

## Inland Fisheries Management in Argentina: Comparative Analysis of Regional Artisanal Fishing

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### **【abstract】**

Recent statistics indicate that globally, marine capture fisheries and inland water captures have declined or remained stagnant owing to overfishing and depletion of aquatic resources. The resultant impact on fish fauna and the aquatic environment has prompted policy makers to formulate adequate fisheries management mechanisms to conserve resources in a sustainable way. The purpose of this study is to examine the management of small-scale inland fisheries in Argentina, and evaluate the patterns of fisheries management from an institutional perspective, in order to address issues concerning the governance of aquatic commons. This study utilizes one of the models proposed by economist Elinor Ostrom to analyze commercial inland artisanal fishing in the Pampean and Patagonian regions in the context of fisheries governance at the local level. Ostrom argues that groups of individuals who share common values and objectives tend to cooperate in the creation of a set of informal rules to organize and use the resource system in the long term. However, the effects tend to be adverse when rules are imposed by the central government without considering local circumstances. The present study concludes that granting some autonomy to fishing communities to organize and use the commons could probably lead to the sustainable use of aquatic fauna. Meanwhile, communication, cooperation, and interaction between local stakeholders are crucial elements to sustain the resource system.

### **【keywords】**

artisanal fishing, inland fisheries, Pampas region, Patagonia region

## 1. Introduction

Globally, there has been a decline or stagnation in marine capture fisheries and inland water captures in light of overfishing and dwindling aquatic resources. This situation that severely affects the fish fauna and the water environment itself, leads decision makers to formulate adequate fisheries management mechanisms to conserve

resources in a sustainable way. The purpose of this paper is to examine the management of inland fisheries in Argentina. It intends to evaluate the patterns of fisheries management from an institutional perspective, in order to address issues concerning the governance of aquatic commons. The study focuses on two cases of regional artisanal commercial fishing patterns. The first corresponds to the modality used to capture native pejerrey *Odontesthes bonariensis* species in the Pampas region, which includes the Buenos Aires Province (Las Tunas Shallow Lake); and the other, on the captures of native pejerrey patagónico *Odontesthes hatcheri* and perca *Percichthys colhuapiensis* species in the southern part or the Patagonian region, which includes the Río Negro Province (Pellegrini Lake). The first part of this study provides an overview of fisheries management in Argentina, and outlines the centralized regime in fisheries in both provinces. The second and the third section examine how users of the commons utilize aquatic resources for their livelihood, based on the fisheries management regime adopted in both the Pampas and Patagonia regions. The subsequent section analyses the degree of adaptation to the Ostrom model in terms of the recognition of local users' rights to organize to use the commons, comparing the two cases. It concludes that granting certain autonomy to fishing communities to organize and use the commons could probably lead to the sustainable use of aquatic fauna. However, communication, cooperation, and interaction between local stakeholders are crucial elements to sustain the resource system.

## 2. Theoretical Framework

Elinor Ostrom suggests that a “bottom-up” approach to prevent the overuse of resources could serve as an alternative to solve the commons problems. She contends that groups of individuals can self-organize and create rules to improve outcomes. Ostrom adds that this is possible because individuals sharing similar values can communicate and interact with one another, coordinate their activities, and cooperate to create agreed upon rules covering the use of resources to prevent overexploitation and degradation (Ostrom (1990)). The government can act as a facilitator in providing information about the use of commons resources and serve as an arbitrator in conflicting situations (Ostrom *et al.* (1999)). In this study, commons resources refer to resource systems that are used by local fishermen in inland waters.

Ostrom developed eight design principles (1-Clearly defined boundaries; 2- Congruence between appropriation and provision rules and local conditions; 3-

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Collective choice arrangements; 4-Monitoring; 5-Graduated sanctions; 6-Conflict-resolution mechanisms; 7-Minimal recognition of rights to organize; 8-Nested enterprises) derived from similarities found in long-enduring common-pool resource (CPR) management (Ostrom (1990), p.90). Ostrom recognizes the lack of specificity in these principles, but justifies her intent in that she was examining the robustness of systems that had persisted over time, identifying the conditions under which CPRs had survived for so long (Ostrom (1994), p.36, Ostrom (2012), pp.77-79).

