



Geoheritage, Geoconservation, and Geotourism Promotion in Costa Rica

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Abstract

Tourism became one of the most important sectors of the economy in Costa Rica since the end of the 1980s. It is from the massive arrival of international tourists attracted by the ecotourism offer based on a robust national system of conservation areas as well as from a rapid adaptation of both public and private sectors that investments in projects to improve the conditions of access, dissemination, and diversification of tourist attractions throughout the country have been increasing steadily. This work shows the main geoheritage and geodiversity characteristics of Costa Rica and focus on an evaluation of the 28 national parks (NP) of the total protected areas of the National System of Conservation Areas (SINAC) for a landscape and aesthetic, cultural, didactic, scientific, and tourism evaluation as potential geoparks. The evaluation determined that 13 of the NPs obtained a high rating, 11 were catalogued as medium, whilst four obtained a low rating. This initiative is an original and novel contribution for Costa Rica since it determines a baseline in the study of geosites and geoparks in the country. In addition, it shows the weaknesses and strengths of each national park in its objective to attract more visitors in the future.

Keywords

Geosites · Geoheritage · Geoconservation · Geoparks · National system of conservation areas · National parks

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13.1 Introduction

Costa Rica attracts more than 2 million tourists per year, who bring an investment of about 2.1 billion dollars to the country (Sada 2015; Hunt and Harbor 2019). Since the colonial period, ecosystems and geofoms present in the country had been used for intensive and extensive agricultural purposes. In the 1960s, Costa Rica's environmental policy changed to reverse this phenomenon and subject large areas of land of water, ecosystem, and landscape importance under conservation (Zeledón 1999; Quesada-Román and Pérez-Umaña 2020a; Acuña-Piedra and Quesada-Román 2021).

The country has a National System of Conservation Areas (SINAC), which divides the country into conservation areas and administers protected areas according to their management categories, which include forest reserves, protected zones, national parks, biological reserves, wildlife refuges, wetlands, natural monuments, marine reserves, and marine management areas. Every existing regulation in the country refers to conservation focused on biotic elements, but there is a gap in protection of certain abiotic resources, such as geological and geomorphological elements; in fact, the situation is similar to other Latin American countries (Palacio 2013; Rosado-González et al. 2020; Quesada Román et al. 2022). For this reason, projects have emerged to identify abiotic elements that should be protected such as the Global Indicative List of Geological Sites (GILGES) and IUGS Geological Heritage Sites, which were promoted by the International Union of Geological Science (IUGS) and the International Association for the Conservation of Geological Heritage (ProGEO), as well as the Geomorphosites Working Group within the International Association of Geomorphologists (Palacio 2013; Herrera-Franco et al. 2021).

A geosite is defined as a landform, geological formation, particular soil, or group of fossils that has an importance for understanding the Earth's history, which receives

additional significance from the population according to their perception and exploitation, these added values being aesthetic, cultural, historical, and socio-economic (Panizza 2001; Reynard & Panizza 2005; Zouros 2007; Ilies and Josan 2008; Mucivuna et al. 2019). Geosites, due to their attributes, can become important tourist attractions as they integrate several elements of human and natural history. Through the elaboration of geotourism maps showing local geomorphology, as well as respective geosites and facilities (such as trails and access), an adequate development of local geotourism is facilitated for the benefit of nearby communities (Reynard 2008; Santos et al. 2019).

Several geosite assessment methodologies have been developed in different countries (Feuillet and Sourp 2010; Reynard and Brilha 2018). These different geosite assessment methodologies allow recognising tangible values that are of varying interests, as well as values that give the geosite a higher significance, both natural and social (González et al. 2014). These methodologies even allow comparing different geosites with similar conditions, such as the study by Pérez-Umaña et al. (2018) who made a comparison of geosites in the volcanoes Poás in Costa Rica, Parícutín in Mexico, and Teide Pico Viejo in the Canary Islands, confirming that the same methodology can be implemented to compare geosites in volcanic areas with similar conditions in the world and provide an input to propose geoparks.

Geoparks are well-defined territories with a certain number of sites of geological interest (including geomorphological; Quesada-Román and Peralta-Reyes 2023) of variable size, which are complemented by ecological, archaeological, historical, cultural, and economic interests, meriting protection that highlights their importance, so that to be named a geopark it must contain geosites (Voth 2008; Medina 2012; De Jesús 2014; Brilha 2016; Gordon 2019).

In 2004, the Global Geoparks Network was founded by UNESCO following the example as the European Geoparks Network, and later the Asian Geoparks Network was created in 2007 (Palacio 2013), both of which form part of the Global Geoparks Network. Currently, the largest number of Geoparks are in Europe and Asia, whilst in Africa, there are only 2 UNESCO Global Geoparks. In the Americas, there are 17 UNESCO Global Geoparks: five in Canada and five in Brazil, two in Mexico, and one each in Uruguay, Ecuador, Peru, Chile, and Nicaragua (Global Geoparks Network 2017).

Latin America has great potential for studies of geosites and for the creation of geoparks. However, the theme is still incipient despite the great contributions that geosite assessments could give to already known tourist sites, as well as to sites that could become more valuable based on their natural and/or cultural characteristics that are still unknown to most of the population. This allows scientific information and cultural values to give more relevance to the geosites

of a given area (Pérez-Umaña and Quesada 2018; Rosado-González et al. 2020).

This work first shows the general geoheritage and geodiversity aspects of Costa Rica. Secondly, it is more focused on the protected areas of the National System of Conservation Areas (SINAC), because they have an organised and consolidated administrative structure, management plans, as well as the infrastructure to cater for growing tourist groups, attracted by their scenic, cultural, didactic, scientific, and touristic attractions. There are no people living inside the natural protected areas, but there are numerous villages in the surrounding areas whose local economy depends on the national parks (Pérez-Umaña and Quesada-Román 2018a, b). Some national parks have marine and insular areas, which were not contemplated because the valuation carried out considers those cultural values related to elements in continental areas. The exception is Cocos Island National Park, which is located 535 km from Cabo Blanco on the Nicoya Peninsula (Zúñiga 2008), because it has unique geological, cultural, historical, geological, and ecological characteristics of tourist interest (Díaz-Bolaños et al. 2012).

