



## Research article

# Evaluation of the management of marine protected areas. Comparative study in Costa Rica

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## ABSTRACT

Costa Rica is one of the most biodiverse countries in the world, and stands out for its commitment to conservation. Along its two coasts, it presents a great heterogeneity of ecosystems and social realities. Social factors, more than physical-natural factors, determine the success or failure of an MPA, so they must be urgently incorporated into all phases of MPA management. The objective of this work is to analyze the management of three marine protected areas, to establish improvements. These areas are Santa Rosa National Park, Marino Ballena National Park and Cahuita National Park. The methodology used assesses 26 indicators grouped into 4 key factors: management body, planning subprocess, public participation, and implementation subprocess. The results of this evaluation are 5 possible scenarios. These scenarios have been termed (from the ideal situation to the least favourable): proactive (1), learning (2), interactive (3), centralized (4) and formal (5) management. The results of this study show that both Santa Rosa and Cahuita present a proactive scenario (1), with high citizen participation, although in practice the way the two MPAs are managed is very different. Marino Ballena, on the other hand, is in scenario 5 (formal), and a series of measures are presented that can move it towards scenario 2 (learning). In general, MPA management in Costa Rica tends to be adaptive, with high public participation, as determined by its public policies. However, the existence of a public policy favors but does not guarantee success in MPA management, as can be seen in the difference in results. Therefore, the periodic evaluation of its management, allowing for feedback, is essential.

## 1. Introduction

In recent decades, coastal-marine ecosystems and their associated ecosystem services have been heavily degraded, mostly due to anthropogenic pressures (Lotze et al., 2006; Halpern et al., 2008; Lotze et al., 2018). Integrated Coastal Zone Management (ICZM) falls within the framework of public policies that operate in the service of sustainable development in very unique geographical areas. It is a public function because it affects issues of public nature or property and basic interests of society (Barragán, 2010). The objective is integration in terms of the search for a balance between the protection of the physical environment and human development.

ICZM has emerged as a suitable methodological, as indicated by numerous international agreements (United Nations Conference on Environmental and Development, 1992 and World Coast Conference,

1993). It consists of a holistic approach, of dynamic and multidisciplinary character, to manage all those aspects that generate human impacts on coastal ecosystems: aquatic and terrestrial (UNEP, 2011). Some of its basic principles are the conservation of natural capital, social equity or economic viability. Also, strategic principles related to public policies and decision making must be taken into account: coordination and cooperation, adaptive management, scientific knowledge, public information, transparency, public participation, decentralization or shared responsibility. Participation is a critical component of progress in ICZM, which deserves special attention. Local knowledge can serve as a basis for innovative policy and management and complement scientific information (Benham, 2017).

ICZM includes the creation of marine protected areas (MPAs) (Cicin-Sain et al., 2005; UNEP, 2018) as a tool for biodiversity conservation and sustainable use of marine and coastal resources (Cvitanovic

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et al., 2013; Gallacher et al., 2016; López-Rodríguez and Rosado, 2017; Maestro et al., 2019; Scianna et al., 2019). MPAs complement and enable ICZM objectives by conserving nursery areas for fisheries production, increasing tourism revenues and recreational benefits, preserving wilderness values, promoting baseline scientific and management studies, etc.

The evolution in the management of MPAs fundamentally highlights: an increase in the number and extent of protected areas, the need to develop management and protection plans for ecosystems (Board, 2001) and the ecosystem approach (Lester et al., 2010). In addition, the Sixth World Parks Congress (2014) recommended increasing the number of effectively managed MPAs, and included in well-connected networks, to 30% by 2030.

Costa Rica is in the only intra-oceanic (separating the Atlantic Ocean from the Pacific Ocean) and intra-continental region in the world (Hall, 1985). Its high biodiversity is due to its geographic location, with coasts on the Pacific and the Caribbean, its irregular topography, which gives rise to a great variety of microclimates, as well as the presence of Cocos Island (Alvarado et al., 2012). Its land area is 51,900 km<sup>2</sup> and its marine area is 589,000 km<sup>2</sup> (SINAC, 2014). MPAs cover 2.73% of the total marine area (UNEP-WCMC, 2021). It stands out among other tropical countries for its commitment to biodiversity conservation and the high priority it occupies on the national political agenda (Gómez and Savage, 1983; Heywood, 1995; DiCastrì and Younés, 1996; Raven, 1997; Steinberg, 2001). It has 2% of its Exclusive Economic Zone (EEZ) under some category of conservation management, and 100% of its Pacific EEZ is managed for sustainable fishing of tuna and related species (Executive Decree No. 38681, October 2014) (Samper-Villareal et al., 2020). Costa Rica was the first developing country to initiate an ICZM programme (Sorensen, 1990, 2000) and has several policies related to ICZM, such as the National Marine Policy (2013) and the Policy for Protected Wildlife Areas (2011) (Samper-Villareal et al., 2020). Numerous MPAs have been created under this model, giving it international recognition (Morales et al., 2011).

The National System of Conservation Areas (SINAC in Spanish) is responsible for dictating policies, planning and executing processes for the sustainable management of natural resources. One of the reasons for its creation was the decentralization of decision-making to the regional level. To this end, eleven conservation areas (AC in Spanish) were established, covering the entire national territory. Ten of them are continental, and the eleventh corresponds to Cocos Island. There are nine management categories, which follow IUCN recommendations (Dudley, 2008). It has 169 protected areas, 62 of which are coastal-marine or exclusively marine. There are three collegiate management and participation bodies: the National Council of Conservation Areas (CONAC), in charge of all main decisions on protected areas, the Regional Council of Conservation Areas (CORAC) and the Local Council of Conservation Areas (COLAC) (Appendix 1).

The human population is aware of the importance of respecting their natural capital, because it provides services to many of its inhabitants, representing their economic livelihood (SINAC, 2018a). The country's main economic activity is tourism (Koens et al., 2009; SINAC, 2016a; ICT, 2017), with biodiversity being the main attraction for both national and international tourists; therefore, its conservation is fundamental for the economy. These arguments justify the establishment of an efficient system and a network of areas to protect its natural capital (Alvarado et al., 2012).

