



OPEN ACCESS

EDITED BY

Dorota Kotbuk,
University College Dublin, Ireland

REVIEWED BY

Robert Eliakim Katikiro,
University of Dar es Salaam, Tanzania
Julian Olaya-Restrepo,
Stanford University, United States

*CORRESPONDENCE

Veronica Relano

✉ relano.ecija@gmail.com

Sierra Christodoulou

✉ sierrachristodoulou@gmail.com

RECEIVED 30 May 2025

ACCEPTED 30 July 2025

PUBLISHED 21 August 2025

CITATION

Relano V, Christodoulou S, Carbajal M and Narvarte M (2025) Community cohesion in the absence of MPA co-design: transforming a paper park in the San Antonio Bay, Argentina. *Front. Ocean Sustain.* 3:1638573. doi: 10.3389/focsu.2025.1638573

COPYRIGHT

© 2025 Relano, Christodoulou, Carbajal and Narvarte. This is an open-access article distributed under the terms of the [Creative Commons Attribution License \(CC BY\)](#). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

Community cohesion in the absence of MPA co-design: transforming a paper park in the San Antonio Bay, Argentina

Veronica Relano^{1*}, Sierra Christodoulou^{2*}, Mirta Carbajal³ and Maite Narvarte⁴

¹EqualSea Lab, CRETUS, University of Santiago de Compostela, Santiago de Compostela, Spain,

²Onewater gUG, Neuötting, Germany, ³Fundación Inalafquen, San Antonio Oeste, Argentina, ⁴Centro de Investigación Aplicada y Transferencia Tecnológica en Recursos Marinos Almirante Storni (CIMAS-CONICET), San Antonio Oeste, Argentina

Successful co-design, incorporating different stakeholder perspectives, knowledge and needs is crucial for environmental initiatives, particularly during the Designation Phase of a Marine Protected Area (MPA), where science and local knowledge directly informs policy and governance. As more diverse stakeholders are involved in this phase, more socio-ecological factors are addressed. This contributes to a more objective management plan, accountability and conflict resolution early on, while simultaneously reducing any vested economic or development interests that may sway an MPA's objectives, rules and regulations. The San Antonio Bay MPA, located in Patagonia, Argentina, demonstrated a lack of multi-stakeholder collaboration and ineffective co-design during the MPA's designation phase that led to conflicts rather than solutions. Interviews conducted with locals described the visible socio-ecological consequences including unregulated tourism and unsustainable fishing, which can be often attributed to a lack of community cohesion, empowerment and participation within the MPA. This case study demonstrates how shorebird festivals, a community-led intervention grounded in local culture and livelihoods, can promote intergenerational pro-environmental behavior and stewardship in a "paper park," i.e., MPAs that are legally designated but ineffective. Through multisector/level partnerships, culturally relevant engagement, the leveraging of media, and bottom-up initiatives, this shorebird festival raises awareness and collective responsibility for the San Antonio Bay MPA and has led to the promotion of other shorebird festivals in Argentina and abroad. Thus, while the festival plays an undeniable and vital role in fostering stewardship and driving positive local change, its full impact in securing the MPA's future is realized when complemented by the state fulfilling its fundamental responsibilities for conservation and addressing pre-existing structural flaws. This must be achieved by enacting local, regional, national and international policies that formalize co-management structures. Such policies could grant community stakeholders a legal and institutionalized role in MPA governance and decision-making, turning paper parks into effective conservation areas that meet the socio-ecological objectives for which they were created.

KEYWORDS

marine protected areas, MPA management, co-design, community engagement, San Antonio Bay, paper parks, festivals, place-based stewardship

1 Introduction

Co-design is an iterative, science-based process resulting from a collaborative and inclusive approach to governance, ensuring that all stakeholders can contribute to environmental decision-making (Pohl, 2008). It fosters active dialogues between stakeholders, scientists, and policy-makers and advocates for multi-stakeholder collaboration. Successful co-design is essential for the effective management of Marine Protected Areas (MPAs) (Giakoumi et al., 2018; United Nations Environment Programme, 2017), enhancing the ability to tackle the root causes, impacts and potential solutions to environmental problems. This approach can not only lead to a fundamental shift in MPA operations but also can support the achievement of environmental, social and economic objectives (Lacey et al., 2018; Moser, 2016).

Co-design is particularly critical during the early phases of MPA establishment, especially during the designation phase where scientific data heavily influences the development of policies, rules and regulations of MPAs' management (White et al., 2006). Effective and equitable co-design, conducted through data and discussion, means more socio-ecological needs are factored into the MPAs' overall governance structure and long-term objectives (Grorud-Colvert et al., 2021). However, designing and establishing an MPA is a complex process that can span various timeframe and geographic scales (The MPA Guide, 2025).

However, what can be done when an MPA has not been co-designed? While it is impossible to change the past, an alternative approach is to keep the community informed and united by fostering dialogue and encouraging a sense of ownership. For younger generations, this can ignite curiosity and a sense of responsibility, while for older generations, it can foster empowerment and active participation. Previous studies have demonstrated that community engagement activities often lead to improved coastal conservation outcomes and a stronger commitment to co-managing protected areas (Day, 2017; Fidler et al., 2022; Huang et al., 2024). Additionally, intergenerational activities and shared experiences have been shown to promote conservation behaviors and strengthen community cohesion, enhancing collective efforts to protect the environment. For example, a survey done in three rural Chinese villages demonstrated that pro-environmental behavior amongst villagers mediated through social cohesion, public participation and place identity positively impacted social-ecological resilience (Sun et al., 2024). Furthermore, engaging communities in participatory monitoring and adaptive management not only improves conservation outcomes but also builds trust and transparency between governing bodies and local populations (Bennett et al., 2021; Diedrich et al., 2017; Gaymer et al., 2014; Roberts and Jones, 2013). Such approaches demonstrate that even when co-design was not initially possible, it is never too late to establish meaningful collaboration and cultivate a long-term culture of stewardship.

Place-based stewardship is pro-environmental behavior conducted through personal values and emotional attachments and directed toward the local environment (Gottwald and Stedman, 2020). It integrates the unique features and socio-ecological processes of the local region, thereby incorporating culturally-relevant experiences into management and

decision-making (Cockburn et al., 2018; Jennings et al., 2024). Arts and cultural festivals have shown to promote place-making through the development of events that instill a sense of belonging to the local area and connection within the community (Brownnett and Evans, 2019; Son and Krolkowski, 2024). Festivals promote social cohesion, collaboration and meaningful social relationships, inspiring local pride and shared history. Community gatherings also boost active participation in collective decision-making, encouraging local citizens to stay informed about changes within their locality (Brownnett and Evans, 2019; Son and Krolkowski, 2024).

The case study of the San Antonio Bay Natural Protected Area in Northern Patagonia, Argentina, demonstrates how festivals and multi-sectoral collaboration can promote a sense of community and belonging, which is an integral part for effective management of an MPA, despite the conflicts between stakeholders and the lack of co-design in the early stages of the Designation Phase that resulted in a poorly-designed management plan. Community-led interventions have progressively fostered informal practices of co-design, encouraging place-based stewardship of, and locally grounded engagement with, the protected area.