The procedure to identify potential geoparks using national parks in Costa Rica has been based on the geosite evaluation methodology of Santos et al. (2020), which takes into consideration a series of elements that add value to the geological/geomorphological richness. The evaluation was carried out taking into consideration the significance and impact of the national parks on Costa Rican society, taking as a reference cultural attributes, visitation data, and research carried out in them, obtaining this information through the bibliographic review.

Subsequently, the values were summed up to determine the potential of the territories to be proposed as geoparks according to their cultural and tourism values and the geodiversity they possess. The results of this summation are shown by means of cartography, which serve as input in this proposal. The Natural Jenks statistical method was used in ArcMap 10.3 to group the sum values into three ranges (high, medium, and low). The SINAC Conservation Areas were used in the discussion, as these are the administrative boundaries of the national parks. The conservation areas are denominated: Central (ACC), Central Pacific (ACOPAC), Arenal-Huetar Norte (ACA-HN), Arenal-Tempisque (ACA-T), Guanacaste (ACG), Tempisque (ACT), La Amistad Pacífico (ACLAP), La Amistad Caribe (ACLAC), Tortuguero (ACTo), Osa (ACOSA), and Coco Marine (ACMC).

The results of evaluation of potential geoparks in Costa Rica were validated taking as reference access, visitation, attractions, cultural manifestations, sense of national, regional, or local belonging. It was also analysed and discussed why certain national parks have received higher scores than the others from a landscape and/or aesthetic,

cultural, didactic, scientific, and touristic point of view. In Costa Rica, tourism represents an important part of Gross Domestic Product and is responsible for approximately 4–5% of its annual economic growth (Quesada-Román et al. 2022). Therefore, the development of initiatives and proposals that promote greater knowledge about tourist attractions of the national parks and its dissemination based on their natural and cultural values is a necessity for the country. The objectives of this chapter are to (i) depict the geodiversity of the country in a general perspective, and (ii) identify the national parks of Costa Rica that have the capacity to be also named UNESCO Global Geoparks given their natural and social characteristics, and based on the geosites that can be used as tourist attractions.

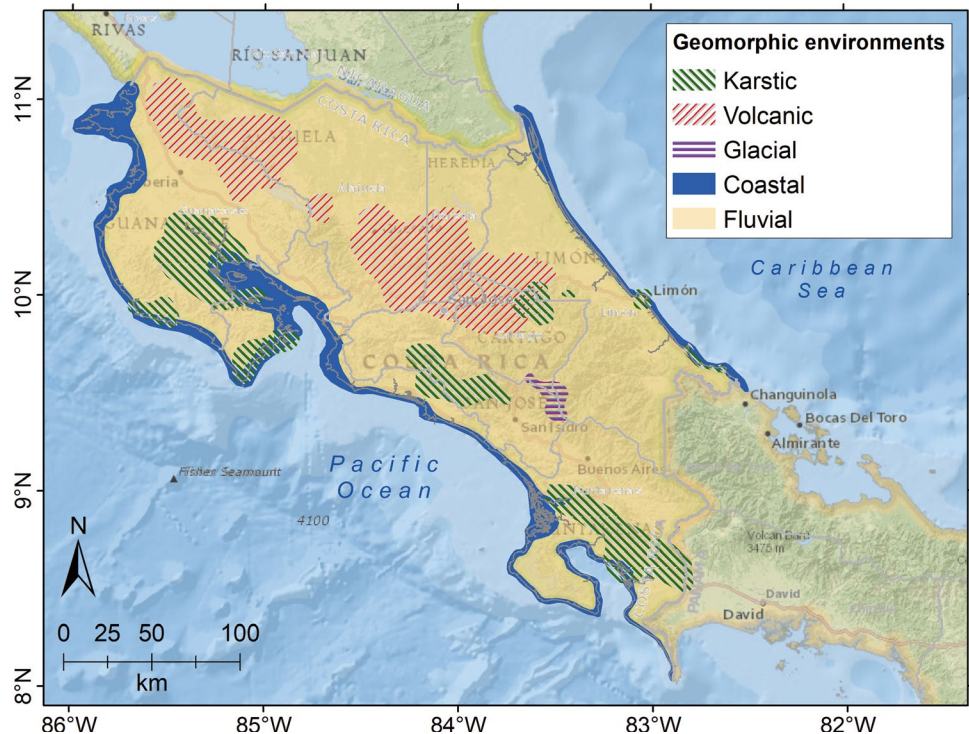
13.2 Geoheritage and Geodiversity of Costa Rica

Costa Rica exhibits a diverse range of geomorphic environments, including fluvial, coastal, and volcanic landscapes, with additional contributions from glacial and karstic formations (see Fig. 13.1). The country is geographically divided into two basins: the Pacific and the Caribbean, separated by a continuous chain of ranges with an NW–SE orientation, influencing precipitation patterns in each basin. Generally, the Caribbean region experiences annual means of up to 3000 mm, whilst the Pacific region receives between 1500 and 3000 mm.

