

RESEARCH ARTICLE

Examining Human-Nature Relationships Through the Lens of Reciprocity: Insights From Indigenous and Local Knowledge

Reciprocal contributions: Indigenous perspectives and voices on marine-coastal experiences in the channels of northern Patagonia, Chile

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Handling Editor: Irene Teixidor-Toneu**Abstract**

1. The recovery of marine ecosystems in areas heavily impacted by fishing and environmental exploitation depends, to some extent, on the sustainable management of resources and should be complemented by cultural traditions, practices and scientific knowledge. These knowledge systems may involve reciprocal actions and interactions between people and coastal environments, which, unfortunately, are often overlooked in government coastal management strategies.
2. Our study was conducted in the channels and fjords of northern Chilean Patagonia. The life experiences of nine community members, some of whom are co-authors of this article, involve reciprocal interactions with coastal areas and species. We highlight two customary practices that are important for food sovereignty and the responsible management of marine-coastal ecosystems. To understand their perspectives on nature, we analysed the ontological and cosmogonic aspects of these practices, their ecological implications and the challenges they currently face.
3. We present two case studies: (i) the 'Corralitos de pirenes' in the Chiloé archipelago, which refers to small stone walls or enclosures built in the intertidal zone to create a suitable habitat for rockfish to spawn. The community consumes a percentage of the fish eggs, and the fish benefit by having a protected spawning site maintained by the locals; (ii) 'benthic rearrangements,' a practice carried out by shellfish divers who manually restructure underwater substrates that have

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been depleted by overexploitation of artisanal fishing. To this end, they manually relocate various species to re-establish their ecological interactions.

4. Both cases demonstrate a deep, place-based ecological knowledge that fosters an understanding of ecosystems and fishing management rooted in the coastal families. These practices have been developed within family and community contexts and are continuously passed down through generations.
5. These experiences embody a biocultural ethic that must be recognized, valued and expanded upon. Their ecological contributions (e.g. improvement of habitats) and socioecological endeavours (care for the environment) aim to foster biocultural continuity, engaging the elderly, adults and children. These experiences occur in a scenario of socio-environmental crises where industries, such as salmon farming, generate cultural and ecological impacts that intertwine both in time and within the depths of the sea.

KEYWORDS

common goods, customary practices, Indigenous ecological knowledge, marine conservation, Patagonia, reciprocal contributions

1 | INTRODUCTION

1.1 | Background and aims

People are integral to nature, and their relationships involve multiple dimensions and drivers on spatial and temporal scales (Chan et al., 2016; Comberti et al., 2015). In recent decades, understanding these relationships has focused on the economic, ecological and Western cultural aspects (e.g. Constanza et al., 2017), which, although important, represent only some of the perspectives in the dialogue between societies and biodiversity. More recently, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), an independent international organization linked to the United Nations Organization (UN), has made a global call to explore and comprehend the values of nature ingrained in societies (Pascual et al., 2023). Embedded within these values is the concept of nature-people reciprocity, which has been advocated for by Indigenous leaders and researchers who consider it a central element of their coexistence with the natural world (Kimmerer, 2013). However, these calls for reciprocity oppose the hegemonic worldview and dominant ideologies, such as neoliberalism (Escobar, 2014; Leitao, 2023). For example, privatizing food species through competitive fishing licences has been a recurrent fisheries policy in many South American countries, such as Chile (Mellado et al., 2019). In many cases, these policies can evoke sustainable practices but also can restrict the access of Indigenous and local communities to the sea (Pinkerton, 2017), affecting biocultural continuity and the expression of their customs and values, especially the practice of reciprocity with nature (Ojeda et al., 2024).

The concept of reciprocal contributions has recently emerged as a conceptual lens to catalyse the recognition of reciprocity as a

value that embodies diverse ways of knowing between humans and other components of nature (Ojeda et al., 2022). Reciprocal contributions encompass actions, interactions and experiences between people and other elements of nature, emphasizing that humans are an integral part of natural systems. These interactions create positive feedback loops that benefit both people and nature, directly or indirectly, across multiple dimensions and scales (Ojeda et al., 2022). The concept also opens a dialogue about how reciprocity can be understood and practiced. Reciprocity may be expressed in a gamma of forms through practices related to cultural keystone species (e.g. Mattalia et al., 2024), as kinship notion of people with nature (Jones et al., 2010), even in ways of learning others by empathy (Medina et al., 2020; Ojeda et al., 2018). The concept of reciprocal contributions could go beyond functional reciprocity, encompassing ontological foundations and moral commitments that shape Indigenous stewardship. Through examples from Indigenous and local communities in Patagonia, this study contributes to a broader dialogue on the diverse ways reciprocity can be understood and enacted, underscoring its functional, ontological and cosmogonic significance.

Human relationships with nature are diverse, shaped by worldviews, values and principles that vary across contexts (Pascual et al., 2023; Rozzi, 2018). These values—including goals, priorities and guiding principles (Hitlin & Piliavin, 2004; Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), 2019)—influence interactions with the environment, generating knowledge and practices that reflect reciprocity with nature (Jones et al., 2010). Within this context, ontological (what things are) and cosmogonic (how things interact with us) dimensions shape decisions and actions that impact both the environment and values, such as reciprocity (Callicot, 2017; Sao Mateus, 2017). For example, if a juvenile marine organism—locally known as ‘renewal’—is perceived through these lenses, it should remain in its habitat;

removing it would violate cultural taboos and could have negative consequences for both local communities and ecosystems (Alvarez et al., 2008). Thus, ontological and cosmogonic dimensions are central to our connection with territories and other forms of life, guiding decisions with far-reaching environmental impacts.