However, conservation and management efforts have not been equal in all MPAs (Beita-Jiménez et al., 2019). For example, Cocos Island, one of the most highly valued MPAs in the world (Edgar et al., 2014), is a World Heritage Site (Morales-Ramírez, 2008) and has one of the highest biomasses of top predators on coral reefs (Friedlander et al., 2012; Alvarado et al., 2016; Fourriére, 2016). However, MPAs such as those in the North Pacific have several fishing communities and are under pressure from strong and disorderly coastal development (Alvarado et al., 2018). The multi-use of marine spaces in this region generates

conflicts (Villalobos-Rojas et al., 2014).

Evaluation of the measures implemented is essential to identify the strengths and weaknesses of the management of each MPA and its impact on the communities (Pomeroy et al., 2006; Stoll-Kleemann and Job, 2008; Maestro et al., 2020). In this regard, various methodologies have been developed, some of which are based on the framework developed by IUCN-WCPA, following an iterative cycle of context, vision, planning, inputs, management processes, outputs, outcomes, and evolution (Pomeroy et al., 2006). Relevant examples have been developed by WWF (2003), NOAA, IUCN-WCPA and WWF (2004), WB and WWF (2007), and UNESCO (2007).

In 2008, SINAC conducted an audit that identified deficits in marine-coastal conservation (SINAC, 2008). Its report recommended, among its conclusions, the expansion and strengthening of the MPA system, the development and implementation of zoning criteria and the promotion of marine scientific research. A special volume of the *Revista de Biología Tropical* (Cortés and Morales-Ramírez, 2014), compiles a series of recommendations for the creation and/or expansion of MPAs in Costa Rica's North Pacific. Other studies, such as de Morais (2017), analyze MPA governance using case studies. The main challenges include the prevalence of terrestrial conservation, the tradition of establishing no-take zones, the top-down management approach, coordination between government agencies, centralized decision-making, financial resources, and international influence. In this regard, recent publications suggest that spatial planning, including ICZM, should evolve towards a bottom-up model, in which the local people are involved in planning processes (Arévalo-Valenzuela et al., 2021), or towards an intermediate model that combines elements of both top-down and bottom-up (Ballarini et al., 2021; Ferreira et al., 2015; Cowel et al., 2020) (Fig. 1).

This study focuses on three MPAs (Fig. 2) located in three different ACs: Santa Rosa in the Guanacaste AC (ACG), Marino Ballena in the Osa AC (ACOSA), and Cahuita in the Amistad Caribe AC (ACLAC). The objective was to analyze the management implemented in these areas and to identify the management scenario that has been adapted to each of them, as well as to present the general trend of such management in Costa Rica. These case studies have been chosen because they belong to different ACs and present different ecosystems, with very different social realities, representing the great heterogeneity of the country.

## 2. Material and methods

### 2.1. Study area

#### a. Santa Rosa

It is located in the ACG, a UNESCO World Heritage Site, and was declared a national monument in 1966 because of its historical value (Law 3694). In 1971, its status was changed to national park (NP) to protect the last remnants of dry forest in the region (MAG, 1987). The first marine portion was added in 1977 to conserve the sea turtle nesting area. Today the marine portion is larger and contains a wide variety of coral species.

The protected area of the ACG comprises different management categories, established by the corresponding executive decrees. They are administered and managed as a unit of 120,000 terrestrial ha and 43,000 marine ha, which constitute a single biogeographical block. Therefore, the Santa Rosa NP is within a management model that aims to maintain the integrity of its focal elements (SINAC, 2016a).

The ACG is very different from the management of other protected areas in Costa Rica because it integrates biological, social, economic, and political aspects (Janzen, 2000). It conducted a more transparent land acquisition process, by hiring local staff and pioneering the participation of society in conservation decision-making (Basurto, 2013).

#### b. Marino Ballena

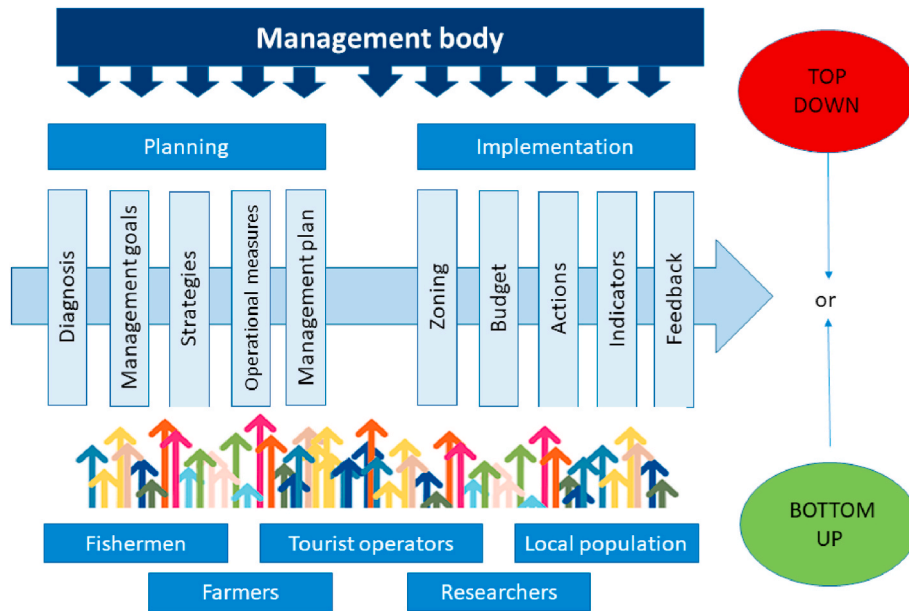


Fig. 1. Bottom-up vs. top-down models in MPAs in Costa Rica.