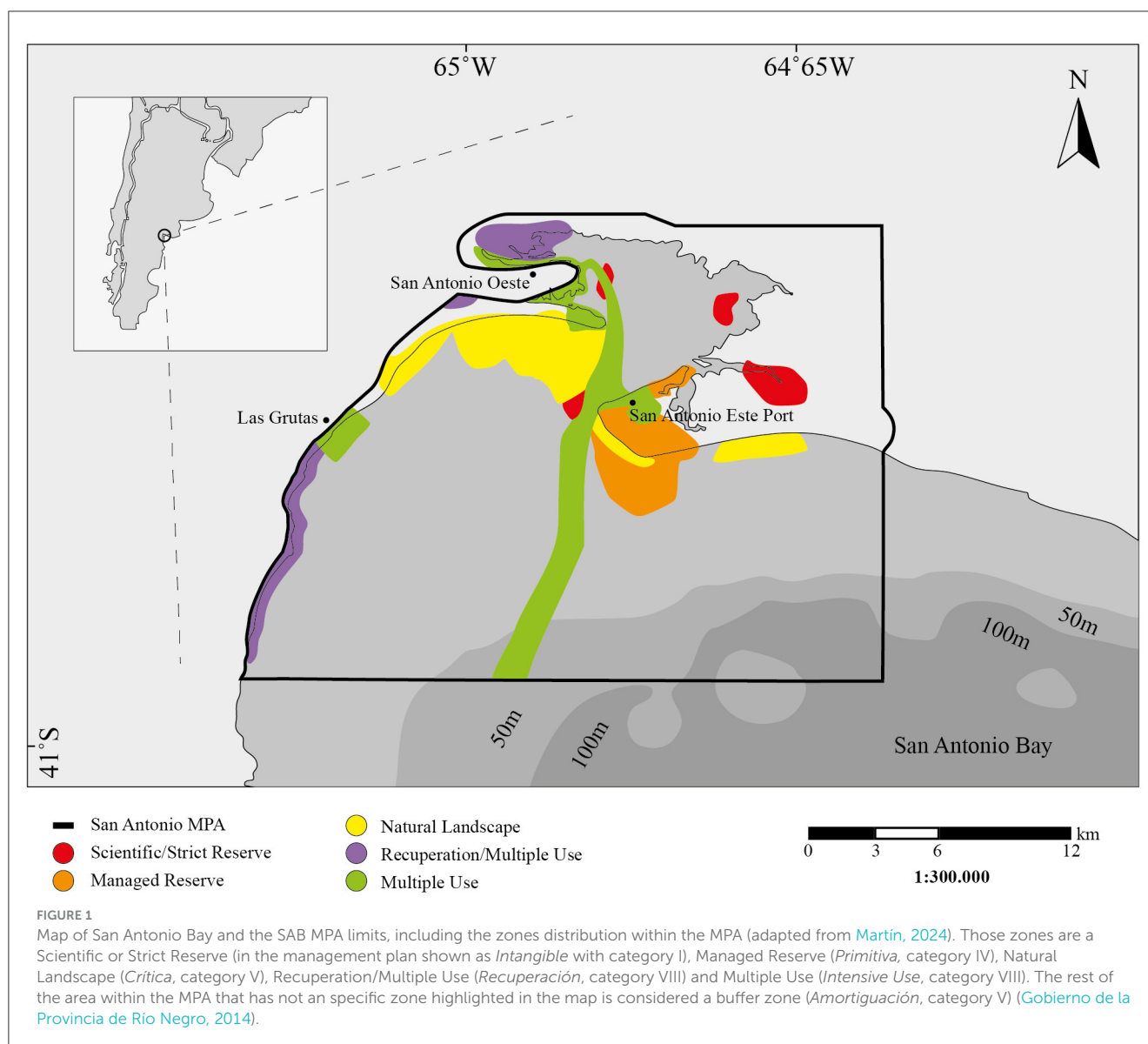
2 Context

2.1 Argentina and the San Antonio Bay MPA

Argentina's Exclusive Economic Zone (EEZ) spans 1,082,467 km². Of this, 128,759 km² are designated as MPAs, accounting for about 12% of the country's national waters (UNEP-WCMC, 2025). However, <2% of these MPAs are actively implemented or effectively managed (Marine Conservation Institute, 2025). *Note: These figures do not include the Islas Malvinas- Falkland Islands due to their disputed sovereignty and separate administrative system.*

The San Antonio Bay Natural Protected Area (ANPBSA) in Spanish but from now on in this paper, this will be referred to as San Antonio Bay MPA and with the acronym of SAB MPA) spans approximately 812 km² of which 592km² is marine area (Gobierno de la Provincia de Río Negro, 2014) (Figure 1). The MPA, situated in the northwest of the San Matías Gulf, is home to 29,284 inhabitants, according to the most recent official census conducted in 2010 across San Antonio Oeste, Las Grutas, and San Antonio Este (Gobierno de la Provincia de Río Negro, 2014). Characterized by sandy/shell beaches, rocky shores and an extensive salt marsh (AMP Argentina, 2025; Salas et al., 2016), this high primary productivity area sustains a rich diversity of marine and coastal species (Gobierno de la Provincia de Río Negro, 2014). The MPA is multi-zone with varying levels of protection, in accordance with the categories established under provincial Law 2669.

The SAB MPA was designated in 1993 under provincial Law MN°2670/93. The MPA was created with the primary objective of protecting and conserving the environments on which the reproduction, rest and feeding of various birds, both residents and migratory, depend (Law MN° 2670/93) “*To protect and conserve the environments on which the reproductive, resting and feeding localities of diverse resident and migratory birds depend, as well as to protect the faunal species and organisms that rest, feed or reproduce in the Bay area*” (Gobierno de la Provincia de Río



Negro, 2014). In 1993, this site was also recognized as an area of ecological importance and classified as an International Reserve of the Hemispheric Network of Shorebird Reserves (AMP Argentina, 2025; WHSRN, 2019), with 16 bird species classified as globally threatened (BirdLife International, 2024). Furthermore, in 2008, BirdLife International designated San Antonio Bay as an Important Bird Area (IBA) (AMP Argentina, 2025; BirdLife International, 2024). Over 18 species of shorebirds rely on it as a migratory and/or non-breeding stopover site, with a minimum estimate of 70,000 specimens present in the bay simultaneously (Gobierno de la Provincia de Río Negro, 2014). Specifically, between 25% and 50% of the total population of the Rufa Red Knot (*Calidris canutus rufa*)—estimated at 30,000 individuals—passes through San Antonio Bay during their southward migration from the Arctic to Tierra del Fuego, which spans an expansive distance of 16,000 kilometers (Gobierno de la Provincia de Río Negro, 2014; González et al., 2006). This species has declined by 40% since 2000 (González et al., 2004) and is listed as endangered under the Bonn Convention.

Despite SAB MPA being designated as a protected provincial natural area in 1993, the management plan was only published in 2014 under provincial decree No.398/2014, meaning the protected area was in the designation phase for over two decades (Gobierno de la Provincia de Río Negro, 2014). Furthermore, it was only in 2008, through provincial decree M No.1003/2008 that the boundaries were established and clearly defined (Decreto Provincial M No, 1003/2008). This puts into question the effectiveness of this MPA, as an MPA that was designated for an extended time without being implemented is often referred to as a “paper park” (Gorud-Colvert et al., 2021; Relano and Pauly, 2023).

The long-standing designation, coupled with the lack of proper implementation, has left this MPA vulnerable to the severe environmental and human-use challenges it continuously faces, despite its ecological importance (AMP Argentina, 2025). These include improper chemical waste (Fricke et al., 2015; Gastaldi et al., 2024; Häder et al., 2020; Helbling et al., 2022, 2024; Martinetto et al., 2011; Seco Pon and Pereyra, 2021), spread of exotic species

(Schwindt et al., 2014; Pereyra et al., 2021; Arcángel et al., 2022; de la Barra et al., 2023), overfishing (Florez et al., 2024; Ocampo Reinaldo et al., 2023; Romero et al., 2017), unplanned urbanization (Bonuccelli and Narvarte, 2017; Bonuccelli et al., 2021), and unregulated tourism (Beltrami and Martínez, 2019).

Since becoming a recognized protected area, San Antonio Bay's tourism industry boomed. Between 2006 and 2008, the resorts near the MPA faced the highest growth rates in the country (Gobierno de la Provincia de Río Negro, 2014). However, the influx of tourists has led to the deterioration of many dunes and other sensitive ecosystems—which serve as critical feeding and nesting grounds—due to motorized vehicles and increased beach access (Gobierno de la Provincia de Río Negro, 2014). With the growing tourism industry, the municipal landfill in San Antonio Oeste is reaching its limits and resulting in infectious hotspots, illegal dumping, and significant landscape degradation. Notably, the landfill is located just ~3 km from the nearest residential area or community space, posing additional health and environmental risks for local residents (Gobierno de la Provincia de Río Negro, 2014). Poor management of industrial waste and sewage has spilt heavy metals and effluents into surrounding environments, leading to eutrophication (Saad et al., 2019; Caniguan et al., 2025) and health risks for both biota (Marinho et al., 2017; Vázquez et al., 2007) and humans (De Pietri et al., 2008; Gobierno de la Provincia de Río Negro, 2014). For example, anthropogenic debris such as plastics and paper have been found in the nests of marine birds (Seco Pon and Pereyra, 2021), and children between the ages of 6–8 in San Antonio Oeste were found to have elevated blood lead levels exceeding permitted levels (Comisión Multisectorial, 2015). Earlier implementation of zoning and waste management regulations, sustainable tourism guidelines, and stakeholder education initiatives for planners and tourism operators could have mitigated the impacts of the seasonal tourism surge faced by the SAB MPA between its designation in 1993 and the approval of its management plan in 2014.

