

ORIGINAL RESEARCH

Socioeconomic dynamics of recreational fishing in the Mar Chiquita Reserve: implications for conservation and regional development

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ABSTRACT. Recreational fisheries are increasingly recognized for their ecological and socio-economic importance, particularly in coastal protected areas where they interact with conservation objectives. This study analyzes the socioeconomic dynamics of recreational fishing in the Mar Chiquita Coastal Lagoon Reserve (Argentina), with the aim of identifying and characterizing the spending user profiles. Data were collected through 82 structured questionnaires conducted between December 2024 and February 2025 using a mixed recruitment strategy that combined non-probability convenience and snowball sampling. Results indicate that the fishery consist of experienced male fishers, primarily from nearby urban areas, with high visitation frequency and multi-site use within the coastal lagoon system. The fishery is multispecific, with flounder (*Paralichthys orbignyanus*) and silverside (*Odontesthes argentinensis*) being the main target species. Fishing motivations are mainly associated with environmental attributes, highlighting the multidimensional recreational value of the area. Expenditure patterns reveal that local economic impact is not primarily determined by overnight stays but by fishing modality. Boat-based fishing is associated with higher spending levels due to the use of local services such as boat rentals, guides, and boat transportation. Four distinct spending profiles were identified, revealing marked heterogeneity in the contribution of recreational fishers to the local economy. The comprehensive spending segment showed the greatest potential for local economic spillovers, whereas the remaining groups concentrated their expenditures on specific categories and exhibited low levels of local spending. These findings emphasize that recreational fishing contributes to local economies through selective and activity-specific expenditures rather than traditional tourism patterns. This study provides the first exploratory approach to understanding the spending profiles of recreational fishers in a marine-coastal protected area in Argentina, offering key insights to support integrated management strategies that balance conservation goals with sustainable recreational use.



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Key words: Coastal protected areas, socioeconomic impact, marine-coastal management, Mar Chiquita Coastal Lagoon, local economies.

Dinámicas socioeconómicas de la pesca recreativa en la Reserva Mar Chiquita: implicaciones para la conservación y el desarrollo regional

RESUMEN. La pesca recreativa es cada vez más reconocida por su importancia ecológica y socioeconómica, especialmente en áreas costeras protegidas donde interactúa con los objetivos de conservación. Este estudio analiza la dinámica socioeconómica de la pesca recreativa en la Reserva Laguna Costera Mar Chiquita (Argentina), con el objetivo de identificar y caracterizar los perfiles de gastos de los usuarios. Los datos se recopilaron mediante 82 encuestas estructuradas realizadas

entre diciembre de 2024 y febrero de 2025 mediante una estrategia de selección mixta que combinaba el muestreo por conveniencia no probabilístico y el muestreo en cadena. Los resultados indican que la actividad pesquera está integrada por pescadores varones experimentados, principalmente provenientes de áreas urbanas cercanas, con alta frecuencia de visitas y uso de múltiples sitios dentro del sistema lagunar costero. La pesquería es multiespecífica, con el lenguado (*Paralichthys orbignyanus*) y el pejerrey (*Odontesthes argentinensis*) como las principales especies objetivo. Las motivaciones para pescar se asocian principalmente con atributos ambientales, lo que resalta el valor recreativo multidimensional del área. Los patrones de gasto revelan que el impacto económico local no está determinado principalmente por las pernотaciones, sino por la modalidad de pesca. La pesca desde embarcaciones se asocia con mayores niveles de gasto debido al uso de servicios locales como alquiler de botes, guías y transporte acuático. Se identificaron cuatro perfiles de gasto distintos, evidenciando una marcada heterogeneidad en la contribución de los pescadores recreativos a la economía local. El segmento de gasto integral presentó el mayor potencial de derrame económico, mientras que los restantes concentraron sus gastos en rubros específicos y mostraron un bajo nivel de consumo local. Estos hallazgos destacan que la pesca recreativa contribuye a las economías locales mediante gastos selectivos y específicos de la actividad, en lugar de los patrones turísticos tradicionales. Este estudio proporciona la primera aproximación para entender el perfil de gastos de los pescadores recreativos en un área marina-costera protegida de Argentina, ofreciendo información clave para respaldar estrategias de gestión integradas que equilibren los objetivos de conservación con el uso recreativo sostenible.

Palabras claves: Áreas costeras protegidas, impacto socioeconómico, manejo marino-costero, Laguna Costera Mar Chiquita, economías locales.

INTRODUCTION

Recreational fishing is defined as a leisure activity carried out by individuals whose objectives are neither subsistence nor the commercial sale of catches (FAO 1997). This activity may vary depending on the fishing technique used, fishers' motivations, the time devoted to the activity, and the distance traveled to fishing sites (Arlinghaus and Cooke 2009). Globally, recreational fishing is recognized as an activity of significant ecological and economic relevance (Pawson et al. 2008; Ihde et al. 2011). As it relies on the use of natural resources, it reflects a continuous interaction with ecological systems, generating an increasing demand for biological, social, and economic information to support effective management (Guidi et al. 2021; Zumpano et al. 2023). Proper management requires the integration of multiple dimensions and governance frameworks that clearly identify stakeholders and roles, often involving multiple subnational levels (e.g. provincial and municipal levels) (Zumpano 2025).