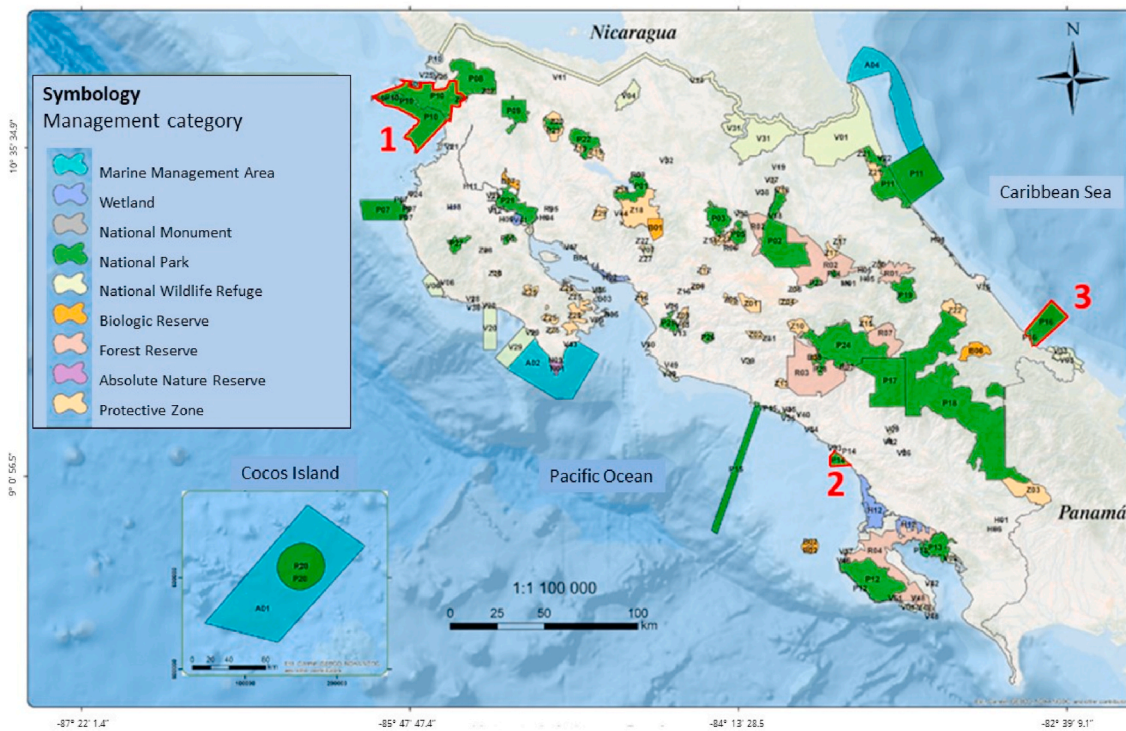


Fig. 2. Costa Rica's protected areas system and the three study areas: Santa Rosa (1), Marino Ballena (2) and Cahuita (3). Source: adapted from SINAC's website (2020).

Located in ACOSA, on the South Pacific coast, it was declared a NP in 1989 to safeguard coral reef areas and commercially valuable species (MIRENEM, 1990). It is a temporary refuge for the humpback whale and was the first park created exclusively to protect marine and estuarine natural resources. However, it was not until 1992 that its creation was legitimised (MIRE-NEM, 1992). It has an area of 115 ha on land and 5375 ha offshore (García, 1997). It is one of the areas in Costa Rica's central-south Pacific region with the highest number of coral species, 18 in total (Alvarado et al., 2005).

The initiative came from civil society, with the aim of protecting its

marine resources from commercial fishing activities (SINAC, n.d.). Once the park was created, fishing was prohibited, except for sport and artisanal fishing, which was regulated by the Ministry of Environment and Energy (MINAE in Spanish). This affected the inhabitants of the community, who, without access to the beaches, saw their source of livelihood limited. This situation generated conflicts, sometimes leading to violent actions. As a consequence, the community and MINAE started negotiating again and in 1997, a co-management scheme was adopted (Solís and Madrigal, 2004). Local stakeholders created the Marino Ballena National Park Association (ASOPARQUE in Spanish) to manage the

park together with the then Ministry of Environment, Energy and Telecommunications (MINAET in Spanish). However, this initiative failed due to the lack of operability, as Costa Rica does not have any regulations governing co-management. As a result, ASOPARQUE disappeared and, consequently, the differences between local groups and the state remained and in some cases even became more radical. Since then, the park has been administered by the government.

### c. Cahuita

Located in the province of Limón, in the ACLAC, Cahuita was declared a natural monument in 1970, and became a NP in 1978. Its purpose was to protect the most important coral reef on the Caribbean coast. The community had conflictive relations with the government in the past, because they were not previously consulted about the creation of the protected area (Quesada, 2006). Conflicts over expropriation and payment for the land lasted more than two decades (Piedrahíta, 1998). The debt was finally cancelled in 2002. In 1994, the conflict intensified because the government decided to increase the park's entrance fee, which provoked strong protests from the community. However, this disagreement culminated in 1997 with one of the first co-management experiences in Costa Rica, between MINAE and the Cahuita community, which had been collaborating in the management of the park since 1986 (Quesada, 2006). In 1998, the co-management committee was created (MINAE, 1998).

In 2012, the Workers Union of the Ministry of Environment and Energy opposed this model, as they were losing a significant amount of money from park entrance fees, and filed a complaint. In 2005, a report on the co-management of the Marino Ballena National Park, whose recommendations were also applied to Cahuita, concluded that co-management should disappear as it had no legal basis. Regional actions were not long in coming, seeking to regulate and protect its governance model. Despite the obstacles, and unlike Marino Ballena, this community has been able to extend its co-management agreement to the present day, since the Committee provided stability to the process for more than 20 years, demonstrating that the governance model has a successful historical foundation (SINAC, 2016b).

## 3. Methodology

The methodology used to analyze the management of Santa Rosa, Marino Ballena and Cahuita National Parks has been applied before in the Azores Marine Park (Maestro et al., 2020) and the Galápagos National Park and the Galapagos Marine Reserve. It has a social perspective that is based on the analysis of two fundamental elements: processes and people involved. The steps to be taken are as follows:

### Step 1. Selection of key management aspects

Four management aspects were identified as key. Key aspects are considered to be those of a transversal nature and that also encompass different elements. These are: management body, planning sub-process, public participation, and implementation sub-process. Based on the methodologies developed by the World Database of Protected Areas (WDPA), these four aspects have been chosen because, in a first approach, we aim to cover the whole process of planning and execution, and the people involved in the management: the managers and stakeholders (Fig. 3) (see Fig. 4).