Active Quaternary volcanism is observed in Guanacaste, the Central volcanic ranges, and the Arenal tectono-volcanic complex. The Talamanca Range exhibits Miocene–Quaternary volcanism, preserving volcanic forms eroded by fluvial and glacial dynamics since the Last Glacial Maximum. Non-active volcanic ranges like Tilarán and Aguacate exist, alongside active volcanic ranges with dynamic volcanoes such as Rincón de la Vieja, Arenal, Poás, Irazú, and Turrialba (refer to Fig. 13.3). Some massifs, despite their inactivity, retain original morphologies amid high erosion and weathering rates. Various volcanic landforms, concealed by dense forests, include waterfalls often found in lava flows or faults, showcasing volcanic and fluvial interactions. Examples of such features are abundant in both basins at the foothills of volcanic ranges. In both basins, fluvial and volcanic mountain landscapes experience high erosion and weathering rates, primarily due to rainfall and seismicity, resulting in frequent mass movement activities such as landslides, rockfalls, debris flows, and lahars (Campos et al. 2022). These processes contribute sediment to the fluvial system, impacting both natural landscapes and human activities.

The Northern Caribbean region consists mainly of Quaternary deposits eroded from the Guanacaste and Central volcanic ranges. This region exhibits abrupt changes with knickpoints, forming impressive waterfalls, wide eroded alluvial fans, extensive alluvial plains, river-estuarine channels in Tortuguero and Barra del Colorado, coastal lagoons, coastal bars, dynamic long beaches, and

Fig. 13.1 Main geomorphic environments depicting the general geodiversity of Costa Rica. Modified from Quesada-Román and Pérez-Umaña (2020a, b)



islands. Conversely, the Southern Caribbean region, adjacent to Talamanca Range foothills, features a narrow coastline transition dominated by hills, coral reefs, islands, beaches, and carbonate platforms.

The Pacific basin's intricate topography, characterised by lithological diversity and rapid base level changes from active and relict volcanic ranges, fosters the formation of massive alluvial fans, dynamic valleys, or tectonic depressions (e.g. General Valley, Central Volcanic Depression, and Turrialba), and various levels of alluvial terraces leading to the alluvial plains (i.e. Tempisque, Tárcoles, Parrita, and Térraba) with meanders extending to the coast. The Pacific coastal landforms are more diverse than their Caribbean counterparts, featuring gulfs, bays, coves, sea stacks, arches, tombolos, beaches, deltas covered by mangroves, and numerous islands. The country also has a diverse composition of wetlands divided into palustrine, lacustrine, and estuarine (Veas-Ayala et al. 2023).

During the Last Glacial Maximum, periglacial and glacial processes shaped the highest mountains of Costa Rica (above 3000 m) in the Talamanca Range, leaving relict erosional glacial landforms. These include volcanic slopes modified by glacial and periglacial action, glacial cirques, arêtes, riegels, roches moutonnées, as well as depositional landforms such as lateral moraines, till deposits, and glacial lakes. Although these formations are now relict, they are presently covered by páramo vegetation, harbouring several endemic fauna and flora species. Additionally, karst landforms are found along Fila Brunqueña, the Gulf of Nicoya, and certain parts of Nicoya beaches on the Pacific side, where mogotes, caverns, and sinkholes define this unique geomorphic environment. On the Caribbean side, karst landscapes are present in San Carlos, Turrialba, and the Southern Caribbean coastline, featuring carbonate platforms, islands, and caves.

13.3 Potential Geoparks Analysis

The assessment of the proposal developed in this research reveals that there are national parks that have significant geological and cultural values, whereas some obtained values indicate that there are areas that can be better exploited. The results of the evaluation are shown in Table 13.1.

The results were classified in three ranges (low, medium, and high) based on the sum of their variables to compare all the national parks. In the low value category are located those whose final assessments were between 0.310 and 0.545, these being Guanacaste, Diríá, Palo Verde, Tortuguero, Carara, La Cangreja, Barbilla, Internacional La Amistad, Corcovado, and Piedras Blancas National Parks. In the medium value category those scoring between 0.546 and 0.762 were included, corresponding to Santa

Rosa, Miravalles Jorge Manuel Dengo, Tenorio Volcano, Marino Las Baulas, San Lucas Island, Juan Castro Blanco, Braulio Carrillo, Manuel Antonio, Tapantí-Macizo de la Muerte, and Los Quetzales National Parks. National parks with scores between 0.763 and 0.973 were grouped in the high value category, including Rincon de la Vieja, Arenal Volcano, Barra Honda, Poás Volcano, Irazú Volcano, Turrialba Volcano, Cahuita, Marino Ballena, Chirripó, and Cocos Island National Parks (Fig. 13.2).

The Conservation Area with the highest number of national parks belonging to the high value category is the Central Conservation Area (ACC) where three national parks (Poás Volcano, Irazú Volcano, and Turrialba Volcano) obtained high scores. The Conservation Areas Guanacaste (ACG), Tempisque (ACT), Arenal-Huetar Norte (ACA-HN), Osa (ACOSA), La Amistad Pacífico (ACLAP), La Amistad Caribe (ACLAC), and Coco Marine (ACMC) have only one national park scoring high values each one. Other Conservation Areas do not have national parks in this category.

The Central Conservation Area (ACC) is the area with the highest number of national parks with a medium rating, with a total of three protected areas, namely Braulio Carrillo, Tapantí-Macizo de la Muerte, and Los Quetzales National Parks. Arenal-Tempisque (ACA-T) and Central Pacific (ACOPAC) Conservation Areas also stand out with two national parks of medium rating. The rest of the conservation areas have at least one national park with average score, except for the Osa (ACOSA) and La Amistad Pacífico (ACLAP), La Amistad Caribe (ACLAC), Tortuguero (ACTo), and Coco Marine conservation areas, where none of their protected areas have been evaluated as medium.

National parks with low ratings are distributed in the conservation areas of Central (ACC), Guanacaste (ACG), Tempisque (ACT), Arenal-Tempisque (ACA-T), Central Pacific (ACOPAC), Osa (ACOSA), La Amistad Pacífico (ACLAP), La Amistad Caribe (ACLAC), and Tortuguero (ACTo). Arenal-Huetar Norte (ACA-HN) and Coco Marine conservation areas do not have protected areas with a low score.