In many jurisdictions, fishing licenses constitute the most common operational tool for managing

recreational fisheries (Terashima et al. 2020), representing a key instrument for economic analyses of the activity. However, management efforts are often primarily focused on commercial fisheries, relegating recreational fishing to a secondary role. This limits the ability to conduct comprehensive economic assessments that compare the impacts of the two sectors in areas where they exploit the same resources (Terashima et al. 2020), as well as to evaluate existing regulatory frameworks, where analytical and implementation gaps persist (Fenichel et al. 2013).

As an economic driver, recreational fishing generates multiple value chains and can act as a catalyst for regional development, particularly through tourism (Strehlow et al. 2025; Von Borstel Juárez et al. 2019). Sectors that benefit include charter services, ground transportation, accommodation, food services, and the sale of fishing gear. To fully understand these impacts, it is essential to define fishers' socioeconomic profiles (Guidi 2019; Von Borstel Juárez et al. 2019; Terashima et al. 2020; Guidi et al. 2021), distinguishing between local fishers -whose economic contribution tends to be lower- and visiting fishers, who often make a more substantial contribution to local economies (García et al. 2020; Nava Islas 2023).

Accurately assessing recreational fishing remains methodologically challenging, as it requires consistent and long-term data. These difficulties are further compounded by the seasonal and spatially dispersed nature of the activity (Arlinghaus and Cooke 2009).

In Argentina, recreational fishing is a widespread activity with notable socio-economic relevance (Llompert et al. 2012; Dellacasa and Braccini 2016; Guidi et al. 2021; García et al. 2025b). It is practiced across the country by individuals of diverse ages, genders, and social backgrounds, in a wide range of environments (Dellacasa 2020; Guidi et al. 2021; García et al. 2022). Numerous studies have focused on inland fisheries, such as lagoons in Buenos Aires and La Pampa provinces, as well as Patagonian systems, particularly in relation to salmonid fisheries (Llompert et al. 2012; Arena et al. 2023). However, studies focusing on marine coastal recreational fisheries remain scarce (Dellacasa 2020).

Along the northern coast of Argentina, important recreational fishing sites are located within multiple-use protected areas, where the activity is permitted under specific regulations (García et al. 2026). In this context, recreational fishing in protected areas requires particular attention, as these environments are especially vulnerable to negative impacts associated with the activity, such as overexploitation, the introduction of non-native species, and pollution derived from waste (Martin et al. 2016; Alic et al. 2021; García et al. 2021; Zumpano et al. 2025). These pressures may compromise conservation objectives and have fueled an ongoing debate on the compatibility between recreational fishing and biodiversity protection in protected areas.

Within this framework, advancing the design of specific management strategies for recreational fisheries is essential. However, the effectiveness of such strategies largely depends on a proper understanding of the economic dimension of the activity. The analysis of expenditure patterns and local economic impacts represents a key input for

developing management approaches that balance recreational use with conservation goals. In this context, the present study aims to identify the main expenditure categories of recreational fishers in a marine-coastal protected area, in order to characterize spending profiles and provide insights to support resource use assessment and conservation-oriented management strategies.

MATERIALS AND METHODS

Study area

This study was conducted in the Mar Chiquita Coastal Lagoon Reserve, located along the coast of Buenos Aires Province, Argentina (37° 44' S, 57° 25' W) (Figure 1 A and 1 B). The area comprises a coastal lagoon, streams and channels, as well as a portion of the Argentine Sea, and is protected under multiple conservation designations. Overall, the Mar Chiquita Reserve covers approximately 103,518 ha and is recognized as a conservation unit (Figure 1 C). This reserve includes a combination of public and private lands; the latter mainly used for agricultural and livestock activities (Campanini et al. 2025). Public lands encompass a provincial protected area (Provincial Nature Reserve –8,007 ha; Provincial Wildlife Refuge– 50,005 ha), which includes sandy beaches, dunes, and the coastal lagoon; a federal military-use area (1,555 ha) characterized primarily by native grasslands; and a UNESCO Biosphere Reserve (72,011 ha) (Figure 1 D). This latter designation also includes a portion of the Argentine Sea (43,417 ha). Within the Biosphere Reserve lies the urban settlement of Balneario Parque Mar Chiquita, which covers approximately 130 ha and has around 500 permanent residents, increasing to approximately 3,000 during the summer season (Morea 2020).

The Mar Chiquita Reserve is an area of significant faunal importance. Its environmental heterogeneity is reflected in its high biodiversity (García

et al. 2025a). The transition between Pampean grasslands and the coastline is complemented by the presence of a coastal lagoon (i.e. an estuarine lagoon) exhibiting a wide salinity gradient, from freshwater inputs to marine influence, giving the system unique characteristics at the national scale (Bachmann and Isacch 2017). Fish diversity in the reserve is relatively high, and many species are

targeted by recreational fishing (Lucifora 2003, Pellegrino and Cousseau 2005; García et al. 2026). Fishing activity occurs throughout the week, although effort is higher during weekends, particularly near the lagoon mouth (García et al. 2021; Figure 2). Additionally, both fishing and tourism activities increase significantly during the high season, from mid-December to late February.