### Step 2. Identification of specific indicators

A series of specific indicators were selected for each aspect. This resulted in 26 indicators (Table 1), which were chosen based on the literature reviewed and on our expert criteria. Some of them have been developed by the authors, while others have been adapted from other methodologies. Table 2 shows the general themes that have been drawn

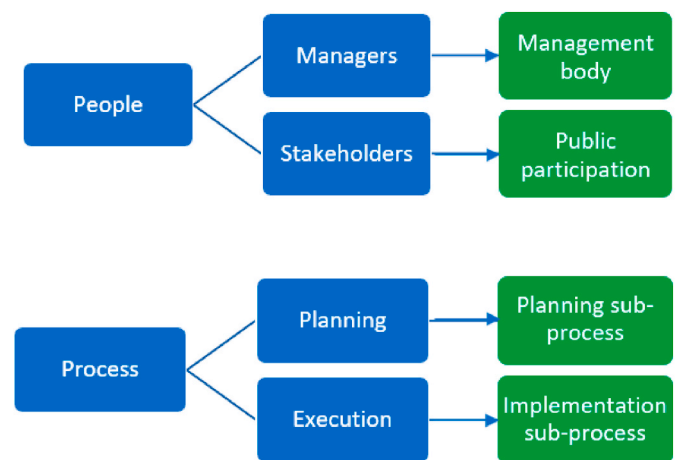


Fig. 3. The four aspects analyzed in the study.

from these sources.

Step 3. Data collection and assessment of indicators: score from 1 to 3 points.

Each of the indicators has been rated on a scale of one to three, with one being the most unfavourable situation and three the optimum. Although using these options is a simple representation, it covers the entire spectrum of responses, from a negative assessment of the indicator to an optimal situation, passing through an intermediate state. This system facilitates responses and future proposals for improvement. For each indicator, each of the ranges has been specified to identify what "optimal state" means (Table 1).

To respond to the indicators, several sources of information have been used (Table 3), primarily semi-structured in-depth interviews with the managers of the protected areas. In addition, members of the tourism, fishing, and local sectors were interviewed, where relevant and/or possible.

Semi-structured face-to-face interviews were conducted (n = 23), always by the same person (Table 4). Of the 23 interviews, nine were conducted in Santa Rosa NP, nine in Marino Ballena NP and five in Cahuita NP (Appendix II). During our visit to Cahuita Natural Park, the main leaders of the local committees were not available. Consequently, there are fewer interviews in this park. However, the in-depth interviews conducted were tremendously useful. Taking into consideration that the questions referred to fact-based data and not opinions, the intention was to eliminate the possibility of bias and confusing answers.

The information obtained from the interviews and field observations was contrasted with the bibliographic sources to determine the score obtained for each indicator. A total of 22 bibliographic sources were contrasted, of which 13 were scientific articles, 7 were technical documents from the administration and 2 were doctoral theses.

### Step 4. Definition of five management scenarios: Expert criteria

Once all indicators have a value from 1 to 3, the average is calculated to find out how each of the four key aspects is valued. The different possibilities that can be found are considered, depending on the value from 1 to 3 of each of the aspects. From this combination, we have proposed five models that represent five realities, depending on four variables each (Table 5). They are ordered from the ideal situation to the least favourable as follows:

- *Scenario 1: Proactive management.* The team that makes up the managing body is multidisciplinary and highly trained. They collaborate and cooperate with other institutions. Participatory management is carried out where all stakeholders are represented. It is planned years ahead and possible problems are anticipated.