Our study focuses on northern Patagonia, Chile, where human marine use can be traced back over 14,000 years (Falabella et al., 2016). Many cultural practices deeply rooted in this archipelagic environment have persisted over time despite the modernization of fishing activities (Alvarez, 2022b). For example, the use of cholchenes (also known as 'vivideros'), which are small boulder aggregations located in the intertidal zone to keep seafood alive, reflects long-standing traditions. Access to the sea and its resources is governed by customary protocols that are passed down from generation to generation (Ibarra et al., 2023). In this context, the concept of the 'commons' is understood as shared access to community-regulated natural resources (Berkes, 2005; Ostrom et al., 1999). Cultural practices that align with this communal approach are also considered part of the commons, with biocultural memory playing a highly significant role (Bollier, 2014; Gutiérrez-Aguilar et al., 2016).

In Patagonia, most current regulatory processes in the marine-coastal environment are state-regulated with a neoliberal approach, emphasizing individual and private ownership rights that promote competition and exclusion among diverse actors (Román & Campero, 2020). As a result, constant socio-environmental conflicts have been triggered, undermining the rich diversity of long-standing ontologies and worldviews that remain closely interconnected with nature (Castilla et al., 2021). Moreover, people's contributions to the sea are rarely acknowledged, and even less recognized are how these actions can enhance resource management (Ibarra et al., 2023).

Chilean neoliberal policies stand in contrast to Indigenous marine initiatives. For example, the Coastal Marine Spaces of Indigenous Peoples, commonly known as ECMPO in Chile (hereafter referred to as 'ECMPO'), was created by Indigenous communities and approved by the Chilean state to promote marine stewardship and Indigenous self-determination. ECMPO is comparable to Indigenous Protected and Conserved Areas in an international context (Araos et al., 2021). Established under the Lafkenche Law (No. 20,249), ECMPO applications aim to protect the traditional use of natural spaces by communities living in coastal areas (Araos et al., 2021). We argue that addressing multiple dimensions of reciprocal contributions can strengthen long-standing community efforts in Indigenous marine stewardship.

This study aims to characterize two cases of reciprocal contributions and explore their ontological and cosmogonic dimensions. The first case examines the Corralitos de Pirenes on Apiao Island, an ancestral intertidal practice transmitted over centuries and rooted in a relational Indigenous ontology (Sepúlveda, 2017). The second case focuses on underwater rearrangements designed to enhance marine productivity. Both cases were selected because they represent contemporary practices that embody reciprocity. We complement these cases with narratives and insights from Indigenous leaders engaged in customary practices and addressing external pressures,

such as salmon farming and intensive artisanal fishing, within their territories.

2 | METHODS

2.1 | Positionality statement

Daniel Caniullán, Juan Catín, Pérsida Cheuquenao, Yohana Coñuecar, Pedro Jara, Nelson Millatureo and Darly Vargas are members of Indigenous communities in southern Chile, and some of them are community leaders in marine ethnopolitical processes. They are knowledge holders who work to revitalize Indigenous practices connected to conservation and customary management. Each of them has actively participated in cultural preservation exercises and the protection of their territories. This article addresses their perceptions of contributions and associated conflicts in southern Chile—stemming from a dialogical community process—but these perceptions do not politically represent their communities nor claim to offer a final vision on the analyses herein. They recognize that Indigenous Peoples are heterogeneous and horizontal in terms of representation. It is crucial to note that this article stems from a long-standing initiative led by Indigenous communities to defend their territories and conserve nature from an Indigenous perspective. Within this framework, these communities have sought scientific support on various occasions to document and systematize practices and knowledge that demonstrate their close relationship with all components of their territories. Ricardo Alvarez, Florencia Diestre and Jaime Ojeda are non-Indigenous researchers, who have worked closely with local (both Indigenous and non-Indigenous) communities in the Patagonian archipelago. Their work has focused on documenting and valuing traditional practices and ethical-normative considerations related to the access and use of marine spaces and food species.

2.2 | Context of case studies

The first case, Corralitos de Pirenes, occurs on Apiao Island in the Chiloé archipelago within the Los Lagos region (Figure 1), home to approximately 621 residents, 80% of whom are Indigenous (INE, 2017). Primary economic activities on the island are traditional (Skewes et al., 2012), including family-based agriculture and livestock (comprising 60% of the economy), algae harvesting (26%) and fishing and diving (8%) (Fundación Superación Pobreza (FSP), 2016). Corralitos de Pirenes are boulder aggregations in the intertidal zone where people collect eggs and fish. These structures are managed through communal ownership, with an emphasis on sharing rather than hoarding. While they may be associated with specific families, it is culturally inappropriate to engage in disputes over beaches and resources such as shellfish, fish and algae, as such conflicts are believed to bring poverty and scarcity. Corralitos de Pirenes share similarities with fishponds or Corrales de Pesca, intertidal structures