13.4 Tourism and Geosites in National Parks

Although this study gives important evidence of the potential that different national parks have in Costa Rica for the development of geoparks through the dissemination of scientific information on the geosites that each national park hosts due to their natural and cultural characteristics, a specific study of each national park is necessary to understand their particularities in even greater detail. However, although not all national parks have high value, they have a

Table 13.1 Assessment of the proposal in Costa Rica's national parks

National parks	Scientific value	Ecological assessment	Cultural assessment	Aesthetic assessment	Average
Chirripó	0.893	1	1	1	0.973
Poás Volcano	1	0.75	1	1	0.938
Irazú Volcano	1	0.75	1	1	0.938
Cocos Island	0.857	1	1	0.750	0.902
Marino Ballena	0.750	1	1	0.833	0.896
Arenal Volcano	0.893	0.75	1	0.917	0.890
Turrialba Volcano	0.821	0.75	1	0.917	0.872
Rincón de la Vieja	0.821	0.75	1	0.917	0.872
Cahuita	0.893	1	0.75	0.667	0.827
Barra Honda	0.857	1	0.5	0.917	0.818
Miravalles Jorge Manuel Dengo	0.714	0.75	0.75	0.833	0.762
Juan Castro Blanco	0.536	1	0.75	0.667	0.738
Tenorio Volcano	0.607	0.75	0.75	0.833	0.735
Manuel Antonio	0.893	0.5	0.75	0.667	0.702
Braulio Carrillo	0.607	1	0.5	0.667	0.693
Santa Rosa	0.893	0.25	1	0.500	0.661
Los Quetzales	0.500	0.75	0.75	0.583	0.646
Tapantí-Macizo de la Muerte	0.571	0.25	0.75	0.833	0.601
Marino Las Baulas	0.679	0.75	0.25	0.667	0.586
San Lucas Island	0.643	0.25	0.75	0.667	0.577
Corcovado	0.679	0.5	0.25	0.750	0.545
Tortuguero	0.607	0.75	0.25	0.500	0.527
Guanacaste	0.500	0.5	0.5	0.583	0.521
Palo Verde	0.750	0.25	0.25	0.667	0.479
Internacional La Amistad	0.536	0.25	0.25	0.667	0.479
Carara	0.429	0.25	0.5	0.583	0.440
Piedras Blancas	0.393	0.25	0.25	0.583	0.369
Barbilla	0.417	0.25	0.25	0.500	0.354
Diriá	0.321	0.25	0.25	0.500	0.330
La Cangreja	0.321	0.25	0.25	0.417	0.310

high annual visitation due to natural conditions, scenery, or ease of access that make them attractive to local and foreign tourists (Table 13.2).

Table 13.2 shows national parks with the highest annual visitation in Costa Rica, highlighting that one includes a volcano and two are coastal national parks. This high visitation is due to its short distance from San José and a cultural root with them (Alvarado et al. 2023; Mora et al. 2024). It should be noted that three of the nine most visited NPs obtained a high rating, whilst one obtained a medium rating (Manuel Antonio NP). Their high number of visitors indicates that there is good access to these national parks,

which is used by the local people to have businesses to earn income from the sale of food and souvenirs. However, during the period between 2012 and 2016, Poás Volcano National Park was the second most visited national park in Costa Rica, but in 2017, it was closed due to eruptive activation which put tourists at risk. This situation was beneficial for other national parks that attracted more tourists during 2017 (Pérez-Umaña et al. 2019). It was until 2019 that Poás Volcano National Park was positioned as the fourth most visited national park in the country with 147,230 visitors and 85,114 visitors in 2020 (SINAC 2021).