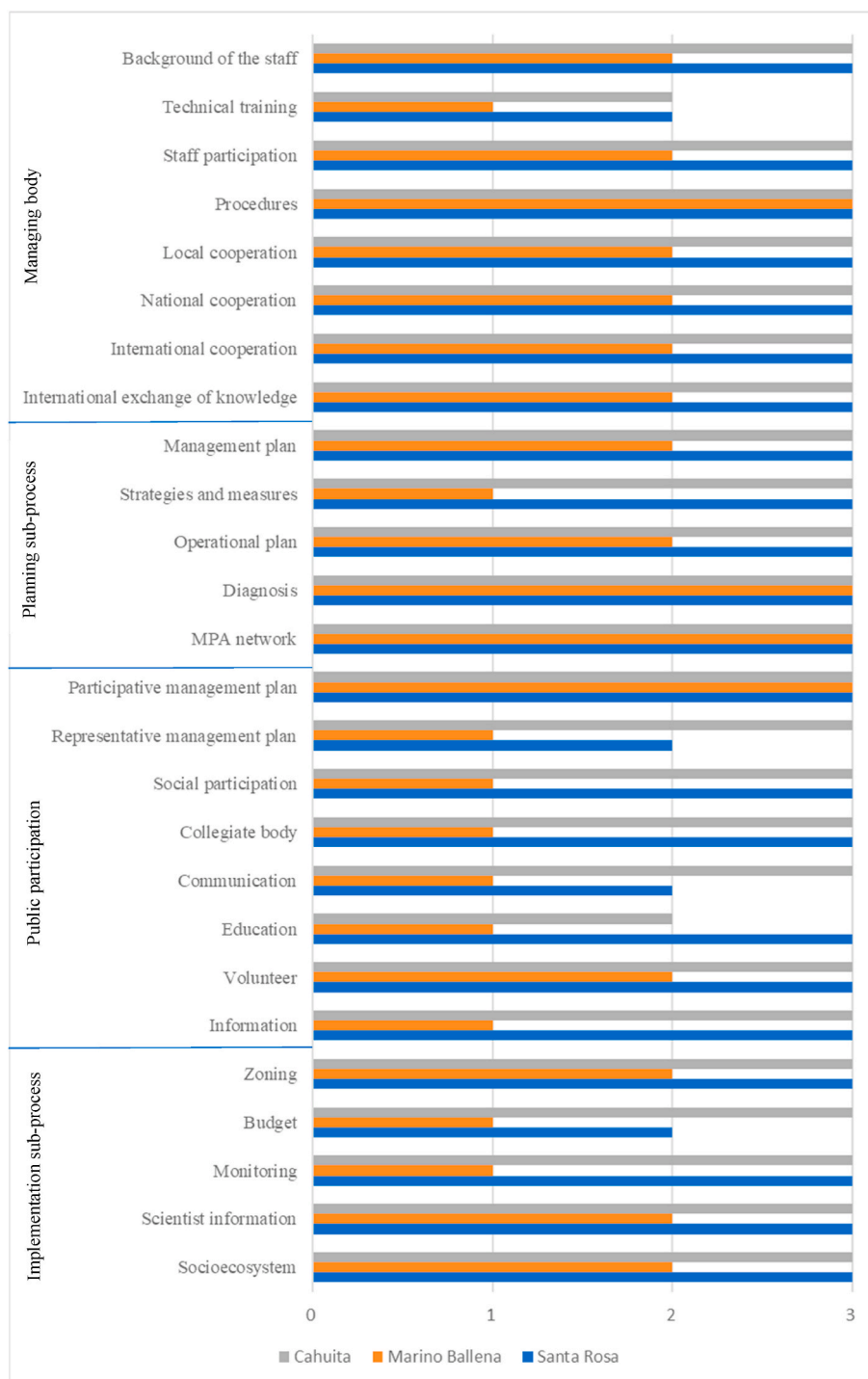


Fig. 4. Evaluation of indicators.

- *Scenario 2: Learning management.* Management actions are well planned and executed; however, there is no sound management body or mechanism for public participation. It is managed by responding to mistakes and successes from the past.
- *Scenario 3: Interactive management.* The management responsibility falls largely on social actors. All stakeholders are well represented and have appropriate participation mechanisms. Planning and implementation subprocesses are carried out transparently by the authorities. Awareness is high among the population.
- *Scenario 4: Centralized management.* The managing body is sound and multidisciplinary and functions correctly. It can belong to different

- scales. It has responsibility, determines the management objectives and develops and executes the management plan. However, public participation is not very common in decision-making.
- *Scenario 5: Formal management.* Priority is given to short-term management. Planning is extremely static, public participation in decision-making is not carried out, nor are there evaluation mechanisms or strategic medium-to long-term objectives.

A method of analysis and projection of reality through the construction of scenarios has been used, by applying alternative (five options) and contrasted (can be compared) scenarios (Maestro et al.,

**Table 1**  
Indicators for MPA management analysis.

Key management aspect	Indicator	Evaluation
Management body	1. Background of the staff	1 Without basic training or education.
		2 Higher education: only natural sciences.
		3 Higher education: multidisciplinary team (natural and social sciences)
	2. Technical training offered to staff	1 No, or sporadically.
		2 Yes.
		3 It also anticipates future needs.
	3. MPA staff participation in the planning processes	1 No.
		2 Sporadic.
		3 In all planning processes.
	4. MPA staff have the necessary procedures to participate in the planning processes	1 No.
		2 It has some procedures, sometimes insufficient.
		3 Yes.
5. Cooperation with other institutions at the local level	1 No.	
	2 Not with all institutions or not on a regular basis.	
	3 It exists on a regular basis with all institutions.	
6. Cooperation with other institutions at the regional level	1 No.	
	2 Not with all institutions or not on a regular basis.	
	3 It exists on a regular basis with all institutions.	
7. Cooperation with other institutions at the international level	1 No.	
	2 Not on a regular basis.	
	3 It exists on a regular basis, with a large number of institutions.	
8 Collaboration and exchange of knowledge with other international projects/programmes	1 No.	
	2 Not on a regular basis.	
	3 It exists on a regular basis, with a large number of projects/programmes.	
Planning sub-process	9. Management plan	1 No.
		2 Not implemented, or only partially implemented.
		3 It exists, is updated, is fully implemented, and has an established schedule for regular reviews and updates.
	10. Strategies and management measures identified with the management objectives	1 They do not exist or are not related to the objectives.
		2 They exist partly in relation to the objectives.
		3 They exist and are completely identified with the objectives.
	11. Operational Plan	1 No.
		2 Partially implemented.
		3 Fully implemented.
	12. Ecosystem diagnosis carried out prior to the development of the management plan	1 No.
		2 Not available to interested parties.
		3 Yes, and it is published or available.
13. The MPA integrated into an MPA network	1 No.	
	2 It's in the process of being integrated.	
	3 Yes.	
Public participation	14. Public participation in the process of developing the management plan	1 There was or is no management plan.
		2 Yes.
		3 Yes, at all stages of the development of the management plan and participation is foreseen for

**Table 1 (continued)**

Key management aspect	Indicator	Evaluation
Implementation sub-process	15. Representative public participation in the process of developing the management plan	1 the evaluation of the management plan.
		2 There was no management plan, it was not representative or there is no management plan.
		3 Only the priority groups were represented.
	16. Social actors participation in management decision making or planning processes	1 No.
		2 Through consultation
		3 Interactive participation with a direct impact on decision making
	17. Collegiate body for participation	1 No.
		2 Is not representative and/or does not function properly.
		3 It exists, it is representative and it works properly.
	18. Communication between stakeholders and managers	1 Very little or none.
		2 Not within an established programme.
		3 A communication programme is being implemented to build stakeholder support for the MPA.
19. Sustainability education activities	1 No.	
	2 Sporadically.	
	3 On a regular basis and with wide participation.	
20. Volunteer or environmental communication activities	1 No.	
	2 Sporadically.	
	3 On a regular basis and with wide participation.	
21. MPA information available to stakeholders and the general public	1 No.	
	2 Part is available upon request to the park management.	
	3 It is available on the website, available to any interested party.	
22. Zoning of the MPA	1 It does not exist for the use or conservation of resources.	
	2 It exists for use and conservation, but it is only partially functional or outdated.	
	3 It exists updated, with measures and concrete uses for each zone.	
23. Budget allocated for the management of the MPA is adequate	1 This information is not accessible.	
	2 The budget guarantees the costs of the administration and surveillance staff and the means necessary for management (vehicles, equipment, fuel, etc.).	
	3 The budget al.so allows for other innovative activities such as: research, development, etc.	
24. Monitoring and evaluation of biophysical, socio-economic and governance indicators	1 No.	
	2 It does not follow a strategy or regular collection of results, which are not systematically used for management.	
	3 There is a good system of monitoring and evaluation,	

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**Table 1** (continued)

Key management aspect	Indicator	Evaluation
		which is well implemented and used in adaptive management.
	25. Scientific information integrated into MPA management	1 No. 2 In some cases. 3 It serves to evaluate and improve the management of the MPA.
	26. The MPA considered a socio-ecosystem	1 No. 2 The social system is an important factor, but the natural system is a priority. 3 It is considered and taken into account throughout the process.