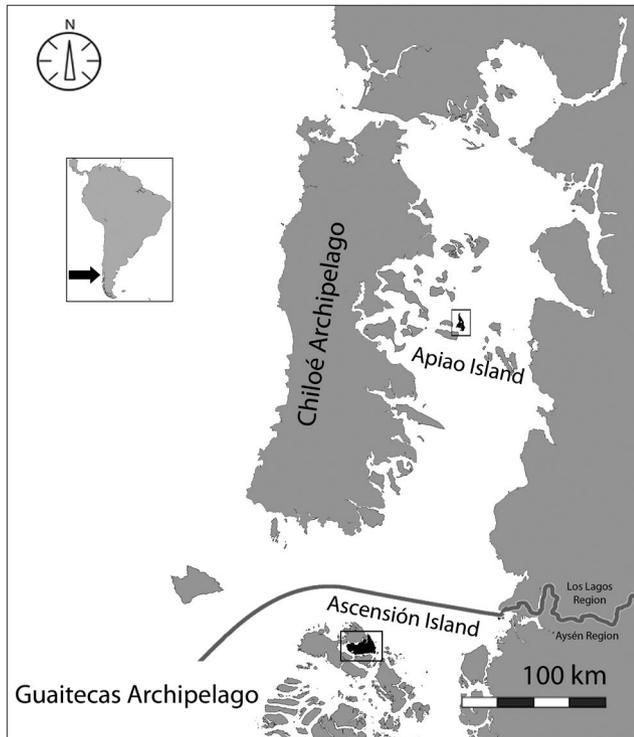


FIGURE 1 The study was conducted in two localities in northern Patagonia, Chile, where biocultural practices embody reciprocal contributions: Apiao Island in the Quinchao archipelago (Chiloé) within the Los Lagos region, and Ascensión Island in the small Guaitecas archipelago within the Aysén region.

used for centuries in passive fishing by harnessing the tides (Alvarez et al., 2008) across Patagonian waters (see PSGC (Pacific Sea Garden Collective), 2022). However, customary practices are increasingly threatened by the presence and expansion of industries such as salmon farming. This industry not only interferes with ancestral navigation routes and shellfish beds that have traditionally sustained families but also contributes to the accumulation of waste and chemicals that severely degrade marine life and beaches. In addition, intensive artisanal fishing -from urban coves- overexploits natural banks on which local communities depend (Hucke-Gaete et al., 2010). These impacts jeopardize both biodiversity and the traditional ways of life that rely on it (Outeiro et al., 2022).

The second case is located on Ascensión Island, within the Las Guaitecas archipelago in the Aysén region (Figure 1). The island covers 60km², with a coastline of 58km and a population of 1843 inhabitants. The residents are concentrated in three settlements, with approximately 51% identifying as Indigenous (INE, 2017). The local way of life centres around commercial fishing, which has significantly changed since the late 20th century. In the 1980s, the seabed experienced unprecedented exploitation, primarily targeting the sea snail *Concholepas concholepas*, commonly known as loco (Gelcich et al., 2010). This species experienced a fishing boom and was marketed internationally as Chilean abalone. Currently, the Chilean State regulates commercial diving associated with artisanal fishing. However, conflicts arise as large groups of divers from other regions

come to Las Guaitecas archipelago to harvest loco and sea urchins. These conflicts between local and external fishers have generated socio-environmental tensions, leading to the overfishing of commercial species and resulting in confrontations between the groups (Alvarez et al., 2016).

2.3 | Methodology

Our methodological approach embraces the concept of reciprocal contributions to characterizing how both cases generate mutual braidings between people and marine species (Ojeda et al., 2022). This approach is enhanced by relational ethnography (Desmond, 2014), emphasizing the importance of embracing Indigenous worldviews within research frameworks (Ingold, 2013a). The relational ethnography provides a nuanced understanding of how Indigenous communities sustain their livelihoods through practices rooted in mutuality and respect for ecological systems. Our perspective aligns with the *diálogo de saberes*, which emphasizes collaborative exchange and mutual learning across different knowledge systems (Leff, 2004). By prioritizing dialogues rooted in the exchanges and co-production of knowledge, we aim to create spaces where diverse knowledge systems can be complemented. Rather than viewing participants as passive subjects, the research process was based on collaborative engagement, where knowledge holders from many territories contributed as both participants and co-authors.

2.4 | Interviews and analysis

We obtained informed consent from all participants prior to conducting interviews verbally. This is because today there is a social climate of harassment toward coastal indigenous communities in our country by some actors associated with the exploitation of the sea, harassment that has included the misuse of written signatures of indigenous people obtained in a deceitful manner. To circumvent distrust, we agreed with the participants to use verbal consent. This consent included describing the meaning of the study, its scope and how the recorded memories and reflections would form part of a manuscript. We employed two primary sources that informed us of reciprocal contributions. The first source involved semi-structured interviews with two members of Indigenous communities from Apiao Island and Ascensión Island. These interviews aimed to explore their direct experiences with the two described practices (corralitos de pirenes and underwater rearrangements) and included community dialogues (collective conversations that occur in work spaces, for example, during a shore harvest for shellfish or during fishing operations; and social spaces, for example, in rural social centres or their own homes) regarding contributions, conflicts and future pathways. The second primary source, with a broader geographical scope, included five additional members of Indigenous communities who provided insights into relational aspects (e.g. contributions), conflicts and future initiatives (such as ECMPO policy requests) in

marine Patagonia. These knowledge holders, with their territorial and cultural expertise, played a significant role in shaping this manuscript through their traditional community dialogues. Consequently, these seven knowledge holders collaborated as (i) interviewees, (ii) participants in community-based dialogues that enriched the manuscript's content and (iii) co-authors who directly contributed to its development.

The sampling was non-probabilistic, focusing on identifying knowledge holders from coastal and island regions who engage in reciprocal contributions. These individuals subsequently referred us to others directly or indirectly involved in the cases. Additionally, some of the participants are leaders with extensive experience advocating for Indigenous marine rights in Patagonia. The validity of this sample is not considered absolute but is grounded in the consensus established by the participants regarding the content addressed, which they consider significant (Santaella, 2006). Seven interviews were conducted between March and May 2023 using Google's videoconferencing software and telephone, each lasting between 40 and 60 min. This format was agreed upon with the interviewees due to the distances at which they reside, as well as their work schedules and organizational responsibilities. We employed the semi-structured interview technique (Canales, 2006; Roulston & Choi, 2018; Wenegrat, 2001), comprising 20 questions aimed at understanding reciprocal contributions, management protocols, the cycles and seasons of these practices, learning mechanisms and the transmission of teachings. Finally, we inquired about the risks and barriers they face in their territories and explored their efforts to revitalize cultural practices associated with marine biodiversity. We ensured the ethical conduct of the research by obtaining informed consent from each participant, which was secured before each interview and reaffirmed during the conversation process.