2.2 A lack of co-design in practice

To understand the dynamics of co-design during the designation phase of the SAB MPA and how key actors perceive the SAB MPA 8 years after the management plan was implemented, the first author conducted 15 semi-structured interviews in January 2022. The interviews quoted in this article were originally collected for a previous study (Relaño Écija, 2022). For that study, all participants provided written informed consent to participate. The research protocol was approved by the Behavioural Research Ethics Board of The University of British Columbia on 16 April 2021 (ethics ID number H20–03281A003PAA) and involved stakeholders from various sectors, including local NGOs, scientists, tourism boards, fishers, and government officials. They revealed both voluntary and involuntary forms of stakeholder exclusion, highlighting key barriers and opportunities for improved management. To design the interview questions, the first author reviewed both gray and academic literature and held informal discussions with key actors involved in the MPA, who were selected for their generational ties to the area predating its designation and their direct or indirect dependence on it for their livelihood.

It's important to note that they were not the same actors who participated in the original designation of the MPA in 1993, though they come from the same stakeholder groups.

Despite the management plan, published in 2014, stating that participatory planning “through an active-consultative type of participation with direct representation” was a priority during the designation phase (Gobierno de la Provincia de Río Negro, 2014), data from the interviews contradicts this. The interviews suggest that participation was skewed toward certain actor groups, undermining the intended balanced representation. The management plan states that 49 stakeholders with supposedly different but direct interests in the management of the MPA were involved. The management plan also states that all stakeholders were heard and willing to yield their positions for the “greater good” (Gobierno de la Provincia de Río Negro, 2014). However, this contradicts the list of actors—also outlined in the management plan—who participated in meetings during the proposed and designated stages, as they did not represent the broader community interests in the MPA, for unknown reasons (Figure 2). Nearly 50% of stakeholder involvement came from government institutions, with no representation from fishers, who represent a key economic activity in the region (Gobierno de la Provincia de Río Negro, 2014). This may stem from a combination of factors, such as selective inclusion, the convenience of choosing familiar and readily-available stakeholders, and time and budgetary constraints.

During the semi-structured interviews, a scientist from a local university explained “*There was quite active participation of some members ... but very important ones were missing, including artisanal fishing, which practically has not been included*”. The reasons for their absence could vary widely, ranging from not having received information about the meetings, lacking the time or capacity to attend, or even feeling that the issues discussed were unrelated to their concerns—even when the meeting information had been properly communicated. The use of technical language, lack of mutual knowledge exchange, and absence of trust may also discourage fishers from attending meetings, which could have been mitigated with the use of adapted materials and facilitators. As Hoschke et al. (2024) point out, these power dynamics and one-way knowledge flows can hinder genuine fisher engagement in marine governance processes. Their lack of engagement in the SAB MPA underscores a broader challenge in fostering inclusive participation, as artisanal fishers are key stakeholders whose input is vital for effective and equitable management of the protected area. Addressing these barriers to participation should be a priority to ensure holistic and representative governance.

A retired artisanal fisher explained “*We told the Fisheries [Secretary] to protect the sea. But there is no protection here, [...] we are going further and further out to fish*”. Another artisanal fisher explained how commercial fishers of hake and shrimps are using nets unsustainably: “*[Commercial fishers collect] bags of 400 crates' worth of fish and seafood, and of those 400 crates, only 100 crates go into the hold ... [due to fish size regulations]. The other 300 go back into the water, dead*”. These statements directly reflect the ongoing unsustainable extraction of fish stocks in the MPA and its vicinity, and the lack of communication between different authorities, underscoring a critical barrier to effective MPA management. They also highlight the need to prioritize increased participation of artisanal fishers and other key stakeholders to ensure holistic and

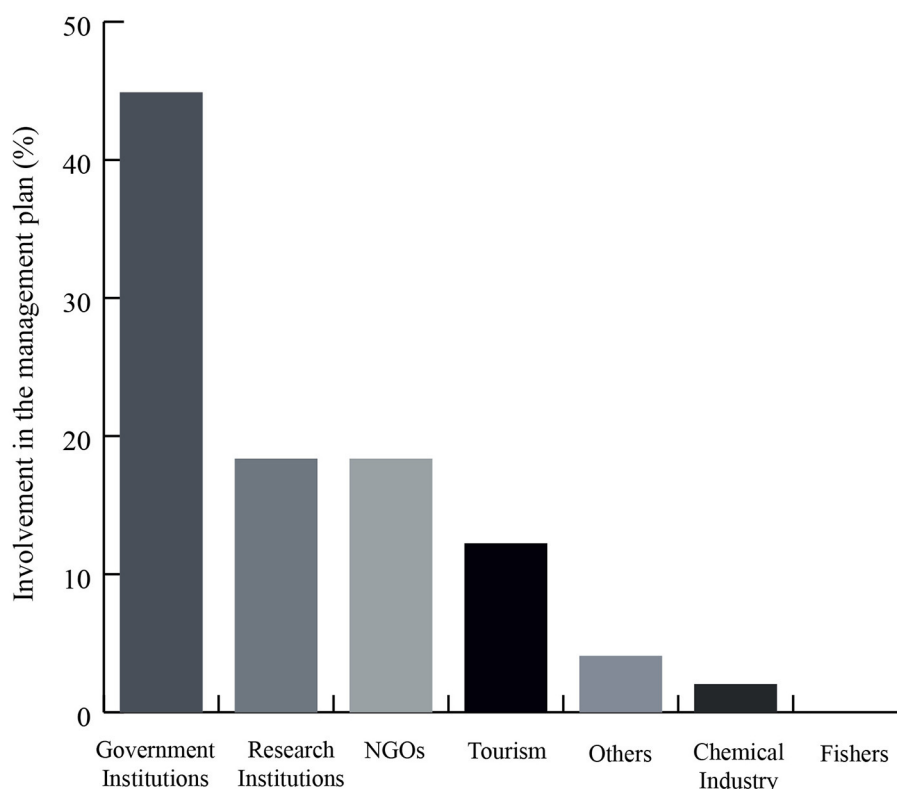


FIGURE 2

Stakeholder groups involved in the proposed and designated stages of the San Antonio Bay MPA (Gobierno de la Provincia de Río Negro, 2014): Government institutions (45%), Research institutions (18.4%), NGOs (18.4%), Tourism (12.2%), Others (4%), Chemical Industry (2%) and Fishers (0%). "Others" includes individuals not fitting the six main categories or spanning multiple types.

representative governance. However, in some cases, stakeholders voluntarily chose not to participate. As the Secretary of Tourism of Río Negro explained, *"I participated in the drafting of the Management Plan... of course the work teams invites all the people and institutions that it considers [...] [to] have some direct or indirect impact [...], what often happens is that not all of them participate"*.

Additionally, many local stakeholders exhibit a significant disconnect from the environment that surrounds them. As a biologist with decades of experience working in this area explains, *"I think that people know very little about this protected area. If they know that there is a protected area, they see it almost as an impediment and not as an opportunity for a better place"*. This is further exemplified by the following statement from the President of the San Antonio Bay Environmental Protection Agency in 2022, *"For us, the most serious problems that we have regarding damage to the area or non-compliance with the regulations come from the local people... [for example, with] shorebirds, [locals] recognise them as an economic resource that allows them to extend the [tourist] season [for business]"*.

Some interviewees noted that, instead of fostering solutions, conflicts among stakeholders emerged during the MPA's designation phase. As a businessperson involved in eco-tourism remarked, *"We didn't go hand-in-hand, but rather we went crashing into each other"*. Rapid tourism growth can introduce new prospects to the local community that define success through economic outputs, often leading to extractive and unsustainable

practices and place alienation (Cocola-Gant, 2023; Higgins-Desbiolles et al., 2019). Others emphasized the importance of renewing the management plan and incorporating more co-design processes. The San Antonio Bay Environmental Protection Agency explained, *"We must work on updating the management plan, and there must be discussions with all sectors regarding uses [...] These conflicts of uses that we have must be resolved in this new period so that it is easier for people to understand why we have a Natural Protected Area [...]"*.

The SAB MPA serves as an example of how the absence of stakeholders in the initial stages of MPA creation, and shortcomings of the participatory strategy during the management plan, can result in a poorly co-designed management plan and conflicts that lead to subsequent environmental degradation in the area (Bianchini et al., 2018). This highlights the importance of developing an inclusive and comprehensive participatory approach for the main actors within the MPA such as fishers and tourism operators, that ensures the involvement of a wide variety of stakeholders in management discussions, accurately representing all those who depend on the MPA. However, as evidenced through these interviews, many stakeholders voluntarily chose not to participate in MPA management discussions or exhibited a disconnect from their environment. This is why, collectively designing and managing a protected area requires a fundamental shift *"of a system's form, structure, function or purpose"* (Moser, 2016). This challenge is echoed by the Secretary of Tourism

Development in Río Negro, who, when discussing the obstacles to implementing change, remarked: “[...] *the sustainable development proposal often implies a change in community customs that are entrenched in popular culture*”.