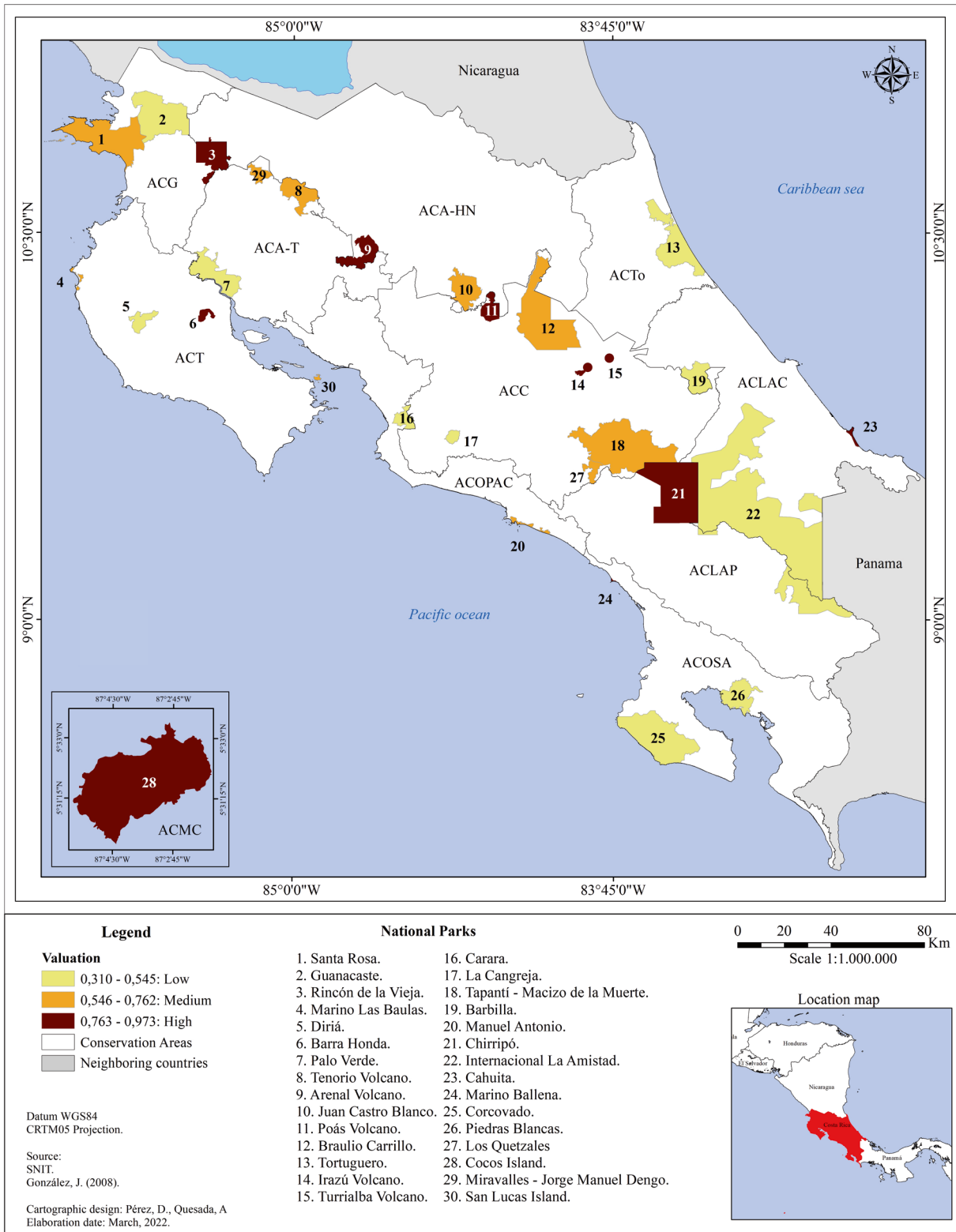


Fig. 13.2 Results of the assessment of national parks proposed as geoparks in Costa Rica

Table 13.2 Most visited national parks in Costa Rica, 2017–2020

National park	Visitors 2017	Visitors 2018	Visitors 2019	Visitors 2020
Manuel Antonio	475,052	524,835	513,050	224,762
Irazú Volcano	343,254	422,947	352,034	188,786
Marino Ballena	167,054	165,875	171,562	127,106

In 2020, there was a significant reduction in visits to national park by almost 50% as a result of restrictions imposed by the Costa Rica government to prevent the spread of COVID-19 and to protect the health of visitors to protected areas (Mora 2020). Some national parks continued to receive visitors, but their numbers were considerably reduced as shown in Table 13.2.

Most of the studied protected areas have at least one road entrance, such as Poás, Irazú, and Barva volcanoes being the only volcanoes in Central America to have a road that reaches their craters (Quesada-Román and Mata-Cambronero 2021; Pérez-Umaña 2023). An important aspect is that not all these protected areas have a paved road, but they do have land access to enter. There are national parks that are only accessible by sea, such as Cocos Island and San Lucas Island National Parks. In addition, some national parks have access by sea or air such as Tortuguero and Corcovado National Parks, but this does not reduce the interest of tourists, as well as to walk their trails and get to know the national protected area. Since a geopark is composed of geosites in its interior that serve as tourist attractions, it is necessary to list recognised sites of natural and/or cultural interest that serve as input for this proposal. These geosites should be sites that tourists can access and are representative of Costa Rica's national parks (Table 13.3).

13.5 Cultural Values in National Parks

Geoparks may have ancient cultural objects or cultural values within their territories, which contribute to the preservation of intangible values, such as cultural heritage (Porshnov et al. 2019). In other words, a geopark contains not only geological and geomorphological heritage, but also cultural heritage. These cultural manifestations are related to everything that people relate to these territories, as for example Pérez-Umaña (2017, 2023) describes that the Poás volcano has been inspiration for many artists as well as it is the place that is inspiration for many tales and legends. Another example is provided by Pérez-Umaña et al (2020) who state that the Irazú volcano had a place where indigenous rituals were performed, believing that it was the place where their gods lived. Vargas (2012) pointed out that the SINAC has functions such as managing, promoting,

facilitating, and participating in the development of sustainable tourism in protected areas based on responsible administration, planning, and management practices. These functions are the basis for the formulation of this proposal, as the existence of infrastructure facilitates the establishment of geoparks through the NP and subsequently the other protected areas of the country.

The geosites are binding elements in this proposal, as they allow to establish which attractions are available for the geoparks. In the case of Costa Rica, due to its tectonic, geological, geomorphological, climatic, and biological dynamics, there are diverse geomorphic environments ranging from volcanic, fluvial, coastal, to even glacial of the past, which have been modified by human action over the last thousands of years.

13.6 Examples in National Parks

Amongst sites of volcanic origin are several active and inactive volcanoes, one of its most striking geosites being the Main Crater in the Poás Volcano National Park (Fig. 13.3a). It is a spectacular feature and probably one of the largest craters in the world (Salguero 2003), originated by a strong Plinian eruption 3500 years ago. It has been an important inspiration for various artistic and literary works (Pérez-Umaña, 2017, 2023). Other volcanic geosites of interest are located in Irazú Volcano (Fig. 13.3b), with a summit at 3432 m asl where the craters of Diego de la Haya, Playa Hermosa, and Principal Crater are located. Also, from the summit, one can see the Pacific and Caribbean coasts and the Turrialba Volcano, which is a volcano that borders the Irazú volcano (Pérez-Umaña et al. 2020; Alvarado 2021).

In the Guanacaste Volcanic Range in northern Costa Rica, Orosí Volcano (Fig. 13.3c) is located within Guanacaste National Park, surrounded by tropical dry forest and with a fascinating eruptive history (Vargas-Sanabria and Quesada-Román 2018; Quesada-Román and Vargas-Sanabria 2022). Arenal Volcano (Fig. 13.3d) is one of the most striking volcanoes due to its conical shape, with an age of 7000 years, being one of the youngest volcanoes in Costa Rica (Alvarado 2021).