These seven knowledge holders engaged in dialogues with members of their communities during this period, allowing them to reinforce ideas and memories that were ultimately incorporated into this manuscript. As a result, they are included as co-authors. Methodologically, we recognize that these Indigenous dialogue methods enrich conventional ethnographic approaches, such as semi-structured interviews and focus groups. This approach addresses the challenge of minimizing the unequal dynamics inherent in knowledge extraction, thereby moving toward relational and decolonial ethnographies that produce co-constructed knowledge (Micarelli, 2018). Moreover, it shifts the focus from merely studying people and the tools they use to sustain their lives to engaging in the process of thinking with them (Ingold, 2013b), thereby giving greater meaning to the ethnographic content for Indigenous peoples themselves.

The interviews were supplemented with ethnographic field notes, incorporating participant observation during ethnopolitical processes related to requests for Coastal Marine Spaces of Indigenous Peoples (Law 20.249 that Creates the Marine Coastal Area of Indigenous Peoples, 20.249, 2008). This participant observation was also linked to a school educational project on Apiao Island, which aimed to ethnographically document the practice of Corralitos

de Pirenes. Both the interviews and field notes served as essential records, providing valuable insights into the worldviews and experiences of the interviewees (Álvarez-Gayou, 2003). The collected data were analysed using manifest content analysis (Krippendorff, 2018) to identify reciprocal contributions (e.g. Ojeda et al., 2022), with particular emphasis on the ontological and cosmological dimensions present in the narratives.

We employed manifest content analysis as the primary tool to examine the collected data. This approach focuses on identifying explicit elements within the text, such as observable words, phrases or themes (Mayring, 2014). Unlike latent content analysis, which seeks to interpret underlying meanings, manifest analysis concentrates on directly visible and objectively quantifiable content (Schreier, 2021). This methodology is helpful for describing patterns and frequencies (Bengtsson, 2016) and proved valuable in highlighting key findings from the conversations, allowing us further to explore these insights through follow-up discussions with the co-authors. This iterative process enriched the key themes that emerged from the study, enabling us to collaboratively highlight and categorize content expressed in the interviews and meetings.

3 | RESULTS

3.1 | Reciprocal contributions: The 'Corralitos de Pirenes'

The Corralitos de Pirenes structured by boulder agglomeration that act as shelters for small rockfish, locally referred to as 'pilles' or 'coldes', which belong to the genus *Patagonotothen* spp. (Figure 2). These fish lay eggs that adhere to one another, forming clusters known as pirenes. Sepúlveda (2017) describes that eggs are extracted during the months of August and September. These marine innovations and their management foster positive ecological relationships by providing shelters, created through boulder aggregation, where fish such as *Patagonotothen* spp. continue to spawn, even though some of their eggs—and occasionally the fish themselves—are harvested annually. Locally referred to as 'semilleros', these structures also support other marine species by promoting reproduction and enhancing marine biodiversity. Additionally, they serve as feeding grounds for other species, including coastal birds like *Nycticorax nycticorax* (see Figure 3). A member of the Indigenous community on Apiao Island notes that there are at least 12 Corralitos, each associated with a particular family. In May, during the waning moon, families restore the stone walls if any parts have shifted due to wave action. In June, pirenes (*Patagonotothen* eggs) begin their spawning phase, which continues through September. During this period, the fish known as 'pilles' or *Patagonotothen* lay eggs up to six times, with families collecting at least 1 kg of eggs on each occasion.

The harvest is a joyful family activity. In addition to collecting eggs or restoring the wall, families participate in various other activities, such as shore fishing, gathering shellfish, collecting seaweed, gathering firewood from the beach, and harvesting medicinal



FIGURE 2 (a) *Pirenes* (eggs) and *Pilles* or *Coldes* (rockfish) inside a basket used for shellfish (*Llolle*). (b) 'Corralito de Pirenes' in the estuary of Apiao Island. (c) *Pirenes* (eggs) under a rock. (d) *Pille* or *Colde* (*Patagonotothen* spp.). Images were taken by Pedro Jara and Paula Barros.

