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Review of marine recreational fisheries regulations in Argentina

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Review of marine recreational fisheries regulations in Argentina

Abstract

The effects of recreational fishing on marine stocks and ecosystems have raised global concern in recent years. In Argentina, Southwest Atlantic, angling, netting and spearfishing of coastal bony fishes, sharks, rays and chimaeras are very popular pastime activities with more than 50 years of history. Despite the perceived traditional and economic relevance of these activities in the country, marine recreational fisheries were largely unregulated, and no official fisheries monitoring programs at the national level have been ever put in place. Except for a few particular systems for which some catch-and-effort data were collected by research institutions and non-governmental organizations, no comprehensive surveys aimed at describing the ecological, social or economic aspects of these fisheries have been made. Here, an updated review of the regulations in place for marine recreational fisheries along the Argentine coastline is presented. Of the five coastal provinces encompassing *ca.* 8400 km and about 20 latitude degrees (~36°S to 55°S) of coastline, only Buenos Aires province has a thorough legislation for its whole territory, which includes 15 protected areas. In the remaining provinces, the regulations for marine recreational fisheries are limited to a few protected areas (seven out of 37 coastal areas under provincial, national or shared jurisdiction). This lack of legislation encourages alleged recreational fishers to develop small-scale commercial fishing operations that are neither controlled nor monitored as such, contributing to the overexploitation of some key coastal stocks.

Keywords

shore- and boat-based fisheries; coastal fisheries management; Southwest Atlantic; angling; spearfishing; netting.

1. Introduction

Unregulated commercial fishing can be a major threat to the marine environment [e.g., 1, 2]. However, although the effects of recreational fisheries on marine stocks and ecosystems have received less scientific and societal attention, the topic has raised concern in recent years [3 – 7]. This was in part due to the differences observed in fish population structure and abundance between zones with and without recreational fishing, located inside areas where commercial fisheries were banned or restricted [e.g. 8 – 11]. Besides, the impact of recreational fishing is mostly exerted on coastal environments, which can be critical habitats for reproduction, feeding and migration of several fish species [1, 4]. In consequence, current increasing trends in recreational fishing effort, particularly in developing countries [e.g. 12 – 14, but see 15], could have significant negative effects if not properly managed. These effects may include the alteration of ecosystem functioning [4, [16](#), [17](#)], particularly if keystone species are selectively harvested [3, [18](#)].

At present, most of the data available on recreational fisheries comes from the Northern Hemisphere. In the Southern Hemisphere, it mainly comes from Australia, New Zealand and South Africa. In South America, some estimations of total recreational harvest at a regional scale are available for Brazil [[12](#), [19](#)]. Argentina is the third South American country in coastline length, after Chile and Brazil. Its five coastal provinces, from north to south: Buenos Aires, Río Negro, Chubut, Santa Cruz, and Tierra del Fuego, Antártida e Islas del Atlántico Sur (hereafter Tierra del Fuego), encompass *ca.* 8400 km and about 20 latitude degrees (~36°S to 55°S) of marine coastline¹ (Fig. 1). Recreational angling (shore- and boat-based), netting, and spearfishing are very popular pastime activities alongshore [20 – 34]. Longstanding marine angling tournaments, some of which gathering up to 4,000 participants, have being organised since the early 1960's [e.g. 27, 35, 36]. In addition, the country hosted a few international spearfishing competitions, such us the 2nd and 10th South-American Spearfishing Tournaments in 1962 and 1975, respectively; the extraordinary Spearfishing Tournament in Commemoration of the Centenary of the Welsh Landing at Puerto Madryn (Chubut) in 1965; and the 1st Latin American Spearfishing Tournament in 1972. The 6th

¹ Estimations provided by the World Resources Institute.
<https://web.archive.org/web/20120419075053/http://earthtrends.wri.org/text/coastal-marine/variable-61.html>, (accessed 07.09.16).

Panamerican Spearfishing Tournament will be held in Comodoro Rivadavia, Chubut, in March 2017. It is noteworthy that some research studies reporting unusual records or the extension of distributional limits for coastal fishes in Patagonia were based on individuals caught by recreational anglers and spearfishers [22, 33, 37 – 40]. However, despite the perceived significance of these recreational fisheries in Argentina, they remain largely unregulated. No regular official monitoring programs were ever put in place. Furthermore, no formal characterization or official statistics exist for most recreational fisheries in the country (neither in the marine nor in the freshwater environment). The acquisition of catch-and-effort estimates, only available for a few fishing modalities, species and/or sites, was motivated by scientific interest and/or conservation purposes of non-governmental organizations (NGOs) rather than by governmental demands. A few examples of research programs with different objectives and temporal coverage made it possible to obtain sparse catch-and-effort data for shore- and boat-based angling and spearfishing along the Argentine coast [21, 24 – 29, 33]. For example, long term data available for a shore-based and a coastal boat-based angling competition (“The 24 Horas de la Corvina Negra” [*Pogonias cromis*], and the “Fiesta Nacional del Salmón de Mar” [*Pseudoperca semifasciata*]) showed, respectively, a sharp decrease in the trophy size and a virtual disappearing of the main target, *P. cromis*, in the last years [36], and decreasing CPUEs of *P. semifasciata* as well as of other by-catch species including the Patagonian rockfish *Sebastes oculatus*, and the Argentine sea bass *Acanthistius patachonicus* (First author of this MS, unpublished data).

[Fig. 1 here]

Unlike being bony fishes, shark, rays and chimaeras recreational fisheries received greater attention in the Argentine coast. Chondrichthyes fisheries were assessed with the aim of identifying species targeted, fishing areas, seasons and fishing modalities; registering the occurrence of tournaments; and compiling the regulations in force in each province within the framework of the Argentine National Plan of Action for

Conservation and Management of Sharks (NPOA-Sharks²) [41]. Nonetheless, two recent studies that analyzed the temporal trends in abundances of medium- and large-sized trophy sharks in Argentine waters reported a decreasing number of the main target species: sand tiger shark (*Carcharias taurus*), copper shark (*Carcharhinus brachyurus*), broadnose sevengill shark (*Notorynchus cepedianus*) and tope shark (*Galeorhinus galeus*) [32, 34].

These studies suggest that proper management of the Argentine coastal fisheries is urgently needed. This article reviews the regulations currently in place for the recreational marine fisheries in Argentina. Although a few cephalopod and shellfish species are also recreationally caught alongshore [e.g. 42, 43], this revision will be limited to the capture of bony and cartilaginous fishes.

2. Marine recreational fisheries regulations in Argentina

About 400 species of bony fishes [44] and 105 cartilaginous species [41] inhabit the Argentine sea. Among these, 38 species of Osteichthyes represented by 33 genera and 24 families, and 15 species of Condriichthyes split in 13 genera and 11 families were identified as the main targets of recreational fisheries along the Argentine coast (Table 1). The first specific regulation for recreational fishing in Argentina was elaborated in 1973 in Chubut (mandatory fishing license for anglers and spearfishers); other specific legal instruments were created during the mid-1990s in the provinces of Buenos Aires and Chubut. The National Law N. 24922 (i.e. the Federal Fishing Regime), enacted in 1998, establishes that the exploration, exploitation, conservation and administration of living resources occupying the adjacent territorial Argentine Sea up to 12 nautical miles (nm) from the coast are under the jurisdiction of the coastal provinces. In the Argentine Sea, recreational boat-based fishing rarely occurs beyond 12 nm from shore, so no specific restriction exists for recreational fishing in waters of national jurisdiction (with the exception of coastal Natural Parks, see below). Within provincial waters, there are few regulations applicable to the coastal strip, which have been independently elaborated by each province, mostly during the last decade (Table 2). At present,

² This document was elaborated to accomplish with the recommendations of the International Plan of Action for Conservation and Management of Sharks (IPOA-Sharks). <http://www.fao.org/ipoa-sharks/background/about-ipoa-sharks/en/>, (accessed 07.10.16).

Buenos Aires (including 15 protected areas within its provincial limits³ [46]) is the only province that has a thorough set of regulations applicable throughout its coast. In the remaining provinces, only a few protected areas (seven out of 37 existing ones³ [46]) have specific legislation for recreational fisheries: Punta Bermeja and Bahía de San Antonio Natural Protected Areas – NPAs (Río Negro); Península Valdés NPA (Chubut); Monte León National Park – NP, and Ría Deseado and Cabo Vírgenes Provincial Reserves – PRs (Santa Cruz); and Tierra del Fuego NP (Tierra del Fuego). The protected areas mentioned are under provincial jurisdiction, with the exception of the National Parks, which are administrated by national authorities (i.e. the National Parks Administration).

The poor or null regulations, added to the low capabilities and resources for enforcement of the provincial governmental agencies in charge of the fisheries administration, and the lack of long-term monitoring programs, had contributed to the overexploitation of some key coastal fisheries resources [e.g. 24, 32, 34, 36].