This is why the intervention presented in this paper focuses on engaging local communities by leveraging popular culture and utilizing spaces traditionally used for sharing and leisure among different transgenerational actors. The aim is to highlight the importance of the MPA and foster a sense of shared responsibility in its proper management—an endeavor in which everyone can play a part.

2.3 Intervention objective and community

The objective of this intervention is to demonstrate that community-building activities, such as festivals celebrating the arrival of a migratory species—originally the inspiration for establishing this protected area—can effectively foster intergenerational engagement and multi-sectoral collaboration. These events bring together diverse actors from different backgrounds and with varying interests, while simultaneously enhancing a shared sense of responsibility and ownership for the protection of the coastal environment. By leveraging emblematic or characteristic species to connect with the community, these initiatives can align conservation goals with cultural traditions. Incorporating activities such as music and food festivals, artisanal markets, and other local traditions into the community-building festival not only celebrates the arrival of the shorebirds but also reinforces a collective appreciation for the area's unique natural beauty.

The intervention is the Shorebird Festival (in Spanish: Festival de Aves Playeras), primarily coordinated by Fundación Inalafquen, is a community-wide initiative that engages both residents and tourists in the protection and conservation of the San Antonio Bay area. The festival involves multiple communities, including residents, tourists, educational institutions, and various organizations, creating a diverse and inclusive platform for environmental education and engagement. Since 2010, this annual event has celebrated the presence of migratory shorebirds within the MPA, aiming to foster a commitment to their conservation.

The primary goal is to raise awareness about the ecological significance of shorebirds and their habitats among a broad audience. By engaging the community through educational and cultural activities, the festival seeks to instill a sense of stewardship and encourage active participation in conservation efforts, thereby promoting the festival promotes better management of the San Antonio Bay MPA. It educates the public on the importance of conservation, promotes responsible use of natural resources, and encourages collaborative efforts among stakeholders, enhancing the overall effectiveness of the MPA's management strategies.

This approach encourages deeper community connection to the environment, fostering stewardship behaviors that extend beyond the festival itself. By instilling pride in local, natural and cultural heritage, these events inspire citizens to demand better coastal decision-making and governance. Moreover, such initiatives create opportunities for intergenerational learning,

where younger generations gain insights into traditions and ecological values, while older generations feel empowered by their role in mentoring and sharing knowledge. Ultimately, these festivals can catalyze sustained community mobilization, stronger conservation outcomes, and the promotion of inclusive and participatory coastal governance.

3 Detail

The festival was included as a strategic contribution to achieving the protection of key habitat during the Rufa Red Knot migration as part of a co-designed social marketing campaign known as the PRIDE campaign supported and guided by Rare Conservation in collaboration with Western Hemispheric Shorebird Reserve Network (WHSRN). The PRIDE campaign was a multi-step initiative that involved various actors from the community (e.g., tourist companies, school teachers, local officials, students, and environmental guards) that aimed to develop key actionable activities to promote conservation, awareness and social cohesion in the San Antonio Bay, thereby accommodating diverse demographics and facilitating the co-designing of the festival.

From this information campaign arose various activities, including workshops, Environment Art Day, school visits and field trips, and shorebird mascots and merchandise, often organized through co-designed collaborations with other organizations such as Rare Conservation and educational centers (Fundación Inalafquen, 2019). These activities were combined to develop the Shorebird Festival, engaging the community and youth to raise awareness of the values and problems of the MPA and promoting collective responsibility of, and place-based stewardship for, the wellbeing of the shorebirds and the local ecosystems.

3.1 Co-design strategies and behavior change

The PRIDE campaign aimed to transform behaviors and intentions within the Bay community to limit any barriers to, and negative perceptions of, coastal and marine conservation. Behavior changes are a crucial factor in the long-term success of conservation efforts as it leads in a behavioral shift of the local community in how they interact with and perceive their environment (Ashley et al., 2019; Sullivan-Wiley et al., 2023). Participants in a study by Gkargkavouzi et al. (2020) highlighted how information campaigns and educational initiatives are crucial to influence attitudes and perceptions to enact positive behavior intentions. The PRIDE campaign used community survey results (targeting residents, tourists, beach users and students) to guide its strategy for enhancing conservation, social cohesion, and engagement (Fundación Inalafquen, 2019).

3.2 Partnerships

To organize and co-design these activities at the festival ensuring the involvement of the community required the collaboration of various organizations and the San Antonio

Municipality. The collaborators, diverse in their specialization and type of entity, represent a large variety of backgrounds and expertise, adding strategic value to the festival each year. The collaborators across the editions included companies, shops, hotels (31%), entrepreneurial artisanal craftswomen (28%), non-profits (22%), municipal and provincial government (8%), others (7%) and educational institutions (4%).

The collaborators for each edition changed every year depending on thematic, human resources to search for collaborations, and institutional and/or personal interest. One factor that may help explain the widespread acceptance and visibility of the festival is the formal endorsement it received under Provincial Law 4644 in 2011, although the collaboration agreements are not formalized under this law. Specifically, Article 4 of the law states that “all activities to be carried out in relation to the Migratory Shorebirds Week shall be considered of provincial interest of provincial interest and will be sponsored by the Legislature of Río Negro” (LEY No 4644, 2010).

4 Discussion

The annual Shorebird Festival in the San Antonio Bay demonstrates how community engagement can support conservation efforts, which are defined by Sandbrook (2015) as “actions that are intended to establish, improve or maintain good relations with nature”, especially where top-down MPA establishment and management failed. The annual festivals have resulted in a variety of learned lessons (presented in this section 4.1–4.4) in engaging collaborators and community members into promoting conservation efforts through social campaigns. Organizing a diverse and engaging festival comes with many challenges, but also great benefits to the local community, and the local ecosystem. These lessons would be valuable to anyone wanting to promote community-level behavioral changes and place-based stewardship.

4.1 Collaboration and multisector/level partnerships must be cultivated

The first and second editions of the festival were organized by Inalafquen with funding from Rare Conservation. Legal declarations and the active dissemination of festival activities and successes through social media played a key role in securing additional funding and support for future editions. As a result, a growing number of institutions—both governmental and non-governmental, at national and international levels—contributed in various ways. These included providing financial support, proposing activities, and sending workshop leaders, exhibitors, and panelists to participate in different sessions. Some of the key supporting institutions were Legislature of Río Negro, Secretary of the Environment and Climate Change, Municipality of San Antonio Oeste, Aves Argentinas, Fundacion Felix de Azara, Fundación Ambiente y Recursos Naturales, WHSRN, Women4Biodiversity, and International Conservation Fund of Canada, among others.

Financial assistance from local businesses and companies evolved, with some editions being supported entirely with

contributions from neighbors and local businesses. It demonstrated the community’s awareness of the importance of conserving the attributes and functions of the SAB MPA, who appropriate the festival and consider the festival crucial in terms of developing a meeting space that multiplies socio-environmental values. New actors and greater weight in the human dimension have made it possible to achieve positive results in a sustained manner with the community.

Building collaborative momentum requires strategic cultivation. The festival’s growth demonstrates the power of starting with dedicated partners like Inalafquen and Rare Conservation and strategically leveraging initial successes (Fundacion Inalafquen, 2019). To empower the festival in the long-term, recognition and active communication (social media, press coverage) were crucial for attracting a widening circle of collaborators. This highlights the importance of actively showcasing value and impact to build sustained multi-level partnerships and diversify funding streams, moving toward community ownership.

However, while the growing involvement of local businesses and residents highlights the community’s commitment to the San Antonio Bay and its MPA, the presence and active participation of the state remain essential. The voluntary efforts and financial contributions from neighbors, though inspiring, cannot substitute the need for sustained governmental action and policy implementation. The festival itself stands as living proof of how deeply rooted environmental awareness is becoming in the region, serving as a catalyst for collective engagement and cultural recognition of the MPA’s value. Despite this growing consciousness, many of the structural issues threatening the area—including pollution, habitat degradation, and insufficient enforcement of regulations—persist. These challenges require coordinated institutional responses, long-term planning, and adequate funding. In this sense, the festival’s success should be seen not as an endpoint, but as a strong call for reinforced public responsibility and strategic collaboration between civil society and the state.

4.2 Culturally relevant engagement can foster broad participation

Leveraging popular culture and local traditions (e.g., music, food, artisanal markets) within the festival framework proved highly effective in attracting diverse, intergenerational community members and multiple sectors. For example, involving rangers and artists who can present their work supports local livelihoods and collaboration. Grounding conservation messaging within familiar social and leisure spaces helped bridge the gap between environmental goals and community customs, fostering a sense of shared identity and collective appreciation for the MPA’s natural heritage.