As this paper studies the fisheries institutional regimes arranged by central government authorities in relation to Ostrom's approach, it adopts the seventh principle to determine whether the recognition of certain rights, such as informal rules devised by local users can also sustain the resources over time. It also examines how inland fishing communities self-organize to use aquatic resources, and the role of the government in regulating their activities to conserve natural resources. Ostrom states that granting certain rights to direct users to organize and use the resources can lead to sustain the resources over time (Ostrom (1990)).

Agrawal contends that the seventh principle, which indicates that local users can manage the resources sustainably when their rights are recognized by external authorities, should be taken as a general, rather weak conditions for long-enduring CPR management. He agrees that local users have the right to devise their own rules, but he points out, drawing from the argument of HariPriya Rangan, that "unspecified rights and the settlement of major disputes often cannot be addressed without state intervention." (Agrawal (2002), pp.49-58). Rangan, who studied the case of state forestry in Indian Himalaya, also argues that some forms of state control of access to resources and state management can sustain the use of resources (Rangan (1997)). As previously mentioned in Ostrom et al. argument, while some state intervention can help sustain the use of resources, giving some autonomy to their operations can also lead to the management of the commons in the long term. With regard to the rest of Ostrom's principles, it requires further research to evaluate the conditions under which a resource system as a whole can endure overtime, through local communities' self-organization mechanisms.

In terms of the research methodology on site, the study involved face-to-face interviews with local fishermen and local governmental officials, as part of the field work conducted by the author, in July 2015, in the district of Trenque Lauquen, Buenos Aires Province, and in the district of General Roca in Río Negro Province, Argentina, in June 2016. In addition, data were collected from governmental fisheries departments

and research archives.

### 3. Overview of Fisheries in Argentina

Fisheries management in Argentina is centralized and owing to the federal system of governance, each province is responsible for stipulating its own fishing regulation. Even though the country is endowed with large and diversified water bodies, with a coastline extending up to 4,725 km, fisheries and aquaculture are considered non-traditional economic activities in Argentina. Inland artisanal commercial fishing is operated extensively mainly for local consumption. The Ministry of Agroindustry reports that in Argentina, the La Plata basin, with more than 4,000 km-long channels, constitutes an important water system for artisanal fishermen. Local artisanal fishermen are subject to provincial legislation and operate close to their residence individually or in small groups or cooperatives for subsistence, directly selling to the public, as well as supermarkets or restaurants. The total capture volumes are difficult to estimate due to the lack of formal statistics on fish sales in local markets (Ministerio de Agroindustria (2017a), p.2-6). Conversely, inland recreational fishing is a common practice in both the Pampas and Patagonia regions and generates important local income.

Given that the main economic activity in Argentina is agriculture and livestock production, the contribution of fisheries to national production has been limited (0.2%)(1)(2). In fisheries, the main contributions to the national account are export revenue and employment generated in the coastal areas, with Mar del Plata being one of the main fish landing platforms. Available data indicates that the total value of exports of fishery products increased marginally between 2009 (US\$1,147.9 million) and 2013 (US\$1,501.9 million)(3)(4), although exports of inland fishery products, based on harvest activities in the La Plata basin, declined compared to 2011 (Table 1). The main exports from inland waters are the sabalo and to a lesser extent pejerrey species(5).

Therefore, inland fishing primarily caters to local consumption needs which has been

Table 1 Trade of Fisheries Products

*US\$ FOB Million*

	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
<b>Total Export</b>	1,147.9	1,321.6	1,490.0	1,333.2	1,501.9
<b>Inland Export</b>	13.8	15.4	21.5	17.7	18.3

Source: FAO, 2014-2016; MAGyP, 2020.

Note: Numbers are rounded.

practiced by small rural fishing communities for their livelihood.

#### 4. Institutional Framework of Fisheries in Buenos Aires Province

##### 4-1. An Outline of Fisheries Regulations

Inland commercial fisheries within the province of Buenos Aires have been regulated under the Provincial Fishing Law 11.477, which establishes a legal framework for the extraction, culture or farming of maritime, fluvial, and lacustrine fish resources, as well as the investigation, commercialization, industrialization, and transportation of aquatic animals predominant in the province. The Undersecretary of Fisheries of Buenos Aires oversees the enforcement of the measure, as part of efforts to protect water resources<sup>(6)</sup>. Grosman argues that despite the Provincial Fishing Law, the absence of an explicit regulation is evident in terms of recreational fishing activities. Moreover, confusing and ambiguous conceptions exist regarding the use of water resources, property rights, forms of appropriation, ownership, and access regimes (Grosman (2001), p.186). For example, while the angler has the right to access public fishing grounds, if the natural water body is located on private property, the owner can decide who has the right to fish.