[Table 1 here]

[Table 2 here]

2.1. Buenos Aires

The existing legal instrument for this province, which encompasses freshwater and marine recreational fisheries, was enacted in 2007 (Legal Provision N. 217/2007 of the Ministry of Land Affairs). This legal tool constitutes an update of the Legal Provision N. 19/1996 of the Fishery Provincial Directorate. The provision 217/2007 defined a series of recreational fishing categories and broadened the range of topics to be regulated. Regarding the marine ecosystem, six recreational fishing modalities are distinguished by this provision: ‘no target species’, ‘no target species with further restrictions’ (includes some species that deserve special attention due to their biological features and/or conservations status), ‘target species’, ‘targeting silversides’ (*Odontesthes argentinensis*, *O. smitti* and *O. platensis*), ‘targeting large coastal sharks’, and ‘unconventional marine coastal fisheries’ (i.e. no hook-and-line is used in this

³ SIAPM Project – Argentina: “Sistema interjurisdiccional de áreas protegidas costero-marinas”. ARG/10/G47 GEF- PNUD. Fundación Patagonia Natural. <http://www.patagonianatural.org>, (accessed 12.01.17).

category) (Table 3). The latter, already considered in the provision N. 19/1996, includes netting with different gears (drop nets and cast nets) that target mainly silverside (*O. incisa*) as well as other less frequent species, and longlines of up to 15 hooks. Provision N. 217/2007 also defines which species are included in these categories, provide size limits based on estimates of female length at 50% maturity (L_{50}) for a few species, and establishes bag limits for each category or for 2–3 categories combined (Table 3). It is worth noting that not all the species included in each category were selected by their vulnerability and/or their biological or ecological attributes; in some cases, the approaches used were outdated, generating a mismatch between the regulations and the present knowledge on the biology and ecology of the target species. For example, in ‘no target species’, one of the categories with the highest bag limit (up to 40 fish per day) the law included the Argentine sea bass *A. patachonicus*, a long-lived, slow-growing rocky reef fish [47], and the narrownose smooth-hound *Mustelus schmitti*. The additional legal provision N. 78/2014 of the Fishery Provincial Directorate (under the Ministry of Land Affairs) further restricted to 10 fish per day the bag limit for both *M. schmitti* and the picked dogfish *Squalus acanthias* (the latter not originally listed in N. 217/2007, but included within the ‘no target species’ category in Provision N. 78/2014). These sharks were categorized as endangered and vulnerable, respectively, in the International Union for Conservation of Nature – IUCN red list [48]. Other vulnerable rocky reef fishes included in the ‘target species’ category, which allows up to 10 fish per day, are the Argentine sandperch *P. semifasciata* and the wreckfish *Polyprion americanus* [47]. Furthermore, such a low size limit for *P. semifasciata* (37 cm TL) is unreasonable since this species may reach more than 120 cm TL, and small sandperch has neither recreational nor gastronomic interest in this region [24]. The release of the coastal sharks *C. brachyurus*, *C. taurus*, *N. cepedianus*, *Sphyrna* spp. and *G. galeus* became mandatory since 2007 (Provision N. 217/2007). In addition, the 2007 law explicitly bans the sale of recreational catches, limits the number of fishing rods per angler and hooks per line in each fishing category, states the authorized types and a minimum hook size for sharks, and prohibits the use of triple hooks (with the exception of flathead fisheries and of those modalities that utilize lures, for which only one triple hook is allowed) (Table 2). Fly casting, spinning, trolling, jigging and bait casting are permitted but lures using any kind of batteries are prohibited. Besides, the organization of recreational fishing tournaments within this province must comply with legislation.

[Table 3 here]

Finally, a mandatory fishing license must be obtained to practice recreational fishing in Buenos Aires, which can be obtained through the internet. Buenos Aires is the only province that has a straightforward procedure in place to get the license, which is free of charge for some groups of users (i.e. retirees, disabled people, war veterans and children under 14 years old). For other users, the licenses cost between USD 1.00 (tournament license, valid for three days) and USD 4.50 (annual license for the ‘unconventional marine coastal fisheries’ category)⁴. A conventional annual license costs between USD 1.25 and USD 2.50, depending on the angler category.

2.2. *Río Negro*

No specific regulations for marine recreational fisheries exist in the province of Río Negro, except for two Provincial Natural Protected Areas (Punta Bermeja and Bahía de San Antonio). The capture of sharks, rays and chimaeras is forbidden inside the Punta Bermeja NPA. This protected area was created in 1971 with the aim of protecting one of the largest colonies of the sea lion *Otaria flavescens*. It is located on the northern margin of the San Matías Gulf and occupies approximately 14 km of coastline and a marine fringe about 1 km wide (the geographical limits for the area were established in 2005 by a Provincial Decree). The release of the Chondrichthyes incidentally captured is mandatory inside the area (Resolution N. 999/2015 of the Secretariat of Environment and Sustainable Development of Río Negro; see Annex I): the chimaera *Callorhynchus callorhynchus*, 18 species of rays and 13 species of sharks, some of which rarely caught in Argentine marine waters [49, 50] (Table 4). Recreational netting is forbidden inside the protected area and shore-based angling is allowed only in a zone of restricted use, defined by the Management Plan approved in 2010 [51] (Table 2).

[Table 4 here]

The Bahía de San Antonio Natural Protected Area was created in 1993 with the aim of protecting the reproduction, resting and feeding habitat of resident and migratory

⁴ <http://www.maa.gba.gov.ar/sistemas/pesca/licencias/licencias00.php>, (accessed 27.10.16).

shorebirds. It is located on the northeastern margin of the San Matías Gulf and encompasses a marine area of about 598 km² [46], covering the intertidal zone up to the lowest tide line. Its provisional geographical limits were defined in 2008 by a Provincial Decree. The Management Plan of the protected area was approved in 2014 by the Provincial Decree N. 398/2014. This plan allows recreational fishing within a restricted shore area, limiting the type of fishing gear used, and proposes to ban the capture of the seahorse *Hippocampus patagonicus* inside the protected area, encouraging its release when captured incidentally.

2.3. Chubut

In the province of Chubut, a mandatory fishing license is required for recreational fishing (children under 14 years old are exempt from getting the license) (Provincial Law N. XVII-8, formerly Law N. 1087, enacted in 1973). However, this regulation was not fully implemented by the Provincial Fishery Administration in the last 40 years. Currently, there are three license categories: spearfishing, coast- and boat-based; the latter, having a cost of USD 3.40 (annual license), is the only paid category (Bovcon, Personal Communication⁵). Besides, the Law N. XVII-8 establishes that recreational fishing tournaments must be regulated by the provincial government.

Other regulations for recreational fisheries in this province are restricted to the Península Valdés and the San José Gulf (Legal Provision N. 214/1994 of the General Directorate of Maritime Interests and Inland Fisheries of Chubut, currently the Provincial Fishery Administration, and the Management Plan for Península Valdés [52]). Península Valdés was declared as a Natural World Heritage Site by UNESCO in 1999 and, in 2001, the Chubut government categorized the Península Valdés as a Natural Protected Area⁶, stated its geographical limits, and approved its Management Plan. Península Valdés is included within the Valdés Biosphere Reserve⁷. Obtaining a fishing license is mandatory for both line- and spearfishing in this protected area, and chartered boats have to be authorized by the Provincial Fishery Administration. The Legal Provision N. 214/1994 distinguishes three different recreational fishing

⁵ Dr. Nelson Bovcon, 2017, Chubut Fisheries Administration.

⁶ The Peninsula Valdés and the San José Gulf have a long and complex history of protection which dates back to 1967 [53].

⁷ <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/latin-america-and-the-caribbean/argentina/valdes/>, (accessed 29.09.16).

categories: ‘shore-based fishing’, ‘boat-based fishing (particular or chartered boats), and ‘spearfishing’. This is the only coastal area in the country in which some restrictions for spearfishing exist. Although the Legal Provision N. 214/1994 establishes a closure for boat-based fishing during the austral spring, in practice the open season in the San José Gulf extends from October to early April, with a peak between late December and February (spring and summer) [24]. On the other hand, the Management Plan does not impose any seasonal ban for boat-based fishing inside the San José Gulf, which contradicts the provision N. 214/1994. Restrictions for recreational sailing in the northern and western Nuevo Gulf between early June and late December (winter and spring) are due to the breeding season of the southern right whale *Eubalaena australis*. This latter restriction is imposed each year by the Tourism and Protected Areas Administration. No seasonal closures are in place for spear- or shore-based fishing. In some zones of the protected area, all three fishing categories are prohibited, and the sale of the recreational catch (fresh or processed), as well as the organization of fishing tournaments, are explicitly banned (Provision N. 214/94) (Table 2). Different bag limits are specified only for boat-based fishing (maximum weight of 30 kg per fisher per day) and spearfishing (up to 2 fish weighing more than 5 kg each or up to 4 fish weighing less than 5 kg each per fisher per day). In no case fishers can store more fish than the daily limit. For boat-based fishing, only one hook per line is allowed, which should be larger than a minimum specified size (the Provision indicates 9/0). Although the Legal Provision N. 214/1994 is still valid (Annex 9 of the Management Plan), only spatial restrictions for the recreational categories ‘shore-based’ and ‘boat-based fishing’ were defined, while ‘spearfishing’ was not even mentioned [52]. The Plan, at present being revisited, intends to limit the numbers of anglers and fishing guides, and suggests that the presence of a fishing guide onboard should be mandatory for boat-based fishing. During the 1990s, there was a cooperation agreement between the Fishery and Tourist administrations for controlling the recreational fisheries within the Península Valdés. At present, the regulations proposed in the Management Plan were not yet implemented and recreational fisheries within the Península Valdés are uncontrolled.