**Table 2**  
Topics evaluated with indicators adapted from other methodologies.

Topics	Sources
Trainings	Stolton et al. (2007), Hockings et al. (2007), Coad et al. (2015)
Planning tools	Coad et al. (2015)
Management plans	Stolton et al. (2007), Hockings et al. (2007), Gillespie (2007), Coad et al. (2015)
Operative plans	Stolton et al. (2007), Hockings et al. (2007)
Public participation	Hockings et al. (2007), Coad et al. (2015)
Collegiate bodies	Gillespie (2007)
Communication	Stolton et al. (2007), Hockings et al. (2007), Gillespie (2007), Coad et al. (2015)
Environmental education	Hockings et al. (2007), Coad et al. (2015)
Volunteer	Hockings et al. (2007)
Information	Gillespie (2007)
Budget	Hockings et al. (2007), Coad et al. (2015)
Monitoring	Hockings et al. (2007), Coad et al. (2015)
Scientific knowledge	Stolton et al. (2007), Hockings et al. (2007), Gillespie (2007)

**Table 3**  
Sources of information.

	INDICATOR RESPONSE			
	Management body	Planning sub-process	Public participation	Implementation sub-process
In depth interviews with managers	X	X	X	X
Management documents/instruments	X	X	X	X
In depth interviews with economic sector			X	X
Other (scientific articles, field work, workshops, conferences, meetings, etc.)	X	X	X	X

2020). This is a tool for understanding the potential and limits of management. The factors that define these scenarios can change over time, thus, are images of present, future, and/or desirable situations

**Table 4**  
Number of respondents separated by sector and national park.

Sector \ National Park	Santa Rosa	Marino Ballena	Cahuita
Managers/technicians	4	3	1
Fishing sector	2	1	2
Tourism sector	1	4	1
Local community representatives	1	1	1
Conservation association	1	0	0
<b>Total</b>	<b>9</b>	<b>9</b>	<b>5</b>

(Licha, 2000; Nygrén, 2019). Therefore, it is a proposal that allows us to understand the evolution of a management model. In addition, it can be seen whether certain specific changes (in any of the indicators) cause significant changes to the general model or not.

**4. Results and discussion**

In Santa Rosa NP, the management body has specialised higher education, but there are different levels of administration, not always with a university education. At the more operational levels (resource guards), many decisions are made and they participate in planning processes (SINAC, 2013). Marino Ballena NP has 16 staff members, only two of which make up the management body, both with higher education backgrounds. However, they are all obliged to multi-task due to lack of staff. A study by the University of Costa Rica found that a total of 37 permanent staff would be needed to meet the park’s current needs (Zumbardo, 2017). In the case of Cahuita NP, there is a co-management system, in which its managing body is the co-management board. It involves SINAC and several user associations (Development, Fishermen, Tourism, and Senior Citizens). Each member has different responsibilities and, therefore, different training. In the case of the park management body (under SINAC), the training is specialised.

In general, there is no solid training programme that anticipates the needs of the protected area. In the Santa Rosa and Cahuita NPs, training is offered, but according to the interviewees, it is usually too basic and insufficient. In the Marino Ballena NP training is offered sporadically. Some examples of courses are “customer service” or “shooting and protection of weapons”. There is also a lack of training directly related to integrated coastal management.

In the three MPAs, cooperation and collaboration with other institutions and organisations at different scales is constant: from the local fisheries and tourism sector, to the Costa Rican Tourism Institute (ICT), the Cantonal Institutional Coordination Committee (in the case of the Santa Rosa NP), to a large number of national and international NGOs and universities. The participation of the association “Costa Rica por Siempre” stands out. Cooperation at the local level is evident in the case of Cahuita since, through the co-management board, all sectors of interest are represented and participate in the management of the NP. At the international level, the collaboration with the Santa Rosa NP is remarkable, as it welcomes numerous researchers every year. Public policies in Costa Rica are characterized by inter-institutional coordination, articulation of regulatory frameworks and attention to the quality of life of local populations, their activities and natural resources (Sampedro-Villareal, 2020). Within the framework of this work, the Wildlife Protected Areas Policy and the National Policy of the Sea stand out above all. Some of its principles are comprehensiveness, ecosystem approach, representative public participation and social equity (SINAC, 2010).

In the Santa Rosa NP, there is a single management plan for the entire Guanacaste conservation area for the period 2014–2024 (SINAC, 2013). It includes specific strategies to mitigate the threats identified in the previous diagnosis. It is currently under revision. Each year an operational plan is approved and quarterly reports are developed to monitor the actions implemented.

The management plan for the Marino Ballena NP has been in place

**Table 5**  
Management scenarios.

Type of management	Rating				Figures
	Management body	Planning sub-process	Public participation	Implementation sub-process	
Proactive	3	3	3	3	
Learning	2	2	2	2	
Interactive	1,2	1,2,3	3	1,2,3	
Centralized	3	1,2,3	1,2	1,2,3	

(continued on next page)

Table 5 (continued)

Type of management	Rating				Figures
	Management body	Planning sub-process	Public participation	Implementation sub-process	
Formal <sup>a</sup>	1,2	1,2	1,2	1,2	

<sup>a</sup> Formal management occurs with any combination of one and two when the total is not two.

since 2011 and has been approved by the ACOSA Technical Committee and CORAC. However, it is not being implemented, mainly due to a lack of resources. Its objectives are focused on the conservation of the park, but always with the participation of the communities. The first revision is currently underway, with the aim of reactivating it.

The Cahuita NP Management Plan, in force from 2016 to 2026, was elaborated following a participatory process with an ecosystem approach (SINAC, 2012). At the same time, COLAC develops an operational plan each year. Prior to this, a diagnosis of the NP was carried out, including a biophysical, legal, socio-economic, tourism, and management analysis, a SWOT and the identification of activities associated with the conservation targets. A set of lines of action was established, with three years for the development of the priority activities on the agenda of the Local Council. It is estimated that after 10 years of implementation, effective management will have been achieved (SINAC, 2012).