4.3 Leveraging media, different forms of communication and activism

Multifaceted communication amplifies reach and impact. Employing a diverse range of communication methods and



activities with various organizations and community members, from performances and workshops to visual arts and online campaigns, maximized the festival's appeal across different demographics and interests.

To disseminate information about the festival and mobilize the community, audio media like local TV and radio channels (SAO TV, Canal 10, Radio Municipal, Radio 90.7) were used to keep residents informed. Physical visual media like newspapers (Informativo hoy, Diario Río Negro, Noticias Net) were also used to inform residents of the festival. With the assistance of a graphic designer, flyers and posters with the festival logo were created to share information on the festival in community and high-pedestrian traffic areas and allowed the festival to be more recognized and thematic (Figure 3). Social media, notably Facebook (accounts like Fundación Inalafquen, Festival Aves Playeras Bahía San Antonio) and Instagram (accounts under the same name), were used to target younger audiences. Lastly, word of mouth was equally very powerful between neighbors, families and friends.

As the festival's visibility expanded nationally, there was also greater press coverage internationally. The #weareallshorebirds campaign, created as an activity of the festival to gain visibility in social media, expanded to more than 19 countries and more than 190 institutions (Figure 4). This holistic approach not only increased local participation but also significantly boosted national

and international visibility and amplified the conservation message far beyond the immediate locality.

The San Antonio festival acted as one of the first promoters of shorebird festivals for other regions in Argentina, including: Río Grande (Tierra del Fuego), Río Gallegos (Santa Cruz), Mar Chiquita (Cordoba), Bahía de Samborombon (Buenos Aires), and Albufera Mar Chiquita (Buenos Aires). The success of the festival also reached Peru (Lambayeque) where they celebrated their 8th festival in 2024 and in Mexico (La Paz, Baja California Sur) where they celebrated their 2nd festival in 2025 (Figure 5).

4.4 Bottom-up initiatives can introduce co-design elements post-hoc

The San Antonio Bay case demonstrates that even when an MPA lacks co-design in its initial phases, community-led initiatives can retrospectively introduce crucial elements of participatory management. By fostering dialogue, collaboration, and shared ownership at the community level, the Shorebird Festival helped mitigate some of the apathy and conflict resulting from the initial top-down approach (Bianchini et al., 2018), demonstrating that co-design principles can be dynamically applied to improve MPA

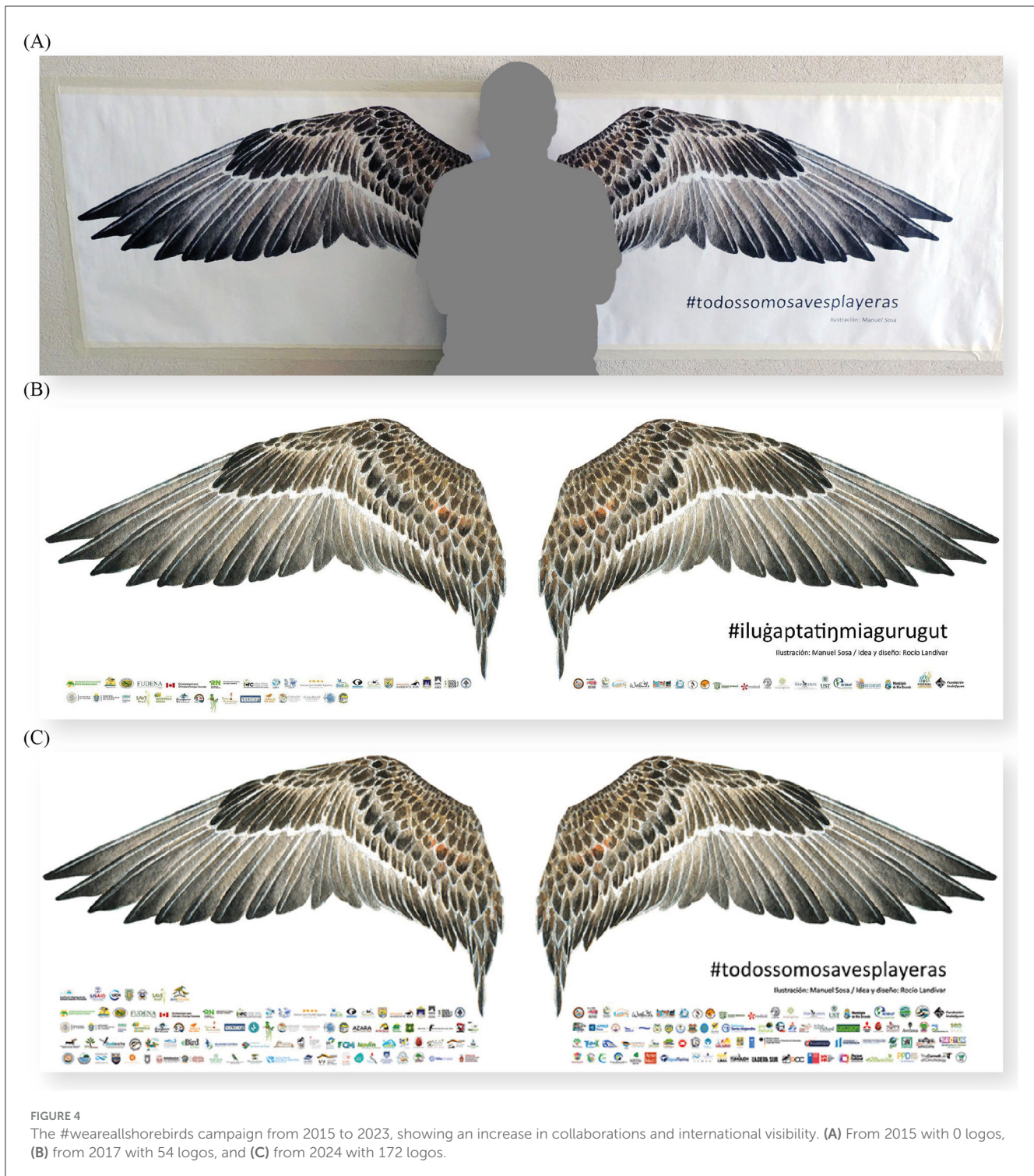


FIGURE 4

The #weareallshorebirds campaign from 2015 to 2023, showing an increase in collaborations and international visibility. (A) From 2015 with 0 logos, (B) from 2017 with 54 logos, and (C) from 2024 with 172 logos.

effectiveness and ownership over time. Co-design can be a flexible, influential and dynamic process, although ideally should always be put in practice from the very first stages of planning an MPA.

The Shorebird Festival at the SAB MPA demonstrates the importance of community engagement and social cohesion in safeguarding coastal ecosystems and shorebirds. The festival provided a bottom-up approach to increasing multi-sector collaboration, co-designed activities, and environmental

stewardship. The lack of co-design in an MPA, whilst more effective and should be implemented at the designation phase of the MPA, does not disqualify co-design from being implemented later on to mitigate and rectify the apathy, conflict and exclusion that for example, the San Antonio Bay community faced during the development of the MPA.

Community festivals can catalyse stewardship and activism. Since the launch of the festival, alongside a growing awareness

(A)



(B)



(C)



FIGURE 5

Examples of other shorebird festival posters in other regions and countries. (A) Mar Chiquita, Cordoba, Argentina (B) La Paz, Baja California Sur, Mexico (C) Lambayeque, Peru.

of the environmental degradation affecting the SAB MPA, a segment of the community has come to recognize that their well-being, health, and the sustainability of local fishing and tourism activities are directly tied to the bay's conservation and ecological quality. This Shorebird Festival served as more than an annual awareness event; it actively nurtured a sense of stewardship and shared responsibility for the MPA. Here awareness has translated into concrete actions, such as tangible pro-environmental behaviors (increased respect for MPA zoning and regulations) and broader civic action, such as community

mobilization against detrimental development projects (e.g. oil/gas) (Duarte and Rebella, 2023).

By highlighting the importance of coastal bird species, festivals can influence policy and inspire conservation actions, ensuring the preservation of the MPA's ecosystems for future generations. Overall, the festival has proven to be a powerful tool for integrating social engagement with marine and coastal conservation. However, this does not diminish the crucial role of the government in supporting the MPA, as the formalization of the festival by the provincial government is not enough to address the ongoing

management issues faced by the area. Whilst the festival has been held since 2010 and was formalized in 2011, the 2014 management plan included no mention of the festival or any other community engagement initiatives (Gobierno de la Provincia de Río Negro, 2014), likely because these efforts originated from the Inalafquen Foundation rather than the government. So far, the festival's positive activism and environmental stewardship has not been assessed in terms of whether they have been translated into lasting policy or participatory changes reflected in management decisions or governance structures. Additionally, the fact that the management plan has not been updated since 2014 makes it challenging to analyse the festival's impact since then, though the interviews conducted in 2022 provide insight into the lack of institutional changes that have occurred between 2014 and 2022.