2.4. Santa Cruz

The Provincial Law N. 1464 (enacted in 1982) and its Regulatory Decree N. 195/1983 regulate aquaculture as well as the use and protection of aquatic flora and fauna (marine

and freshwater) in provincial waters. Regarding marine recreational fisheries, these general legal instruments only set the basis for specific legislation: prohibit the commercialization of recreational catch, explicitly state that holding a fishing license is not necessary for marine recreational fishers (differently from the requirement for freshwater recreational fishers), require authorization for the organization of fishing tournaments, and allow for spearfishing in jurisdictional waters, stating that fishing seasons, areas, species, and bag and size limits should be regulated by corresponding authorities (i.e. the Provincial Fisheries Administration or the Provincial Agrarian Council, the latter inside provincial reserves) (Table 2).

No other regulations for marine recreational fisheries have been established since the early 1980s for the province. However, three protected areas located in Santa Cruz, the Monte León NP (under national jurisdiction), and the Ría Deseado and Cabo Vírgenes PRs have specific regulations for angling. The Monte León NP encompasses 48 km of coastline [54]. It was created by a National Law in 2004 but its Management Plan had been approved in 2002 (Legal Provision N. 223/2002 of the National Parks Administration)⁸. In 2011, the National Parks Administration approved regulations for recreational shore-based fisheries inside the park limits: a public beach of *ca.* 1.5 km long is the only area where angling is allowed within this park; open season is restricted to the austral summer and early fall (January to April); fishing license is mandatory (free of charge); up to five fish per day per angler of each one of only the three species allowed to be caught (Patagonian blennie *Eleginops maclovinus*, silverside *O. smitti* and parona leatherjacket *Parona signata*); no fish can be stored beyond the daily bag limit, and all other species caught must be released, as well as *E. maclovinus* below 30 cm of total length; angling must be practiced exclusively during daylight; only one fishing rod with up to two hooks per line is authorized; and fishing tournaments are explicitly prohibited inside the park. Although it is planned to create a new marine protected area under shared jurisdiction (provincial and national) next to this national park, it was not yet implemented.

The Ría Deseado Provincial Reserve was created in 1977 by the Decree N. 1561, but it was legally declared as a Provincial Reserve in 2010⁹. Located in the northern region of

⁸ The chronology is inverted because the donation of the land was subject to the elaboration and approval of the Management Plan for the protected area [55].

⁹ The Ría Deseado Provincial Reserve was created by a decree of the Under Secretariat of Maritime Affairs. However, a Provincial Law from 1972 states that Provincial Reserves in Santa Cruz must be

the coast of Santa Cruz, it encompasses a marine area of 100 km² [46] and primarily aimed at protecting several colonies of the Maguellanic penguin *Spheniscus magellanicus*, as well as other charismatic fauna inhabiting the estuary such as the red-legged cormorant *Phalacrocorax gaimardi* and the Commerson's dolphin *Cephalorhynchus commersonii* [45]. Recreational fisheries are banned between September and April around two islands (Chaffers Island and Isla de los Pájaros) where the two largest reproductive colonies of *S. magellanicus* are located (Legal Provision N. 74/2014 of the Provincial Agrarian Council). Chondrichthyes fisheries inside the reserve were banned in 2013 (Legal Provision N. 01/2013 of the Wildlife Directorate). Provisions N. 01/2013 and 74/2014 include regulations in force until the Management Plan and specific regulations for recreational fisheries are approved for the area. In addition, the Legal Provision N. 74/2014 defines areas where recreational fishing is allowed within the Reserve, coincident with the zonation envisioned by its Management Plan.

In the estuary of the Ría Deseado, recreational shark fishing had been practiced over the last 50 years. The “Certamen de Pesca del Tiburón”, a fishing tournament targeting *N. cepedianus*, is the oldest fishing tournament in Patagonia [35, 56]. The provisional regulations in force for the Reserve generated a conflict between authorities and anglers, who were reluctant to release all sharks caught. Sharks below the minimum size specified in the tournament rules had already been tagged and released since 2008. However, in the last three editions of this fishing tournament (2014 – 2016), a ten-years project led by the NGOs Fundación Patagonia Natural and Conservation Leadership Programme¹⁰ allowed to reach an agreement with anglers, towards releasing all sharks after tagging them [56, 57].

Finally, the Cabo Vírgenes Provincial Reserve is a small protected area of about 14 km² and 9 km of coastline. It was created in 1986 and its Management Plan was approved in 2007. The plan allows angling within a restricted shore area; netting is explicitly prohibited inside the protected area [58].

2.5. Tierra del Fuego

created by a Provincial Law and administered by the Provincial Agrarian Council. This irregular situation was corrected in 2010.

¹⁰ <http://www.conservationleadershipprogramme.org/>, (accessed 17.01.17).

Specific regulations for recreational fisheries have not been so far elaborated for the southernmost province of Argentina. Nonetheless, inside the Tierra del Fuego National Park, both freshwater and coastal fisheries have been banned. This National Park was created in 1960 and expanded in 1966. It currently covers an area of 690 km² in the southeastern portion of the Tierra del Fuego Island and is limited by the lake Fagnano to the north, the international Chilean border to the west and the Beagle Channel to the south. The General Regulations for the Conservation and Management of Wildlife was enacted in 1991, under the National Parks Administration, and states general prohibitions for hunting and fishing, as well as for possessing, storing and transporting alive or dead native wildlife from the Park. Nevertheless, recreational fishing of introduced species (i.e. salmonids) in freshwater environments inside the Park was allowed until the fishing season 2012 – 2013, and banned since the next fishing season (2013 – 2014) because of the risk of invasion by the exotic freshwater diatom didymo (*Didymosphenia geminata*) (Legal Provision N. 227/2013 of the National Parks Administration and subsequent editions of the Regulations for the Patagonian Continental Sport Fishing¹¹). The ban on salmonid fisheries in fresh waters inside the park has *de facto* limited the development of marine recreational fishing within its boundaries (Valenzuela, Personal Communication¹²).

3. Discussion

This review summarizes the regulations in force for the marine recreational fisheries along the Argentine coast and highlights the weaknesses of the policy and institutional framework, product of the poor attention that in general has been given to these activities by the national and provincial governments. As a consequence, many marine recreational fisheries with more than 50 years of history have been largely unregulated or mismanaged, and the magnitude of their ecological, social and economic value and impacts remains mostly unknown.

Marine recreational fisheries in Argentina are being managed under the State control model (i.e. each provincial government retains full management authority up to 12 nm from the coast) [59]. Differently from other South American countries such as Chile and

¹¹ http://www.reglamentodepesca.org.ar/reglamento_anexos_parques.php, (accessed 03.10.16).

¹² Dr. Alejandro Valenzuela, 2016, Patagonia Austral Coordination, National Parks Administration.

Brazil, where recreational fisheries also constitute thriving industries [see 60 – 62], there is no national (i.e. federal) institution in Argentina that provides a general regulatory framework for the management of these fisheries, upon which each provincial government or its governmental agencies in charge of protected areas management may elaborate more specific and/or stricter legislation. This explains the large heterogeneity observed in the regulations used for managing marine recreational fisheries in each coastal province and in different coastal protected areas of Argentina. Thus, the regulations were developed without coordination responding to the different agendas and enforcement capabilities of each institution involved. Ban on the sale of recreational catches; mandatory release of certain species; restrictions of type and number of fishing gears used; and spatial zonation (within protected areas), were amongst the most management measures adopted. Mandatory fishing licenses, bag limits, and restrictions of type, size and numbers of hooks per line were less used. The requirement of recreational fishing licenses is considered advantageous since it may provide: (1) funding to support fisheries management; (2) a mechanism for limiting access; and (3) means to count the number of recreational fishers and eventually characterize. Furthermore, these licenses do not need to be fee-based in order to be useful [59]. A license is required only in two provinces (Buenos Aires and Chubut) and in one national park located in the province of Santa Cruz. This constitutes an important difference in relation to other American countries for which the recreational fishing license is mandatory throughout their coast [e.g., 60, 63–66].

The elaboration of the Argentine NPOA-Sharks initiative for the conservation of *Condriichthyes*, which was jointly promoted by national authorities [27, 41], was an exception to the situation described (i.e. lack of a national regulatory framework). Mexico and Brazil, the other American countries included amongst the top 20 shark catching nations, also put in place their National Plan of Action for Conservation and Management of Sharks [67, 68]. The Argentine Plan proposed a series of short and mid term actions: (1) to promote research on *Condriichthyes* recreational fisheries; (2) to increase the baseline information for assessing the impact of artisanal and recreational fisheries on *Condriichthyes*; (3) to promote the creation of monitoring programs for *Condriichthyes* recreational fisheries; (4) to systematize the collection of data on *Condriichthyes* recreational fisheries; (5) to adopt and implement a regulatory framework for *Condriichthyes* recreational fisheries; and (6) to promote environmental education

through the media, and to organize workshops directed to anglers to spread best practices in Chondrichthyes recreational fisheries [41].