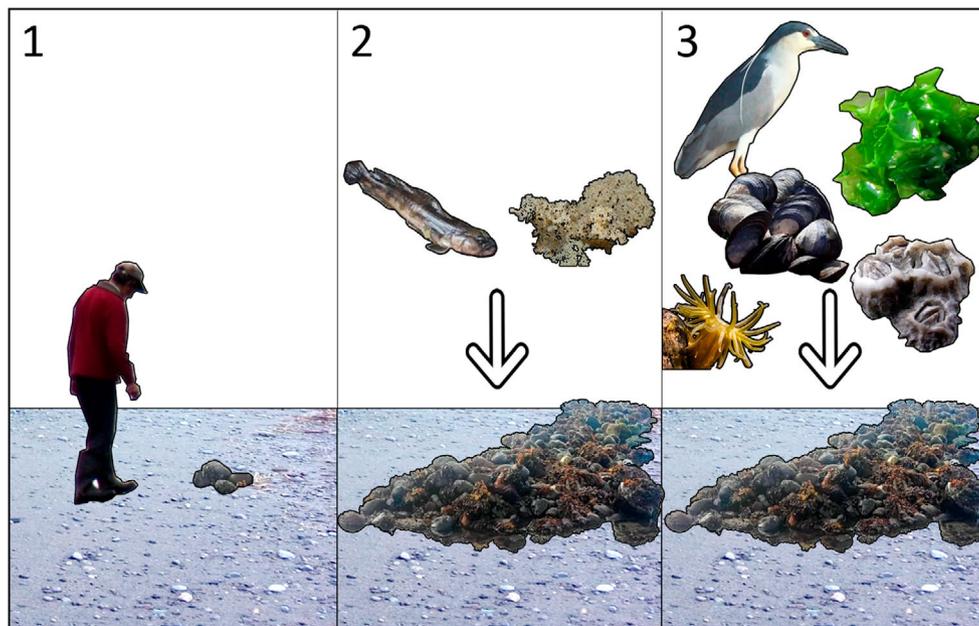


FIGURE 3 The described phases illustrate how reciprocal contributions can enhance interactions with other coastal species. (1) Building Corralitos on overexploited beaches involves using pebbles and boulders to create three-dimensional structures. (2) These boulder aggregations attract rockfish such as *pilles* (*Patagonotothen* spp.), which begin to lay their eggs (*pirenes*) there. (3) Gradually, the structure becomes a habitat for a variety of other species (e.g. *Nycticorax nycticorax*, *Mytilus chilensis*, *Ulva* spp.), thereby activating intertidal biodiversity.

plants. Once the 4-month egg-laying season ends, the fish return to the sea. Another important aspect of these Corralitos is the growth of oysters (*Ostrea chilensis*) and mussels (*Mytilus chilensis*) on the stones, along with crustaceans, algae and various other species that disperse throughout the rest of the beach, revitalizing the coastal area (Figure 3).

Stewardship of the intertidal zone involves selective extraction by families based on their knowledge of the life cycles

of various species. For example, they avoid capturing species like *pilles* (*Patagonotothen* spp.) and their *pirenes* (eggs) during spawning or reproduction, particularly when they are juveniles. These care protocols also extend to other species inhabiting this coastal area. For instance, crabs (*Taliepus dentatus*) are harvested only between April and September, after which they are allowed to rest. Clams (*Venus antiqua*) are collected between October and November, while silversides (*Odontesthes regia*) are harvested from September

to November. Another approach to limiting the exploitation of the intertidal zone is the practice of sharing part of the harvest with relatives and close neighbours. As a result, not all of the island's inhabitants need to gather shellfish simultaneously, since those who stay home still receive fresh food. These protocols also help prevent conflicts between families collecting shellfish, particularly during significant tides. Above all, it promotes an equitable distribution of the collected food among the inhabitants, discouraging individual hoarding.

3.2 | Reciprocal contributions: Underwater rearrangements

The commercial species *C. conchopelas* (loco) is a large carnivorous gastropod that preys on different mussels such as *Mytilus chilensis*, *Choromytilus chorus* and *Aulacomya atra*, as well as crustaceans like cirripedes (*Austromegabalanus psittacus*) and urochordates such as the piure (*Pyura chilensis*). Due to the intensive harvesting of fisheries like *C. conchopelas*, the seabed has been significantly altered, especially in areas with free access. In response, some experienced divers, including those from Indigenous communities, engage in a traditional ecological practice rooted in accumulated generational knowledge. This practice enables them to understand when and how human-induced changes to the environment can yield beneficial outcomes for both humans and other species. The practice involves 'fixing' or reorganizing the seabed to restore, as closely as possible, the previously established biodiversity and interspecies relationships. This marine enhancement is also shared by divers

associated with Benthic Resource Management Areas (Management and Exploitation Areas for Benthic Resources; MEABR). These management areas respond to a public policy, allowing fishers to manage and monitor geographically limited coastal areas (Gelcich et al., 2010). Within these zones, fishers can partially control the potential imbalances caused by competition or interference from other divers.

In underwater rearrangements, divers relocate colonies of *P. chilensis* (Piure), which form large, solid clusters and deposit them in areas they aim to revitalize (Figure 4). They also transfer colonies of other species, such as molluscs (e.g. *M. chilensis*) and barnacles (e.g. *A. psittacus*). Additionally, they prioritize the protection of macroalgae forests (Figure 5) from potential exploitation by external fishing fleets, given the high demand for these resources nationwide (see Rosenfeld et al., 2019). For this reason, both kelp forests and piure colonies are regarded as 'biodiversity hotspots'. Through time, if this area remains untouched by commercial fishing activities, these rearrangements could provide shelter for other species, offering feeding and breeding grounds, which leads to the revitalization of the ecosystem—a benefit for the shellfish diving trade.

3.3 | Dimensions of reciprocal contributions

Both cases exemplify practical actions of marine stewardship that are also deeply interwoven with the ontological and cosmogonic dimensions of reciprocity. These actions, species and habitats reflect diverse ways of understanding what entities represent within Indigenous worldviews. For example, the ontological dimension is