Baigún and Delfino also perceive that the management of fisheries in the Pampas region has been entirely traditional, based on conventional fishing regulations and restocking programs (Baigún and Delfino (2001), pp.132-134). Noting that fishing regulations are not reinforced by technical and scientific studies, they argue that the current capture limits for pejerrey (15 pieces per angler per day) in water bodies smaller than 1,000 hectares in the lower Salado River area could lead to overfishing. Since the lower basin is located close to urban areas, there is an influx of anglers during high seasons, while the impact on the fish population might be lower in the remote western area of the river (Baigún and Delfino (2001), pp.135-136).

In the 1990s, licenses were provided to individuals or cooperatives (Alvarez and Zingoni (2001), pp.146-148) to exploit some “lagunas” or shallow lakes for pejerrey fishing, including Las Tunas (Trenque Lauquen district), del Monte (Guamini), and Cuero (Pehuajó) shallow lakes (López *et al.* (2001), pp.24-25). However, apparently in the 2000s, fishing was banned in the province, except for recreational fishing purposes (Government official Buenos Aires A, interview (September 4, 2012); Government official Buenos Aires B, interview (July 23, 2015)). In 2016, under a new governmental directive, artisanal commercial fishing resumed, and permits were granted to use the

Las Tunas shallow lake complex<sup>(7)</sup> after a long period of closure.

#### 4-2. Trenque Lauquen: Artisanal Commercial Fisheries in Las Tunas Shallow Lake

Trenque Lauquen is located in the western part of Buenos Aires Province. It is situated on the Pampas plains and covers an area of 5,500 km<sup>2</sup>, with approximately 43,000 inhabitants<sup>(8)</sup>. The main towns are 30 de Agosto, Beruti, Garré, and Girodías, while there also exist smaller rural villages. Trenque Lauquen is endowed with a large shallow lake complex, the Hinojo-Las Tunas. Particularly, the Las Tunas shallow lake complex covers an area of 25,000 hectares and has a maximum depth of 4.5 meters (Dirección de Desarrollo Pesquero (1998), p.8). A report of the Fisheries Department of Buenos Aires Province indicates that this complex has many rounded lakes that do not have floating or submerged aquatic plants. The shores are sandy with a slight slope (Dirección de Desarrollo Pesquero (1998), p.8).

In Trenque Lauquen, according to Clarín, the Las Tunas shallow lake complex emerged as a result of heavy rainfall that overflowed a canal connecting River Quinto in 1987. The subsequent precipitation impacted vast agricultural areas, converting it into the Hinojo-Las Tunas shallow Lake complex. Effectively, the land of some farmers sank after being inundated by a vast body of water, forcing them to become fishermen. They had to learn fishing techniques and processing methods as well as the use of fishing gear and boats to sustain their livelihood<sup>(9)</sup>. Beruti is located a few kilometers away from the Hinojo-Las Tunas shallow lake complex. The neighborhood community has been relying on fishing since the water engulfed their agricultural land (Government official Buenos Aires C, interview (July 22, 2015)). The peculiarity of the land in this area is its permeability and salinity (Ameghino (1886); Dangavs (2005), p.222; Ringuélet *et al.* (1967), p.201) that explain why agricultural land has been converted into a shallow lake.

The government of Buenos Aires had prohibited commercial fishing in all water bodies within the province, although apparently prior to 2000s, permission was granted to certain fishing cooperatives (Alvarez and Zingoni (2001), p.148; Government official Buenos Aires A, interview (September 4, 2012); Government Official Buenos Aires B, interview, July 23, 2015)). The closure may be attributed to the technical limnological and ichthyological studies conducted in Las Tunas, which showed that the quality and size of pejerrey species were not conducive to be intensively exploited (Dirección Provincial de Pesca (1999), pp.19-20). Moreover, according to technical studies conducted in 2013, the population of pejerrey remained low and small (less than the

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permitted capture size of 25 cm) (Dirección Provincial de Pesca (2013), p.12). Therefore, probably commercial fishing was not promoted from the technical perspective, either.