Six years after the elaboration of that Plan, and probably also as a response to the increased global awareness and concern for the conservation status of Chondrichthyes [e.g. 69, 70, but see 71], only daily bag limits for particular Chondrichthyes species and the mandatory release of some or all Chondrichthyes caught were added to the Argentine legislation for recreational fisheries. However, this occurred only in the province of Buenos Aires and in two protected areas, Punta Bermeja NPA and the Ría Deseado PR, in the provinces of Río Negro and Santa Cruz, respectively.

It is surprising that in four of the five coastal Argentine provinces, most regulations for recreational fisheries are only valid within certain protected areas. The management tools applied inside the Argentine coastal protected areas are the typical input (regulating fishing effort and modalities) and output (regulating catch) controls described in [59]. One tool that could be introduced in Argentina is the engagement of local fishers in the recreational fishing industry, as fishing guides, as observed in the Galapagos Marine Reserve (Ecuador). Although promising, the implementation of the “Pesca Artesanal Vivencial” (PAV) in Galapagos was not fully successful [72, 73]. Indeed, the revision of the Management Plan for the Península Valdés NPA intends to give priority to artisanal fishers and NPA residents (including the city of Puerto Madryn) to serve as fishing guides for boat-based recreational fisheries.

4. Conclusions

The overall lack of legislation for marine recreational fisheries in Argentina has encouraged alleged recreational fishers to develop small-scale commercial fishing operations that are neither controlled nor monitored as such. So far, no monitoring programs have been put in place to evaluate the effects of the current regulations on fish populations targeted by recreational fishers or even their levels of compliance, nor even inside protected areas. Furthermore, the low enforcement capabilities of provincial administrations and the lack of specific funding have precluded the organization of systematic control programs for the marine environment, even in the protected areas for which specific legislation exists. The difficulties for accessing updated information about regulations in force for each province/protected area (i.e. with a few exceptions, it

is impossible to find them by browsing the internet) are a clear symptom of the situation described.

This review constitutes a first step to address the institutional shortcomings for managing recreational fisheries in Argentina as a fundamental step to improve their governance [7, 59].

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References

- [1] J.B. Jackson, M.X. Kirby, W.H. Berger, K.A. Bjorndal, L.W. Botsford, B.J. Bourque, R.H. Bradbury, R. Cooke, J. Erlandson, J.A. Estes, T.P. Hughes, S. Kidwell, C.B. Lange, H.S. Lenihan, J.M. Pandolfi, C.H. Peterson, R.S. Steneck, M.J. Tegner, R.R. Warner, Historical overfishing and the recent collapse of coastal ecosystems, *Science* 293 (2001) 629–637. <http://dx.doi.org/10.1126/science.1059199>.
- [2] R. Hilborn, T.A. Branch, B. Ernst, A. Magnusson, C.V. Minte-Vera, M.D. Scheuerell, J.L. Valero, State of the world’s fisheries, *Ann. Rev. Environ. Res.* 28 (2003) 359–399. <http://dx.doi.org/10.1146/annurev.energy.28.050302.105509>.
- [3] F.C. Coleman, W.F. Figueira, J.S. Ueland, L.B. Crowder, The impact of United States recreational fisheries on marine fish populations, *Science* 305 (2004) 1958–1960. <http://dx.doi.org/10.1126/science.1100397>.

- [4] S.J. Cooke, I.G. Cowx, The role of recreational fishing in global fish crises, *Bioscience* 54 (2004) 857–859. [http://doi.org/10.1641/0006-3568\(2004\)054\[0857:TRORFI\]2.0.CO](http://doi.org/10.1641/0006-3568(2004)054[0857:TRORFI]2.0.CO).
- [5] B. Morales-Nin, J. Moranta, C. García, M.P. Tugores, A.M. Grau, F. Riera, M. Cerdà, The recreational fishery off Majorca Island (western Mediterranean): some implications for coastal resource management, *ICES J. Mar. Sci.* 62 (2005) 727–739. <http://dx.doi.org/10.1016/j.icesjms.2005.01.022>.
- [6] M.A.L. Young, S. Foale, D.R. Bellwood, Impacts of recreational fishing in Australia: historical declines, self-regulation and evidence of an early warning system, *Environ. Cons.* 41 (2014) 350–356. <http://dx.doi.org/10.1017/S0376892914000046>.
- [7] R. Arlinghaus, S.J. Cooke, S.G. Sutton, A.J. Danylchuk, W. Potts, K.M.F. Freire, J. Alós, E.T. Da Silva, I.G. Cowx, Recommendations for the future of recreational fisheries to prepare the social-ecological system to cope with change, *Fish. Manage. Ecol.* 23 (2016) 177–186. <http://dx.doi.org/10.1111/fme.12191>.
- [8] D.M. Schroeder, M.S. Love, Recreational fishing and marine fish populations in California, *CalCOFi Rep.* 43 (2002) 182–190.
- [9] C.M. Denny, T.J. Willis, R.C. Babcock, Effects of Poor Knight Islands Marine Reserve on demersal fish populations, *Doc Science Internal Series 142*, Department of Conservation, Wellington, 2003.
- [10] L.A. Venerus, A.M. Parma, D.E. Galván, 2008, Annual occupation pattern of temperate rocky reefs by the Argentine sandperch *Pseudoperca semifasciata* in San José Gulf Marine Park, Argentina, *Fish. Manage. Ecol.* 15 (2008) 217–229. <http://dx.doi.org/10.1111/j.1365-2400.2008.00603.x>.
- [11] D. Rocklin, J.-A. Tomasini, J.-M. Culioli, D. Pelletier, D. Mouillot, Spearfishing regulation benefits artisanal fisheries: the ReGS indicator and its application to a multiple-use Mediterranean Marine Protected Area, *PLoS ONE* 6 (2011) (e23820) <http://dx.doi.org/10.1371/journal.pone.0023820>.
- [12] K.M.F. Freire, Recreational fisheries in Northeastern Brazil: inferences from data provided by anglers, in: G.H. Kruse, V.F. Gallucci, D.E. Hay, R.I. Perry, R.M. Peterman, T.C. Shirley, P.D. Spencer, B. Wilson, D. Woodby (Eds), *Fisheries*

Assessment and management in data-limited situations. University of Alaska Fairbanks, Alaska Sea Grant College Program, Fairbanks, 2005, pp. 377–394.

[13] K.M.F. Freire, Unregulated catches from recreational fisheries off northeastern Brazil, *Atlántica*, Rio Grande 32 (2010) 87–93.

<http://dx.doi.org/10.5088/atl.2010.32.1.87>.

[14] D. Pauly, D. Zeller, Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining, *Nature Comm.* 7 (2016) (10244).

<http://dx.doi.org/10.1038/ncomms10244>.

[15] G.R. Wilde, K.L. Pope, Worldwide trends in fishing interest indicated by internet search volume, *Fish. Manage. Ecol.* 20 (2013) 211–222.

<http://dx.doi.org/10.1111/fme.12009>.

[16] D.P. McPhee, D. Leadbitter, G.A. Skilleter, Swallowing the bait: is recreational fishing ecologically sustainable?, *Pacific Cons. Biol.* 8 (2002) 40–51.

[17] L. Couce-Montero, V. Christensen, J.J. Castro, Effects of small-scale and recreational fisheries on the Gran Canaria ecosystem, *Ecol. Model.* 312 (2015) 61–76.

<http://dx.doi.org/10.1016/j.ecolmodel.2015.05.021>.

[18] W.C. Lewin, R. Arlinghaus, T. Mehner, Documented and potential biological impacts of recreational angling: insights for conservation and management, *Rev. Fish. Sci.* 14 (2006) 305–367. <http://dx.doi.org/10.1080/10641260600886455>.

[19] K.M.F. Freire, M.C.S. Bispo, R.M.C.A. Luz, Competitive marine fishery in the state of Sergipe, *Acta Fish. Aquacult.* 2 (2014) 59–72.

<http://dx.doi.org/10.2312/ActaFish.2014.2.1.59-72>.

[20] F. Sanabra, *Buceando recuerdos*, Ocean Ediciones Submarinas, Puerto Madryn, 2002.

[21] L.O. Lucifora, *Ecología y conservación de los grandes tiburones costeros de Bahía Anegada, Provincia de Buenos Aires, Argentina* (Doctoral dissertation), Universidad Nacional de Mar del Plata, Buenos Aires, 2003.