Costa Rica has a small segment of glacial geomorphology from the Last Glacial Maximum in the Talamanca Range (Orvis and Horn 2000; Quesada-Román et al. 2019). It is in

Table 13.3 Geosites of interest in Costa Rica's national parks

National park	Geosites
Poás Volcano	Main Crater, Botos Cone, Von Frantzius Cone, Congo Volcano
Irazú Volcano	Craters, Cerro Cabeza de Vaca, Active landslide, Pyroclastic Cone
Chirripó	Crestones, Cerro Chirripó, Las Morrenas, Cerro Ventisqueros
Santa Rosa	Peña Bruja, Naranjo Beach
Cahuita	Punta Cahuita, Vargas Port
Cocos Island	Cocos Island, Cerro Iglesias, Wafer Bay, Punta Presidio
Braulio Carrillo	Barva Volcano, Cacho Negro Volcano, Cerro Zurquí, Sucio River
Turrialba Volcano	Craters, Boquetes
Arenal Volcano	Arenal Volcano, Cerro Chato, Lava Flows, Arenal Lake Viewpoint
Manuel Antonio	Punta Catedral, Manuel Antonio Beach, Espadilla Sur Beach, Punta Serrucho
Tortuguero	Cerro Tortuguero, Tortuguero Canals, Barra de Tortuguero, Cerro Tortuguero
Rincón de la Vieja	Rincón de la Vieja Crater, mud volcanoes, Santa María Crater, Las Pailas
Corcovado	Corcovado Lagoon
Marino Ballena	Punta Uvita, Uvita Beach, Piñuela Beach, Ballena Beach
Marino Las Baulas	Grande Beach, Ventanas Beach, Langosta Beach
Internacional La Amistad	Cerro Kamuk, Cerro Pittier, Sabanas Esperanza, Silencio Valley
Tapantí-Macizo de la Muerte	Cerro de la Muerte, Cerro Asunción, Cerro Jaboncillo, Tapanti Waterfall
Tenorio Volcano	Rio Celeste Waterfall, Los Teñideros, Montezuma Volcano, Cerro La Carmela
Palo Verde	Palo Verde Lagoon, Cerro Catalina, Cerro Guayacán
Los Quetzales	Source of the Savegre River
Barra Honda	Caves, Mirador Nacaome, Cerro Barra Honda
Carara	Meandric Lagoon, Entierro Hills
Diriá	Brasil Waterfall, River sources
Guanacaste	Orosí Volcano, Cacao Volcano, Pedregal Site, Orosilito Volcano
Juan Castro Blanco	Platanar Volcano, Volcán Viejo, Río Segundo Caldera
Barbilla	River sources
Piedras Blancas	River sources
La Cangreja	Cerro La Cangreja
San Lucas Island	Cocos Beach
Miravalles Jorge Manuel Dengo	Miravalles Volcano

this area where the highest mountain in Costa Rica is located, Cerro Chirripó (Fig. 13.4a), with an altitude of 3820 m asl, located within the Chirripó National Park. Also, within this national park are located Los Crestones (Fig. 13.4b), intrusive rocks that were exposed by glacial erosion at an altitude of 3720 m asl. The national park hosts impressive paleoglacial landscapes such as valleys, moraines, lakes, and glacial cirques (Fig. 13.4c; Quesada-Román and Pérez-Umaña 2020b). Several glacial cirques have developed within the summits that nowadays indicate impressive paleostage dynamics during the Last Glacial Maximum, 20,000 years ago (Quesada-Román et al. 2020c, 2021).

Coastal areas are amongst the most popular tourist attractions in Costa Rica. An example is Manuel Antonio National

Park, located in the Central Pacific. Punta Catedral, a tombolo bordered by sandy beaches and forest (Fig. 13.5a), is one of the main attractions of this park, whereas Punta Serrucho (Fig. 13.5b), a rocky formation of large cliffs resulting from constant marine abrasion, is another one.

In the southern Caribbean of Costa Rica, the Cahuita National Park is located, with Punta Cahuita (Fig. 13.5c). This place is one of the few coral reefs in the Costa Rican Caribbean that provide sediments for the formation of white sand beaches (Herrera 1992; Zúñiga 2008; Quesada-Román and Pérez-Briceño 2019). Also, in the Marino Ballena National Park in the Central Pacific of Costa Rica is located Punta Uvita (Fig. 13.5d), an interesting geosite, which is a sandy tombolo that connects an islet with the beach (Zúñiga



Fig. 13.3 Volcanic geosites in Costa Rica's national parks. **a** Main Crater, Poás Volcano National Park *Source* (Poás Volcano National Park Facebook). **b** Playa Hermosa Crater and Sapper Hill, Irazú

Volcano National Park. **c** Orosí Volcano, Guanacaste National Park. **d** Arenal Volcano, Arenal Volcano National Park

2008). From this site, wide landscapes with a low swell touching the beaches of the tombolo as well as the nearby mountains of the Fila Costeña can be observed.

The geosites of some national parks in Costa Rica strengthen the proposal to establish geoparks in the country. Some characteristics such as scientific, cultural, historical, economic, and scenic beauty are determining factors in this proposal. Visitors to the national parks in Costa Rica can enjoy a variety of sites and features, from exuberant landscapes such as on top of the Turrialba and Irazú volcanoes, with interesting geological and geomorphological characteristics.

Since their origins, the national parks proposed in this study have had a cross-cutting approach to risk management. In 1955, with the approval of the Organic Law of the Costa Rican Tourism Institute N°1917, the first national parks in Costa Rica were created in the volcanic massifs of the main mountain ranges (Zeledón 1999). This becomes one of the first risk management actions in the country because it delimited the areas with risk potential and put a stop to expansion of an agricultural frontier and

the development of infrastructure into areas where people would put their lives at risk (Alvarado et al. 2021).