During the fieldwork conducted by the author in 2015, approximately 40 families living in the Beruti community relied on fishing and became self-organized to capture pejerrey, creating their own operational rules and transporting and selling their catch to consumers or trading agencies in Buenos Aires, according to an interviewed official (Government official Buenos Aires C, interview (July 22, 2015)). For instance, it seems that a group of fishermen set up fishing areas and boats for harvesting in the fishing ground (Fisher A, interview (July 22, 2015)). These motorized boats came in various sizes, in which one or two fishermen could embark, and they usually commenced their harvest early in the morning and returned to the embarkation station at midday. Apparently, the captured pejerrey was transported to each fisherman's house, where it was processed. A portion of the processed pejerrey was stored in 1 kg bags and frozen for distribution as estimated by a government official (Government official Buenos Aires C, interview (July 22, 2015)).

In the interview, an official stated that the price of pejerrey was estimated at ARS300 per 30 kg, excluding the removal of thorns and other processing services. The flesh without thorns costed ARS40 per kg (Government official Buenos Aires C, interview (July 22, 2015)). According to López *et al.*, in 1998, the legal concession of Las Tunas fisheries was granted to three cooperatives, each of which was authorized to use 100 nets per eight fishermen (12.5 nets per person). They stated that the fishing quotas per cooperative permitted the extraction of 2,000 lots per year, each lot weighing 30 kg (López *et al.* (2001), p.39).

Beruti's fishermen, mostly aged between 20 and 30, have apparently been relying on fishing for decades, having learned fishing and processing techniques from their parents as stated by Fisher A (Fisher A, interview (July 22, 2015)). It appears that Las Tunas has been occupied by this fishing community, which has restricted the access to external users or outsiders (Government official Buenos Aires C, interview (July 22, 2015)). Group members have organized to monitor and control both the access and use of the fishing ground. There was a small station in the fishing ground where a member used to stay at night on a rotational basis to monitor the entry of outsiders into the resource system, as stated by an official (Government official Buenos Aires C, interview (July 22, 2015)).

It was perceived that fishermen respected their internal rules, including closed seasons, because they understood that the conservation of resources is important for

their livelihood. One of the interviewed fishermen stated that during closed seasons, he sought temporary jobs, such as carpentry and masonry, and resumed fishing operations in December (Fisher B, interview (July 22, 2015)). This case meets the conditions suggested by Ostrom for the good governance of commons resources of a community, as these individuals used to communicate and interact with one another and coordinate their activities (Ostrom (1990)).

In July 2016, the central government of Buenos Aires revived the exploitation of Las Tunas complex after a long period of closure. It opened a fishing filleting plant to reactivate local fish production. The main objective of this move was to support Beruti's households by creating jobs at the local level. Even though technical studies revealed that the shallow lake was in a good condition for harvesting at that time, the government stated that resource conservation was crucial. Therefore, officials announced that the inspection system would be reinforced through the allocation of fishing rangers, surveillance boats, and other equipment. The training provided to fishing control agents would include ways to create infraction statements, verification of current infractions and so on. In order to regulate the captures in Las Tunas, a station has been planned so that a municipal inspector can register access, capture sizes, and the number of delivered containers. Local officers also stated that they are considering working with rural patrols teams to prevent conflicts and sustain the control policy. However, officials underscored the need for fishermen's collaboration in conserving pejerrey resources to achieve sustainable use of resources<sup>(7)</sup>.

## 5. Institutional Framework of Fisheries in Río Negro Province

### 5-1. An Outline of Fisheries Regulations

Inland commercial fishing in Río Negro Province has been regulated under the Provincial Law Q 1254, which establishes the requirements and prohibitions to perform this activity in the province<sup>(10)</sup>. As for regulations concerning access to public riverbanks and water bodies, the Provincial Law Q 3365 establishes free access as long as the use of resources is for recreational purposes<sup>(10)</sup>. Therefore, fisheries operations are subject to governmental or formal written laws. The peculiarity in this province is that inland commercial fishing is authorized in Pellegrini Lake, providing licenses to fishermen and establishing fishing regulations.