The continued inconsistency between the festival and the formal governance frameworks in the SAB MPA limit the positive ecological and formal participatory outcomes that could be cultivated from community-led interventions. Thus, further evidence is required to determine the direct impact of the festivals on management and ecological outcomes to understand the long-term dynamics of building trust and participation.

Additionally, according to Edgar et al. (2014), Gill et al. (2017), and Watson et al. (2014), which identified critical capacity shortfalls that limit the success of MPAs, the SAB MPA's management requires several urgent actions in order to promote the values and objectives put forward by the festival. Although not assessed during this study, systemic governance changes must be developed for long-term sustainability, replicability and impact of community interventions. First, the professionalization of management is essential, with authorities at all organizational levels requiring qualified professionals as staff. The lack of a local and professional authority and the absence of adequate office space to support effective administration are critical shortcomings. Second, the establishment of a sufficient and independent budget is crucial to support the hiring and training of environmental guards, ensuring they are led by professionals and equipped for their roles (Gill et al., 2017). Lastly, clear and localized authority is necessary, ensuring that the management body is well-defined, knowledgeable about its responsibilities, and physically present within the territory to enable effective governance and coordination (Watson et al., 2014). Addressing these issues is vital for overcoming past challenges and achieving sustainable management of the SAB MPA, thereby continuing to empower communities and build social capital for sustained environmental defense.

5 Acknowledgments of limitations and opportunities

While the Shorebird Festival has yielded significant positive outcomes in community engagement and awareness, its impact is subject to several limitations within the broader context of the San Antonio Bay MPA's management challenges:

1. Inability to rectify structural management flaws: The festival, as a community-driven initiative, cannot fundamentally address core institutional weaknesses rooted in the MPA's lack of co-design and poor management. Ongoing issues like

pollution, habitat loss, weak enforcement, staffing gaps, budget shortfalls, and unclear authority require systemic state-led reforms beyond the festival's scope.

2. Dependence on sustained governmental support and action: While the festival reflects strong local commitment, it cannot replace the state's responsibility for long-term conservation. Effective MPA management depends on sustained government funding, policy enforcement, and professional staffing—areas where major gaps persist.
3. Governance efforts setback: The San Antonio Bay Local Conservation Authority—initially a successful forum for government and civil society to address local issues—has since deteriorated. As resource-based economic activities took priority, the authority stopped functioning; its last meeting was in August 2022.
4. Partial stakeholder reach: Although the festival engages a wide range of actors and strives for inclusivity, it may not reach stakeholders who have historically avoided marine governance or those who remain disengaged or alienated from conservation efforts.
5. Festival as a catalyst but not substitute for a management solution: Over time, the festival may act as a catalyst for the strengthening of formal governance frameworks and action, alongside meaningful policy changes. The festival inspires community engagement and awareness, highlighting the need for institutional action to convert community momentum into lasting conservation outcomes. However, it does not constitute a comprehensive management plan or governance structure for the MPA itself because its primary function is education and advocacy. Its success underscores the *need* for effective formal management and long-term conservation outcomes rather than replacing it.

This study focused on assessing the early stages of the local communities participating in the transformation of a paper park and increasing participatory strategies in informal settings, through qualitative methodologies. Whilst the Shorebird Festival demonstrates success in cultivating awareness of the protected area and facilitating community involvement, direct impacts to ecological and governance outcomes have not yet been clearly demonstrated. Therefore, we recommend further studies to analyze the connection of community actions and bottom-up approaches to co-manage the MPA, and assess the quantitative impacts of the festival, such as through a Posterior Participation Assessment. This will provide a more complete understanding of how perceptions in the MPA changed over time and what could be the role and long-term socio-economic and ecological benefits of a community-led intervention, such as a festival, to promote intergenerational pro-environmental behavior, stewardship in a “paper park” and participatory decision-making.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

Ethics statement

The interviews quoted in this article were originally collected for a previous study (Relaño Écija, 2022). For that study, all participants provided written informed consent to participate. The research protocol was approved by the Behavioural Research Ethics Board of The University of British Columbia on 16 April 2021 (ethics ID number H20–03281A003PAA).

Author contributions

VR: Writing – review & editing, Project administration, Formal analysis, Writing – original draft, Methodology, Data curation, Supervision, Resources, Investigation, Visualization, Conceptualization, Funding acquisition, Validation. SC: Investigation, Writing – review & editing, Conceptualization, Formal analysis, Writing – original draft, Data curation, Validation, Methodology, Visualization. MC: Writing – review & editing, Formal analysis, Investigation, Resources, Validation. MN: Resources, Validation, Writing – review & editing, Formal analysis, Investigation.

Funding

The author(s) declare that financial support was received for the research and/or publication of this article. This work has received financial support from the EqualSea (Transformative adaptation toward ocean equity) project. VR gratefully acknowledges the financial support received from “la Caixa” Foundation Fellowship (ID 100010434) with the Fellowship Code LCF/BQ/AA18/11680035.

References

- AMP Argentina (2025). *Coastal-marine MPA: Bahía de San Antonio*. Available online at: <https://ampargentina.org/areas/bahia-de-san-antonio/> (accessed 2 April 2025).
- Arcángel, A. E., Rodríguez, E. A., de la Barra, P., Pereyra, P. J., and Narvarte, M. (2022). Seasonal changes in facilitation between an ascidian and a kelp in Patagonia. *Mar. Ecol. Prog. Ser.* 693, 95–106. doi: 10.3354/meps14090
- Ashley, M., Pahl, S., Glegg, G., and Fletcher, S. (2019). A change of mind: applying social and behavioral research methods to the assessment of the effectiveness of ocean literacy initiatives. *Front. Mar. Sci.* 6:288. doi: 10.3389/fmars.2019.00288
- Beltrami, M., and Martínez, M. (2019). *Formulación del plan estratégico para el desarrollo turístico sustentable del municipio de San Antonio Oeste. PLAN 2030: Futuro turístico sustentable para Las Grutas, San Antonio Oeste y San Antonio Este*. San Antonio Oeste: Municipalidad de San Antonio Oeste.
- Bennett, N. J., Katz, L., Yadao-Evans, W., Ahmadi, G. N., Atkinson, S., Ban, N. C., et al. (2021). Advancing social equity in and through marine conservation. *Front. Mar. Sci.* 8:711538. doi: 10.3389/fmars.2021.711538
- Bianchini, A., Losada, A., Ortiz, N., Quintas Rufino, E., Salatino, L., Stucchi, R., et al. (2018). *Estudio preliminar de la percepción social en relación a las problemáticas ambientales en San Antonio Oeste y Las Grutas. Informe técnico N°03/2018*. San Antonio Oeste: Escuela Superior de Ciencias Marinas, Universidad Nacional del Comahue. Available online at: <https://bicyt.conicet.gov.ar/fichas/produccion/11860854> (accessed February 10, 2025).
- BirdLife International (2024). *San Antonio Oeste*. Available online at: <https://datazone.birdlife.org/site/factsheet/san-antonio-oeste> (accessed February 10, 2025).
- Bonuccelli, R. S., and Narvarte, M. (2017). *Manejo de aguas residuales en Las Grutas (Río Negro): ¿Matando a la gallina de los huevos de oro? Informe técnico N°02/2017*. San Antonio Oeste: Escuela Superior de Ciencias Marinas, Universidad Nacional del Comahue. Available online at: <https://bicyt.conicet.gov.ar/fichas/produccion/7285726> (accessed February 5, 2025).
- Bonuccelli, R. S., Narvarte, M., and Saad, J. F. (2021). *Disolución de rocas carbonatadas: Estudio preliminar sobre un proceso de karstificación en los acantilados de Las Grutas. Informe técnico N°01/2021*. San Antonio Oeste: Escuela Superior de Ciencias Marinas, Universidad Nacional del Comahue. Available online at: https://rdi.uncoma.edu.ar/bitstream/handle/uncoma/16070/Inf%20T%C3%A9cnico%20ESCiMar%20Nro%2001-2021_Karstificaci%C3%B3n%20del%20acantilado%20de%20Las%20Grutas%20C%20R%C3%ADo%20Negro.docx%20281%29.pdf?sequence=1&isAllowed=y (accessed February 5, 2025).
- Brownnett, T., and Evans, O. (2019). Finding common ground: the conception of community arts festivals as spaces for placemaking. *Health Place* 61:102254. doi: 10.1016/j.healthplace.2019.102254
- Caniguan, M. A., Becherucci, M. E., Gastaldi, M., Narvarte, M. A., and Saad, J. F. (2025). Seawater temperature and tidal action as modulators of Ulva spp. micropropagules density in a eutrophic coastal system. *Estuaries Coasts* 48, 774–789. doi: 10.1007/s12237-025-01517-0
- Cockburn, J., Cundill, G., Shackleton, S., and Rouget, M. (2018). Towards place-based research to support social–ecological stewardship. *Sustainability* 10:1434. doi: 10.3390/su10051434
- Cocola-Gant, A. (2023). Place-based displacement: touristification and neighborhood change. *Geoforum* 138:103665. doi: 10.1016/j.geoforum.2022.103665
- Comisión Multisectorial (2015). *El proceso hacia la remediación*. Available online at: <https://multisectorialplomo.org/2005-2015/> (accessed May 14, 2025).