The development of the management plan was participatory and mostly representative in all three MPAs, especially in Cahuita, where all the participating sectors are involved through the COLAC. Other MPAs have undergone a similar process. For example, MPA planning in Aotearoa (New Zealand) evolved from a conflictual to a more collaborative process, which was accompanied by improvements in efficiency and broad support for MPA implementation. These benefits can largely be attributed to increasingly inclusive and holistic decision-making processes (Davies et al., 2018). In the Santa Rosa and Cahuita NP, social actors participate or intervene in decision-making and in the different planning processes, through the CORAC, in the first case, and the co-management board in the second. In both cases there is fluid communication between stakeholders and managers. In the Cahuita NP, the co-management board meets monthly. Subsequently, each representative reports back to their sector. In addition, two annual meetings are held with the community, where they are informed of the progress made in the NP and can voice their opinion. Its co-management regime makes citizen participation strong, as it is the people themselves who make the decisions. In the Marino Ballena NP, however, although the elaboration of the management plan followed a participatory process, social actors are currently not involved in the management processes. The administration is making great efforts to initiate solid and transparent relations with the population, trying to form a COLAC that allows active participation.

At the national level, SINAC runs two programmes of interest,

volunteering and education, but participation in the different MPAs is unbalanced. Representatives of the NPs accompany students from schools to the parks. In the Santa Rosa NP, the relationship with the population was strengthened thanks to the Biological Education Programme. A large number of schools participate and it is nationally recognised. In parallel, there are other programmes, such as “Biosensibilización Marina”, which also works with children (SINAC, 2018b).

The information available varies from park to park. For example, the website of the Guanacaste conservation area contains a great deal of information, ranging from the most elementary to a database with scientific and technical studies that have been carried out in the area. Public documents generated in the implementation of the management plan should be available on this website (SINAC, 2013). In Cahuita they use the Facebook page of the protected area to communicate with the population and share information. Any citizen can access it on request. Marino Ballena does not have its own website or Facebook page, and communication is carried out through ACOSA.

The three MPAs are zoned, as indicated in the public use regulations. In general, zoning has been very useful, although in the case of the Marino Ballena NP, there are problems with illegal fishing in the marine zone (Ross, 2013).

In 1977, the National Parks Fund was created to finance the National Parks Service, which currently supports activities under the jurisdiction of SINAC. This fund has three main sources of income, which, in order of importance, are: entrance fees to protected areas, water concession fees, and the national park stamp. Based on the principle of financial solidarity, the areas that receive the most visitors share the income with others that receive less or are not open to the public, which has generated a great deal of criticism. In 2005, a SINAC-MINAE study revealed that only 38% of the financial resources allocated to SINAC were reinvested in actions related to protected areas, while the remaining 62% covered other matters, including the functioning of SINAC’s Central and Regional Offices and sub-regional offices (SINAC-MINAE, 2005). Marino Ballena is a case in point. It is notable for the lack of resources available for its management, despite being the third most visited protected area in Costa Rica (ICT, 2018). There is a lack of staff, vehicles, drinking water, improved facilities, and office equipment. At the beginning of this century, several studies highlighted this deficit (Ugalde and Solís, 2002; Confederación Costarricense de Guardaparques, 2001; Arguedas-Mora, 2002), a situation that has not changed to date.

Nevertheless, thanks to its particular development, the Santa Rosa NP has a certain financial, administrative, and operational autonomy (Basurto, 2013), so it can make decisions on budgetary issues, such as obtaining alternative sources of income. This allows them to distribute it according to their needs and to improve the operational side of management. In the Cahuita NP there are two entrances, one controlled by SINAC and the other by the community. For the latter, visitors pay a voluntary entrance fee. The full amount collected is reinvested in the community, which allows them to benefit from more effective management actions.

Since 1998, SINAC has applied a common methodology for management monitoring (Induni, 2005). Santa Rosa stands out for collecting and managing a large amount of scientific information. In the Marino Ballena NP, there is no indicator monitoring programme, but certain studies are carried out for specific aspects, such as tourism surveys. In addition, the Cahuita NP has its own monitoring programme to analyze the status of the focal elements identified in the management plan. These include, among others, reef monitoring (twice a year) and turtle monitoring. They have statistics for the last few years, and all scientific information is integrated into the management plan.

Scientific research varies considerably between MPAs. Some, such as the Santa Rosa NP, have a long tradition of research, but most areas in Costa Rica lack real and up-to-date data, leaving room for speculation in determining which services are under threat. The Santa Rosa and Cahuita NPs are considered socio-ecosystems. The Marino Ballena NP is still on its way to developing a strong relationship with the community.

#### 4.2. Identification of management scenarios for the three MPAs

Not all conservation areas have evolved in the same way. The Santa Rosa NP's management model (Fig. 5) has a strong local component. Its approach is clearly based on education and awareness-raising rather than control and protection, which is reflected in its day-to-day management. They have identified that the inclusion of the population at all stages is a fundamental element for effective and long-term management. It had a council that preceded CONAC, with the idea of involving society in decision-making. The management scenario that best suits this national park is *proactive*, thanks to the integrated work, its horizontal organisational structure, the broad citizen participation, and the strong scientific support, which have also served to successfully manage the protected area (SINAC, 2013).

Cahuita NP represents a unique management model (Fig. 6) and legal situation. The co-management, which has been developed in a successful, transparent and efficient manner, has reduced the initial socio-environmental conflict. It has promoted the joint search for opportunities, the sharing of responsibilities for the maintenance of ecosystem services, the improvement of the quality of life and the prosperity of the community of Cahuita and its national park. The park has reactivated the community's economy, generating productive activity throughout the year (SINAC, 2016b). The community's ancestral history, dependent on its ecosystem services, has been fundamental to the success of this co-management scheme. The management scenario that best suits their

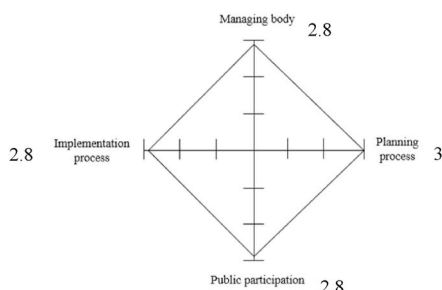


Fig. 5. Evaluation of the management of Santa Rosa National Park.