The fisheries management in Río Negro was traditionally concerned with marine commercial fishing. Inland fisheries began to play an important role when the



government decided to reinforce local tourism with the promotion of recreational fishing. Wegrzyn and Santos state that the province has been always encouraged to undertake collaborative management, especially in the area of fisheries. Accordingly, several meetings and conventions have been held regularly with the participation of local stakeholders to discuss issues concerning the management of salmonids and recreational fishing, facilitating the involvement of local anglers in recreational fishing management issues (Wegrzyn and Santos (2005), pp.40-41). Therefore, in this region, inland recreational fishing prevails rather than inland commercial fishing.

#### 5-2. General Roca: Artisanal Commercial Fishing in Pellegrini Lake

The General Roca is located in the northwestern part of the Río Negro Province. The land covers an area of 14,655 km<sup>2</sup> with 320,000 inhabitants<sup>(11)</sup>. The Pellegrini Lake is located in the so-called Alto Valle region. This artificial lake was formed as a natural depression containing a rich concentration of salt and nutrients suitable for fisheries production. It was created to regulate the water flow of Neuquén River through the Arroyón canal. It is a closed lake with no effluents. The area is 11,000 hectares with an average depth of 9.4 meters (Ministerio de Agricultura, Ganadería y Pesca de Río Negro (2016); Amalfi and Vernere (2009), pp.2-3).

Pellegrini Lake has been the only inland water body used to extract and land native pejerrey patagónico and perca species for commercial purposes in Río Negro. The central provincial government of Río Negro manages and controls the aquatic resources. The beneficiaries were local fishermen authorized to land and process captures (Ministerio de Agricultura, Ganadería y Pesca de Río Negro (2016). It appears that based on an agreement between the provincial government and the fish-filleting plant owner, the control of fish landings and processing operations was conducted in this facility. Local fishermen had to land and process (fillet) their catches in the fish-filleting facility so that fishery officers, from the provincial government, could verify the sanitation and capture requirements (Government official Río Negro, interview (June 15, 2016)).

Interviews with fishermen and an official stated the owner of the facility commercialized the processed fish (for human consumption or bait) for local markets (Government official Río Negro, interview (June 15, 2016); Fisher C, interview (June 15, 2016)). According to Fisher C, in this transaction, the plant owner paid ARS60 per kg to the fisherman and then sold the filleted product on the market for ARS100 per kg, retaining the difference as his own profit. The owner also charged the fishermen to use

his facility. Apparently, this transaction generated conflicts between the plant owner and certain fishermen. Fisher C argued that the payment was too low to sustain a living (Fisher C, interview (June 15, 2016)). He stated that, the fish-filleting plant was originally built with materials and effort from local fishermen so that it could be freely used for processing their fish landings. However, circumstances changed, and the plant owner stipulated the transaction conditions, causing discontent among fishermen (Fisher C, interview (June 15, 2016)). This case shows that when transactions do not satisfy the needs of local fishermen, conflicts may arise between users.

The provincial government has managed and controlled the Pellegrini Lake fishery. In the area of inspection operation, it was supported by the national security force called Prefectura Naval Argentina<sup>(12)</sup>. The management of fish resources includes determining fishing efforts based on access restrictions (number of fishermen), the maximum number of fishing gear, the minimum size of gillnets, and closed seasons. Restocking programs for native species have been conducted using seeds produced at Pellegrini Lake Hydrobiological Station. Authorized local fishermen captured mature pejerrey and perca species during the closed season and delivered the samples to government technical officials for farming (Ministerio de Agricultura, Ganadería y Pesca de Río Negro (2016); Government official Río Negro, interview (June 15, 2016)). Despite the absence of modern cultivation materials and obsolete infrastructure, restocking programs were performed periodically, especially in 2008, probably because of the government's decision to promote local artisanal commercial fisheries. However, captures have been decreasing from 2008 to 2010 (Ministerio de Agricultura, Ganadería y Pesca de Río Negro (2016); MAGyP (2011)).