[22] D.E. Galván, L.A. Venerus, A.J. Irigoyen, A.M. Parma, A.E. Gosztonyi, Extension of the distributional range of the silver porgy *Diplodus argenteus* (Valenciennes 1830) and the red porgy *Pagrus pagrus* (Linnaeus 1758) (Sparidae) in

- northern Patagonia, southwestern Atlantic, J. Appl. Ichthyol. 21 (2005) 444–447.
<http://dx.doi.org/10.1111/j.1439-0426.2005.00621.x>.
- [23] J.F. Pellegrino, M.B. Cousseau, La pesca deportiva desde la costa en Mar del Plata. Los peces costeros. The Authors: Mar del Plata, 2005.
- [24] L.A. Venerus, Dinámica espacial del salmón de mar *Pseudoperca semifasciata* (Cuvier, 1829) (Pinguipedidae) – Implicancias para el uso sustentable de sistemas de arrecifes rocosos (Doctoral dissertation), Universidad de Buenos Aires, CABA, 2006.
- [25] R.L. García Liotta, Pesca de tiburones en reservas naturales: ¿paradoja en la gestión de áreas protegidas? Un análisis sobre la pesca artesanal y deportiva de tiburones en la Isla Jabalí, Reserva Natural Bahía San Blas, Provincia de Buenos Aires, Argentina (MSc dissertation), Universidad Nacional de San Martín, Buenos Aires, 2008.
- [26] M. Gastaldi, Caracterización y evaluación de la pesquería recreativa del róbalo *Eleginops maclovinus* (Pisces, Eleginopidae) del Golfo San Matías durante la temporada 2008 (“Licenciatura” dissertation), Universidad Nacional de Córdoba, Córdoba, 2009.
- [27] P. Cedrola, N. Bovcon, C. Bruno, C. Bustamante, G. Caille, S. Calvo, G. Chiamonte, R. García Liotta, R. González, D. Laura, V. Massola, L. Mendia, M. Moronta, R. Perier, M. Remes Lenicov, M.L. Tombesi, La pesca deportiva de condrictios en el Mar Argentino, in: O.C. Wöhler, P. Cedrola, M.B. Cousseau (Eds.), Contribuciones sobre biología, pesca y comercialización de tiburones en Argentina. Aportes para la elaboración del Plan de Acción Nacional. Consejo Federal Pesquero, Buenos Aires, 2011.
- [28] F.M. Llompart, La ictiofauna de Bahía San Blas (Provincia de Buenos Aires) y su relación con la dinámica de las pesquerías deportiva y artesanal (Doctoral dissertation), Universidad Nacional de La Plata, Buenos Aires, 2011.
- [29] F.M. Llompart, D.C. Colautti, C.R.M. Baigún, Assessment of a major shore-based marine recreational fishery in the southwest Atlantic, Argentina, NZ J. Mar. Freshw. Res. 46 (2012) 57–70. <http://dx.doi.org/10.1080/00288330.2011.595420>.
- [30] M. López, L.A. Venerus, Análisis histórico del buceo en Puerto Madryn, V Jornadas de Historia de la Patagonia “Homenaje al Dr. Pedro Navarro Floria”, Facultad

de Humanidades y Ciencias Sociales, Universidad Nacional de la Patagonia “San Juan Bosco”, Comodoro Rivadavia, 2013, 15–17 April.

[31] L.A. Venerus, A.J. Irigoyen, D.E. Galván, A.M. Parma, Spatial dynamics of the Argentine sandperch, *Pseudoperca semifasciata* (Pinguipedidae), in temperate rocky reefs from northern Patagonia, Argentina, Mar. Freshw. Res. 65 (2014): 39–49.

<http://dx.doi.org/10.1071/MF12163>.

[32] S.A. Barbini, L.O. Lucifora, D.E. Figueroa. Using opportunistic records from a recreational fishing magazine to assess population trends of sharks, Can. J. Fish. Aquat. Sci. 72 (2015) 1853–1859. <http://dx.doi.org/10.1139/cjfas-2015-0087>.

[33] N.D. Bovcon, Evaluación de las pesquerías recreativas costeras de la provincia del Chubut, Argentina: base para su ordenamiento y manejo (Doctoral dissertation), Universidad Nacional del Comahue, Bariloche, 2016.

[34] A.J. Irigoyen, G.A. Trobbiani. Depletion of trophy large-sized sharks populations of the Argentinean coast, south-western Atlantic: insights from fishers’ knowledge, Neotrop. Ichthyol. 14 (2016) (e150081). <http://dx.doi.org/10.1590/1982-0224-20150081>.

[35] P.V. Cedrola, G.M. Caille, G.E. Chiamonte, A.D. Pettovello, Demographic structure of broadnose seven-gill shark, *Notorynchus cepedianus*, caught by anglers in southern Patagonia, Argentina, Mar. Biodivers. Rec. (2009) (e138).

<http://dx.doi.org/10.1017/S1755267209990558>.

[36] R.F. Dellacasa, J.M. Braccini, Adapting to social, economic and ecological dynamics: changes in Argentina’s most important marine angling tournament, Fish. Manage. Ecol. 23 (2016) 330–333. <http://dx.doi.org/10.1111/fme.12158>.

[37] A.J. Irigoyen, D.E. Galván, L.A. Venerus, Occurrence of dusky grouper, *Epinephelus marginatus* (Lowe, 1834) in gulfs of northern Patagonia, Argentina, J. Fish. Biol. 67 (2005) 1741–1745. <http://dx.doi.org/10.1111/j.1095-8649.2005.00866.x>.

[38] L.A. Venerus, D.E. Galván, A.J. Irigoyen, A.E. Gosztanyi, First record of the namorado sandperch, *Pseudoperca numida* Miranda-Ribeiro, 1903 (Pinguipedidae; Osteichthyes) in Argentine waters, J. Appl. Ichthyol. 23 (2007) 110–112.

<http://dx.doi.org/10.1111/j.1439-0426.2006.00800.x>.

- [39] G.A. Trobbiani, D.E. Galván, M. Cuestas, A.J. Irigoyen, Occurrence of the snowy grouper, *Hyporthodus niveatus* (Valenciennes 1828), in Argentine waters, J. Appl. Ichthyol. 30 (2014) 182–184. <http://dx.doi.org/10.1111/jai.12350>.
- [40] G.E. Chiaramonte, P.V. Cedrola, G. Caille, A.E. Gosztonyi, Upgrading the status (taxonomy, fisheries and conservation) of the school shark *Galeorhinus galeus* (Elasmobranchii: Triakidae) in Patagonian waters, South West Atlantic Ocean, Rev. Cienc. Pesq. 24 (2016) (in press).
- [41] Subsecretaría de Pesca y Acuicultura, Secretaría de Ambiente y Desarrollo Sustentable, Ministerio de Relaciones Exteriores, Comercio Internacional y Culto, Plan de Acción Nacional para la conservación y el manejo de condriactos (tiburones, rayas y quimeras) en la República Argentina. http://www.minagri.gob.ar/sitio/areas/pesca_maritima/plan/PAN-TIBURONES/index.php, 2009 (accessed 12.01.17).
- [42] J.R. Dadón, C. Castaños, R. Pérez García, M.T.G. Chiappini, J.M. Cruses, Efectos a largo plazo de las pesquerías de almeja amarilla (*Mesodesma mactroides*) y berberecho (*Donax hanleyanus*), y de la urbanización sobre las comunidades intermareales, in: K. Alveal, T. Antesana (Eds.), Sustentabilidad de la Biodiversidad, Universidad de Concepción, Concepción, 2001, pp. 703–715.
- [43] N. Ortíz. Biología poblacional del pulpo colorado *Enteroctopus megalocyathus* en la costa patagónica y sus implicancias en el manejo pesquero (Doctoral dissertation), Universidad de Buenos Aires, CABA, 2009.
- [44] J.M. Díaz de Astarloa, Los peces óseos del Mar Patagónico, in: Foro para la Conservación del Mar Patagónico y Áreas de Influencia (Ed.), Estado de conservación del Mar Patagónico y áreas de influencia. <http://www.marpatagonico.org>, 2008, pp. 163–186 (accessed: 22.09.16).
- [45] Consejo Agrario Provincial de Santa Cruz, Reserva Provincial Ría Deseado – Plan de Manejo. Government of the Province of Santa Cruz, Santa Cruz, 2015.
- [46] M. Giaccardi, Componente 1: Fortalecimiento de la gobernanza de las Áreas Marinas Protegidas (AMPs). Tech Rep, Project GEF/FAO "Fortalecimiento de la Gobernanza para la Gestión y Protección de la Biodiversidad Costero Marina en áreas ecológicas clave y la aplicación del enfoque ecosistémico de la pesca (EEP)", MS.

- [47] D.E. Galván, L.A. Venerus, A.J. Irigoyen, The reef-fish fauna of the Northern Patagonian gulfs of Argentina, Southwestern Atlantic, *Open Fish Sci. J.* 2 (2009) 90–98. <http://dx.doi.org/10.2174/1874401X00902010090>.
- [48] IUCN, The IUCN Red List of Threatened Species. Version 2016-2. <http://www.iucnredlist.org>, 2016 (accessed 28.09.16).
- [49] G.E. Chiaramonte, E. Di Giacomo, Los condrictios del Mar Patagónico y área de influencia, in: *Foro para la Conservación del Mar Patagónico y Áreas de Influencia* (Ed.), Estado de conservación del Mar Patagónico y áreas de influencia. <http://www.marpatagonico.org>, 2008, pp. 152–162 (accessed: 22.09.16).
- [50] J.M. Cuevas, M.L. García, First record of bigeye thresher shark (*Alopias superciliosus* Lowe, 1841) and new record of thresher shark [*Alopias vulpinus* (Bonnaterre, 1788)] (Chondrichthyes, Alopiidae) from Argentina, *J. Appl. Ichthyol.* 32 (2015) 123–125. <http://dx.doi.org/10.1111/jai.12945>.
- [51] Gobierno de Río Negro and Consejo de Ecología y Medio Ambiente de Río Negro, Plan de Manejo Area Natural Protegida “Reserva Faunística Punta Bermeja”. Government of the Province of Río Negro, Río Negro, 2010.
- [52] Dirección General de Conservación de Áreas Protegidas, Plan de manejo “Sistema Península Valdés”. Government of the Province of Chubut, Chubut, 1998.
- [53] A. Cinti, J.M. Orensanz, A.M. Parma, Final Report: “Elaboración del Documento del Plan de Manejo para la Pesca Comercial de Mariscos Mediante Buceo en el golfo San José”, Joint Working Agreement, Province of Chubut – CCT CONICET – CENPAT, Volume 2, Folio 249, 5 April 2011, Government General Notary, Provincial Law No. 3315/2011, 2011.
- [54] A. Bortolus, E. Schwindt, M.M. Mendez, N. Ortíz, M.E. Ré, M.L. Piriz, I. Elías, A.E. Gosztonyi, L. Kuba, N. Ciocco, D.A. Gagliardini, J.M. Orensanz, Estudio de línea de base y plan de monitoreo de la biodiversidad de los ambientes marinos costeros adyacentes al Parque Nacional Monte León, Final Tech Rep, CENPAT (CONICET) and National Parks Administration, Puerto Madryn, 2006.
- [55] Comité de Administración del Plan de Manejo, Plan de Manejo Parque Nacional Monte León, Government of the Province of Santa Cruz, Santa Cruz, 2002.