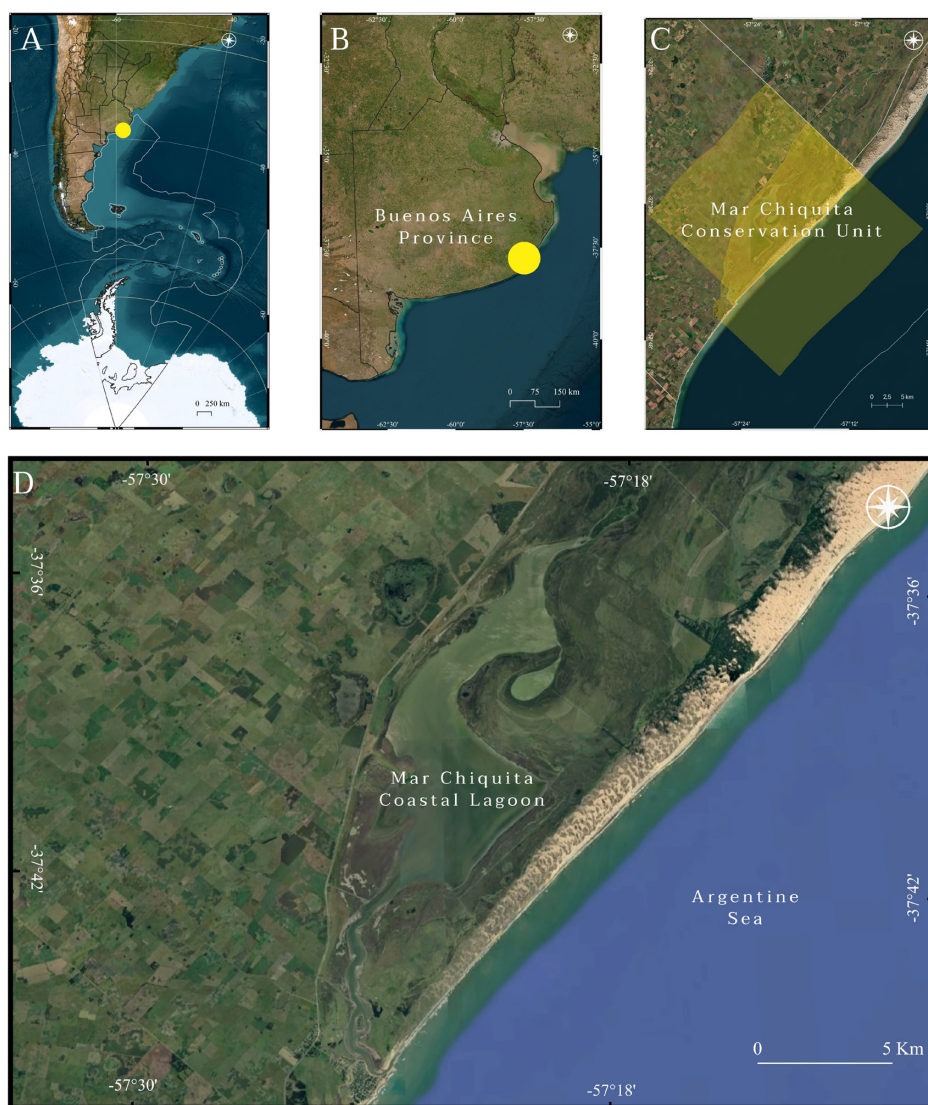


Figure 1. Geographic context of the study area in the Mar Chiquita Conservation Unit (Buenos Aires Province, Argentina). A) Location of Argentina in South America. B) Location of the study area within Buenos Aires Province. C) Delimitation of the Mar Chiquita Conservation Unit. D) Detailed map of the Mar Chiquita coastal lagoon area.

Data collection

To address the study objectives, a quantitative methodological approach was adopted (Cea D'Ancona 2001). For data collection, a structured questionnaire was developed, considered an appropriate and effective instrument for gathering economic information on recreational practices due to its flexibility and the ease of data collection (Blaikie 2010). Social surveys are widely used in participatory processes involving local communities and stakeholders in coastal protected area planning and management (Williams and Micallef 2009; Beeharry et al. 2017).

Survey variables were informed by previous semi-structured interviews conducted in earlier research stages (see Cabral et al. 2019; García et al. 2021). The questionnaire was distributed online using a mixed recruitment strategy that combined non-probability convenience and snowball sampling. Participation was voluntary, and the questionnaire was promoted through social media, WhatsApp groups, and printed posters displayed in local businesses and other locations frequently visited by recreational fishers. Respondents were also encouraged to share the survey with other recreational fishers within their social networks. The target population consisted of recreational fishers



Figure 2. Mar Chiquita coastal lagoon and associated marine ecosystem (A). Recreational fishers and boats operating within the lagoon (B and D) and in the channel connecting to the Atlantic Ocean (C). Photographs: Federico Coulombie (A); Germán O. García (B-D).

over 18 years old who had visited the Mar Chiquita Reserve for fishing purposes at least once in the previous year. A non-probabilistic sample was used, composed of voluntary and anonymous participants. A total of 96 structured questionnaires were completed over a 62-day sampling period, from December 26, 2024, to February 26, 2025. After applying the inclusion criteria, 82 questionnaires were retained for analysis. Surveys were excluded when respondents had not visited Mar Chiquita during the previous year, were local residents, or did not report their place of residence. Because some respondents did not answer every question, sample size varied slightly among variables due to item non-response. Unless otherwise indicated, percentages were calculated using the number of valid responses for each variable.