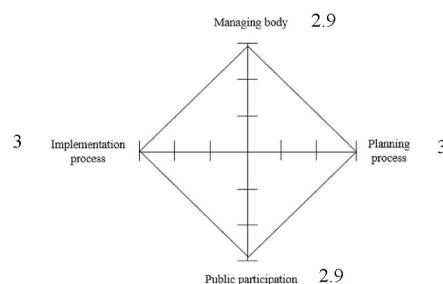


Fig. 6. Evaluation of the management of Cahuita National Park.

reality is *proactive*, even though their governance system differs from the Santa Rosa NP. The social actors carry the responsibility for management and all processes carried out by the authorities are transparent. In addition, planning and implementation processes are consolidated and adaptively managed. The co-management system of this park is nationally prominent (Samper-Villareal, 2020).

The Marino Ballena NP presents a very different reality (Fig. 7), as its inhabitants have not been resource users for so many years. This has led to the co-management model being replaced by Government control. This situation has led to mistrust among the community members. There are conflicts between the parties, although work is currently underway to form a local council in order to improve the situation and include the community in the management. There is a lack of resources, rendering management tasks very difficult, and conflicts and tension persist, representing a *formal* management scenario, as there is no public participation and no adequate management mechanisms in place.

#### 5. Conclusions

In general, it can be observed that protected area management in Costa Rica tends to be adaptive, with high public participation, as reflected in its national policies and as has been observed in the study areas. The ICZM has been identified as the ideal approach for the development of marine and coastal policies in Costa Rica. However, the existence of a public policy favors but does not guarantee success in the management of an MPA, as can be seen by the difference in the results. A common legal framework is important, but the management within each MPA, and the periodic evaluation of its management, allowing for feedback, are fundamental.

Similarly, the application of participatory processes provides elements of information that would be difficult to obtain by other means and becomes an excellent strategy for anticipating conflicts and granting greater legitimacy to public decisions, creating co-responsibility among citizens, economic agents and administrators.

The different management models represent the heterogeneity of the country and the different local realities. The two experiences of co-management in the Cahuita and Marino Ballena NPs, with very different results, show that models are not always replicable. Multiple factors come into play, such as the social history and character of the population. A top-down exclusionary approach to marine conservation

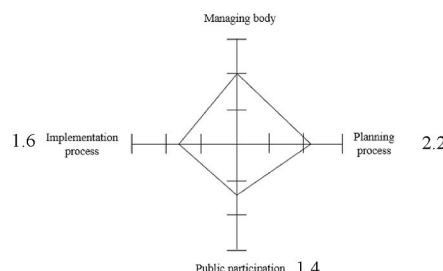


Fig. 7. Evaluation of the management of Marino Ballena National Park.

can undermine trust and hinder local acceptance of conservation measures, thereby compromising the long-term effectiveness of an MPA.

It can also be seen that the same management scenario can have very different applications depending on the reality of the area. Both Santa Rosa and Cahuita are adapted to a *proactive* scenario, but in practice they are managed differently, although with common aspects, such as the strong involvement of the population and the good planning and execution of the measures. This scenario is optimal for MPA management.

Management in Marino Ballena NP is identified as a *formal* scenario, which corresponds to the most basic and elementary of the classifications presented in this paper. In any case, the aim of this research was to assess how management works. In addition, it identifies the factors that may be conditioning the management model. It is logical to assume that it is not possible to move from scenario 5 to 1 directly, so this research recommends some priority actions, which can improve the score, especially in the key aspects that are scored below 2, so that NP can move to the *learning* scenario.

- Public participation:
  - o Develop a public and operative coastal directory (a "Who's who?") with the most influential social and institutional agents in the MPA, linked to uses, activities, and associations.
  - o Support the creation of the foundation or association "Friends of Marino Ballena", inspired by other examples that have been in operation for several decades in some European countries, so that civil society, with the help of the administration, can create an institution that promotes meetings.
  - o Create an effective communication system to disseminate the process of implementing the Management Plan. One of the main components of this system would be a dedicated Marino Ballena website. The NP's social networks could also be used as a communication channel.
- Implementing sub-process:
  - o Develop new criteria for the regulation and management of SINAC's economic-financial regime.
  - o Create the "Marino Ballena Observatory", whose function would be to select, elaborate, interpret, and disseminate information related to the MPA. It would also be responsible for the preparation of the annual report on the management of the protected area. In addition, it could select indicators to evaluate the implementation of the Management Plan, and could be linked to a University.

Finally, it is recommended that an inter-institutional project be developed to train staff working in MPAs in integrated coastal management (applicable to all protected areas), as the "training" indicator did not obtain the highest score in any of the MPAs.

With regard to the methodology applied, fieldwork and interviews have been fundamental, allowing us to obtain a clear vision of the perspective of the different sectors involved in the management of a marine protected area: academia, the economic sector, social actors, and public administration. The methodology is replicable because, in addition to having been applied in several countries, in this study it has allowed a comparison of the management of three MPAs in Costa Rica. This is significant because, at the same time, it allows the evaluation of a country's MPA policy, which is of great interest to administrators and managers in order to improve not only the integrated management of an MPA, but also a network of protected areas. The success of an MPA does not depend exclusively on one aspect, but on a combination of different factors. For this reason, a scenario-based methodology has been chosen, that relates the four elements. In addition, with the representation of the scenarios, it is easy to visualize the factors in which improvement measures should be incorporated to achieve the most suitable scenario, which is identified as proactive.

## Author statement

María Maestro: Term, Conceptualization, Methodology, Investigation, Resources, Writing original draft, Visualization. María Luisa Pérez-Cayeyro: Term, Conceptualization, Methodology, Resources, Writing – review and editing, Supervision. Juan Adolfo Chica-Ruiz: Term, Conceptualization, Methodology, Resources, Writing – review and editing, Supervision. Álvaro Morales Ramírez: Validation, Resources, Supervision.

## Declaration of competing interest

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

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvman.2022.114633>.

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