- [56] P.V. Cedrola, G.E. Chiamonte, G.M. Caille, Primeros ensayos de pesca con devolución de tiburones en las reservas naturales Ría de Deseado y Península de San Julián, Provincia de Santa Cruz, Patagonia, Argentina, Tech. Rep. Fundación Patagonia Natural, Puerto Madryn, 2009.
- [57] J.M. Cuevas, G. Chiamonte, P.V. Cedrola, M. Suárez, R. Dellacasa, M.L. Colecchia Corso, N. Dercole, A. Oberti, Anglers as key stakeholders in a shark conservation programme, Program Book, 7th World Recreational Fishing Conference, Campinas, 2014, 1–4 September, pp. 71-72.
- [58] Consejo Agrario Provincial de Santa Cruz, Plan de Manejo Reserva Provincial “Cabo Vírgenes”, Government of the Province of Santa Cruz, Santa Cruz, 2001.
- [59] FAO, Recreational fisheries, FAO Technical Guidelines for Responsible Fisheries 13, Rome, 2012.
- [60] K.M.S. Freire, R.A. Tubino, C. Monteiro-Neto, M.F. Andrade-Tubino, C.G. Belruss, A.R.G. Tomás, S.L.S. Tutui, P.M.G. Castro, L.S. Maruyama, A.C. Catella, D.V. Crepaldi, C.R.A. Daniel, M.L. Machado, J.T. Mendonça, P.S. Moro, F.S. Motta, M. Ramires, M.H.C. Silva, J.P. Vieira, Brazilian recreational fisheries: current status, challenges and future direction, *Fish. Manage. Ecol.* 23 (2016) 276–290.
<http://dx.doi.org/10.1111/fme.12171>.
- [61] F.S. Motta, J.T. Mendonça, P.S. Moro, Collaborative assessment of recreational fishing in a subtropical estuarine system: a case study with fishing guides from southeastern Brazil, *Fish. Manage. Ecol.* 23 (2016) 291–302.
<http://dx.doi.org/10.1111/fme.12172>.
- [62] D. Nuñez Parrado, M. Niklitschek Huaquín, Caracterización de la pesca recreativa en la Patagonia chilena. Una encuesta a turistas de larga distancia en la región de Aysén. *Estad. Perspect. Tur.* 19 (2010) 83–104.
- [63] Servicio Nacional de Pesca y Acuicultura (SERNAPESCA), Ministerio de Economía, Fomento y Turismo, Gobierno de Chile, Normas que regulan la pesca deportiva en Chile, Temporada 2015–2016.
http://pescarecreativa.sernapesca.cl/index.php?option=com_content&view=article&id=300&Itemid=306&lang=es, 2015, (accessed 12.01.17).

- [64] Mexico, Ley general de pesca y acuicultura sustentables, DOF 04-06-2015. http://www.diputados.gob.mx/LeyesBiblio/pdf/LGPAS_040615.pdf, 2015 (accessed 12.01.17).
- [65] Venezuela, Decreto con rango, valor y fuerza de ley de reforma del decreto con rango, valor y fuerza de ley de pesca y acuicultura, Decreto N° 1.408 del 13 de noviembre de 2014. http://www.insopesca.gob.ve/1/?page_id=39, 2014 (accessed 23.01.17).
- [66] Costa Rica, Ley N° 8346, Ley de pesca y acuicultura. www.visitcostarica.com/ict%5Cpaginas%5CLEYES%5Cpdf%5CLey8436esp.pdf, 2005 (accessed 23.01.17).
- [67] D.S. Shiffman, N. Hammerschlag, Shark conservation and management policy: a review and primer for non-specialists, Anim. Conserv. 19 (2016) 401–412. <http://dx.doi.org/10.1111/acv.12265>.
- [68] M. Lack, G. Sant, The future of sharks: a review of action and inaction, TRAFFIC Rep., TRAFFIC International and the Pew Environment Group, Cambridge, 2011.
- [69] B. Worm, B. Davis, L. Kettner, C.A. Ward-Paige, D. Chapman, M.R. Heithaus, S.T. Kessel, S.H. Gruber, Global catches, exploitation rates, and rebuilding options for sharks, Mar. Policy 40 (2013) 194–204. <http://dx.doi.org/10.1016/j.marpol.2012.12.034>.
- [70] N.K. Dulvy, S.L. Fowler, J.A. Musick, R.D. Cavanagh, P.M. Kyne, L.R. Harrison, J.K. Carlson, L.N.K. Davidson, S.V. Fordham, M.P. Francis, C.M. Pollock, C.A. Simpfendorfer, G.H. Burgess, K.E. Carpenter, L.J.V. Compagno, D.A. Ebert, C. Gibson, M.R. Heupel, S.R. Livingstone, J.C. Sanciangco, J.D. Stevens, S. Valenti S, W.T. White. Extinction risk and conservation of the world’s sharks and rays. eLife 3 (2014). <http://dx.doi.org/10.7554/eLife.00590>.
- [71] M. Braccini, Experts have different perceptions of the management and conservation status of sharks, Ann. Mar. Biol. Res. 3 (2016) (1012).
- [72] F. Zapata, La pesca artesanal vivencial en Galápagos, sistematización del proceso, Fundación Futuro Latinoamericano, 2006.

[73] [A. Schuhbauer, V. Koch, Assessment of recreational fishery in the Galapagos Marine Reserve: failures and opportunities, Fish. Res. 144 \(2013\) 103–110.](#)
<http://dx.doi.org/10.1016/j.fishres.2013.01.012>.

Figure captions

Fig. 1: Coastal provinces of Argentina and location of seven protected areas where some regulations for marine recreational fishing exist outside Buenos Aires province. 1: Punta Bermeja Natural Protected Area (NPA); 2: Bahía de San Antonio NPA; 3: Península Valdés NPA; 4: Ría Deseado Provincial Reserve (PR); 5: Monte León National Park (NP); 6: Cabo Vírgenes PR; and 7: Tierra del Fuego NP. SMG: San Matías Gulf, SJoG: San José Gulf; NG; Nuevo Gulf; SJG: San Jorge Gulf; and BC: Beagle Channel.