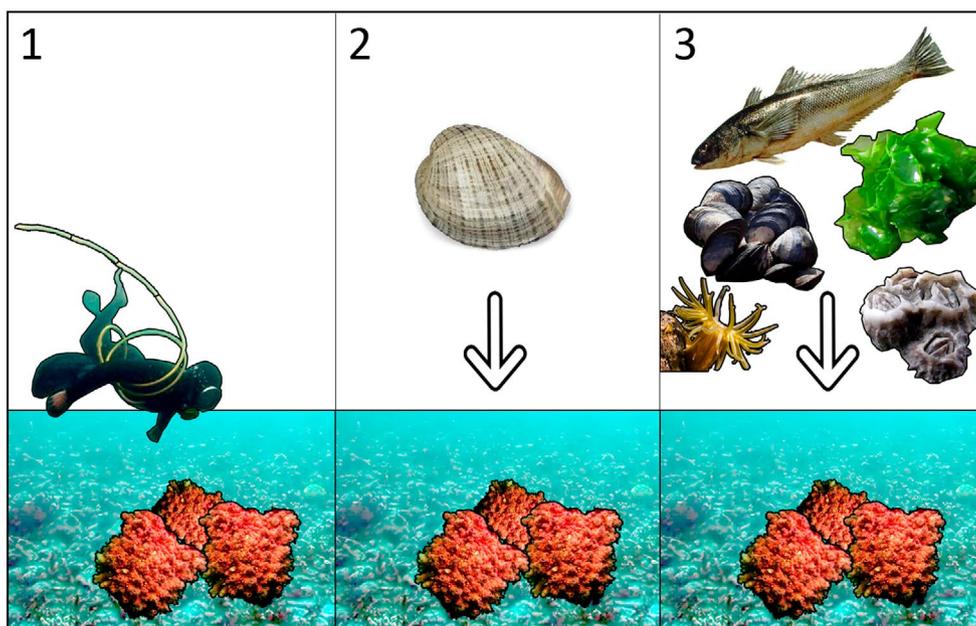


FIGURE 4 The described phases illustrate the importance of subtidal rearrangements. (1) Divers translocate Piure colonies (*Pyura chilensis*), a foundational species, to overexploited seabeds. These human-induced rearrangements can attract commercial and food species such as *Concholepas concholepas* (locos). (2) Gradually, these Piure colonies can favour habitats for more diverse marine life, thereby enhancing the biodiversity of the underwater environment.



FIGURE 5 Macroalgae forests support underwater life, including artisanal fishing economies in Patagonia.

evident in how the sea is perceived by the Mapuche, Lafkenche and Williche Indigenous peoples, for whom the sea is Lafkenmapu (Lafken: sea and Mapu: land), understood as an integrated whole. The sea is not merely an entity but is protected by a sacred presence (N'gen Lafken, a tutelary spirit) that commands respect. This reverence extends to marine life, which is essential to people's livelihoods and governed by established social protocols. For instance, it is considered disrespectful to disturb the Patagonian blennie (*Eleginops maclovinus*) during its breeding season, as this would violate its privacy. Furthermore, people avoid hoarding marine spaces and species within Lafkenmapu, as it is believed this would bring misfortune and poverty.

Indigenous community leaders embody the Mapuche people's sense of reciprocity with the sea, emphasizing respectful treatment of marine life based on relational, ethical and nutritional commitments. This cosmogonic dimension—how elements interact with humans—is central to how communities engage with marine-coastal biodiversity (see [Table 1](#), Nos. 1 and 2). The Mapuche normative framework, known as Az-mapu (CEPAL-FILAC, 2020), is founded on recognizing the interdependence and interconnectedness of all life forms, a concept referred to as Itrofil mognen. These guiding principles ensure a Küme mognen (good life), implying that natural elements are not merely resources but possess inherent dignity and may even be regarded as tutelary spirits. Thus, interactions with both human and nonhuman entities are crucial for understanding the cosmogonic dimensions of reciprocity and their positive and negative outcomes. For instance, in the Chiloé archipelago, disrespectful behaviour—such as people's conflicts over algae or seafood on the coast—is believed to provoke reactions from nonhuman beings entities (Núñez, 2022): the Pincoya (a mermaid) may take away food species, or the Cuchivilu (a creature with characteristics of both pig and snake) might emerge to pollute the coast. Such human behaviours are understood as causing poverty across multiple species.

Ontological and cosmogonic dimensions help us understand the significance of the beings that constitute biodiversity and the

relationships among them. For example, Williche families, by building and maintaining corralitos de pirenes, create additional spaces that provide shelter for pilles (*Patagonotothen* spp.) to spawn. This practice, guided by commitment protocols, allows these fish to incubate their eggs (pirenes) in a safe and secure environment, supporting their life cycle. Coastal species, including birds, molluscs and algae, benefit from these innovations, while cultural beliefs in supernatural entities associated with the sea can also reinforce bio-cultural stewardship. Thus, reciprocal contributions extend beyond two-dimensional interactions between humans and specific species, occurring instead within a complex network of interdependent relationships.

3.4 | Conflicts and opportunities

The stories shared by the Indigenous representatives also describe the conflicts encountered in marine-coastal areas. The impact of salmon farming recurrently appears in their narratives, marked by the concern about the declining fish population and contamination of algae and shellfish (see [Table 1](#), No. 3). Their accounts also reveal that they have witnessed ecological transformations over time: 'It used to be a beautiful place. It was like a hidden paradise. And now, when I revisit those same places, they have turned into lifeless deserts' (see [Table 1](#), No. 4). The ecological and cultural impacts become more prominent when people are stripped of their customary rights by the Chilean State. This is exemplified by the words of an Indigenous leader from the Hualaihué commune (see [Table 1](#), No. 5), who states that her customary practices are considered illegal on her shores.

However, actions that involve people's reciprocal contributions to food species are emerging in various forms. For example, on the coast of Buill (42°24'11"S/72°43'04"W), an Indigenous leader reveals that one of her beaches, historically overexploited for clam extraction by external fishing fleets, has been protected under their ECMPO application (Ecmpto Weki Wil). After 2 years of conservation efforts, the clam population is recovering ([Table 1](#), No. 6). This beach collectively decided to stop extractive activities to allow for the resurgence of local customary practices. Coastal protection under the Indigenous policy (ECMPO) can lead to the recovery of food species to benefit intertidal biodiversity and people.