Only six fishermen (as of June 2016) have been authorized to catch endemic species from the lake. Although they were related to each other, competition might have segregated the group, producing some conflicts over the use of resources. Fisher C, a local authorized fisherman I interviewed, said that reconciliation was not possible because each had his own interests and was reluctant to cooperate (Fisher C, interview (June 15, 2016)). Since unequal profit shares were allocated, it seems that some fishermen sold processed fish to their own clients. Fisher C has relied on this activity for over 43 years. He used to arrange the nets at night, leaving early in the morning to harvest the fish from the lake. His son also relied on fishing and worked with his father, but Fisher C said he would not recommend fishing to his grandson because of the unstable economic conditions (Fisher C, interview (June 15, 2016)).

The pejerrey species are captured in winter and perca in both winter (on a small

Table 2 Degree of adaptation to Ostrom theory

Province	Status	Variable	Ostrom theory
Buenos Aires	Sustainable	Self-organized group	Adapted
Río Negro	Unsustainable	Centralized	Non-Adapted

scale) and summer. The provincial government establishes the closed season (Ministerio de Agricultura, Ganadería y Pesca de Río Negro (2016); nevertheless, detecting and punishing non-licensed fishing is costly. Fishermen were concerned about the existence of non-licensed fishing and were willing to express their concerns to local officers. However, it seems that there was no mechanism to gather fishermen's concerns at the local level (Fisher C, interview (June 15, 2016)), that is, local agencies that could gather all the problems faced by fishermen and place them in the central provincial government.

## 6. Analysis of the two cases

In Buenos Aires, groups of fishermen have developed their own rules through community-based organizations. Even though the fisheries system is centralized, it seems that the apparently weak control over the use of the fishing ground has facilitated members of the community, to coordinate and cooperate to use the resource system. However, it appears that in Río Negro, the fishing management has led to noncooperation among some fishermen owing to the perception of unequal distribution of revenues, and there is a need to decentralize the system to address fishermen's concerns at the local level (see Table 2).

Ostrom's seventh principle "Minimal recognition of rights to organize," suggests that recognizing certain rights (such as access to fishing ground and type of equipment to be used) to organize the resource system could prompt users to enforce their devised rules and conserve resources. However, as Ostrom stated, "if external governmental officials presume that only they have the authority to set the rules, then it will be very difficult for local appropriators to sustain a rule-governed CPR over the long run" (Ostrom (1990), p.101). Therefore, as the central government imposes rules that are not congruent to local needs and circumstances, it can undermine the resource system itself.

## 7. Discussion and Conclusions

The Ostrom model in governing the commons demonstrates that providing some autonomy to local people in organizing and using commons resources, such as devising their own operational rules, could lead to sustainable fishing practices. However, when the central government imposes rules that are not congruent with local needs, locals can be resistant to these regulations, generating conflicts between the involved actors. The fishing community in Buenos Aires Province has created its own internal rules and became self-organized, devising fishing operations (including distribution of time, space, technology, and monitoring) and rules over the past decades. Although the central authorities administer the water resources in the region, this case makes us assume that even without strong intervention by the government, informal groups can at times manage CPRs well through coordination and cooperation among members. However, artisanal commercial fishing practiced in Río Negro Province presented a contrasting situation. Cooperation and coordination between direct users to organize their fishing activities were weak, and there was a prevailing absence of a local agency to address user's concerns regarding fishing operations.

In view of the cases studied, decentralization and the recognition of certain rights to local direct users could help reorganize and sustain inland fishing systems. In the case of Buenos Aires, as fishing communities have self-organized to use commons resources, the central government can act as facilitators to solve certain internal issues, such as providing support in terms of monitoring and surveillance activities, to improve their activities. As for Río Negro, the central government can delegate decisions concerning the management of resources to local governments so that users can interact with policymakers in the area and facilitate the resolution of local problems.

The findings of this research provide an open inquiry into how local governments can coordinate with direct users and the central government to sustain inland fisheries in both regions. Further research based on fisheries' management regimes in other countries, such as Japan, could help introduce some fisheries' management patterns in Argentina, considering the co-management system as a mechanism to organize the utilization of commons resources. More precisely, giving some autonomy to direct users to organize and devise their own rules to utilize the resource system. Follow-up research is needed, as fishing operations, regulatory measures, and local situations may have changed in recent years.

#### Notes

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