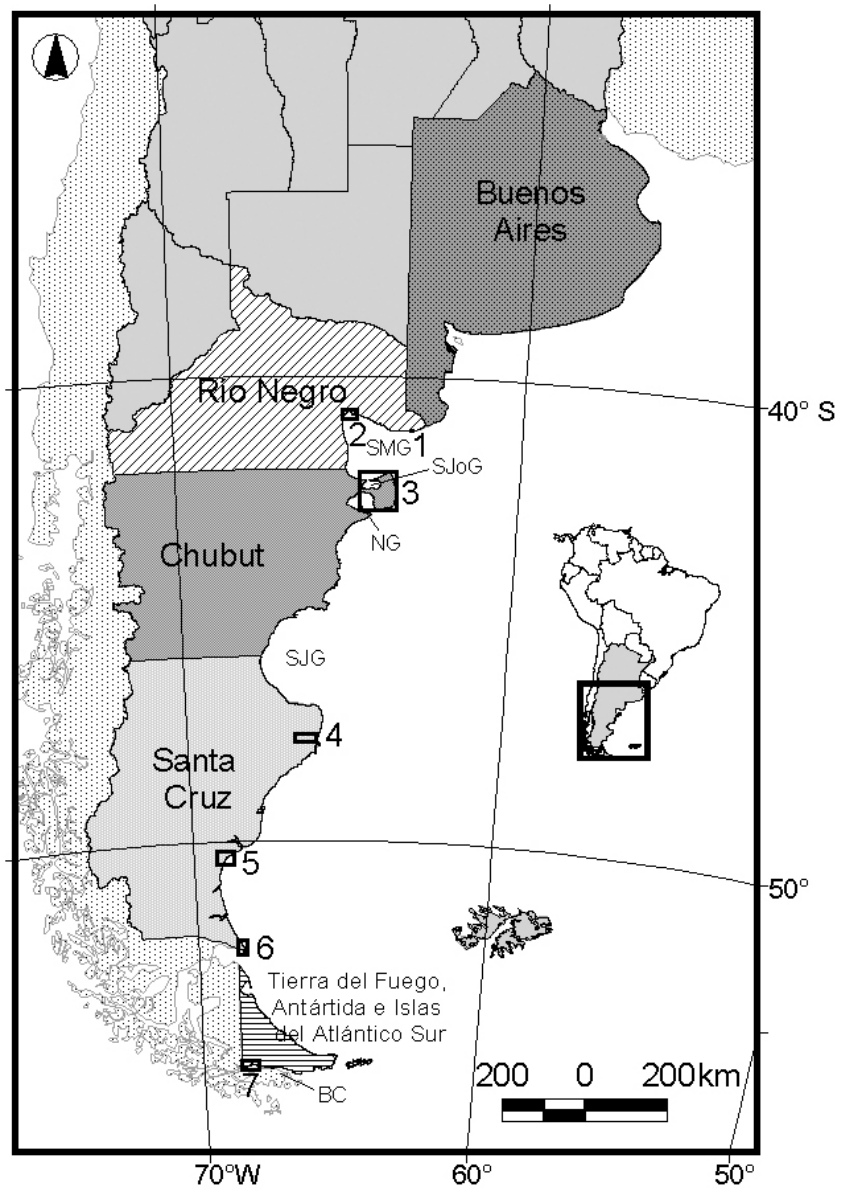


Fig. 1

Table 1: Most common targeted species in the recreational shore- and boat-based, as well as spear fisheries along the Argentine coast. Only the categories ‘Frequent’ and ‘Seasonal’ from Table 2.3 in [33] were added (the species catalogued as ‘Rare’ or ‘Very rare’ in [33] were not included in this list).

	Family	Species			References
		Scientific name	Common name	Local name	
Osteichthyes	Ariidae	<i>Genidens barbatus</i> (Lacepède 1803)	White sea catfish	Bagre de mar	[23]
	Atherinopsidae	<i>Odontesthes incisa</i> (Jenyns 1841)	Silverside	Cornalito	[23]
		<i>Odontesthes smitti</i> (Lahille 1929)	Silverside	Pejerrey (Corno)	[33, 23, 45] a
		<i>Odontesthes argentinensis</i> (Valenciennes 1835)	Silverside	Pejerrey (Escardón)	[21,23, 28] a
		<i>Odontesthes platensis</i> (Berg 1895)	Silverside	Pejerrey (Panzón)	[23, 28, 33]
		<i>Odontesthes nigricans</i> (Richardson 1848)	Silverside	Pejerrey (Sapito)	[33, 45]
		<i>Bovichtus argentinus</i> MacDonagh 1931	–	Diablito	[23]
	Bovichtidae				
	Carangidae	<i>Parona signata</i> (Jenyns 1841)	Parona leatherjacket	Palometa pintada	[23, 33] a
		<i>Seriola lalandi</i> Valenciennes 1833	Yellowtail amberjack	Pez limón	a, b
	Cheilodactylidae	<i>Nemadactylus bergi</i> (Norman 1937)	Castaneta	Castañeta	a, b
	Congridae	<i>Conger orbignianus</i> Valenciennes 1837	Argentine conger	Congrio	[23] a
	Eleginopidae	<i>Eleginops maclovinus</i> (Cuvier 1830)	Patagonian blennie	Róbalo	[26, 33, 45]
	Engraulidae	<i>Lycengraulis grossidens</i> (Spix and Agassiz 1829)	Atlantic sabretooth anchovy	Saraca	[23]
Moridae	<i>Salilota australis</i> (Günther 1878)	Tadpole codling	Bacalao criollo	b	
Mugilidae	<i>Mugil liza</i> Valenciennes 1836	Lebranche mullet	Lisa	[23]	
Nototheniidae	<i>Notothenia angustata</i> Hutton 1875	Maori chief	Sapo	c	

	Paralichthyidae	<i>Paralichthys orbignyanus</i> (Valenciennes 1839)	–	Lenguado	[23, 28]
		<i>Paralichthys patagonicus</i> Jordan 1889	Patagonian flounder	Lenguado	[28]
	Percophidae	<i>Percophis brasiliensis</i> Quoy and Gaimard 1825	Brazilian flathead	Pez palo	[23, 33] a
	Phydidae	<i>Urophycis brasiliensis</i> (Kaup 1858)	Brazilian codling	Brótola	[23]
	Pinguipedidae	<i>Pseudopercis semifasciata</i> (Cuvier 1829)	Argentine sandperch	Salmón de mar	[24] a
		<i>Pinguipes brasilianus</i> Cuvier 1829	Brazilian sandperch	Turco	[23, 24] b
	Pleuronectidae	<i>Oncopterus darwinii</i> Steindachner 1874	Remo flounder	Lenguado	[28]
	Polyprionidae	<i>Polyprion americanus</i> (Bloch and Schneider 1801)	Wreckfish	Chernia	a
	Pomatomidae	<i>Pomatomus saltatrix</i> (Linnaeus 1766)	Bluefish	Anchoa de banco	[23] a
	Sciaenidae	<i>Menticirrhus americanus</i> (Linnaeus 1758)	Southern kingcroaker	Burriqueta	[23]
		<i>Pogonias cromis</i> (Linnaeus 1766)	Black drum	Corvina negra	[23, 36] a
		<i>Midrocogonias furnieri</i> (Desmarest 1823)	Whitemouth croaker	Corvina rubia	[21, 23, 28, 36] a
		<i>Cynoscion guatucupa</i> (Cuvier 1830)	Stripped weakfish	Pescadilla	[21, 23, 28, 33] a
		<i>Macrodon ancylodon</i> (Bloch and Schneider 1801)	King weakfish	Pescadilla real	[23] a
	Scombridae	<i>Sarda sarda</i> (Bloch 1793)	Atlantic bonito	Bonito	a
		<i>Scomber colias</i> Gmelin 1789	Atlantic chub mackerel	Caballa	a, b
	Sebastidae	<i>Sebastes oculatus</i> Valenciennes 1833	Patagonian rockfish	Escrófalo	[24]
	Serranidae	<i>Dules auriga</i> Cuvier 1829	–	Cocherito	[23]
		<i>Acanthistius patachonicus</i> (Jenyns 1840)	Argentine sea bass	Mero	[23, 24, 28, 33] a
	Sparidae	<i>Pagrus pagrus</i> (Linnaeus 1758)	Red porgy	Besugo	[22] a
		<i>Diplodus argenteus</i> (Valenciennes 1830)	Silver porgy	Sargo	[22, 23]
	Trichiuridae	<i>Trichiurus lepturus</i> Linnaeus, 1758	Largehead hairtail	Pez sable	a
Condrichthyes	Arhynchobatidae	<i>Atlantoraja castelnaui</i> (Miranda Ribeiro 1907)	Spotback skate	Raya a lunares	[27, 33]
		<i>Sympterygia bonapartii</i> Müller and Henle	Smallnose fanskate	Raya marmorada	[23, 27, 33]

	1841			
	<i>Sympterygia acuta</i> Garman 1877	Bignose fanskate	Raya picuda	[27, 33]
Callorhynchidae	<i>Callorhynchus callorhynchus</i> (Linnaeus 1758)	Plownose chimaera	Pez gallo	[23, 27, 33, 45] b
Carcharhinidae	<i>Carcharhinus brachyurus</i> (Günther 1870)	Copper shark	Bacota	[21, 23, 25, 27, 28, 32, 34]
Hexanchidae	<i>Notorynchus cepedianus</i> (Péron 1807)	Broadnose sevengill shark	Gatopardo	[21, 23, 25, 27, 28, 32 – 34]
Myliobatidae	<i>Myliobatis goodei</i> Garman 1885	Southern eagle ray	Chucho	[23, 27, 33, 45]
Odontaspidae	<i>Carcharias taurus</i> Rafinesque 1810	Sand tiger shark	Escalandrún	[21, 23, 25, 27, 28, 32, 34]
Rhinobatidae	<i>Pseudobatos horkelii</i> (Müller and Henle 1841)	Brazilian guitarfish	Guitarra grande	[23]
Squalidae	<i>Squalus acanthias</i> Linnaeus 1758	Picked dogfish	Espinillo	[27, 45]
Scyliorhinidae	<i>Schroederichthys bivius</i> (Müller and Henle 1838)	Narrowmouthed catshark	Pintarroja	[45]
Triakidae	<i>Galeorhinus galeus</i> (Linnaeus 1758)	Tope shark	Cazón	[21, 23, 25, 27, 28, 32 – 34, 45] a, b
	<i>Mustelus schmitti</i> Springer 1939	Narrownose smooth-hound	Gatuzo	[21, 23, 25, 27, 33, 45] a
Trygonorrhinidae	<i>Zapteryx brevirostris</i> (Müller and Henle 1841)	Lesser guitarfish	Guitarra chica	[23]

^a Chartered boats from Mar del Plata city, Buenos Aires: www.makoteam.com.ar and www.sandokanpesca.com.ar, (accessed 21.09.16).

^b First author of this MS (Unpublished data).