The questionnaire consisted of three sections. The first section aimed to characterize the socioeconomic and demographic profile of visitors, including variables such as gender, age, employment status, and place of residence, following previous studies (García et al. 2022). The second section focused on fishers' experience and site selection, including age at initiation, years of experience in Mar Chiquita, factors influencing destination choice, fishing modality, fishing locations within the reserve, and target species. The third section addressed trip characteristics and expenditures. Variables included the number of fishing trips made during the previous year, seasonal patterns, trip duration, group size, travel distance, number of overnight stays, type of accommodation, and average lodging costs. All monetary values were collected in Argentine pesos (ARS) and converted to U.S. dollars (USD) using the average exchange rate during the survey period (1 USD = 1,078 ARS). Additional questions addressed food consumption and associated costs, boat-based fishing practices, service costs (e.g. boat rental), boat storage costs for private vessels, and total expenditure per fishing trip. Respondents were also asked whether they consumed their catch and to estimate their total spending associated with a typical fishing trip to the reserve.

Spending profile analysis

To identify fisher profiles based on their spending patterns, a cluster analysis was performed using the K-Modes algorithm, which is appropriate for categorical data. The analysis included 82 observations and six binary variables (0 = no, 1 = yes), derived from questionnaire responses indicating whether respondents incurred expenses for: (i) accommodation, (ii) food purchases within the locality, (iii) boat rental or storage, (iv) boat transport services, (v) fishing guide services, and (vi) the purchase of fishing supplies in the town of Mar Chiquita. Similarity among observations was calculated using the Simple Matching Coefficient (SMC). To determine the optimal number of clusters, the Silhouette coefficient was evaluated for k values ranging from 2 to 6, with a four-cluster solution ($k = 4$) selected as the best-performing model. To reduce the influence of random initialization and improve solution stability, the algorithm was run 999 times, retaining the partition with the best fit. To complement the cluster analysis, a Non-metric Multidimensional Scaling (NMDS) ordination was performed using the distance matrix to visualize similarities among users in a reduced-dimensional space and to assess the separation among the groups identified by the K-Modes algorithm.

RESULTS

Characteristics of surveyed recreational fishers

Most respondents identified as men, greatly outnumbering those identifying as women (Table 1). The average age of fishers was 51.6 ± 12.5 years (range: 21-79 years; $n = 82$). Regarding employment status, most respondents were self-employed (56.8%), followed by salaried workers (32.1%) and retirees (11.1%).

Three main groups of fishers were identified based on place of residence: 63.4% originated

from cities located between 30 and 100 km from Mar Chiquita, 17.1% from distances greater than 300 km, and 15.9% from locations within 30 km. Among those living between 30 and 100 km away, most resided in Mar del Plata (96.2%). Fishers traveling from distances between 100 and 300 km were primarily from the Gran Buenos Aires area (61.5%) and the Ciudad Autónoma de Buenos Aires (15.4%), while those living within 30 km mainly came from nearby localities such as Santa Clara del Mar, Mar de Cobo, La Caleta, and Parque Lago.

Respondents reported extensive experience in recreational fishing, with an average of 41.4 ± 12.4 years (range: 6-73 years; $n = 82$). Experience specifically in Mar Chiquita averaged 26.4 ± 16.9 years (range: 1-70 years; $n = 82$).

Fishing practices

When asked about their primary fishing modality, 63.8% of respondents reported fishing primarily from shore (31.3% using rod and reel and 32.5% using fly or lure), whereas 36.3% identified boat-based fishing as the primary modality (30% rod and reel and 6.3% fly or lure) (Table 2). On average, fishers visited 4.35 ± 3.74 sites (range: 1-14 sites; $n = 81$) within the lagoon and adjacent coastal areas. The most frequently visited sites (reported by more than 50% of respondents) were the lagoon mouth and Recreo San Gabriel. Other commonly visited locations (30-50%) included Punta Pejerrey, Puente de CELPA, Punta Ondina, and Canal 5.

When asked about target species, fishers reported capturing an average of 2.95 ± 1.83 species (range: 1-9 species; $n = 82$). The most frequently mentioned species were the flounder (*Paralichthys orbignyanus*) and silverside (*Odontesthes argentinensis*), cited by more than 75% of respondents (Figure 3). Black drum (*Pogonias cromis*) and striped mullet (*Mugil liza*) were mentioned by approximately 34% of fishers. Other species included elephant fish (*Callorhynchus callorhynchus*), small

Tabla 1. Demographic characteristics of recreational fishers surveyed in the Mar Chiquita Reserve. Values are expressed as percentages (%).