4 | DISCUSSION

The 'Corralitos de Pirenes' and underwater rearrangements originated from Indigenous and local communities, where fishers and divers strive to maintain their customary practices in northern Patagonia. These two cases are rooted in customary uses, incorporating Indigenous worldviews and relational ontology, where memories and guidelines have been passed down through generations. It is important to note that practices embodying values such

TABLE 1 Illustrative stories from the Indigenous representatives interviewed contribute to the reflection on reciprocal contributions and conflicts in coastal areas.

N°	Story	Source
1	"The sea is a being that generates life; when one harms the sea or the beings that live there, one incurs anger. That is why it is also called N'gen lafken, the guardian spirit of the sea."	Lafkenche leader. Gorbea, commune of Gorbea, La Araucanía region
2	"We have enough because we have protected it."	Williche leader. Llanichid Island, Hualaihué commune, Los Lagos region
3	"(In areas with salmon farms) there is no longer seafood, nor algae (...) not even crabs (...)"	Williche community participant. Apiao Island, Los Lagos region
4	"The faeces (from the salmon) that accumulate on the seabed deplete the oxygen levels, causing a shift from a thriving sea of life to a sea of destruction. I have seen many seabeds where there used to be immense biodiversity (...). It used to be a beautiful place. It was like a hidden paradise. And now, when I revisit those same places, they have turned into lifeless deserts (...) at moments like these, we begin to worry because this is not normal."	Longko Williche. Melinka, commune of Guaitecas, Aysén region
5	"We have always relied on these areas to sustain ourselves. It is an acquired territorial right for those of us who live here. Yet, for the State, we are illegal in our territory. Our extraction methods are deemed illegal. Our utilization of marine resources is seen as illegal. Illegal in the way we use our territory. We are looked down upon as if we have no rights."	Williche leader. Llanichid Island, Hualaihué commune, Los Lagos region
6	"I remember that this area used to have clams, but they have been depleted due to diving boats. And now, the clams are 'rebounding' (Sic.) again. It is surprising to witness the effect that protecting this beach for two years has had. It can be seen that this benefits the ecosystem itself, and the clam population has returned (...). This means that the spaces that had been lost can be restored."	Williche leader. Buill, commune of Chaitén, Los Lagos region

as reciprocity with nature may vary in strength or continuity across different territories in southern Chile. Certainly, both examples have connections with other practices worldwide. For instance, the Clam Gardens of North America (Deur et al., 2015) and the reintroduction of giant clams in the Indo-Pacific (Friedman & Teitelbaum, 2008) are examples of anthropogenic modifications that enhance the productivity of coastal areas by drawing on long-standing traditional customs. While we recognize numerous local initiatives related to nature-people reciprocity, it is crucial, in an international context, to connect local and global discussions about values and their linkages with fisheries management.

4.1 | The cosmogonic and ontological dimensions of these practices

Reciprocal contributions are embedded in a worldview that defines the position of people and other entities within the world, outlining their interconnected relationships (Alvarez et al., 2023). From the perspective of these communities, it is crucial to avoid transgressions that may harm the well-being of both human neighbours and surrounding species. This commitment to well-being is reinforced through specific protocols and rituals. Protocols are socially agreed-upon practices that regulate behaviour in shared spaces, particularly in collecting and harvesting coastal marine species. For example, shellfishing practices include avoiding unfair competition, refraining

from hoarding and not harvesting species that are too young to reproduce, among other guidelines.

Rituals, as reiterated acts that reinforce customary norms, play a direct role in upholding these relational values (Alvarez, 2012, 2022a, 2022b). For instance, during the winter solstice, some families on Apiao Island perform a small ritual to ensure the annual return of certain fish species by casting quinoa (*Chenopodium quinoa*) into the corralito. Historically, this ritual, known as 'Treputo', was widespread and commonly practiced until the mid-20th century (Alvarez et al., 2008). While its current practice is more limited, many ritual practices continue to endure across the archipelago or remain part of the collective memory (García & Ojeda, 2022).

4.2 | Conflicts

From the 1980s until the present, an unregulated expansion of the salmon industry has taken place, generating adverse ecological impacts on the ecosystems of Patagonia (Castilla et al., 2021), threatening the ecosystem services (Alvarez, 2022b) and leading to significant cultural homogenization along the coast (Outeiro & Villasante, 2013). In this context, reciprocal contributions and their associated ontologies and worldviews are threatened. The potential for underwater rearrangements becomes complex when salmon farms are established nearby. It is understood that the increase in nutrient loads, particularly phosphorus and nitrogen, can be an

important factor contributing to increased phytoplankton density and a transition from dominant diatom groups to dinoflagellates (Niklitschek et al., 2013). Salmon farms exacerbate the sedimentation of organic matter, resulting in reduced oxygen levels and a decline in species diversity (Buschmann et al., 2006).

The contributions of Indigenous communities to marine ecosystems are also threatened by fishing exploitation and rural-to-urban migration. Conflicts arise between artisanal fishing fleets and local fishers residing in remote coastal areas of Patagonia. For instance, some artisanal fishing fleets from the Los Lagos region sail to the Guaitecas archipelago, located in the Aysén Region (both adjacent regions) to undertake sea urchin and clam diving (Saavedra Gallo, 2013); this generates competition for benthic resources, especially in open-access areas. Typically, when tensions escalate, and issues persist, the current regulations are uniformly enforced (General Law of Fisheries and Aquaculture, 2023), encouraging extractive practices, thus prolonging conflicts over time (Saavedra Gallo, 2013). In addition, it must be considered that these remote Patagonian archipelagos are experiencing important demographic processes due to the aging population and extensive migration to urban areas (INE, 2017). This migration trend is linked to public policies focusing on developing urban centres and neglecting rural coastal living and its customary practices.