^c Durbas, H. (Personal communication), experienced spearfisher with more than 40 years of continuous practice in the northern Patagonian gulfs of Argentina.

JMPO_2016_600: Review of marine recreational fisheries regulations in Argentina.

Table 2: Synthesis of main regulations for marine recreational fisheries in Argentina, by province and protected area. TTP: Throughout the province; PB: Punta Bermeja Natural Protected Area (NPA); BSA: Bahía de San Antonio NPA; PV: Península Valdés NPA; RD: Ría Deseado Provincial Reserve (PR); ML: Monte León National Park (NP); CV: Cabo Vírgenes PR; TF: Tierra del Fuego NP. (C): The restriction only involves Chondrichthyes. The regulations for Buenos Aires and PV, Chubut, identify a series of recreational fishing categories (see details in the text); in the other places, no recreational fishing categories were defined (ND) in the corresponding legal instruments.

Recreational fisheries regulations	Province									
	Buenos Aires		Río Negro		Chubut		Santa Cruz			Tierra del Fuego
	TTP	PB	BSA	TTP	PV	TTP	RD	ML	CV	TF
Ban on recreational fishing										X
Ban on sale of recreational catches	X				X	X	X	X		
Mandatory fishing license	X			X	X			X		
Closing season					X		X	X		
Spatial zonation		X	X		X		X	X	X	
Bag limits	X				X			X		
Storing limits					X			X		

Minimum size limits	X							X		
Mandatory release of one or more species	X (C)	X (C)	X				X (C)	X		
Restrictions to the type and number of fishing gear	X	X	X			X		X	X	
Restrictions to the type and number of hooks per fishing line	X					X		X		
Ban on the organization of fishing tournaments						X		X		
Fishing categories	<ul style="list-style-type: none"> • ‘No target species’ • ‘No target species, with further restrictions’ • ‘Target species’ • ‘Targetting silversides’ • ‘Targeting large coastal sharks’ • ‘Unconventional marine coastal fisheries’ 	ND	ND	<ul style="list-style-type: none"> • ‘Shore-based’ • ‘Boat-based’ • ‘Spearfishing’ 	<ul style="list-style-type: none"> • ‘Shore-based’ • ‘Boat-based’ (particular and chartered boats) • ‘Spearfishing’ 	ND	ND	ND	ND	ND

Table 3: Species included in each marine recreational fishing category for Buenos Aires province. The bag limit for each category is given in number of fish per fisher per day in all cases except for *Odontesthes incisa* (given in weight). The numbers in parentheses show the minimum size limits (total length) for six species and two genera. Rocky reef fishes (*sensu* [47]), for which particular life history traits (i.e. long-life, slow-growth, site-attachment) make them more vulnerable to overfishing, are outlined. * The daily bag limit for *Squalus acanthias* was added in 2014 (see the text for details).

Recreational fishing category and bag limit	Family	Species
No target species: 40 fish (10 fish for <i>M. schmitti</i> and <i>S. acanthias</i> *).	Carangidae	<i>Parona signata</i>
	Cheilodactilydae	<i>Nemadactylus bergi</i>
	Congridae	<i>Conger orbignianus</i>
	Percophidae	<i>Percophis brasiliensis</i> (46 cm)
	Pomatomidae	<i>Pomatomus saltatrix</i>
	Sciaenidae	<i>Cynoscion guatucupa</i> (30 cm)
		<i>Macrodon ancylodon</i>
		<i>Menticirrhus americanus</i>
		<i>Micropogonias furnieri</i> (35 cm)
		<i>Umbrina canosai</i>
		<i>Urophycis brasiliensis</i>
		<i>Acanthistius patachonicus</i>
	Serranidae	<i>Pagrus pagrus</i> (26 cm)
Sparidae	<i>Squalus acanthias</i>	
Squalidae	<i>Mustelus schmitti</i> (60 cm)	
Triakidae	Other species	
No target species, with further restrictions: 2 fish.	Callorhynchidae	<i>Callorhynchus callorhynchus</i>
	Myliobatidae	<i>Myliobatis</i> spp.
	Sciaenidae	<i>Pogonias cromis</i>
	Squatinae	<i>Squatina</i> spp. (75 cm)
	–	Rays
Target species: 10 fish.	Ariidae	<i>Netuma barbatus</i>
	Carangidae	<i>Seriola lalandi</i>
	Mugilidae	<i>Mugil</i> spp. (45 cm)
	Paralichthyidae	<i>Paralichthys</i> spp.
		<i>Xystreureys</i> spp.
	Pinguipedidae	<i>Pseudopercis semifasciata</i> (37 cm)
	Polyprionidae	<i>Polyprion americanus</i>
	Scombridae	<i>Sarda sarda</i>
<i>Scomber colias</i>		

Targeting silversides: 40 fish.	Atherinopsidae	<i>Odontesthes</i> spp. (except <i>O. incisa</i>)
Targeting large coastal sharks: mandatory release of all fish.	Carcharhinidae Hexanchidae Odontaspidae Sphyrnidae Triakidae	<i>Carcharinus brachyurus</i> <i>Notorhynchus cepedianus</i> <i>Carcharias taurus</i> <i>Sphyrna</i> spp. <i>Galeorhinus galeus</i>
Unconventional marine coastal fisheries: 20 kg of <i>O. incisa</i> or 50 fish of other species.	Atherinopsidae –	<i>Odontesthes incisa</i> Other species

Table 4: List of Chondrichthyes for which release is mandatory inside the Punta Bermeja Natural Protected Area (slightly modified from Annex I, Legal Provision N. 999/2015 of the Secretariat of Environment and Sustainable Development of Río Negro). Some sharks listed in the Provision (outlined) are rarely caught in the Argentine Sea [44, 49].

	Family	Species	
Chimaeras	Callorhynchidae	<i>Callorhynchus callorhynchus</i>	
Rays	Arhynchobatidae	<i>Atlantoraja castelnaui</i>	
		<i>Bathyraja multispinis</i>	
		<i>Bathyraja brachyurops</i>	
		<i>Bathyraja macloviana</i>	
		<i>Psammobatis rudis</i>	
		<i>Psammobatis lentiginosa</i>	
		<i>Rioraja agassizii</i>	
		<i>Sympterygia bonapartii</i>	
		<i>Atlantoraja cyclophora</i>	
		<i>Sympterygia acuta</i>	
		<i>Atlantoraja platana</i>	
		<i>Psammobatis bergi</i>	
		Dasyatidae	<i>Bathytoshia centroura</i>
		Myliobatidae	<i>Myliobatis goodei</i>
Narcinidae	<i>Discopyge tschudii</i>		
Rajidae	<i>Amblyraja doellojuradoi</i>		
	<i>Zearaja chilensis</i>		
	<i>Dipturus trachyderma</i>		
	Torpedinidae	<i>Tetronarce puelcha</i>	
Sharks	Alopiidae	<u><i>Alopias vulpinus</i></u>	
	Carcharhinidae	<i>Carcharhinus brachyurus</i>	
		<u><i>Prionace glauca</i></u>	
	Cetorhinidae	<u><i>Cetorhinus maximus</i></u>	
	Hexanchidae	<i>Notorynchus cepedianus</i>	
	Lamnidae	<u><i>Isurus oxyrinchus</i></u>	
	Odontaspidae	<i>Carcharias taurus</i>	
	Scyliorhinidae	<i>Schroederichthys bivius</i>	
	Sphyrnidae	<i>Sphyrna zygaena</i>	
	Squalidae	<i>Squalus acanthias</i>	
	Squatinae	<i>Squatina guggenheim</i>	
Triakidae	<i>Galeorhinus galeus</i>		
	<i>Mustelus schmitti</i>		

Review of marine recreational fisheries regulations in Argentina

Abstract

The effects of recreational fishing on marine stocks and ecosystems have raised global concern in recent years. In Argentina, Southwest Atlantic, angling, netting and spearfishing of coastal bony fishes, sharks, rays and chimaeras are very popular pastime activities with more than 50 years of history. Despite the perceived traditional and economic relevance of these activities in the country, marine recreational fisheries were largely unregulated, and no official fisheries monitoring programs at the national level have been ever put in place. Except for a few particular systems for which some catch-and-effort data were collected by research institutions and non-governmental organizations, no comprehensive surveys aimed at describing the ecological, social or economic aspects of these fisheries have been made. Here, an updated review of the regulations in place for marine recreational fisheries along the Argentine coastline is presented. Of the five coastal provinces encompassing *ca.* 8400 km and about 20 latitude degrees (~36°S to 55°S) of coastline, only Buenos Aires province has a thorough legislation for its whole territory, which includes 15 protected areas. In the remaining provinces, the regulations for marine recreational fisheries are limited to a few protected areas (seven out of 37 coastal areas under provincial, national or shared jurisdiction). This lack of legislation encourages alleged recreational fishers to develop small-scale commercial fishing operations that are neither controlled nor monitored as such, contributing to the overexploitation of some key coastal stocks.

- Recreational angling, netting and spearfishing are very popular pastime activities in Argentina
- Marine recreational fisheries were largely unregulated and monitoring programs are lacking
- A review of the regulations in place for Argentine marine recreational fisheries is presented
- Only one of five coastal provinces has regulated these activities throughout its whole territory
- A list of the most important recreational targets was compiled