Variable	%
Gender ($n = 82$ surveys)	
Female	4.9
Male	93.9
No-binary	1.2
Age ($n = 82$ surveys)	
18-30	3.7
31-45	28.0
46-60	42.7
> 60	25.6
Employment situation ($n = 81$ surveys)	
Retired	11.1
Salaried employee	32.1
Self-employed	56.8
Place of residence ($n = 82$ surveys)	
Less than 30 km	15.9
Between 30 and 100 km	63.4
Between 100 and 300 km	3.7
More than 300 km	17.1

sharks such as *Mustelus schmitti* and *Galeorhinus galeus*, and occasionally larger sharks. The common carp (*Cyprinus carpio*), a non-native species present in tributaries, was reported by nearly 5% of respondents (Figure 3).

Many of these species were collectively referred to as 'coastal mix' (35.4% of responses), a local term encompassing a diverse group of coastal fish species. This group includes species such as white-mouth croaker (*Micropogonias furnieri*), striped weakfish (*Cynoscion guatucupa*), kingfish (*Menticirrhus americanus*), southern pompano (*Parona signata*), Brazilian codling (*Urophycis brasiliensis*), menhaden (*Brevoortia aurea*), and bluefish (*Pomatomus saltatrix*), among others.

Table 2. Motivations, fishing modalities, sites visited, and target species of recreational fishers surveyed in the Mar Chiquita Reserve. Values are expressed as percentages (%).

Variable	%
What factor do you consider most relevant when choosing Mar Chiquita as a fishing destination? (n = 82 surveys, 112 categorized responses)	
Natural characteristics of the site	40.3
Fish diversity	40.3
Tranquility	20.8
Diversity of fishing modalities	14.3
Good catch rates	10.4
Proximity	9.1
Target species	6.5
Safety	3.9
Which fishing modality do you most frequently practice in Mar Chiquita? (n = 80 surveys)	
Shore-based fishing with fly or lure	32.5
Shore-based fishing with rod and reel	31.3
Boat-based fishing with rod and reel	30.0
Boat-based fishing with fly or lure	6.3
Which sites in Mar Chiquita do you usually visit for fishing? (n = 81 surveys, 352 categorized responses)	
Recreo San Gabriel	54.3
Lagoon mouth	51.9
Punta Pejerrey	44.4
CELPA Bridge	42.0
Punta Ondina	40.7
Canal 5	30.9
Recreo Juan y Juan	25.9
Paso de Gómez	24.7
Pozo del Vidalero	22.2
Las Gallinas Stream	18.5
Grande Stream	16.0
Sotelo Stream	14.9
Médano Blanco	3.6
Canal 7	13.6
Reserve Beach	11.1
Recreo San Antonio	6.2
Vivoratá Stream	3.7

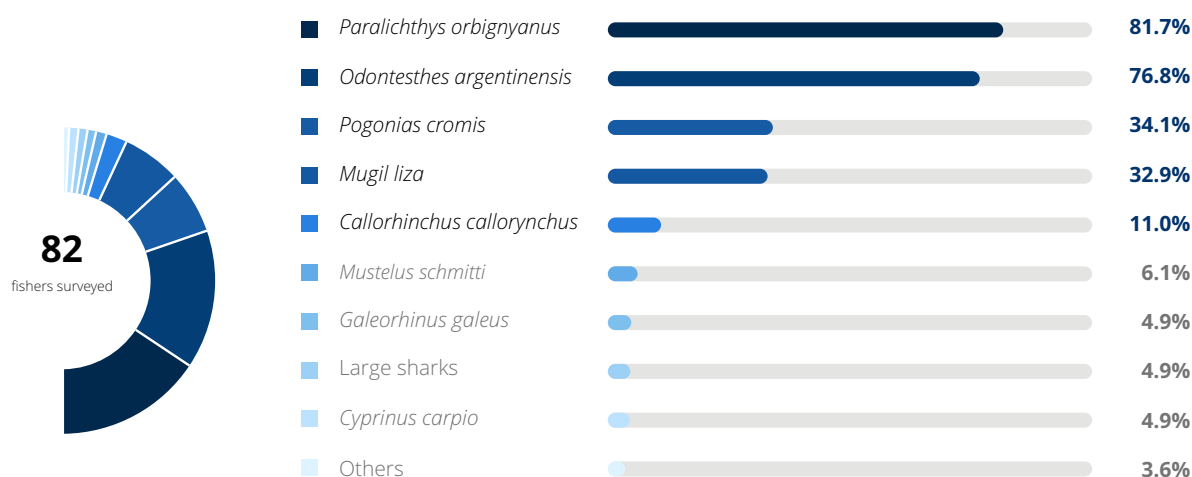


Figure 3. Distribution of target fish species reported by recreational fishers, expressed as the percentage of respondents (n = 82 surveys; 241 total mentions).

Stay patterns and expenditure

Fishers reported an average of 22.2 ± 34.5 visits over the previous 12 months (range: 1-250 visits; n = 78), indicating high variability in fishing frequency. Fishing activity occurred year-round, with no single dominant season. Spring and summer were mentioned by 82.9% of respondents, autumn by 73.2%, and winter by 61%, suggesting continuous use of the area throughout the year.