Although Costa Rica has worked on the protection of natural resources through the protection of biodiversity, which is why there are so many national parks in the country (Pérez-Umaña 2020), it is within the objectives for the creation of a protected area that the justification needs to involve a risk management approach. The same is true for environmental education; the entire environmental approach is visualised transversally so that citizens know that the existence of a national park is because it poses a threat to the population, as in the case of volcanoes, and that it is a site that should be taken care of from an environmental point of view. In other words, the creation of a protected area in Costa Rica provides knowledge of how to take care of the environment and stay away from dangers, working with resilience and adaptation to natural threats and providing full environmental education to society.

Another aspect to consider is the impact that national parks have on the local economy. Pérez-Umaña (2019)

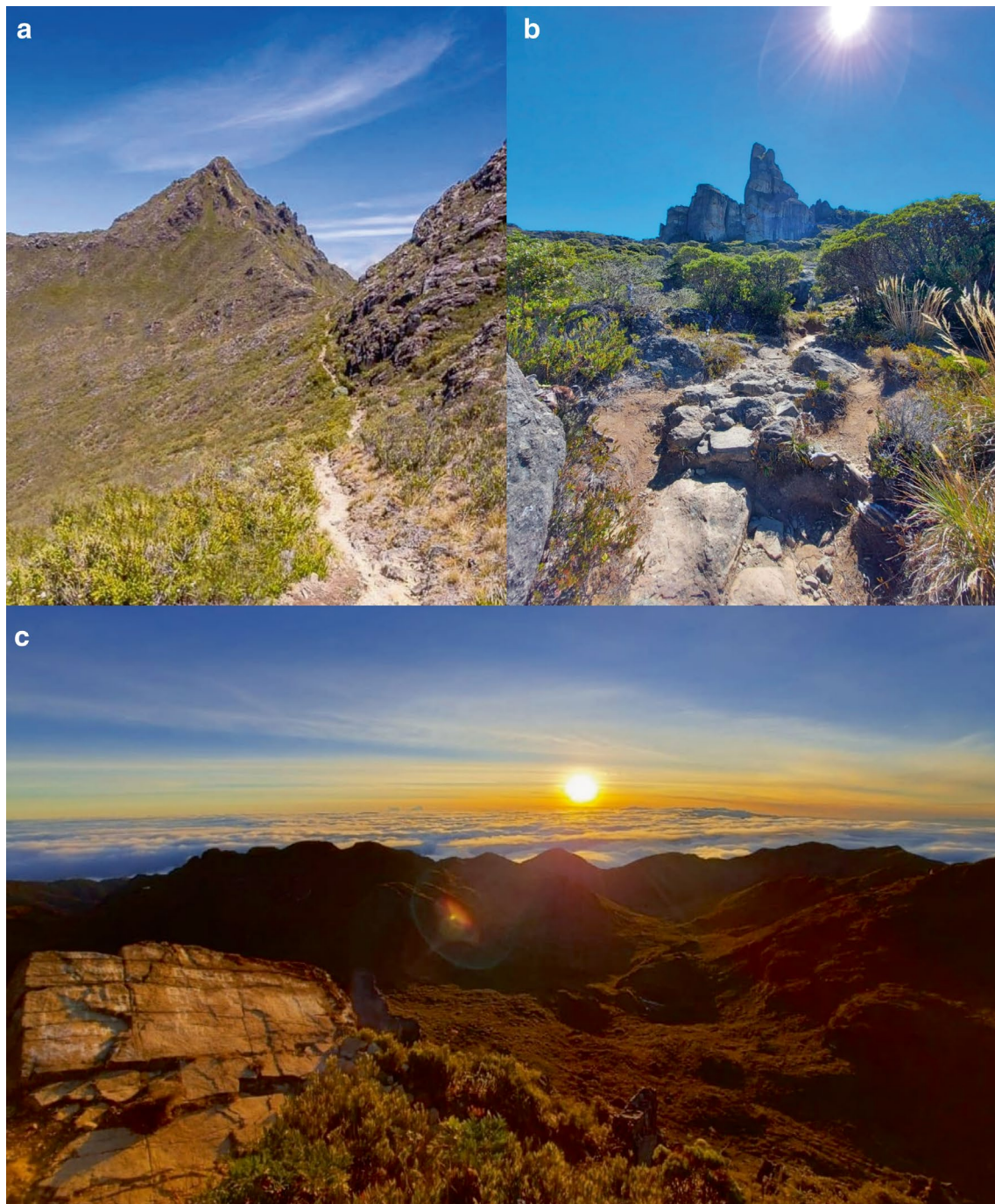


Fig. 13.4 Geosites of glacial origin in Chirripó National Park. **a** Cerro Chirripó. **b** Los Crestones. **c** Glacial landscape seen from Cerro Chirripó (Source courtesy of Melissa Agüero Rojas)

mentioned that the existence of a figure that protects the local geoh heritage would be an additional benefit for neighbouring communities who would see an increase in their income from tourists visiting these places. Currently, as demonstrated by Pérez-Umaña (2021), who reported that

through social networks information about site values and access to sites of interest is disseminated and nearby populations have economic income by offering to the public sales of home-made food from the region or other natural products to visitors.