Acknowledgments

VR sincerely thanks the Robin Rigby Trust Fellowship for Collaborative Coastal Research for its financial support for the fieldwork. A special thank you to Anne Weißkirchen for drafting and editing the figures and to the National University of Comahue and Fundación Inalafquen for their support during the fieldwork, as well as Salvador Luis Cambarieri and Guillermo Soria for introducing us to the locals of San Antonio Oeste, San Antonio Este and Las Grutas.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declare that no Gen AI was used in the creation of this manuscript.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

- Day, J. C. (2017). Effective public participation is fundamental for marine conservation: lessons from a large-scale MPA. *Coast. Manag.* 45, 470–486. doi: 10.1080/08920753.2017.1373452
- de la Barra, P., Pereyra, P. J., Gastaldi, M., Saad, J. F., Rodríguez, E. A., Narvarte, M. A., et al. (2023). Intertidal populations of *Ulva* spp. and *Undaria pinnatifida* are good habitat providers for invertebrates but not for fish. *Mar. Biol.* 170:91. doi: 10.1007/s00227-023-04238-9
- De Pietri, D. E., García, S., and Rico, O. (2008). Modelos geo-espaciales para la vigilancia local de la salud. *Rev. Panam. Salud Publica* 23, 394–402. doi: 10.1590/s1020-49892008000600004
- Decreto Provincial M N° 1003/2008 (2008). Available online at: <https://web.legisrn.gov.ar/digesto/normas/documento?id=2008100019&e=DEFINITIVO> (accessed 23 November 2024).
- Diedrich, A., Stoeckl, N., Gurney, G. G., Esparon, M., and Pollnac, R. (2017). Social capital as a key determinant of perceived benefits of community-based marine protected areas. *Conserv. Biol.* 31, 311–321. doi: 10.1111/cobi.12808
- Duarte, J., and Rebella, L. (2023). [Entrevista] 'Miles de puestos de trabajo, de turismo y de la pesca están en riesgo porque todo puerto petrolero contamina'. Available online at: <https://www.laizquierdadiario.com/Fabricio-Di-Giacomo-de-la-Multisectorial-Golfo-San-Matias-necesitamos-una-respuesta-colectiva> (Accessed May 15, 2025).
- Edgar, G. J., Stuart-Smith, R. D., Willis, T. J., Kininmonth, S., Baker, S. C., Banks, S., et al. (2014). Global conservation outcomes depend on marine protected areas with five key features. *Nature* 506, 216–220. doi: 10.1038/nature13022
- Fidler, R. Y., Ahmadi, G. N., Amkietli, A., Awaludinnoo, Cox, C., Estradivari, et al. (2022). Participation, not penalties: community involvement and equitable governance contribute to more effective multiuse protected areas. *Sci. Adv.* 8:8929. doi: 10.1126/sciadv.abl8929
- Florez, L., Romero, A., Ocampo Reinaldo, M., and González, R. (2024). *Informe técnico N° 08/2024: Composición de las capturas y estimaciones del descarte en la pesquería de arrastre del Golfo San Matías*. San Antonio Oeste: Instituto de Biología Marina y Pesquera Almirante Storni (IBMPAS), CONICET. Available online at: <https://bicyt.conicet.gov.ar/fichas/produccion/11734160> (accessed January 26, 2025).
- Fricke, A., Koppio, G. A., Alemany, D., Gastaldi, M., Narvarte, M., Parodi, E. R., et al. (2015). Changes in coastal benthic algae succession trajectories and assemblages under contrasting nutrient and grazer loads. *Estuaries Coasts* 39, 462–477. doi: 10.1007/s12237-015-9999-2
- Fundacion Inalafquen (2019). *Campaña Pride Rare*. Available online at: <https://www.fundacioninalafquen.org.ar/campana-pride-rare> (accessed May 24, 2025).
- Gastaldi, M., Pankey, M. S., Svendsen, G., Medina, A., Firstater, F., Narvarte, M., et al. (2024). Holobiont dysbiosis or acclimation? Shift in the microbial taxonomic diversity and functional composition of a cosmopolitan sponge subjected to chronic pollution in a Patagonian bay. *PeerJ* 12:e17707. doi: 10.7717/peerj.17707
- Gaymer, C. F., Stadel, A. V., Ban, N. C., Cárcamo, P. F., Ierna, J., and Lieberknecht, L. M. (2014). Merging top-down and bottom-up approaches in marine protected areas planning: experiences from around the globe. *Aquat. Conserv.* 24, 128–144. doi: 10.1002/aqc.2508
- Giakoumi, S., McGowan, J., Mills, M., Begger, M., Bustamante, R. H., Charles, A., et al. (2018). Revisiting 'success' and 'failure' of marine protected areas: a conservation scientist perspective. *Front. Mar. Sci.* 5:223. doi: 10.3389/fmars.2018.00223
- Gill, D. A., Mascia, M. B., Ahmadi, G. N., Glew, L., Lester, S. E., Barnes, M., et al. (2017). Capacity shortfalls hinder the performance of marine protected areas globally. *Nature* 543, 665–669. doi: 10.1038/nature21708
- Gkargkavouzi, A., Paraskevopoulos, S., and Matsiori, S. (2020). Public perceptions of the marine environment and behavioral intentions to preserve it: the case of three coastal cities in Greece. *Mar. Policy* 111:103727. doi: 10.1016/j.marpol.2019.103727
- Gobierno de la Provincia de Río Negro (2014). *Anexo Decreto N° 398 - Plan de manejo Área Natural Protegida Bahía de San Antonio, Río Negro, Viedma, Argentina*. Suplemento Boletín Oficial, 5258.
- González, P. M., Baker, A. J., and Echave, M. E. (2006). Annual survival of red knots (*Calidris canutus rufa*) using the San Antonio Oeste stopover site is reduced by domino effects involving late arrival and food depletion in Delaware Bay. *Hornor* 21, 109–117. doi: 10.56178/eh.v2i12.792
- González, P. M., Carbajal, M., Morrison, R. I. G., and Baker, A. J. (2004). Tendencias poblacionales del playero rojizo (*Calidris canutus rufa*) en el sur de Sudamérica: a study in population trends. *Ornit. Neotrop.* 15, 357–365. Available online at: https://digitalcommons.usf.edu/ornitologia_neotropical/vol15/iss5/38/?utm_source=digitalcommons.usf.edu%2Fornitologia_neotropical%2Fvol15%2Fiss5%2F38&utm_medium=PDF&utm_campaign=PDFCoverPages (accessed November 25, 2024).
- Gottwald, S., and Stedman, R. C. (2020). Preserving one's meaningful place or not? Understanding environmental stewardship behaviour in river landscapes. *Landsc. Urban Plan.* 198:103778. doi: 10.1016/j.landurbplan.2020.103778
- Gorrud-Colvert, K., Sullivan-Stack, J., Roberts, C., Constant, V., Horta e Costa, B., Pike, E. P., et al. (2021). The MPA guide: a framework to achieve global goals for the ocean. *Science* 373:abf0861. doi: 10.1126/science.abf0861
- Häder, Donat-P., Banaszak, A. T., Villafañe, V. E., Narvarte, M. A., González, R. A., and Helbling, E. W. (2020). Anthropogenic pollution of aquatic ecosystems: emerging problems with global implications. *Sci. Total Environ.* 713:136586. doi: 10.1016/j.scitotenv.2020.136586
- Helbling, E. W., Narvarte, M., González, R., and Villafañe, V. E. (2022). *Global Change in Atlantic Coastal Patagonian Ecosystems: A Journey Through Time*. Cham: Springer.
- Helbling, E. W., Villafañe, V. E., Narvarte, M. A., Burgueño, G. M., Saad, J. F., González, R. A., et al. (2024). The impact of extreme weather events exceeds those due to global-change drivers on coastal phytoplankton assemblages. *Sci. Total Environ.* 918:170644. doi: 10.1016/j.scitotenv.2024.170644
- Higgins-Desbiolles, F., Carnicelli, S., Krolkowski, C., Wijesinghe, G., and Boluk, K. (2019). Degrowing tourism: rethinking tourism. *J. Sustain. Tour.* 27, 1926–1944. doi: 10.1080/09669582.2019.1601732
- Hoschke, R., Pauli, N., Langlois, T., Knight, A. T., Davies, H., and Navarro, M. (2024). Navigating diverse commercial fisher perspectives for effective knowledge exchange in fisheries research and management. *Environ. Sci. Policy* 158:103798. doi: 10.1016/j.envsci.2024.103798
- Huang, S. C., Chang, Y., and Chang, S. K. (2024). From regional effectiveness evaluation and community engagement toward effective marine protected areas. *Ocean Coast. Manag.* 251:107075. doi: 10.1016/j.ocecoaman.2024.107075
- Jennings, V., San, K. M., Brown, M. J., Choice, L., Simpson, Q., Ford, I., et al. (2024). Place-based conservation in coastal and marine ecosystems: the importance of engagement with underrepresented communities. *Sustainability* 16:9965. doi: 10.3390/su16229965
- Lacey, J., Howden, M., Cvitanovic, C., and Colvin, R. M. (2018). Understanding and managing trust at the climate science-policy interface. *Nat. Clim. Chang.* 8, 22–28. doi: 10.1038/s41558-017-0010-z
- LEY N° 4644 (2010). Article 4. Available online at: <https://web.legisrn.gov.ar/legislativa/legislacion/documento?id=8542> (accessed February 12, 2025).
- Marine Conservation Institute (2025). *Argentina*. Available online at: <https://mpatlas.org/countries/ARG/> (accessed April 9, 2025).
- Marinho, C. H., Giarratano, E., Esteves, J. L., Narvarte, M. A., and Gil, M. N. (2017). Hazardous metal pollution in a protected coastal area from Northern Patagonia (Argentina). *Environ. Sci. Pollut. Res.* 24, 6724–6735. doi: 10.1007/s11356-017-8393-y
- Martín, G. (2024). Plan de manejo, ordenamiento territorial y urbanización: superposiciones y conflictos en el Área Natural Protegida Bahía de San Antonio, Argentina. *Proy. Estud. Geogr. Ordenam. Territ.* 18, 93–124. doi: 10.48162/rev.55.064
- Martinetto, P., Teichberg, M., Valiela, I., Montemayor, D., and Iribarne, O. (2011). Top-down and bottom-up regulation in a high nutrient-high herbivory coastal ecosystem. *Mar. Ecol. Prog. Ser.* 432, 69–82. doi: 10.3354/meps09173
- Moser, S. C. (2016). Can science on transformation transform science? Lessons from co-design. *Curr. Opin. Environ. Sustain.* 20, 106–115. doi: 10.1016/j.cosust.2016.10.007
- Ocampo Reinaldo, M., Svendsen, G., Romero, A., Florez, L., Cuesta Núñez, J., and González, R. (2023). *Informe técnico N° 01/2023: Campaña de investigación pesquera y ambiental ReDe 2022. Resultados preliminares sobre biomasa y estructura poblacional de la merluza común*. San Antonio Oeste: Instituto de Biología Marina y Pesquera Almirante Storni (IBMPAS), CONICET. Available online at: <https://bicyt.conicet.gov.ar/fichas/produccion/11727523> (accessed January 26, 2025).
- Pereyra, P. J., de la Barra, P., Saad, J. F., Gastaldi, M., Arcángel, A. E., Rodríguez, E. A., et al. (2021). Unravelling facilitation among introduced species: a mechanistic approach. *Biol. Invasions* 23, 3483–3496. doi: 10.1007/s10530-021-02592-7
- Pohl, C. (2008). From science to policy through transdisciplinary research. *Environ. Sci. Policy* 11, 46–53. doi: 10.1016/j.envsci.2007.06.001
- Relano Écija, V. (2022). *The de facto protection of marine protected areas* [Doctoral dissertation, University of British Columbia].
- Relano, V., and Pauly, D. (2023). The 'paper park index': evaluating marine protected area effectiveness through a global study of stakeholder perceptions. *Mar. Policy* 151:105571. doi: 10.1016/j.marpol.2023.105571
- Roberts, T., and Jones, P. J. S. (2013). North East Kent European marine site: overcoming barriers to conservation through community engagement. *Mar. Policy* 41, 33–40. doi: 10.1016/j.marpol.2012.12.016
- Romero, M. A., Grandi, M. F., Koen-Alonso, M., Svendsen, G., Ocampo-Reinaldo, M., García, N., et al. (2017). Analysing the natural population growth of a large marine mammal after a depletive harvest. *Sci. Rep.* 7:5577. doi: 10.1038/s41598-017-05577-6
- Saad, J. F., Narvarte, M. A., Abrameto, M. A., and Alder, V. A. (2019). Drivers of nano- and micropelagic community structure in a Patagonian tidal flat ecosystem. *J. Plankton Res.* 41, 621–639. doi: 10.1093/plankt/fbz045
- Salas, M. C., Defeo, O., and Narvarte, M. (2016). Attachment features of mytilids in ecosystems with mobile substrate: *Brachidontes rodriguezi* in San Antonio Bay (Patagonia, Argentina). *J. Mar. Biol. Assoc. U.K.* 96, 1449–1456. doi: 10.1017/s0025315415001599