The average number of overnight stays per visit was 2.41 ± 2.30 nights (range: 1-10 nights; n = 82). However, 51% of respondents reported not staying overnight, indicating predominantly day-use visits consistent with geographic proximity. Among those who did stay overnight, 38% spent only one night, suggesting weekend trips. Regarding accommodation, four types were identified among those who stayed overnight. Approximately 30% used their own or borrowed houses, and 12.5% camped in free camping areas, both involving no direct costs. Those staying in organized campsites (40%) reported an average cost of USD 16.45 per night, while those renting accommodations (17.5%) reported an average of USD 39.4 per night.

In terms of food expenditure, 73% of respondents reported consuming food during fishing trips.

However, 71% of these brought food from home, resulting in no local expenditure. Among those who spent money locally (29%), most purchased supplies in local shops (70%; average USD 19.5), followed by takeaway food (23%; USD 8.6), and a small proportion dining in restaurants.

Private vehicles were the primary mode of transport (95%), with minimal local transportation costs. Although only 36% identified boat-based fishing as their primary fishing modality, 72% of respondents reported engaging in boat-based fishing at least occasionally. Among these fishers, 40% rented boats (average USD 19.59 per day), 49% used their own boats, and 10% hired fishing guides. Among those with private boats, 62% did not incur storage costs. Regarding boat transportation services, 33% of respondents used crossing services (average USD 5.9), while 67% did not. None of the respondents reported selling their catch; fishing was practiced either as catch-and-release (14.6%) or for personal consumption (85.4%). Additionally, 31% purchased fishing gear locally.

Spending profile

Based on expenditure patterns, four distinct spending profiles of recreational fishers were identified.

tified (Table 3; Figure 4). These profiles revealed marked heterogeneity in the ways recreational fishers contribute to the local economy, ranging from minimal local expenditure to diversified consumption across multiple categories.

The largest group (36.6%) was characterized by expenditure primarily related to boat rental or

storage, with a smaller proportion also using boat transportation services. Expenditure on food, fishing supplies, and guiding services was minimal, indicating that spending was concentrated on boating infrastructure rather than on the broader local tourism economy. A second group (24.4%) exhibited an integrated spending pattern, combining high

Table 3. Recreational fishers’ profiles identified through K-modes clustering based on expenditure patterns, accommodation preferences, and fishing-related characteristics. Values represent the distribution of individuals among the four identified profiles. Acc: accommodation; F: food; BRS: boat rental/storage; WT: water transport; FG: fishing guide; FS: fishing supplies

Spending profile	N	Acc (%)	F (%)	BRS (%)	WT (%)	FG (%)	FS (%)
A: boat-oriented spending	30 (36.6)	23	3	100	40	3	10
B: integrated spending across all categories	20 (24.4)	25	95	25	45	10	90
C: low overall spending	19 (23.2)	0	0	0	16	16	21
D: accommodation-oriented spending	13 (15.9)	100	23	0	23	15	15

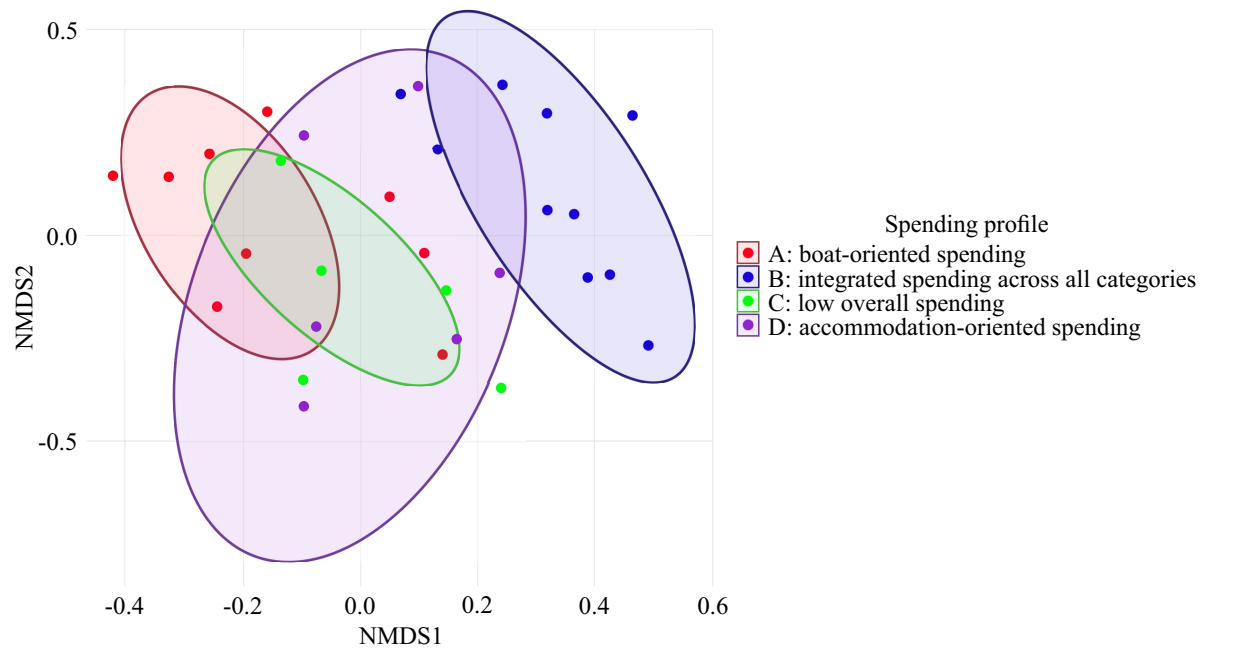


Figure 4. NMDS ordination of the 82 recreational fishers, coloured according to the four expenditure profiles identified by K-modes clustering (stress: 0.13) (boat-oriented, integrated, low overall, and accommodation-oriented spending). Shaded areas indicate the convex hull of each expenditure profile.