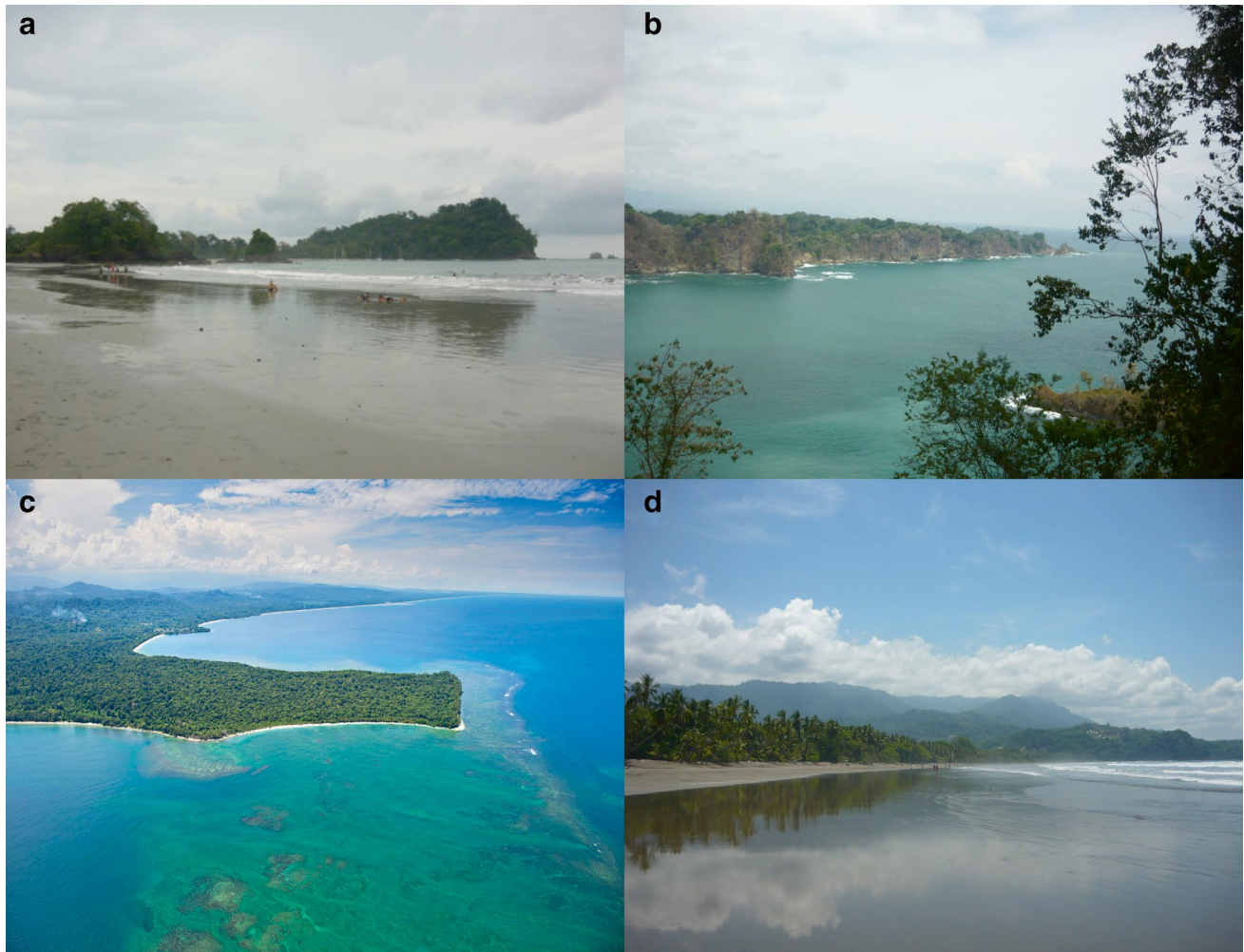


Fig. 13.5 Geosites in coastal national parks. **a** Punta Catedral, Manuel Antonio National Park. **b** Punta Serrucho, Manuel Antonio National Park. **c** Punta Cahuita, Cahuita National Park (Source Pucci et al. 2014). **d** Punta Uvita, Ballena Marine National Park

13.7 Conclusions

Costa Rica has gained global recognition for its environmental initiatives developed over the past three decades. These efforts have led to the creation of numerous protected areas, establishing the country as a premier ecotourism destination worldwide. The unique geodiversity of Costa Rica, shaped by the interplay of tectonics, volcanism, tropical climate, and diverse vegetation, encompasses a variety of geological environments, including volcanic, fluvial, coastal, karstic, and glacial landscapes.

In this proposal, 30 national parks of Costa Rica were evaluated and analysed because they are protected areas with a significant and ideal administrative and territorial organisation to be proposed as geoparks. In addition, several geosites of interest were identified inside national parks that strengthen the proposal. They would become important tourist attractions of these potential geoparks.

The evaluation found that 10 of Costa Rica's national parks were rated high, 10 were rated medium, whilst 10 were rated low. The evaluation shows that there are national parks that can improve to become geoparks such as better promotion of national parks as a tourist attraction or increasing accessibility, which would allow for greater number of visits by tourists.

Scientific and didactic evaluation work together; therefore, the more scientific research is carried out in these national parks and the more these results are disseminated, the better the general knowledge about the protected areas will be. As far as landscape appreciation is concerned, this can be increased if new viewpoints open to the public that tourists can use as new attractions in national parks, obviously hand in hand with management plans and sustainable development (Quesada-Román et al. 2023).

In the national parks which scored high, efforts should be made to ensure that they maintain the rating obtained.

Local, regional, and national population's attachment to these national parks can be improved, expanded, and new sites with wide landscapes that attract tourists can be found. People have a sense of identification with some national parks, but this must be improved so that the national population identifies with the national parks. Similarly, the tourist, scientific, and didactic structure should be improved to increase the number of visitors and to ensure that the results of studies are widely disseminated and known.

This initiative is a proposal in Costa Rica, a country that depends on the tourism sector, analysing landscape, cultural, didactic, scientific, and tourism variables to strengthen an existing tourism product. The aim is to improve the tourism offer in such a way that the visitor will not only have a place for recreation but will also be able to receive knowledge given the added social and cultural values. The proposal of geoparks accompanied by some geosites enriches Costa Rica in terms of tourism and economy, because by promoting these geoparks, new geosites can be sought to diversify the tourism offer that should be divulged (Quesada-Valverde and Quesada-Román 2023).

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