4.3 | Recognizing reciprocal contributions in policy

The marine-coastal ethnopolitical processes are reorienting the long-term vision of its island inhabitants. They are beginning to articulate and coordinate their requests to safeguard their waters, the diverse species that inhabit them and the broader environment, resulting in improved prospects for future generations (Araos et al., 2023). Indigenous communities have initiated assertion processes based on the ECMPOs to defend customary practices and promote the well-being of both humans and nature (Araos et al., 2020). Marine spaces managed by Indigenous peoples offer a pathway to self-determination and authentic recognition of customary rights and practices. This allows us to visualize a scenario where Indigenous and scientific knowledge converge, working to promote biocultural conservation (Ban et al., 2018; Jones et al., 2010). For instance, the underwater rearrangements on Ascension Island are incorporated into ECMPO requests, selecting locations where local divers can control intense competition with other fishing fleets and escape the harmful impacts of salmon farming. Currently, 'underwater rearrangements' lack legal protection as a practice, although they are established as customary uses to adapt to the profound cultural changes that the fishing industry has undergone during recent history. These reciprocal contributions highlight the potential for shellfish divers to contribute to the well-being of nature through their work and conception of the world.

Similarly, the 'Corralitos de pirenes' are not recognized in official regulations. Yet, they play a crucial role in maintaining the beaches of Apiao Island and supporting the interconnected lives that depend on

them. These practices also reinforce the commitment of the island's inhabitants to their worldview and island ontology year after year. Integrating knowledge from Indigenous, local and scientific sources provides valuable insights into the ecological and economic interactions and the diverse values associated with nature. Evaluating this integration of knowledge can foster social commitment, leading to the co-production of possible future scenarios (Abson et al., 2017). This includes acknowledging that Indigenous knowledge and practices with nature not only offer lessons about sustainable relationships from the past (as seen in stewardship initiatives) but also serve as a valuable source of learning to address the new challenges humanity faces, particularly in building resilience (Groesbeck et al., 2014; Whitaker et al., 2023).

The ECMPO requests provide a framework for renewing human interactions with Patagonian ecosystems. In Chilean Patagonia, 81 ECMPO applications have been submitted, of which 14 have been approved, all located in the Los Lagos Region. The approved ECMPOs cover an area of approximately 30,339 hectares, representing only 0.96% of the nearly 3,150,000 hectares initially requested (see Araos et al., 2023). The bureaucracy and delays in approving ECMPOs present significant challenges and barriers for Indigenous communities. These approvals are managed by a regional collegiate body, whose composition varies by region but generally includes representatives from the regional government, various ministries, municipal mayors of coastal communes and representatives from economic sectors, fisheries and Indigenous communities. Despite these challenges, it is important to recognize that ECMPOs offer a significant opportunity for ecological restoration and the revitalization of customary practices. Testimonies from coastal residents highlight the potential to restore biodiversity following the extractive activities in the remote archipelagos of northern Patagonia.

5 | CONCLUSIONS

In this article, we aimed to delve into the concept of reciprocal contributions, emphasizing the cultural practices and linked with ontological and cosmogonic dimensions in the Chilean Patagonian archipelago. Our assessment of the 'Corralitos de pirene' on Apiao Island has revealed a collective tradition deeply rooted in Indigenous heritage, which has allowed the establishment of mutually favourable relationships between local families and rockfish (*pilles*) through the construction of intertidal walls that, eventually, become ecosystems for many other species. With regards to underwater rearrangements in the Aysén region, we find a practice that operates under the same underlying principle: a deep understanding of the ecosystem to the extent that the practitioners know which species must be relocated to restore vital relationships, allowing many other species to return and repopulate the seabed that has been depleted by overexploitation. Both cases are examples of biodiversity activation based on cultural practices deeply rooted in local history. These exchanges between humans and biodiversity, or vice versa, demonstrate cooperation that results in material and immaterial

benefits. Food, shelter and affection are interwoven in these practices and serve as sources of rituals and oral history (Gruber & Sanda, 2019), enhancing identity formation. Documenting, disseminating and understanding how this cooperation between humans and species unfolds are key for establishing responsible management policies for socioecological systems (Ojeda et al., 2022; Van Der Wal et al., 2022). We find that reciprocal contributions rooted in ontological and cosmogonic approaches can nourish the development of coastal territorial management, including initiatives like Marine Spaces for Indigenous Peoples (ECMPO) and Benthic Resource Management Areas (MEABR), alongside other measures linked to public policies associated with the positive relationship between people and nature.

AUTHOR CONTRIBUTIONS

Ricardo Alvarez, Jaime Ojeda and Florencia Diestre conceived the ideas and designed methodology; Ricardo Alvarez, Florencia Diestre, Daniel Caniullán, Juan Catín, Pésida Cheuquenao, Yohana Coñuecar, Nelson Millatureo and Pedro Jara collected the data and participated in the interviews; Ricardo Alvarez and Florencia Diestre analysed the data; Ricardo Alvarez led the writing of the manuscript. All authors contributed critically to the drafts and gave final approval for submission.

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CONFLICT OF INTEREST STATEMENT

Daniel Caniullán, Juan Catín, Pésida Cheuquenao, Yohana Coñuecar, Pedro Jara, Nelson Millatureo and Darly Vargas are members of the Williche Indigenous communities. As knowledge holders, they actively share their expertise and participate in the processes of applying for Indigenous marine areas. Their reflections and accounts were recorded and systematized by anthropologists Ricardo Alvarez and Florencia Diestre, who ensured that they reviewed and approved the content of this manuscript.

DATA AVAILABILITY STATEMENT

The data supporting this study are cited in the manuscript. Transcripts and interview notes are not published to protect the confidentiality of the participants during the interviews.

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