expenditure on local food and fishing supplies with moderate use of accommodation, boat-related services, and boat transportation. This segment displayed the greatest potential for local economic spillover, as its expenditures were distributed across multiple sectors of the local economy. In contrast, 23.2% of respondents belonged to a low-expenditure profile, with virtually no spending on accommodation, food, or boating services and only occasional purchases of fishing supplies, guiding services, or boat transportation. This pattern is consistent with self-sufficient visitors whose interaction with the local economy is limited. Finally, a fourth profile (15.9%) was defined by expenditure on accommodation, accompanied by moderate spending on food, boat transportation, guiding services, and fishing supplies, but no expenditure on boat rental or storage. This group represents an intermediate spending pattern, centered on overnight stays while maintaining a moderate level of consumption in other categories.

DISCUSSION

This study represents, to the best of our knowledge, the first approach to understanding the spending profile of recreational fishers in a marine-coastal protected areas in Argentina, providing quantitative evidence on user profiles and expenditure structures associated with the activity. The results show that recreational fishing in Mar Chiquita is dominated by experienced fishers, primarily from nearby areas, with high visitation frequency and multi-site use of the lagoon-coastal system within the protected area. Surveyed fishers frequently cited environmental attributes as motivations. From an economic perspective, the identification of four distinct expenditure profiles demonstrates that recreational fishers do not constitute a homogeneous spending sector (with varying impacts on the local economy). Instead, fishers differ in the combination of spending categories in which they reported

expenditures. These findings provide preliminary hypotheses for future monitoring.

The sociodemographic profile of recreational fishers observed in this study is consistent with patterns described for other coastal recreational fisheries in Argentina (Llompert et al. 2012; Heit 2014; Guidi et al. 2021; García et al. 2025b) and elsewhere (Barrella et al. 2016; Lewin et al. 2020; Hunt et al. 2021; Pita et al. 2021). This suggests a certain degree of homogeneity in the expected profile of marine recreational fishers at a regional scale (Dellacasa 2020). Similarly, the observed age structure and the long trajectory in years of practice are comparable to findings from other coastal locations in Argentina and abroad (Burger et al. 1999; Arlinghaus et al. 2008; Barrella et al. 2016; García et al. 2025b). Also, the gender bias observed in this study is consistent with previous findings (García et al. 2022; Zumpano et al. 2024), and contrasts with higher participation rates observed in large urban centers (García et al. 2025b).

The patterns of spatial use and target species observed in recreational fishing at Mar Chiquita reflect the complexity of this activity in coastal lagoon-marine systems. The coexistence of shore-based and boat-based fishing indicates differentiated modes of use that, as documented in other marine fisheries, may be associated with distinct catch compositions and habitat preferences, influencing effort distribution and pressures on specific resources (Soldo 2022). Regarding target species composition, the predominance of flounder (*P. orbignyanus*) and silverside (*O. argentinensis*), along with mentions of black drum, striped mullet, and occasional cartilaginous species, reflects the biological heterogeneity of the ‘coastal mix’ characteristic of the Buenos Aires Atlantic coast, highlighting both the ecological and recreational importance of these resources (Pellegrino and Cousseau 2005; García et al. 2026). The strong presence of species within the so-called ‘coastal mix’ as well as the capture of cartilaginous fish, reinforces the need for precautionary approaches, given the varying biological vulnerabilities of these groups (Lucifora

2003; Zumpano 2025). Furthermore, the intensive use of specific sites (such as the lagoon mouth and access points) highlights priority areas for management actions, including regulation, control, basic infrastructure, and the promotion of responsible fishing practices (see Zumpano 2025).

The predominance of the boat-oriented spending profile, together with the relatively small proportion of fishers exhibiting integrated expenditure across multiple categories, indicates that, within the surveyed population, recreational fishing expenditure in the Mar Chiquita Coastal Lagoon is largely concentrated in services directly supporting fishing activities rather than being broadly distributed across the local tourism economy. From a territorial perspective, these expenditure patterns reinforce the idea that not all coastal destinations operate under a traditional tourism model based on prolonged stays and diversified visitor spending. Instead, for the respondents included in this study, Mar Chiquita functions primarily as a nearby recreational destination where expenditures are closely associated with fishing-related services. More importantly, the results indicate that differences among fishers are explained not only by the amount spent but also by how expenditures are allocated across categories. This finding is consistent with Curtis et al. (2017), who reported that recreational fishing expenditures are often concentrated in activity-specific services such as boat rental, guiding, equipment, and other support services rather than being evenly distributed across tourism sectors. In Mar Chiquita, the predominance of the boat-oriented spending profile clearly illustrates this concentration of economic benefits.

