probably not feasible considering the size of the Brazilian coast and its economic status. Thus, it seems more reasonable to apply the method used here to the state level and then compare with local estimates of total expenditure that we expect would begin to be performed after the first phase of collection of only biological data on recreational fisheries is surpassed. Other source of bias here is considering that non-licensed anglers have the same expenditure habits than licensed ones. This can only be assessed with more local studies. Finally, some authors argue that the use

of expenditure is not the most adequate method to measure the benefit of recreational fisheries but a net social benefit should be calculated instead, which would correspond, *e.g.*, to the difference between willingness to pay and expenditure (Toivonen et al., 2004). Here again, local studies would allow for the estimation of these net social benefits. Questions related to willingness to pay could be added to the questionnaire used here, but this will require a cautious discussion on how to implement it in a way that consider at least the main differences in the anglers' profile.

CONCLUSIONS

The estimate of mean annual expenditure in Brazil by marine anglers of US\$ 524 million is quite high, but could not be compared with gains obtained from commercial fisheries due to the absence of estimates for the same period. The estimation process here inherited some problems from the license database it was based upon. The process also made many assumptions, which can be replaced by real data as soon as more studies are available throughout the country. Finally, the decreasing number of licenses issued in the last year analyzed here could be signaling the effect of an economic crisis on recreational activities in Brazil and/or reflect a mistrust in the licensing system resulting from an instability in the institutional arrangement responsible for managing recreational fisheries. However, this signal can only be properly captured if at least the license database is continuously maintained.

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