- Sandbrook, C. (2015). What is conservation? *Oryx* 49, 565–566. doi: 10.1017/S0030605315000952
- Schwindt, E., Gappa, J. L., Raffo, M. P., Tatián, M., Bortolus, A., Orensanz, J. M., et al. (2014). Marine fouling invasions in ports of Patagonia (Argentina) with implications for legislation and monitoring programs. *Mar. Environ. Res.* 99, 60–68. doi: 10.1016/j.marenvres.2014.06.006
- Seco Pon, J. P., and Pereyra, P. J. (2021). First evidence of anthropogenic debris in nests of the kelp gull (*Larus dominicanus*) from a small semi-desert Argentinean coastal ecosystem. *Mar. Pollut. Bull.* 170:112650. doi: 10.1016/j.marpolbul.2021.112650
- Son, I. S., and Krolikowski, C. (2024). Developing a sense of place through attendance and involvement in local events: the social sustainability perspective. *Tour. Recreat. Res.* 49, 1–12. doi: 10.1080/02508281.2024.2335749
- Sullivan-Wiley, K. A., Shyamsundar, P., and Musengezi, J. (2023). Addressing human behavior in conservation design: learning from program applications. *Biol. Conserv.* 279:109877. doi: 10.1016/j.biocon.2022.109877
- Sun, Y., Zhu, L., Zhang, N., Wu, H., Chen, Q., and Wang, H. (2024). Study on pro-environmental behavior to enhance rural social-ecological resilience: the role of place identity and social cohesion as mediating mechanisms. *Land* 13:2144. doi: 10.3390/land13122144
- The MPA Guide (2025). *Stage of Establishment*. Available online at: <https://mpa-guide.protectedplanet.net/explore/stages-of-establishment> (accessed April 6, 2025).
- UNEP-WCMC (2025). *Protected area profile for Argentina from the World Database on Protected Areas, March 2025*. Available online at: <https://www.protectedplanet.net> (accessed April 9, 2025).
- United Nations Environment Programme (2017). *Strengthening the Science-Policy Interface: A Gap Analysis*. Nairobi: United Nations Environment Programme.
- Vázquez, N. N., Gil, M. H., Esteves, J. L., and Narvarte, M. A. (2007). Monitoring heavy metal pollution in San Antonio Bay, Río Negro, Argentina. *Bull. Environ. Contam. Toxicol.* 79, 121–125. doi: 10.1007/s00128-007-9084-z
- Watson, J. E. M., Dudley, N., Segan, D. B., and Hockings, M. (2014). The performance and potential of protected areas. *Nature* 515, 67–73. doi: 10.1038/nature13947
- White, A. T., Aliño, P. M., and Meneses, A. B. T. (2006). *Creating and managing marine protected areas in the Philippines*. Cebu City, Philippines: Fisheries Improved for Sustainable Harvest Project, Coastal Conservation and Education Foundation, Inc. and University of the Philippines Marine Science Institute.
- WHSRN (2019). *Bahía de San Antonio*. Available online at: https://whsrn.org/whsrn_sites/bahia-de-san-antonio/ (accessed April 1, 2025).