The results also confirm that, for the surveyed recreational fishers, this activity constitutes a relevant economic component at the local scale, consistent with findings from other recreational fisheries nationally and internationally (Terashima et al. 2020; Guidi et al. 2021). The identified expenditure patterns suggest that recreational fishers generate economic impacts extending beyond the act of fishing itself by supporting a network of

associated goods and services, including transportation, accommodation, food, fishing supplies, and guiding services. However, only about one quarter of respondents exhibited an integrated spending profile, distributing expenditures across multiple sectors simultaneously. Consequently, within the surveyed group, the benefits generated by recreational fishing are unevenly distributed within the local economy.

This heterogeneity highlights that evaluating the economic contribution of recreational fisheries requires considering not only aggregate expenditure but also expenditure composition. Estimates based exclusively on total spending may overlook important differences in how distinct groups of fishers support specific sectors of the local economy. Recognizing these expenditure profiles can therefore improve the design of local development and tourism strategies by identifying which segments generate the strongest economic linkages and which sectors are most closely associated with different recreational fishing modalities.

Nevertheless, as in other studies of recreational fisheries, this work presents methodological limitations associated with the seasonal and spatially dispersed nature of the activity (Arlinghaus and Cooke 2009). In addition, although the mixed recruitment strategy facilitated access to recreational fishers in the absence of a formal sampling frame, the use of convenience and snowball sampling may have favored the participation of fishers who are more socially connected or more actively engaged in recreational fishing. This potential bias was partially mitigated by disseminating the survey through multiple channels, including fishing and general community social media groups, local businesses, and the Mar Chiquita Visitor Center. Consequently, occasional or less-connected fishers may be underrepresented, and caution is warranted when extrapolating the relative frequency of the identified expenditure profiles to the entire recreational fishing population. The lack of continuous and standardized economic data remains a challenge, highlighting the importance of implementing

long-term monitoring programs, potentially linked to fishing license systems. Such instruments could serve a dual purpose: improving the quality of information available for management and generating financial resources to support conservation and control actions within the protected area. In addition, the expenditure estimates presented in this study are based exclusively on the surveyed fishers and were not weighted to represent the overall recreational fishing population. Consequently, the identified expenditure patterns and spending profiles should be interpreted as descriptive of the sampled population rather than as estimates of the total economic contribution of recreational fishing in the reserve. Likewise, these results should not be extrapolated to annual fishing activity without representative sampling and long-term monitoring capable of accounting for seasonal variation and changes in fishing effort.

From a management perspective, the expenditure profiles identified in this study suggest that recreational fishing should be explicitly incorporated into governance frameworks for protected areas. Rather than treating recreational fishers as a homogeneous user group, management strategies should recognize the diversity of expenditure patterns and their different links to the local economy. For example, because the largest expenditure profile was associated primarily with boat-related services, management measures affecting boating activities are likely to have different socioeconomic consequences than those targeting shore-based fishing. Likewise, the identification of a smaller group of fishers with integrated expenditure across accommodation, food, and fishing supplies suggests opportunities to promote stronger local economic linkages through tourism and service planning. These hypotheses can be evaluated through long-term monitoring programs that assess changes in expenditure patterns under different management scenarios. As noted by Fenichel et al. (2013) and Terashima et al. (2020), the lack of systematic economic information on recreational fisheries tends to obscure their importance relative to commercial

fisheries. Additionally, recreational fishing in Mar Chiquita can be interpreted through an ecosystem services framework as an activity that simultaneously provides provisioning and cultural services. Beyond the nutritional value of harvested fish, the activity is strongly linked to recreational, identity-based, and nature-related experiences, which are particularly relevant in the context of protected areas (Cabral et al. 2024).

CONCLUSIONS

This study provides an initial characterization of recreational fishers' expenditure patterns within the Mar Chiquita protected area and shows that recreational fishers do not constitute a homogeneous economic group. Instead, the surveyed fishers exhibited distinct expenditure profiles, ranging from highly activity-specific spending associated with boating services to more diversified expenditure across accommodation, food, and fishing supplies. These findings suggest that the economic contribution of recreational fishing depends not only on the magnitude of expenditure but also on how spending is distributed among sectors of the local economy.

The survey also indicates that fishers value Mar Chiquita as more than a fishing destination, highlighting environmental attributes such as tranquility, natural features, and fish diversity as important factors influencing site selection. These perceptions reinforce the multiple recreational values associated with the protected area, although they should be interpreted within the scope of the surveyed population.

From a management perspective, the identified expenditure profiles provide useful baseline information for incorporating the socioeconomic dimension of recreational fisheries into protected-area planning and long-term monitoring. However, because this study was based on an exploratory sample, the representativeness of the identified profiles,

their contribution to the overall recreational fishing population, and their economic and ecological implications require further investigation through representative sampling and long-term monitoring programs.

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Conflict of interest statement

None.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author contributions

Silvina A. Romano: methodology, investigation, data curation, formal analysis, writing-original draft, writing-review and editing. Germán O. García: conceptualization, methodology, investigation, data curation, formal analysis, visualization, writing-original draft, writing-review and editing, project administration.

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